

# WOPA 2010

## Workshop on Opportunities in Plasma Astrophysics January 18 - 21, 2010 Princeton Plasma Physics Laboratory

### Workshop Program

11pm, 1/17/10

All workshop sessions are held in the PPPL Auditorium.

#### Monday, January 18

7:30 am – Bus leaves Nassau Inn

7:30 am – Bus leaves Marriott Residence Inn

7:45 am – Bus leaves Wyndham at the Conference Side Entrance

8:00 am – Registration

8:30 am – Welcome, Purpose, Format, and Expected Outcome (S. Prager and H. Ji, PPPL)

9:00 am – Magnetic Reconnection (Chair: James Drake, U. Maryland)

**James Drake, U. Maryland:** Introduction – 15 min.

**Masaaki Yamada, PPPL:** The Rate of Reconnection – 15 min.

**Jan Egedal, MIT:** The Onset Problem – 15 min.

**William Daughton, LANL:** Cross Scale Coupling in Large Systems – 15 min.

**Dmitri Uzdensky, U. Colorado:** Reconnection in Extreme Environments – 15 min.

**James Drake, U. Maryland:** Heating and Particle Acceleration – 15 min.

**James Drake and Masaaki Yamada:** Moderated Discussions Including A Possible National Reconnection Experiment – 30 min.

11:00 am **Break and Registration**

11:30 pm – Waves and Turbulence (Chair: Amitava Bhattacharjee, U. New Hampshire)

**Amitava Bhattacharjee, U. New Hampshire:** Introduction and Overview – 10 min.

**Stanislav Boldyrev, U. Wisconsin – Madison:** Nature and Properties of Turbulence Cascades – 20 min.

**William Matthaeus, U. Delaware:** Dissipation and Particle Acceleration and Heating – 20 min.

12:20 pm **Lunch – PPPL Cafeteria**

1:20 pm – Waves and Turbulence (Continued)

**Troy Carter, UCLA:** Roles of Laboratory Experiments and Observations – 15 min.

**Amitava Bhattacharjee, U. New Hampshire:** Turbulence in Inhomogeneous Plasmas – 15 min.

**Amitava Bhattacharjee, U. New Hampshire:** Connections to Other Topics – 10 min.

**Amitava Bhattacharjee, U. New Hampshire:** Moderated Discussions – 30 min.

2:30 am – Collisionless Shock and Particle Acceleration (Chair: Martin Lee, U. New Hampshire)

**Martin Lee, U. New Hampshire:** Introduction – 12 min.

**Randy Jokipii, U. Arizona:** Heliospheric Shocks – 12 min.

**Robert Lin, UC Berkeley:** Shocks in Corona and Solar Energetic Particles – 12 min.

**Anatoly Spitkovsky, Princeton U.:** Supernova Remnant and Other Shocks – 12 min.

**Ramanath Cowsik, Washington U. St. Louis:** Acceleration and Propagation of Galactic Cosmic Rays – 12 min.

3:30 pm     **Break**

4:00 pm – Collisionless Shock and Particle Acceleration (continued)

**David Burgess, Queen Mary U. London:** Shock Simulations – 15 min.

**Christoph Niemann, UCLA:** Laboratory Shock Experiments – 15 min.

**Martin Lee, U. New Hampshire:** Moderated Discussions – 30 min.

5:00 pm – Public Comments (Chair: Masaaki Yamada, PPPL)

5:30 pm – Breakout Discussions

Magnetic Reconnection – Room B318

Collisionless Shock – Director's Conference Room (3<sup>rd</sup> floor)

Waves and Turbulence – Theory Conference Room

Magnetic Dynamo – Room A118

Interface and Shear Instabilities – Auditorium

Momentum Transport – Display Wall Room

Dusty Plasma – Room S213

Radiative Hydrodynamics – Procurement Conference Room

Relativistic Plasmas – Room B233

Jets – Room B252

6:30 pm – Buses Leave for Reception

7:00 pm – Reception and Dinner at Salt Creek Grille – Princeton

9:30 pm – Buses Leave for Hotels

## Tuesday, January 19

7:30 am – Bus leaves Nassau Inn

7:30 am – Bus leaves Marriott Residence Inn

7:45 am – Bus leaves Wyndham at the Conference Side Entrance

8:00 am – Magnetic Dynamo (Chair: Ellen Zweibel, U. Wisconsin – Madison)

**Ellen Zweibel, U. Wisconsin – Madison:** Introduction and Observations – 30 min.

**Cary Forest, U. Wisconsin – Madison:** Laboratory Experiments – 20 min.

**Fausto Cattaneo, U. Chicago:** Theory and Numerical Simulations – 20 min.

**Eric Blackman, U. Rochester:** Broader Impacts – 20 min.

**Ellen Zweibel, U. Wisconsin – Madison:** Moderated Discussions – 30 min.

10:00 am **Break**

10:30 am – Interface and Shear Instabilities (Dmitri Ryutov, LLNL)

**Ian Mann, U. Alberta:** Space Plasma Prospective – 20 min.

**Marc Pound, U. Maryland:** Astrophysical Prospective – 20 min.

**Aaron Miles, LLNL:** Supernovae and Supernova Remnants – 10 min.

**Carolyn Kuraz, U. Michigan:** High-Energy-Density Laboratory Experiments: – 20 min.

**Uri Shumlak, U. Washington:** Astrophysical Connections from Magnetic Confinement Research – 20 min.

**Dmitri Ryutov, LLNL:** Moderated Discussions – 30 min.

12:30 pm **Lunch – PPPL Cafeteria**

1:30 pm – Momentum Transport (Chair: Eliot Quataert, UC Berkeley)

