

R Paul Drake *Curriculum Vitae*

Name: R Paul Drake

Business Address: 2455 Hayward St., Univ. of Mich., Ann Arbor MI 48109-2143
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Positions: **Henry Smith Carhart Professor of Space Science,
Professor, Applied Physics; Professor, Physics, University of Michigan
Director, Center for Laser Experimental Astrophysics Research
Visiting Senior Scientist, Laboratory for Laser Energetics,
University of Rochester**

Education: B.A. *magna cum laude* 1975, Vanderbilt Univ., Nashville, Tennessee
Majors: Philosophy (with Honors) and Physics
Thesis title: "An Aristotelian Account of Causality"
Ph.D. 1979 (M.S. 1977), both in Physics
The Johns Hopkins University, Baltimore, Maryland
Specialty: Plasma Spectroscopy, Thesis title: "Extreme Ultraviolet
Diagnosis of a Neutral-Beam-Heated Mirror Machine"
Advisor: H. Warren Moos
Professional Ski Instructors of America
Associate Certification for Alpine Ski Instruction, 1983

Honors & Awards: Fellow of the American Physical Society, 1989
Phi Beta Kappa, Vanderbilt University, 1975
Distinguished Lecturer in Plasma Physics, APS/DPP 2003
Outstanding Undergraduate Research Mentorship UROP 2003
Departmental Research Excellence Award, 2009
Dist. Faculty Achievement Award, Rackham Graduate School, 2013
Ted Kennedy Family Faculty Team Excellence Award, 2014
Edward Teller Award, American Nuclear Society, 2017

Publications: > 260 refereed, > 300 citable,
Published first textbook in High-Energy-Density Physics

General Interests: Skiing, water sports, rowing, music, philosophy, economics, history

Professional Associations: American Physical Society
American Nuclear Society
American Geophysical Union
American Astronomical Society

Listed: American Men and Women of Science,
Men of Achievement,
Dictionary of International Biography,
Who's Who in the World and other Who's Who volumes

Research and Biography:

Professor R. Paul Drake has played a leading role in the development of two new, related fields of inquiry – High-Energy-Density Physics (HEDP) and High-Energy-Density Laboratory Astrophysics (HEDLA).

Dr. Drake's doctoral thesis was based on plasma spectroscopy measurements that overturned the common belief that a magnetic confinement device known as a "mirror machine" cannot confine impurity ions. Following this, Drake moved in 1979 into magnetic fusion confinement research at the Lawrence Livermore National Laboratory (LLNL), where he unified confinement theory and stability theory to explain the observed plasma confinement in a device called the Tandem Mirror Experiment. He switched into laser fusion research in 1982 and led early experiments on a laser known as Novette. During the next few years he conducted groundbreaking studies of the Stimulated Raman Scattering instability and related mechanisms in laser-produced plasmas, producing results that are still being cited, shown in textbooks, and taught in classes. This led in 1989 to his selection as a Fellow of the American Physical Society. He was also responsible during the mid-1980's for leading the activation for experiments of the highest-energy laser in the world at the time, known as Nova.

In 1989 Drake was chosen to lead the newly formed Plasma Physics Research Institute, whose purpose was to promote and accomplish joint scientific work involving LLNL and the University of California. He became an Associate Professor at U.C. Davis (and was promoted to Full Professor in 1991). During the next few years he turned his attention to the use of laser-fusion facilities for experiments to accomplish fundamental, discovery-driven research. As of 1989, this was occurring nationally only at one facility through one small grant program. Among other accomplishments, he was the first to identify the importance of a mechanism known as Langmuir Decay in the saturation of Stimulated Raman Scattering, a result that was at first very widely disbelieved but was eventually shown to be correct.

During the early 1990s Drake turned his attention specifically to the use of laser fusion tools and facilities to address issues in astrophysics, which is part of what is now known as High Energy Density Laboratory Astrophysics (HEDLA). This was at the time a completely new area. He is recognized as a founder of this field, along with the other three authors of the 1999 paper in *Science* describing it. In early work in this area, he invented an experimental system for the laboratory study of astrophysically relevant plasma effects driven by high-Mach-number flows. This design has been used since by groups in Japan and Europe to study such systems. He devised what is now the standard method of producing hydrodynamic jets using lasers, worked with a Michigan undergraduate student to develop an experimental design, and helped foster the development of an independent research team that is still pursuing this topic. He published a paper in 2000 providing the first scaling analysis of the requirements of laser experiments to study astrophysically relevant diffusive particle acceleration in collisionless shocks. More recently, he published a paper in 2012 discussing the experimental design of experiments to produce collisionless shocks in unmagnetized

plasmas and one in 2016 evaluating the requirements for the study of photoionization fronts using laboratory energy sources.

His primary focus since 1996, when he came to Michigan, has been in the areas of hydrodynamics and radiation hydrodynamics with applications to astrophysics. He led a long-term, multi-institution effort to explore the phenomena responsible for the mixing of stellar layers during supernovae, publishing in 2004 a paper demonstrating enhanced mixing under certain conditions. His group at Michigan and national and international collaborators continue to pursue this area. At Michigan he directed the 13 M\$/yr Space Physics Research Laboratory from 1998 –2002

Drake devised and led, beginning in 1999, the first astrophysically relevant experiments to produce radiative shocks, and has published papers on the theory of these shocks. These experiments led to many papers by his group members, and have been the subject of five Ph.D. theses at Michigan. He also collaborated extensively with a group in France that has pursued similar experiments. This set the stage for the successful establishment, in 2008, of the 5-year, 17 M\$ Center for Radiative Shock Hydrodynamics at Michigan.

Professor Drake has graduated Ph.D. students working in laser-plasma interactions, complex hydrodynamics, radiation hydrodynamics, waves in the solar wind, and astrophysical flows. He has published papers in experiments, theory, and simulation. Having worked in several areas of HEDP, he was motivated to teach and write in this area. He began offering a graduate course at Michigan in this area and in alternate years he teaches an intense, two-week summer school in this subject, which has been attended by graduate students and young scientists from the US, Europe, and Asia. He authored the first graduate textbook in HEDP, entitled *High-Energy-Density Physics*, and published by Springer in English in 2006 and in Chinese in 2013. In addition to his book, he has produced more than 260 refereed journal publications and more than 300 total citable publications. He was invited to review HEDP in a plenary lecture as part of the 50th anniversary celebration of the Division of Plasma Physics of the American Physical Society, in November 2008 and to write an article on HEDP that was published in *Physics Today* in June, 2010.

During the early 1990s Prof. Drake became a national advocate for university research in HEDP, which at the time was nearly nonexistent. Both his advocacy and his demonstration that such research was possible, at a number of laser facilities, contributed to the national context that led to the establishment of the “Science Use of Nova” program at LLNL and to the initiation of broader national support for university research in HEDP in the mid 1990s. His national role in this area continued. He was invited to speak before the Committee that published the National Academies Press report, *Connecting Quarks with the Cosmos: Eleven Science Questions for the New* in 2003, which advocated increased research in HEDP because of its connections to astrophysics. He was invited to speak before the Committee that published the National Academies Press Report *High Energy Density Physics: The X-Games of Contemporary Science* in 2002. These two NRC reports led to the formation by OSTP of a National Task Force on High Energy Density Physics, which invited him to speak and produced a report entitled

Frontiers for Discovery in High Energy Density Physics in 2004. This in turn led to the formation of an Interagency Working Group to determine how the U.S. government should proceed in stewarding the field of HEDP. Drake was one of three scientists invited in Nov. 2006 to meet with members of this task force regarding the connection of HEDP and Laboratory Astrophysics. The outcome of the Interagency Working Group was the formation of a joint program between the DOE Office of Science and the DOE National Nuclear Security Agency to steward the growth of HEDP as a fundamental discipline. Drake was a member of the first workshop to identify fundamental scientific elements of this program, the High-Energy-Density Laboratory Plasmas workshop, convened by the DOE Under Secretary of Science in 2007, and of the Federal Advisory Committee Subpanel to provide advice regarding the structure of this program in 2008. He was a chapter lead on a subsequent, similar report focused on the National Ignition Facility.

