

Physics Research and Education: Computation and Computer-Based Instruction

Gordon Research Conference Program

Bryant University, Smithfield RI
June 8 – 13, 2008

Chairs

Bradley Ambrose & Wolfgang Christian

Vice Chairs

Chandralekha Singh & Enrique J. Galvez

SUNDAY, JUNE 8, 2008

- 2:00 pm - 11:00 pm Arrival and check-in
- 6:00 pm Dinner
- 7:30 pm – 7:35 pm Welcome / Introductory Comments by GRC Site Staff
- 7:35 pm - 9:30 pm **KEYNOTE SESSION: THE FUTURE IN COMPUTATIONAL PHYSICS EDUCATION**
- Discussion Leader: **Norman Chonacky** (Yale University)
- 7:35 pm - 8:15 pm **Rubin Landau** (Oregon State University)
 "Incorporating Computational Research Developments into the Physics Curriculum"
- 8:15 pm - 8:30 pm Discussion
- 8:30 pm - 9:10 pm **Thom Dunning** (NCSA, University of Illinois)
 "Impact of Petascale Computing on Computational Science and Engineering"
- 9:10 pm - 9:30 pm Discussion

MONDAY, JUNE 9, 2008

- 7:30 am - 8:30 am Breakfast
- 8:30 am - 9:00 am **Group photo** (Location to be announced)
- 9:00 am - 12:30 pm **PERSPECTIVES ON COMPUTERS IN PHYSICS EDUCATION**
- Discussion Leader: **David Cook** (Lawrence University)
- 9:00 am - 9:40 am **Robert Fuller** (University of Nebraska)
 "Challenges from Alfred Bork: What Has Happened to Computers in Physics Education"
- 9:40 am - 10:00 am Discussion
- 10:00 am Coffee Break
- 10:30 am - 11:10 am **E. F. Redish** and **Tom Bing** (University of Maryland)
 "Do External Mathematical Tools Affect How Students Think about Physics?"

11:10 am - 11:30 am	Discussion
11:30 am - 12:10 pm	Harvey Gould (Clark University) <i>"What Should Be the Role of Computers in the Physics Curriculum after Everybody Now Over 40 Retires?"</i>
12:10 pm - 12:30 pm	Discussion
12:30 pm	Lunch
1:30 pm - 4:00 pm	Free Time
4:00 pm - 6:00 pm	Poster Session
6:00 pm	Dinner
7:30 pm - 9:30 pm	MODELING DYNAMICAL SYSTEMS Discussion Leader: John Mallinckrodt (California State Polytechnic University Pomona)
7:30 pm - 8:10 pm	Bruce Boghosian (Tufts University) <i>"Unstable Periodic Orbits as a Pedagogical Tool for Introducing Dynamical Systems in the Undergraduate Curriculum"</i>
8:10 pm - 8:30 pm	Discussion
8:30 pm - 9:10 pm	Sergej Flach (Max-Planck Institute and Nizhny Novgorod University) <i>"Periodic Orbits, Localization in Normal Mode Space, and the Fermi-Pasta-Ulam Problem"</i>
9:10 pm - 9:30 pm	Discussion

TUESDAY, JUNE 10, 2008

7:30 am - 8:30 am	Breakfast
9:00 am - 12:30 pm	ASTRONOMY AND ASTROPHYSICS Discussion Leader: Mario Belloni (Davidson College)
9:00 am - 9:40 am	Adam Frank (University of Rochester) <i>"Computational Astrophysics: From Virtual Stars to Virtual Classrooms"</i>
9:40 am - 10:00 am	Discussion
10:00 am	Coffee Break
10:30 am - 11:10 am	Thomas Müller (University of Stuttgart) <i>"A Trip to the End of the Universe"</i>
11:10 am - 11:30 am	Discussion
11:30 am - 12:10 pm	Craig Savage (Australian National University) <i>"Real Time Relativity: Exploration Learning of Special Relativity"</i>
12:10 pm - 12:30 pm	Discussion