**Eliot Quataert, UC Berkeley:** Introduction and Overview – 25 min.

**James Stone, Princeton U.:** Scientific Opportunities on Accretion Disks – 20 min.

**Matthew Browning, Canadian Inst. Theoretical Astrophysics:** Scientific Opportunities on Stars – 20 min.

**Mark Nornberg, U. Wisconsin – Madison:** Laboratory Opportunities – 15 min.

**Eliot Quataert, UC Berkeley:** Relations to Other Topics and Broader Impacts – 10 min.

3:30 pm **Break**

4:00 pm – Dusty Plasmas (Chair: Edward Thomas, Auburn U.)

**Edward Thomas, Auburn U.:**

Introduction – 15 min.

Astrophysical Issues – 20 min.

Opportunities and Summary – 15 min.

Moderate discussions – 30 min.

5:30 pm – Public Comments (Chair: Greg Hammett, PPPL)

6:30 pm – Buses Leave for Banquet

7:00 pm – Banquet at Prospect House – Princeton University

9:30 pm – Buses Leave for Hotels

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### Wednesday, January 20

7:30 am – Bus leaves Nassau Inn

7:30 am – Bus leaves Marriott Residence Inn

7:45 am – Bus leaves Wyndham at the Conference Side Entrance

8:00 am – Radiative Hydrodynamics (Chair: Bruce Remington, LLNL)

**Julian Krolik, John Hopkins U.:** Theory and Astrophysical Relevance – 30 min.

**Patrick Hartigan, Rice U.:** Observational Relevance – 30 min.

**Bruce Remington, LLNL:** Experimental Relevance – 30 min.

**Bruce Remington, LLNL:** Moderated Discussions – 30 min.

10:00 pm **Break**

10:30 am – Relativistic, Ultra-strongly Magnetized, and Pair Plasmas  
(Edison Liang, Rice U.)

**Edison Liang, Rice U.:** Introduction and Overview – 12 min.

**Luis Silva, Lisbon U.:** Relativistic Beams: Generation, Dissipation and Connection to Shock Physics – 15 min.

**Masahiro Hoshino, U. Tokyo:** Reconnection in Relativistic and Strongly Magnetized Plasmas and Their Radiation – 15 min.

**Anatoly Spitkovsky, Princeton U.:** Numerical Simulations of Collisionless Shocks – 12 min.

**Igor Kaganovich, PPPL:** Weibel Instability and Collisionless Shocks – 12 min.

**Andrey Timokhin, UC Berkeley:** Numerical Models of Pulsar Magnetosphere – 12 min.

**Patric Muggli, USC:** High Brightness Particle Beams – 12 min.

**Edison Liang, Rice U.:** Moderated Discussions – 30 min.

12:30 pm **Lunch – PPPL Cafeteria**

1:30 pm – Jets and Outflows Including Structure Formation (Chair: Hui Li, LANL)

**Phil Kronberg, LANL:** Observations of AGN Jets – 15 min.

**Richard Lovelace, Connell U.:** Theory and Simulations Black Hole Jets – 15 min.

**Sean Matt, U. Virginia:** Jets from Young Stellar Objects – 20 min.

**Paul Bellan, Caltech:** Jet Experiments – 20 min.

**Hui Li, LANL:** Jet Impact on Structure Formation, Key Issues and Connections to Other Topics – 20 min.

**Hui Li, LANL:** Moderated Discussions – 30 min.

3:30 pm **Break**

4:00 pm – Public Comments (Chair: Jay Johnson, PPPL)

4:30 pm – Breakout Discussions

6:45 pm – Buses Leave for Hotels

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### **Thursday, January 21**

7:30 am – Bus leaves Nassau Inn

7:30 am – Bus leaves Marriott Residence Inn

7:45 am – Bus leaves Wyndham at the Conference Side Entrance

8:00 am – Updates from Each Topic (Chair: Jeremy Goodman, Princeton U.)

**James Drake, U. Maryland:** Magnetic Reconnection – 15 min.

**Martin Lee, U. New Hampshire:** Collisionless Shock and Particle Acceleration – 15 min.

**Amitava Bhattacharjee, U. New Hampshire:** Waves and Turbulence – 15 min.

**Ellen Zweibel, U. Wisconsin – Madison:** Magnetic Dynamo – 15 min.

**Dmitri Ryutov, LLNL:** Interface and Shear Instability – 15 min.

**Eliot Quataert, UC Berkeley:** Momentum Transport – 15 min.

**Edward Thomas, Auburn U.:** Dusty Plasmas – 15 min.

**Bruce Remington, LLNL:** Radiative Hydrodynamics – 15 min.

**Edison Liang, Rice U.:** Relativistic, Ultra-strongly Magnetized, and Pair Plasmas – 15 min.

**Hui Li, LANL:** Jets and Outflows Including Structure Formation – 15 min.

10:30 pm **Break**

11:00 am – Cross-Cutting Physics Themes and Research Tools (Chair: Hantao Ji, PPPL)

12:00 pm – Discussions on Next Steps (Chair: Stewart Prager, PPPL)

1:00 pm **Lunch – PPPL Cafeteria**

2:15 pm – Buses Leave for Hotels