Through the work described above, Prof. Drake is also recognized as a founder of the area of High-Energy-Density Laboratory Astrophysics. He has been active in advocacy for and service to this new area. In the mid-1990s he was a founding member of the executive committee of the Topical Group on Plasma Astrophysics of the American Physical Society. He served as the fifth chair of the Topical Group in 2001. He has been a long-term organizer and has been chair of the HEDLA Conference, noted for its promotion of interdisciplinary research combining laboratory scientists with astrophysicists. He has spoken for the NRC Plasma Science Committee on issues of laboratory astrophysics. He was a member of the Laboratory Astrophysics Working Group of the American Astronomical Society, formed in 2007, and whose activities led the American Astronomical Society to establish in 2014 the Laboratory Astrophysics Division, for which he served as Treasurer until 2016.

Drake has made a sustained national and international impact in other ways as well. He has collaborated on experiments in France and Canada. He is frequently invited to survey HEDLA or HEDP for international audiences. He has served on the “jury” for five French Ph.D. candidates. The BBC documentary entitled *Hyperspace* and the Discovery Channel documentary *How the Universe Works* each includes a segment shot featuring him and his team’s experiments, filmed at a major laser facility.

Experience:

Director, Center for Laser Experimental Astrophysics Research,
University of Michigan, 2009-present

Director, Center for Radiative Shock Hydrodynamics,
University of Michigan, 2008-2014

Director, Space Physics Research Laboratory,
College of Engineering, Univ. of Michigan 1998-2002

Visiting Professor, University of Michigan, 1996-1998
Atmospheric, Oceanic and Space Sciences
Nuclear Engineering and Radiological Sciences

Director, Plasma Physics Research Institute,
Lawrence Livermore National Laboratory 1989-1996

Adjunct Professor, Atmospheric, Oceanic and
Space Sciences, University of Michigan 1996

Visiting Scientist, Applied Science Department
College of William & Mary, 1995-1996

Professor,
Department of Applied Science,
University of California Davis 1991-1993

Associate Professor,
Department of Applied Science,
University of California Davis 1989-1991

Group Leader for Plasma Physics
Nova Experiments Program,
Lawrence Livermore National Laboratory,
Livermore, CA 1985-1989

Physicist, Laser Fusion Program,
Lawrence Livermore National Laboratory,
Livermore, CA 1982-1985

Physicist, Magnetic Fusion Program,
Lawrence Livermore National Laboratory,
Livermore, CA 1979-1982

Teaching Assistant and Research Assistant
Department of Physics, Johns Hopkins Univ.,
Baltimore, MD 1975-1979

Teaching: Plasma Physics (1992, 1993)
Statistical Mechanics (1990, 1991)
Laser-Plasma Interactions (1988, 1996)
Mechanics - Dynamics (1997)
Space Plasma Physics (1998, 1999, 2000, 2004, 2005)
Nuclear Energy (1998)
Space Science (2000, 2001)
High Energy Density Physics (2003, 2004, 2005, 2009, 2011, 2013, 2016)
Graduate Fluid Dynamics (2006 twice, 2007, 2008, 2009, 2011, 2012, 2013, 2014, 2015)
Rocket Science (2007)

Advising/Training:

Korbie K. Dannenberg (2005)
Melanie A. Blackburn (2005)
Bradley Seaford (ca. 1992)

3 M.S. Students:

29 Ph.D. Students (actual or estimated graduation)

Keith S. Bradley 1992 ± (Staff Member, ANL)
Kevin L. Baker 1995 ± (Staff Member, LLNL)
Steven H. Bekhor 2002 (unknown)
Timothy B. Smith 2003 (Research Scientist, Michigan)
Paul Kominsky 2007 (Lecturer, Michigan)
Amy B. Reighard 2007 (Initially at LLNL, now Scientist, Naval Surface Warfare Center)
Carolyn C. Kuranz 2009 (Research Scientist, Michigan)
Eric C. Harding 2010 (Staff scientist, SNL)
Forrest Doss 2011 (Staff scientist, LANL)
Tony Visco 2012 (Staff scientist, Alliant Techsystems)
Channing Huntington 2012 (Staff Scientist, LLNL)
Jason Chou 2012 (Software Engineer II, Google)
Christine Krauland 2013 (Staff Scientist, General Atomics)
Eliseo Gamboa 2013 (Postdoctoral Fellow, SLAC)
Carlos DiStefano 2014 (Staff Scientist, LANL)
Michael MacDonald 2016 (Postdoctoral Fellow, UC Berkeley)
Jeff Fein 2016 (Postdoctoral Fellow, SNL)
Rachel Young 2017 (Postdoctoral Fellow, Michigan)
Willow Wan 2017 (Postdoctoral Fellow, LANL)
Joshua Davis 2018
Alexander Rasmus 2018
Laura Elgin 2018
Patrick Belancourt 2018
Robert Van derVort 2019
Joseph Levesque 2019
Adrianna Angulo 2020
Heath Lefevre 2020

Shane Coffing 2020
Raul Melean 2021

8 Post Doctoral Fellows

Steven H. Batha (Staff member, LANL)
Bruno S. Bauer (Professor, U. Nevada Reno)
James J. Carroll III (Professor, Eastern Michigan)
Paul A. Keiter (Research Scientist, Michigan)
Guy Malamud (Research Scientist, Negev, Israel)
Mario Manuel (General Atomics)
Tim Handy (current)
William Gray (current)
Rachel Young (current)
Arijit Bose (current)

International Thesis Committees

Doctoral: Laurent Boireau, Tomasso Vinci, Emeric Falize, Xavier Ribeyre, Bruno Albertazzi
Habilitation a Diriger des Recherches: Alexis Casner, Marina Olazabal-Loume

Many undergraduate research students

2015-2016 Amber George, Arielle Maxner, Adam Shen, Steven Walker, Shikhar Shah, John Soltis, Mrigank Gupta, Alexis Wisniarek, Spencer Paulissen, Matthew Finnigan, Julia Kerst, Brianne Hovde (12)

2014-2015 Eric Aleman, Patrice Balthazar, Marah Brinjikji, Thomas Brown, Thomas Bouranis, Marco Carmona, Hannah Fetner, Ben Fiering, Mrigank Gupta, Dennis Kanarsky, Graham Keep, Arielle Maxner, Nicholas McKay, Grant Renny, Daniel Pflug, Johnny Posada, Shikhar Shah, Joe Spurlin, Madelyn Sturney, Nicholas Tomke, Katherine Vaidya, Steven Walker, Alexa Wisniarek, Hannah Butler, Chandler Ekins, Megan Oosthoek (26)

2013-2014 Eric Aleman, Katrina Bartek, Sarah Bonhard, Thomas Bouranis, Adam Cowherd, Megan Darby, Hannah Fetner, Mrigank Gupta, Joshua Hall, Dennis Kanarsky, Tyler Kane, Graham Keep, Heath Lefevre, Arielle Maxner, Nicholas McKay, Omair Kawoosa, Arwa Raza, Grant Renny, Daniel Pflug, Sam Polson, Johnny Posada, Joe Spurlin, Caitlin Taylor, Nicholas Tomke, Nadia Dubovitsky, Brent Ritter, Molly Force (27)

2012-2013 Christopher Arnett, Britney Blankenship, Sarah Bonhard, Phillip Bonofiglo, Thomas Bournais, Emma Boyd, Adam Cowherd, Megan Darby, Molly Flynn, Joshua Hall, Nathan Janes, David Kaczala, Heath Lefevre, Grant Renney, David Rinaldi, Joe Spurlin, Caitlin Taylor, Nicholas Tomke, Caleb Zerger (19)

- 2011-2012 Britney Blakenship, Philip Bonofiglo, Emma Boyd, Colin Cornwall, Andrew DeZeeuw, Molly Flynn, Nathan James, Jimmy Johnson, David Kaczala, Kathleen Kiker, Heath Lefevre, Meghan Osterman, Grant Renny, Chris Ruiz, Whitney Smith, Andrew Swain, Guy Wilson (17)
- 2010-2011 Philip Bonofiglo, Britney Blakenship, Adam Budde, Colin Cornwall, Philip Falgoust, Kelsey Gasior, Zach Gzicki, Samsul Hoque, Alex Jaeckel, Jimmy Johnson, David Kaczala, Heath Lefevre, Megan McCarthy, Scott Perry, Nico Rombes, Whitney Smith, Paul Stewart, Andrew Swain (18)
- 2009-2010 Dave Bernthal, Philip Bonofiglo, Britney Blakenship, Adam Budde, Nicholas Clift, Colin Cornwall, Joe Ditmar, Matt Forsythe, Kelsey Gasior, Diana Goulding, Matt Gudorf, Namitha Jassem, Emily Lichko, Ray Mahaffy, Megan McCarthy, Eduardo Mucino, Scott Perry, Paul Stewart, Andrew Swain, Joshua Wehrly (20)
- 2008-09 Dave Bernthal, Britney Blakenship, Adam Budde, Paul Darnell, Joe Ditmar, Dara Fischer, Matt Forsythe, Nilton Gjerci, Diana Goulding, Namitha Jassem, Justine Lazo, Wai Lee Chan, Kevin Lin, Mariano Lowenstern, Marissa Mantey, Melina Michelen, Eduardo Mucino, Scott Perry, Paul Stewart, Andrew Swain, Marie Ternes
- 2007-08 Nilton Gjerci, Smantha Yap, Namitha Jassem, Scott Perry, Marie Ternes, Mariano Lowenstern, Eduardo Mucino, Matthew Pistone, Joe Ditmar, Adam Budde, Brittany Worley, Diana Goulding, Donna Marion, Matthew Forsyth, Antonia Hubbard
- 2006-07 Tiffany Thompton, Jessica Human, James Schultz, Nilton Gjerci, Mariano Lowenstern, Eduardo Mucino, Donna Marion, Christine Krauland, Duncan Campbell, Joe Ditmar, Stephen Martin, Clarice Lee, Adrienne Martz, Gurlovleen Rathore, Trisha Donajkowski, Sebastien Lounis, Jasmine Santana, Edward Wagner, Tyler Brown, Andrew Olson
- 2005-06 Christine Krauland, Sebastien, Lounis, Dan Austin, Donna Marion, Mariano Lowenstern, Eduardo Mucino, Trisha Donajkowski, Gurlovleen Rathore, Taufiq Karim, Jasmine Santana, Kai Ravariere, Kyle Hubbard
- 2004-05 Devon Lafferty, Mark Taylor, Donna Marion, Christine Krauland, Doug Kremer, Mike Grosskopf, Gurlovleen Rathore, Joe Garland, Trisha Donjakowski
- 2003-04 Carlos Fernandez, Neal Meyer, Chris Muscatello, Zenka Sellinger, Trisha Donjakowski, Rebecca Gabl, Doug Kremer, Mike Grosskopf, Peter Susalla, Saida Caballero, Erika Roesler, Eric Harding, Zhengfei Zheng, Jonathan Garrett, Koichi Murai
- 2002-03 Dave Leibrandt, Mike Grosskopf, Doug Kremer, Tyacie Corle, Peter Susalla, Erika Roesler, Eric Harding
- 2001-02 Eric Harding, Dave Leibrandt, Mike Grosskopf, Ayan Gosh, Luke Shaefer, Mike Grosskopf, Peter Susalla, Mike Kagan, Michael Thomas, Brandon Eagen
- 2000-01 Eric Harding, Leah Norstrud, Justin Benoit, Doug Gossiaux, Fred Ford
- 1999-00 Harry Reisig, Mike Lopez, Korbie Dannenberg, Eric Harding, Luke Gritter
- 1998-99 Gavin Koo, Harry Reisig, Mike Lopez, Shreya Shah, Joe Mrozinski, Stephen Steffes, Richard Algra
- 1997-98 Gavin Koo, Harry Reisig, Kristy Brock

1996-97 Harry Reisig, Kristy Brock

Professional Service:

Chair, 17th Annual Anomalous Absorption Conference Granlibakken, Tahoe City, CA, in May, 1987

Nominated to the Executive Committee, Division of Plasma Physics American Physical Society, 1989

Member, Fellowship Committee, Division of Plasma Physics of the American Physical Society, 1991

Member, International Steering Committee, International Topical Conference on Research Trends in Inertial Confinement Fusion, La Jolla, CA, Feb. 1991

Member, Program Committee, Division of Plasma Physics of the American Physical Society, Minneapolis, MN, Nov. 1994

Co-chair, Advanced Approaches to Economical Fusion Power, Monterey, CA, September, 1995

Member, Centennial Meeting Program Committee, American Physical Society, 1997-1999

Co-organizer, 2nd Topical Conference on Laboratory Astrophysics with Large Lasers, Tuscon, Arizona, Feb., 1998

Member, Executive Committee, University Fusion Association, 1998-2000

Member, Fellowship Committee, Division of Plasma Physics of the American Physical Society, 1998

Member, Organizing Committee, Snowmass Fusion Summer Study, 1998-1999

Organizing Group Leader, Frontier Science at the NIF: Episode I workshop 1999

Member, Organizing Committee, 3rd Topical Conference on Laboratory Astrophysics with Large Lasers, Houston, Mar. 2000

Member, DOE Committee for Review of Laser User Facilities, July-Oct. 1999

Member, DOE Committee to Review the Inertial Fusion Program at NRL, May 2000

Nominated for Vice-Chair Elect, Vice-Chair, then Chair, Division of Plasma Physics, American Physical Society, 2000

Member, Physics Division Review Committee, Los Alamos Nat. Lab., May 2001

Vice-Chair Elect, Topical Group on Plasma Astrophysics of the American Physical Society, 2000

Vice-Chair, Topical Group on Plasma Astrophysics of the American Physical Society, 2001

Chair, Topical Group on Plasma Astrophysics of the American Physical Society, 2002

Member, Program Committee, Division of Plasma Physics of the American Physical Society, Orlando, FL, 2002

Chair, 4rd International Conference on High Energy Density Laboratory Astrophysics, Ann Arbor, MI, Feb. 2002

Member, Executive Committee, University Fusion Association, 2002-2004

Member, Organizing Committee, Miniconference on Laboratory Astrophysics at APS/DPP meeting, 2003

Member, Organizing Committee, 5th International Conference on High Energy Density Laboratory Astrophysics, Tucson, AZ, Mar. 2004.

Member, Fellowship Committee, Division of Plasma Physics of the American Physical Society, 2004

Member, Scientific Organizing Committee, Michigan Center for Theoretical Physics Conference on Relativistic Jets, Ann Arbor, Dec. 2005.

Member, Organizing Committee, 6th International Conference on High Energy Density Laboratory Astrophysics, Houston, TX, Mar 2006

Member, Program Committee, Div. of Plasma Physics of the American Physical Society, 2006

Member, Organizing Committee, Advanced Accelerator Conference, Wisconsin, July 2006.

Member Stewardship Science Graduate Fellowship Committee, 2007

Member, Technical Program Committee, Inertial Fusion Science and Applications, Japan, Sept. 2007.

Member, Organizing Committee, Joint Conference on High-Energy-Density Physics and 7th International Conference on High Energy Density Laboratory Astrophysics, St. Louis, Mo, Apr. 2008

Member, Physics Adv. Council, Center for Self-Organization in Magnetized Plasmas, 2005-2008

Member, Advisory Council for UCLA's LAPD User Facility, 2000-2008

Member, High Energy Density (Betti) Report Subcommittee, Fusion Energy Sciences Advisory Committee, 2008

External member, JASONS review of National Ignition Campaign, January 2009

Member, Facilities Funding and Programs Study Group of the NRC Decadal Survey Astronomy & Astrophysics 2010, 2009

Member, Organizing Committee, Omega Laser Users Group workshop, April 2009

Co-chair, 2nd Int. Conf. on High Energy Density Physics, Austin, TX, May 2009

Chapter Lead, DOE Research Needs Workshop (ReNeW) on High Energy Density Laboratory Plasmas, 2009-2010

Member, Weapons Science Review Committee, Los Alamos National Lab, 2008-2014

Member, Working Group on Laboratory Astrophysics, Amer. Astro. Society, 2007- 2012

Member, Women in Plasma Physics Committee of the American Physical Society, 2008 – 2011

Treasurer, High Energy Density Science Association, 2006- 2008

Treasurer, High Energy Density Laboratory Astrophysics Conference, 2002 – present

Webmaster, High Energy Density Laboratory Astrophysics Conference, 2005 – 2010

Chair, Working Group on Laboratory Astrophysics, Amer. Astro. Society, 2010-2011

Member, Koonin Committee for review of progress in the National Ignition Campaign, Oct. 2010- 2012

Steering committee member, DOE Office of Science Workshop on Basic Research Directions at the National Ignition Facility, May 2011

Member, Executive Committee to initiate the Laboratory Astrophysics Division of the American Astronomical Society, 2012

Treasurer, Laboratory Astrophysics Division of the American Astronomical Society, 2013- 2016

Member, Proposal Review Committee for the Linear Coherent Light Source, 2013-2014

Member, LMJ-PETAL Basic Science Review Committee, 2014

Member, Nominating Committee, Division of Plasma Physics of the American Physical Society, 2015

Member, NNSA Diagnostic Programs Review Panel, Jan. 2015

Member, ICF Scientific Foundations Review Panel, July 2015

Chair, Nominating Committee, Division of Plasma Physics of the American Physical Society, 2015

Member, Panel of authors for Plasma Science Frontiers Report, Dept. of Energy 2015

Member, Executive Committee, Omega Laser Users Group, 2008-present

Member, Executive Committee, NIF Users Group, 2012-2016

Member, Editorial Board, High Energy Density Physics, The Journal, 2008 – present.

Member, Editorial Board, Physics of Plasmas, 2014-2018

Journal Referee

Physical Review Letters
Nature
Physical Review A/E
Physics of Fluids B/ Physics of Plasmas
Geophysical Research Letters
Astrophysical Journal
Journal of the Optical Society B
Laser and Particle Beams
Physics Letters A
Optics Letters
Journal of Geophysical Research
Journal of Physics D
Astrophysics and Space Science
AIAA Journal
Plasma Physics and Controlled Fusion
Shock Waves
Nature Physics
Review of Scientific Instruments
American Journal of Physics

Proposal Referee

National Science Foundation
National Science and Engineering Council, Canada
Lawrence Livermore National Laboratory
U.S. Dept. of Energy
EPSRC, Britain

Promotion or Thesis Referee or Reviewer

University of California Los Angeles
University of California San Diego
Princeton University
Stanford University
Australian National University
University of Rochester
University of Michigan
University of Toronto
Universite de Paris VI
Universite de Bordeaux
Imperial College, London
State University of New York Stony Brook
University of Nevada Reno
Centre d’Energie Atomique, France
Department of Applied Science, UC Davis
Chairman, 1990 Comprehensive Examination Committee
Chairman, 1991 Comprehensive Examination Committee

Chairman, 1991-1992 Peer Review of Teaching Committee
Lawrence Livermore National Laboratory
Chair, Foreign National Access Working Group, 1989-1990
U.C. Davis Committees
Decennial Review Committee for Crocker Nuclear Lab
Chair, Conflict-of-Interest Committee, 1991-1992, 1992-1993
Numerous qualifying examination committees

U of M, AOSS Department Service:

Member, 1998, Space Physics Research Review Committee
Member, 1998, Search Committee for Space Physics Research Lab
Member, 1998-2001, 2003, 2004 Graduate Education Committee
Member, 1998-1999, Search Committee for Meteorologist
Ex-Officio Member, 1998-2000, AOSS Executive Committee
Member, Fall 1999 Qualifying Examination Committee
Co-Organizer, Fall 1999, Fall 2000 Graduate Student Orientation
Member, 2000-2001 Undergraduate Curriculum Redefinition
Committee
Member, Spring 2001 Qualifying Examination Committee
Member, Spring 2002 Qualifying Examination Committee
Member, Fall 2003 SPRL Review Committee
Member, 2004-2005 Bargaining team for GSI contract
Qualifying examination chair, 2006
Chair, Promotion casebook committee, 2007
Chair, Promotion casebook committee, 2008
Chair, Promotion casebook committee, 2010
Chair, Promotion casebook committee, 2014
Graduate Chair, 2006 – 2014
Member, Graduate Committee, 2014 – present
College Representative for faculty candidate, 2016

Major Scientific Accomplishments:

Plasma Spectroscopy:

Showed that energetic oxygen, injected as an impurity by neutral-atom heating beams, can be confined in a magnetic mirror fusion machine [(Drake and Moos, *Nuclear Fusion* **19**, 407 (1979)], and that mirror-confined plasmas expel low-energy impurities. [(Drake and Moos, *Nuclear Fusion* **20**, 599 (1980)].

Plasma Confinement:

Unified confinement theory and stability theory to explain the observed plasma confinement in the Tandem Mirror Experiment [(Drake et al., *Nuclear Fusion* **21**, 359 (1981)].

Published the first experimental study of radial transport in magnetic-mirror plasmas [(Drake et al., *Nuclear Fusion* **25**, 2110 (1982)].

Laser-Plasma Interactions:

Discovered evidence of the production of hot electrons by the stimulated Raman scattering instability [(Drake et al., *Physical Review Letters* **53**, 1739 (1984)].

Discovered evidence that stimulated Raman scattering is an absolute instability under specific conditions; evaluated implications for laser fusion [(Drake et al., *Physical Review Letters* **60**, 1018 (1988) and other publications].

Quantified the effects of collisional damping and density-gradient scale length on the amplitude and spectrum of stimulated Raman scattering [several publications during 1988 and 1989].

Discovered the first evidence of stimulated Compton scattering in a laser-produced plasma [Drake et al., *Physical Review Letters* **64**, 423 (1990)].

Discovered the importance of effects of time-dependence for stimulated Brillouin scattering in laser-produced plasmas [Drake and Williams, *Physical Review Letters* **67**, 2477 (1991)]

Was first to identify the important of the Langmuir Decay threshold in controlling the onset of Langmuir turbulence in collisional plasmas [Drake and Batha, *Phys. Fluids B* **3**, 2936 (1991)].

Led a research team applying laser-plasma techniques to basic plasma physics, permitting numerous first observations of physical mechanisms [Numerous *Physical Review Letters*, 1990-present].

Provided the first confirmation of the theoretical calculation of convective gain for stimulated Brillouin scattering in inhomogeneous plasmas [Drake, et al., *Physical Review Letters* **77**, (1996)]

Laboratory Astrophysics:

Invented experimental system for the laboratory study of astrophysically relevant plasma effects driven by high-Mach-number flows [Drake, et al., *Phys. Rev. Lett.* **80**, 2068 (1998), *Ap.J. Lett.* **500**, L157 (1998).]

Provided first scaling analysis of the requirements of experiments to study astrophysically relevant diffusive particle acceleration. [Drake, *Phys. Plasmas* Nov. 2000]

Devised and led (as PI) first astrophysically relevant experiment to produce radiative precursor shocks. [Keiter (post doc) et al., *Phys. Rev. Lett.* Oct. 2002].

Identified enhanced transport of material by instabilities in supernova simulation experiment. [Drake, et al. *Phys. Plasmas* May 2004.]

Authored first textbook on High Energy Density Physics, including significant new theory of radiative shocks (2006)

Published analysis of requirements for unmagnetized collisionless shock experiments [Drake and Gregori, *Astrophys. J.* 2012]

Published analysis of requirements for laboratory experiments to produce and study photoionization fronts [Drake et al., *Astrophys. J.* 2016]

Major Leadership Accomplishments

Magnetic Mirror Program

Led several experiments and scoping studies, including the first experimental study of radial transport in magnetic-mirror plasmas.

Laser Fusion Program:

- Led the activation of the Novette Facility for target experiments and directed the experiments from May, 1983 through January, 1984.
- Led the activation of the Nova target chamber and the first experiments using the Nova laser. This included managing a group of approximately 20 people for two years.
- Managed the Plasma Physics Project then the Plasma Group from 1984-1989
- Led the first target experiments to employ advanced pulse shaping on Nova.
- Led and managed an effort to use optical streak cameras to obtain $\pm 10\%$ laser-pulse-shape measurements (1986 to 1988).

Plasma Physics Research Institute:

- Served as acting director beginning Sept. 1989.
- Served as permanent director, Jan. 1990 to July 1996

Space Physics Research Laboratory:

Served as director, July 1998-July 2002. (13 M\$ per year)

Center for Radiative Shock Hydrodynamics (CRASH):

Led the proposal effort 2006 – 2008 and served as director, 2008 – 2014 (17 M\$/5 yrs)

Center for Laser Experimental Astrophysics Research (CLEAR)

Led the CLEAR research team as it has grown to 7 faculty, 3 post docs, and 15 graduate students, CLEAR conducts experimental and computational research in radiation hydrodynamics, complex hydrodynamics, magnetized flows, and X-ray spectroscopy. 2009 – present

Invited Presentations at Conferences:

1. "Current Results of the Tandem Mirror Experiment" Int. Symp. on Physics and Open-ended Fusion Systems, Tsukuba, Japan, April 1980
2. "TMX Experimental Results", Division of Plasma Physics of the American Physical Society, San Diego, CA, Nov. 1980
3. "TMX Results and Future Tandem Mirrors", 17th Annual Symposium of the New Mexico Chapter of the American Vacuum Society, Albuquerque, NM, April 1981
4. "Radial Transport Experiments in TMX", Gordon Research Conf. on Plasma Physics, Ventura, CA, June 1981
5. "Laser-Plasma Interaction Experiments Using Several Kilojoules of Green Light", IEEE Int. Conf. on Plasma Science, St. Louis, Mo., May 1984
6. "Results of Large-Plasma Experiments Using Multikilojoule, Submicron Lasers", Division of Plasma Physics of the American Physical Society, Boston, MA, Oct. 1984
7. "Nova Target Experiments", 7th International Workshop on Laser Interaction and Related Plasma Phenomena, Monterey, CA, Oct. 1985
8. "Preliminary Performance and ICF Target Experiments With Nova", 11th Symposium on Fusion Engineering, Austin, TX, Nov. 1985
9. "Laser-Plasma-Interaction Experiments Using Multikilojoule Lasers", 18th European Conference on Laser Interactions with Matter, May, 1987
10. "Overview of Raman Scattering Experiments Using Nova", 18th Annual Anomalous Absorption Conference, L'Esterel, Quebec, June, 1988

11. "A Survey of Raman Spectra", 9th International Workshop on Laser Interaction and Related Plasma Phenomena, Monterey, CA, November 1989
12. "Recent Studies of Simulated Raman Backscattering", 20th European Conference on Laser Interactions with Matter, January, 1990
13. "Stimulated Raman Backscattering from Laser-Produced Plasmas", National Academy of Sciences Workshop on Optical and Plasma Physics, UCLA, March 1990.
14. "Speculations on Stimulated Raman scattering from Laser-Produced Plasmas: 'Merely' Nonlinear or also Chaotic", 1990 CAP/NSERC Summer Workshop on "Nonlinear and Chaotic Phenomena in Plasmas, Solids, and Fluids", Edmonton, Alberta, July 1990.
15. "Trends in Laser-Plasma-Instability Experiments for Laser Fusion", International Workshop on Research Trends in ICF, La Jolla, CA, Feb. 4-6, 1991.
16. "Three-Wave Parametric Instabilities in Long-Scale-Length, Somewhat-Planar, Laser-Produced Plasmas", 21st European Conference on Laser Interactions with Matter, October, 1991, Warsaw, Poland.
17. "Applications of Nanosecond, Kilojoule Lasers to the Basic Physics of Waves in Plasmas", SPIE Laser and Sensor Engineering Symposium, Los Angeles, Jan. 1992
18. "The Ion Acoustic Decay Instability in Laser Plasmas: Fluid Theory and Second Harmonic Emission", 11th International Workshop on Laser Interaction and Related Plasma Phenomena, Monterey, CA, Oct. 1993
19. "The study of waves and instabilities using Thomson scattering in laser plasmas", US-China-Japan Workshop on Laser Plasma and Drivers, Beijing, Oct. 1994
20. "Is stimulated Brillouin scattering irrelevant to laser fusion", Laser-plasma interactions workshop, Banff, Canada, February 1995
21. "Experiments for Fusion and Physics Using Trident ", 25th Anomalous Absorption Conference, Aspen, Colorado, May 1995.
22. "The study of waves and instabilities using Thomson scattering in laser plasmas", IEEE International Conference on Plasma Science '95, Madison, Wisconsin, June 1995.
23. "Greatly enhanced noise and the onset of stimulated Brillouin scattering", Annual Meeting of the Division of Plasma Physics of the American Physical Society, Denver, CO, November 1996.
24. "Nonlinear Evolution of Parametric Instabilities in Laser Produced Plasmas: Review of experimental evidence", 2nd International Workshop on Laser Plasma Interaction Physics, Banff, Canada, February 1997.

25. "Thomson scattering studies of waves in laser-produced plasmas and their connection with ionospheric interactions", National Radio Science and URSI Meeting, Boulder, CO, January 1998.
26. "Laboratory Astrophysics Experiments Using Large Lasers", New Frontiers in Laboratory Astrophysics, Opening Lecture, Workshop by the Royal Astronomical Society and the Institute of Physics, London, October 1999.
27. "Laser Experiments to Simulate Supernova Remnants", Annual Meeting of the Division of Plasma Physics of the American Physical Society, New Orleans, LA, November 1999.
28. "Overview of Laser Astrophysics Experiments", American Astronomical Society, Rochester, NY, June 2000
29. "Basic Science: Implications for NIF Shock Diagnostics", National Ignition Facility Diagnostic Workshop, Tuscon, Ariz., June 2000
30. "What's a Burning Plasma Good For?", Workshop on Burning Plasma Science, Austin, TX, Dec. 2000
31. "Plasma Laboratory Astrophysics: Mildly Relativistic Plasmas", National Research Council Committee on the Physics of the Universe, Pasadena, CA June 2001
32. "Supernova Hydrodynamics on the Omega Laser", International Conference on Fusion Sciences and Applications, Kyoto, Japan, Sept. 2001
33. "Breakthrough Science and the Role of Universities in High Energy Density Physics", National Research Council Committee on High Energy Density Physics, Irvine, CA Nov. 2001
34. "Laboratory Astrophysics with Intense Lasers: Introduction and Overview", Annual Seminar of the Laboratoire d'Utilisation des Lasers Intenses, Saint-Lary, Pyrenees, France, March 2002.
35. "Understanding Hydrodynamics of High Energy Density Matter: Laboratory Experiments and Astrophysical Connections", April Meeting of the American Physical Society, Albuquerque, NM, April, 2002
36. "Connecting Laboratory Experiments and Astrophysical Phenomena, Meeting on Intercomparison of Plasma Experiments in Laboratory and Space (IPELS), Whitefish, Montana June, 2003.
37. "Progress in Experimental Astrophysics at High Energy Density", Annual Meeting of the Division of Plasma Physics of the American Physical Society, Albuquerque, NM, October, 2003
38. "Radiative Shocks in the Laboratory and Astrophysics", 5th International Conference on High Energy Density Laboratory Astrophysics, Tucson, AZ, March 2004

39. "Hydrodynamics and Radiation Hydrodynamics with Astrophysical Applications", APS April meeting, Tampa, FL April 2005
40. "High Energy Density Physics: Recent Results and New Directions", Target Fabrication Specialist's Conference, Scottsdale, Arizona, May 2005.
41. "Hydrodynamic instabilities in the laboratory and astrophysics", Plenary lecture, European Conference on Plasma Science, Tarragona, Spain, June 2005
42. "Introduction to High Energy Density Physics", Opening Lecture, HEDP Summer School, Berkeley CA August 2005.
43. "Looking Toward Astrophysical Applications of Relativistic Lasers", Ultrafast Laser Applications conference, San Jose, Feb. 2006.
44. "HED Facilities and Their Connection to Issues in Astrophysics", Opening lecture, High Energy Density Laboratory Astrophysics Conference, Houston, TX, Mar. 2006.
45. "Theory of Radiative Shocks", IEEE International Conference on Plasma Science, Traverse City, MI, June 2006.
46. "Using Radiative Shock Experiments and Physical Thinking in Code Validation", Computational Methods in Transport Workshop, Granlibakken, CA, Sept. 2006.
47. "Overview of Laboratory Plasma Astrophysics," Workshop on Collisionless and Relativistic Plasma Astrophysics, Houston, TX, May 2007
48. "Compressible hydrodynamics, radiation transport, and radiation hydrodynamics," NNSA/Office of Science workshop on High Energy Density Laboratory Plasmas (HEDLP), Chicago, IL, May 2007
49. "Approaches to turbulence in high-energy-density experiments," Turbulent Mixing and Beyond, Trieste, Italy, Aug. 2007
50. "Experiments to explore structure in radiative shocks," Inertial Fusion Science and Applications, Kobe, Japan, Sept. 2007
51. "Toward astrophysical applications of relativistic lasers," International Symposium on Laser-Driven Relativistic Plasmas Applied for Science, Industry and Medicine, Kansai Photon Science Institute, Japan, Sept. 2007

52. "Introduction to High Energy Density Physics and its connections to Astrophysics", Annual science meeting of the Centre d'Energie Atomique, Bruyeres, France, Dec. 2007
53. "High Energy Density Laboratory Astrophysics and its connections to supernovae", Joint LLNL/LANL Astrophysics Initiative Workshop, March 2008
54. "Astrophysical problems for which high-energy-density physics can matter", April Meeting of the American Physical Society, St. Louis, April 2008
55. "Supernova-relevant experiments for the National Ignition Facility," European Conference on Laser Interaction with Matter, Darmstadt, Sept. 2008
56. "Perspectives on High-Energy-Density Physics," (Plenary lecture) Annual Meeting of the Division of Plasma Physics of the American Physical Society, Dallas, TX, Nov. 2008.
57. "Laboratory Astrophysics on the Linac Coherent Light Source", LCLS Workshop, Oxford, UK, Jan. 2009.
58. "Challenges to Understanding Radiative Shocks," 2009 IEEE Inter. Conf. on Plasma Science, San Diego CA, June 2009.
59. "Using High Power Lasers to Create Radiative Shock Waves," Conference on Lasers and Electro-Optics, Pacific Rim, Shanghai, Sept. 2009.
60. "High Energy Density Hydrodynamics and Radiation Hydrodynamics", Canadian Assoc. of Physics, Toronto, June 2010
61. "Producing Radiative Shocks for Laboratory Astrophysics Experiments", Workshop on Laser-Matter Interactions, Proquerolles, France, Sept. 2010
62. "Radiative Shocks in Laboratory Astrophysics", International Workshop on Radiation from High Energy Density Plasmas, Reno, Nevada, March 2011
63. "Basic Experimental Research in High-Energy-Density Physics", Sherwood Theory Meeting,
64. "Progress toward turbulent experiments at high energy density", Turbulent Mixing and Beyond, Trieste, Italy, August 2011
65. "A tour through shocks at HED: Collisional to collisionless ", CMSO conference, Hanover, New Hampshire, October 2011
66. "Various Challenges in Simulations of Laboratory Astrophysics Experiments", IPAM Program in Computational Methods in High Energy Density Plasmas: Workshop I: Computational Challenges in Hot Dense Plasmas, Los Angeles, March 2012

67. "Hydrodynamics at High Energy Density", School at Darmstadt, Germany, Oct. 2012
68. "High-Energy-Density Physics", plenary lecture, International Conference on High Energy Density Physics, Beijing, China, Oct. 2012
69. "Considerations relating to foam materials in laboratory astrophysics experiments", 5th International Laboratory Astrophysics Workshop, Weihai, China, August 2013.
70. "Recent Progress in Studies of Complex Hydrodynamics at High Energy Density," Plenary Lecture, International Conference on High Energy Density Physics, Beijing, China, Oct. 2014
71. "Heat Waves and Ionization Fronts", International Conference on Plasma Science, Antalya, Turkey, May 2015.
72. "Challenges in atomic physics and radiative transfer for laboratory astrophysics experiments," US-Israeli Workshop on Atomic Physics, Livermore, CA, Dec 2016.
73. "Challenges and Opportunities in Laboratory Plasma Astrophysics," Annual Meeting of the Laboratory Astrophysics Division of the American Astronomical Society, Austin, TX, June 2017

Invited Presentations by directly-guided post docs and students:

1. S.H. Batha, "Forward Scattering of Laser Light", Annual Meeting of the Division of Plasma Physics of the American Physical Society, 1992
2. B.S. Bauer, "First Experimental Detection of Ion Plasma Waves", Annual Meeting of the Division of Plasma Physics of the American Physical Society, 1994
3. A.B. Reighard, "Astrophysical Connections to a Driven Radiative Shock Experiment", High Energy Density Laboratory Astrophysics, 2006.
4. Carolyn Kuranz, "Supernova Hydrodynamics Experiments with Attention to the Transition to Turbulence", High Energy Density Laboratory Astrophysics, 2006.
5. A.B. Reghard, "Experiments on Collapsing Radiative Shocks", Annual Meeting of the Division of Plasma Physics of the American Physical Society, 2006
6. Carolyn Kuranz, "Supernova Hydrodynamics Experiments on the Omega Laser," Nuclear Astrophysics Workshop, Livermore, CA, August 2007
7. Carolyn Kuranz, "Laboratory blast-wave driven instabilities," International Conference on High Energy Density Laboratory Astrophysics/International Conference on High Energy Density Physics at the April meeting of the American Physics Society, St. Louis, Mo, April, 2008

8. Carolyn Kuranz, "Laboratory blast wave driven instabilities on the Omega Laser," High Energy Density Science User's Project mini-symposium of Stewardship Science Academic Alliance Symposium, Washington, D.C., February 2008
9. Carolyn Kuranz, "Laboratory blast-wave driven instabilities," Annual Meeting of the Division of Plasma Physics of the American Physical Society, Dallas, TX, Nov. 2008.
10. Eric Harding, "Kelvin Helmholtz Experiments, 2nd Inter. Conf. on High Energy Density Physics, Austin TX, May 2009
11. Eric Harding, "Observations Of Subsonic And Supersonic Shear Flows In Laser Driven High-Energy-Density Plasmas," Annual Meeting of the Division of Plasma Physics of the American Physical Society, Atlanta, GA, Nov. 2009
12. Forrest Doss, "CRASH: Theory and Experiments on Radiative Shocks," International Conference on High Energy Density Laboratory Astrophysics, Pasadena, CA, March 2010
13. Forrest Doss, "Structure in Radiative Shocks", Annual Meeting of the Division of Plasma Physics of the American Physical Society, Chicago, IL, Nov. 2010
14. Anthony Visco, "Temperature Measurements in a Radiative Shock System", Radiation from High Energy Density Plasmas (RHEDP) International Workshop, Reno, NV March 2011
15. Forrest Doss, "Structure in Radiative Shocks," 3rd International Conference on High Energy Density Physics, Lisbon, Portugal, May 2011
16. Channing Huntington, "Same-Shot X-Ray Thomson Scattering And Streaked Imaging Of Radiative Shock Experiments At Omega", International Conference on Plasma Science, Chicago, IL, June 2011
17. Eliseo Gamboa, "Imaging x-ray Thomson scattering instrumentation and experiments", High Temperature Plasma Diagnostics conference, 2012
18. Christine Krauland, "Radiative Reverse Shock Laser Experiments Relevant to Accretion Processes in Cataclysmic Variables", Annual Meeting of the Division of Plasma Physics of the American Physical Society, Providence, Rhode Island, Nov. 2012
19. Carlos Di Stefano, "Observation and modeling of mixing-layer development in HED blast-wave-driven shear flow", Annual Meeting of the Division of Plasma Physics of the American Physical Society, Denver, CO Nov 2013
20. Michael J. MacDonald, "Using psana for online data analysis at LCLS", 3rd High-Power Laser Workshop, Menlo Park, CA 2015.

21. Michael J. MacDonald, "Angularly resolved x-ray scattering measurements of dynamically compressed polycrystalline diamond," International Workshop on Warm Dense Matter, Kurashiki, Japan, 2015.

22. Willow Wan, "Supersonic, shockwave-driven hydrodynamic instability experiments at OMEGA-EP," Annual Meeting of the Division of Plasma Physics of the American Physical Society, San Jose, CA Oct. 2016

Lectures:

"Physics of Laser Plasma Interactions"
Massachusetts Institute of Technology, 1988
Subject 6.965 (G): gave 9 of 18 lectures

Summer Schools:

Summer School: Foundations of High-Energy-Density Physics
August 2004
August 2006
July 2008
August 2010
August 2012
June 2014
June 2016

Seminars and Colloquia:

On Magnetic Mirror Topics:

Princeton Plasma Physics Laboratory, fall 1979
Max Planck Institute, Garching, April 1980
Fontenay-aux-Rose, April 1980
Culham laboratory, April 1980
Sandia National Laboratories, Albuquerque, August 1980
University of Wisconsin, Madison, 1981
University of Maryland, 1981
Dartmouth University, spring 1981

"The Significance of Observed Trends in Raman Scattering Data":

Los Alamos National Laboratory, August 1987
Naval Research Laboratory, November 1988
University of Rochester, November 1988

"Progress Toward Laser Fusion Using Nova":

Princeton Plasma Physics Laboratory, November 1988
University of Rochester, November 1988
University of Maryland, May 1989
Cornell University, May 1989

- "Stimulated Raman Backscattering from Laser-Produced Plasmas":
 U.C.Davis, March, 1989
 U.C.Irvine, November 21, 1989
- "Waves in Laser-Produced Plasmas"
 U.C. Davis, May 1991
- "Stimulated Brillouin Scattering: Tests of the Convective Theory"
 Ecole Polytechnique, July 1992
- "Parametric Interactions in Laser Plasmas"
 Univ. of Colorado, Feb. 1993
 M.I.T., March 1993
- "The Laser as a Tool for the study of waves and turbulence in plasmas"
 Univ. of Alberta, Sept. 1994
- "Laser Scattering from Tailored Plasmas"
 Univ. of Michigan, Sept. 1995
 Univ. of Miami, Oct. 1995
- "Laboratory Supernovae: Using big lasers to model exploding stars"
 Sandia National Laboratory, Feb. 1999
 Univ. of Toronto, Feb. 1999
 Lawrence Livermore National Laboratory, Aug. 1999
- "Laboratory Experiments to Simulate Supernova Remnants"
 Univ. of Chicago, Sept. 1999
 Naval Research Laboratory, Nov. 1999
 Los Alamos National Laboratory, Jan. 2000
- "Plasma hydrodynamics", and "Laboratory simulation of astrophysical phenomena"
 DOE National Undergraduate Fellowship Program, June 2000
- "The quest for fusion: when and how will humans make power like the stars do?"
 Michigan Alumni Association, July 2000
- "Laboratory Supernovae: Using big lasers to simulate exploding stars"
 Michigan Alumni Association, July 2000
- "Astrophysics Experiments with Lasers and Z Pinches"
 Univ. of Toledo, November 2000
 Univ. of Rochester, April 2000
- "Connecting Laboratory Experiments with Astrophysical Phenomena"
 Brigham Young University, Feb. 2003
 Rochester Inst. Of Technology, Feb. 2003
 West Virginia Wesleyan, Feb. . 2003
 Swarthmore, Feb. 2003
 UC Irvine, March 2003
 Optical Society of America, March 2003
 Rutgers, April 2003
 Imperial College, November 2003
 West Virginia University, February 2004

Ohio State University, January 2005
Massachusetts Institute of Technology, January 2006
University of Michigan Physics Dept., Feb. 2006

“Hydrodynamics and radiation hydrodynamics with astrophysical applications”
SUNY Stony Brook, Applied Mathematics, March 2008

“High energy density physics with astrophysical applications: hydrodynamics and radiation hydrodynamics”
Observatoire de Meudon, May 2010
CEA Bruyeres, May 2010

“High-energy-density physics of relevance to astrophysics”
SUNY Stony Brook, Physics, November 2010
Michigan State University, October 2015
Naval Research Laboratory, February 2016
University of Rochester, October 2016

High-energy-density physics”
University of Washington, April 2013
Rice University, April 2013
Ohio State University, April 2014
CELIA (Univ. Bordeaux) April 2014
ELI-NP, Bucharest, Romania, August 2016

“Laboratory astrophysics at high energy density”
Rice University, April 2013

Books Published:

R.P. Drake, High Energy Density Physics: Foundations, Inertial Fusion, and Experimental Astrophysics, 534 pages, Springer, Berlin (2006) ISBN-10 3-540-29314-0

Refereed Publications (graduate students underlined, post-docs in italics):

1. R.P.Drake and H.W.Moos, "Evidence for neutral-beam-injected oxygen impurities in 2XIIB", *Nucl. Fusion* **19**,407-410 (1979).
2. R.P.Drake and H.W.Moos, "An extreme-ultraviolet study of the 2XIIB neutral-beam-heated mirror machine, *Nucl. Fusion* **20**, 599-610 (1980).
3. D.L.Correll, J.F.Clauser, F.H.Coensgen, W.F.Cummins, R.P.Drake, J.H.Foote, A.H.Futch, R.K.Goodman, D.P.Grubb, G.M.Melin, W.E.Nexsen, T.C.Simonen, B.W.Stallard, W.C.Turner, "Production of large-radius, high-beta, confined mirror plasmas", *Nucl. Fusion* **20**, 655-664 (1980).
4. F.H.Coensgen, T.A.Casper, C.A.Anderson, J.F.Clauser, W.C.Condit, D.L.Correll, W.F.Cummins, J.C.Davis, R.P.Drake, J.H.Foote, A.H.Futch, R.K.Goodman, D.P.Grubb, G.A.Hallock, R.S.Hornady, A.L.Hunt, B.G.Logan, R.H.Munger, W.E.Nexsen, T.C.Simonen, D.R.Slaughter, B.W.Stallard, O.T.Strand, "Electrostatic plasma confinement experiments in a Tandem Mirror system ", *Phys. Rev. Lett.* **44**, 1132-1135 (1980).
5. R.P.Drake, G.Deis, M.Richardson, T.C.Simonen, "Gas control and wall conditioning in TMX", *J. Nucl. Materials* **93/94**, 291-296 (1980).
6. R.P.Drake, T.A.Casper, J.F.Clauser, F.H.Coensgen, D.L.Correll, W.F.Cummins, J.C.Davis, J.H.Foote, A.H.Futch, R.K.Goodman, D.P.Grubb, R.S.Hornady, W.E.Nexsen, T.C.Simonen, B.W.Stallard, "Effect of end-cell stability on the confinement of the central-cell plasma in TMX", *Nucl. Fusion* **21**, 359-364 (1981).
7. R.P.Drake, D.D.Lang, A.L.Hunt, W.L.Pickles, T.C.Simonen, T.P.Stack, K.L.Wilson, M.I.Baskes, L.G.Haggmark, M.E.Malinowski, "Design of first walls and beam dumps for the Tandem Mirror Experiment Upgrade", *J. Vac. Sci. Tech.* **20**, 1288-1291 (1982).
8. R.P.Drake, E.B.Hooper, C.V.Karmendy, S.L.Allen, T.A.Casper, J.F.Clauser, F.H.Coensgen, R.H.Cohen, D.L.Correll, J.C.Davis, J.H.Foote, A.H.Futch, R.K.Goodman, D.P.Grubb, G.E.Gryczkowski, G.A.Hallock, A.L.Hunt, W.E.Nexsen, W.L.Pickles, A.E.Pontau, P.Poulsen, T.C.Simonen, O.T.Strand, W.R.Wampler, "Radial Transport in the central cell of the tandem mirror experiment", *Phys. Fluids* **25**, 2110-2120 (1982).
9. D.L.Correll, S.L.Allen, T.A.Casper, J.F.Clauser, P.Coakely, F.H.Coensgen, W.C.Condit, W.F.Cummins, J.C.Davis, R.P.Drake, J.H.Foote, A.H.Futch, R.K.Goodman, D.P.Grubb, G.A.Hallock, E.B.Hooper, R.S.Hornady, "Ambipolar potential formation and axial confinement in TMX", *Nucl. Fusion* **22**, 223-234 (1982).
10. E.B.Hooper, G.E.Gryczkowski, R.P.Drake, "Plasma generation in gas box fueling for tandem mirrors", *J. Vac. Sci. Tech.* **20**, 1259-1262 (1982).

11. W.L.Pickles, A.K.Chargin, R.P.Drake, A.L.Hunt, D.D.Lang, J.J.Murphy, P.Poulsen, T.C.Simonen, T.H.Batzer, T.P.Stack, R.L.Wong, "The LLNL Tandem Mirror Experiment Upgrade vacuum system", *J. Vac. Sci. Tech.* **20**, 1177-1181 (1982).
12. R.P.Drake, "Control of plasma-wall interactions in tandem mirrors", *Nucl. Tech./Fusion* **3**, 405-415 (1983).
13. D.P.Grubb, S.L.Allen, T.A.Casper, J.F.Clauser, F.H.Coensgen, R.H.Cohen, D.L.Correll, W.F.Cummins, J.C.Davis, R.P.Drake, J.H.Foote, A.H.Futch, R.K.Goodman, G.E.Gryczkowski, E.B.Hooper, R.S.Hornady, A.L.Hunt, C.V.Karmendy, W.E.Nexsen, W.L.Pickles, G.D.Porter, P.Poulsen, T.D.Rognlien, T.C.Simonen, D.R.Slaughter, P.Coakley, G.A.Hallock, O.T.Strand, "Energy confinement studies in the Tandem Mirror Experiment: power flow", *Phys. Fluids* **26**, 1987-2002 (1983).
14. D.P.Grubb, S.L.Allen, T.A.Casper, J.F.Clauser, F.H.Coensgen, D.L.Correll, W.F.Cummins, J.C.Davis, D.Dietrich, R.P.Drake, J.H.Foote, R.J.Fortner, A.H.Futch, R.K.Goodman, G.E.Gryczkowski, E.B.Hooper, R.S.Hornady, A.L.Hunt, C.V.Karmendy, T.Nash, W.E.Nexsen, W.L.Pickles, G.D.Porter, P.Poulsen, T.C.Simonen, D.R.Slaughter, G.A.Hallock, O.T.Strand, "Energy confinement studies in the Tandem Mirror Experiment: power balance", *Phys. Fluids* **26**, 2003-2010 (1983).
15. W.L.Pickles, M.O.Calderon, M.R.Carter, C.A.Clower, R.P.Drake, A.L.Hunt, D.D.Lang, T.C.Simonen, and W.C.Turner, "Dynamic gas flow during plasma operation in TMX-U", *J. Vac. Sci. Tech.* **A1**, 1288-1292 (1983).
16. S.L.Allen, C.A.Clower, R.P.Drake, E.B.Hooper, A.L.Hunt, and R.Munger, "Initial wall conditioning for the TMX-U fusion experiment", *J. Vac. Sci. Tech.* **A1**, 916-919 (1983).
17. R.P.Drake, R.E.Turner, B.F.Lasinski, K.G.Estabrook, E.M.Campbell, C.L.Wang, D.W.Phillion, E.A.Williams, and W.L.Kruer, "Efficient Raman sidescatter and hot-electron production in laser-plasma interaction experiments", *Phys. Rev. Lett.* **53**, 1739-1742 (1984).
18. R.E.Turner, K.G.Estabrook, R.L.Kauffman, D.R.Bach, R.P.Drake, D.W.Phillion, B.F.Lasinski, W.L.Kruer, E.A.Williams, and E.M.Campbell, "Evidence for collisional damping in high-energy Raman scattering experiments at 0.26 microns", *Phys. Rev. Lett.* **54**, 189-192 (1985).
19. K.R.Manes, O.C.Barr, E.S.Bliss, R.P.Drake, R.O.Godwin, D.G.Gritton, J.S.Hildum, W.F.Holloway, C.A.Hurley, B.C.Johnson, D.J.Kuizenga, B.Merritt, R.G.Ozarski, F.Reinecker Jr., J.R.Severyn, D.R.Speck, M.A.Summers, G.J.Suski, E.P.Wallerstein, "Novette facility: activation and experimental results", *Laser and Particle Beams* **3**, 173-188 (1985).
20. F.Ze, L.J.Suter, S.M.Lane, E.M.Campbell, W.C.Mead, J.D.Lindl, M.D.Rosen, D.W.Phillion, C.W.Hatcher, R.P.Drake, J.S.Hildum, K.R.Manes, "Compression

measurements in ablatively driven inertial confinement fusion", *Comm. Plas. Phys. Cont. Fus.* **10**, 33-41 (1986).

21. E.M.Campbell, J.T.Hunt, E.S.Bliss, D.R.Speck, R.P.Drake, "Nova experimental facility", *Rev. Sci. Instrum.* **57**, 2101-2106 (1986).

22. R.E.Turner, Kent Estabrook, R.P.Drake, E.A.Williams, H.N.Kornblum, W.L.Kruer, E.M.Campbell, "Observation of forward Raman scattering in laser-produced plasmas", *Phys. Rev. Lett.* **57**, 1725-1728 (1986).

23. R.P.Drake, "Laser-plasma-interaction experiments using multikilojoule lasers", *Laser and Particle Beams* **6**, 235-244 (1988).

24. R.P.Drake, P.E.Young, E.A.Williams, Kent Estabrook, W.L.Kruer, B.F.Lasinski, C.B.Darrow, H.A.Baldis, T.W.Johnston, "Laser-intensity-scaling experiments in long-scale-length, laser-produced plasmas", *Phys. Fluids.* **31**, 1795-1802 (1988).

25. R.P.Drake, E.A.Williams, P.E.Young, Kent Estabrook, W.L.Kruer, H.A.Baldis, T.W.Johnston, "Evidence that stimulated Raman scattering in laser-produced plasmas is an absolute instability", *Phys. Rev. Lett.* **60**, 1018-1021 (1988).

26. R.P.Drake, R.E.Turner, B.F.Lasinski, E.A.Williams, D.W.Phillion, K.G.Estabrook, W.L.Kruer, E.M.Campbell, T.W.Johnston, K.R.Manes, J.S.Hildum, "Studies of Raman scattering from disk targets irradiated by several kilojoules of 0.53-micron laser light", *Phys. Fluids.* **31**, 3130-3142 (1988).

27. F.Ze, R.L.Kauffman, B.Lasinski, L.Suter, S.Langer, H.Kornblum, G.Tietbohl, T.Thiessen, D.Montgomery, R.P.Drake, and E.M.Campbell, "Time-resolved x-ray conversion efficiencies of laser-heated plasmas", *Rev. Sci. Inst.* **59**, 1801-1803 (1988).

28. P.E.Young, H.A.Baldis, R.P.Drake, E.M.Campbell, Kent Estabrook, "Direct Evidence of ponderomotive filamentation in a laser-produced plasma", *Phys. Rev. Lett.* **61**, 2336-2339 (1988).

29. P.E.Young, B.F.Lasinski, W.L.Kruer, E.A.Williams, K.G. Estabrook, E.M.Campbell and R.P.Drake, "Simultaneous spectrally and spatially resolved measurements of $3\omega_0$ emission from laser-produced plasmas", *Phys. Rev. Lett.* **61**, 2766-2769 (1988).

30. R.P.Drake, "Control of stimulated Raman scattering for laser fusion by means of collisional damping", *Comments Plas. Phys.Cont. Fus.* **XII**, No.4, 181-190 (1989).

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