12:30 pm	Lunch
1:30 pm - 4:00 pm	Free Time
4:00 pm - 6:00 pm	Poster Session
6:00 pm	Dinner
7:30 pm - 9:30 pm	VISUALIZATIONS
	Discussion Leader: Enrique Galvez (Colgate University)
7:30 pm - 8:10 pm	Michael Trott (Wolfram Research) <i>"Visualizations in Physics Using Computer Algebra – for Insight and Fun"</i>
8:10 pm - 8:30 pm	Discussion
8:30 pm - 9:10 pm	Roberto Salgado (Syracuse University) <i>"VPython for Teaching Physics: Visualizations for Mechanics, Electromagnetism, and Relativity"</i>
9:10 pm - 9:30 pm	Discussion

WEDNESDAY, JUNE 11, 2008

7:30 am - 8:30 am	Breakfast
9:00 am - 12:30 pm	COMPUTATION IN PHYSICS EDUCATION RESEARCH
	Discussion Leader: Peter Shaffer (University of Washington)
9:00 am - 9:40 am	Chandralekha Singh (University of Pittsburgh) <i>"Quantum Interactive Learning Tutorials"</i>
9:40 am - 10:00 am	Discussion
10:00 am	Coffee Break
10:30 am - 11:10 am	Wendy Adams (University of Colorado) <i>"Study of Educational Simulations - Interface Design for Engagement and Learning"</i>
11:10 am - 11:30 am	Discussion
11:30 am - 12:10 pm	Zacharias C Zacharia (University of Cyprus) <i>"The Added Value of Combining Physical with Virtual Inquiry-Based Experimentation in Enhancing Students' Conceptual Understanding in Physics"</i>
12:10 pm - 12:30 pm	Discussion
12:30 pm	Lunch
1:30 pm - 4:00 pm	Free Time
4:00 pm - 6:00 pm	Business Meeting (Nominations for the next Vice Chair(s); Fill out Conference Evaluation Forms; Discuss future Site & Scheduling preferences; Election of the next Vice Chair(s))

- 6:00 pm Dinner
- 7:30 pm - 9:30 pm **INTERNET TECHNOLOGIES**
- Discussion Leader: **Bruce Mason** (University of Oklahoma)
- 7:30 pm - 8:00 pm **Anne Cox** (Eckerd College)
"Pulling it Together: Computation, Curriculum, and Collections"
- 8:00 pm - 8:30 pm **Frank Wattenberg** (United States Military Academy Westpoint)
"Modeling and Simulation as a Focus for Mathematics and Science Education"
- 8:30 pm - 9:00 pm **David Yaron** (Carnegie Mellon University)
"Digital Libraries to Support Problem Solving and Conceptual Learning in Introductory Chemistry"
- 9:00 pm - 9:30 pm Discussion

THURSDAY, JUNE 12, 2008

- 7:30 am - 8:30 am Breakfast
- 9:00 am - 12:30 pm **INTEGRATING COMPUTATION INTO THE PHYSICS CURRICULUM**
- Discussion Leader: **Ruth Chabay** (North Carolina State University)
- 9:00 am - 9:40 am **David McIntyre** (Oregon State University)
"Integrating Computational Activities into the Paradigms in Physics Curriculum"
- 9:40 am - 10:00 am Discussion
- 10:00 am Coffee Break
- 10:30 am - 11:10 am **Mark Haugan** (Purdue University)
"Computational Modeling in the 'Standard' Physics Curriculum—Introductory Physics, Classical Mechanics and Beyond"
- 11:10 am - 11:30 am Discussion
- 11:30 am - 12:10 pm **Shan-Ho Tsai** (University of Georgia)
"Simulating Static and Dynamic Properties of Simple Spin Models in Statistical Physics"
- 12:10 pm - 12:30 pm Discussion
- 12:30 pm Lunch
- 1:30 pm - 4:00 pm Free Time
- 4:00 pm - 6:00 pm **Poster Session**
- 6:00 pm Dinner
- 7:30 pm - 9:30 pm **NEW APPLICATIONS AND ALGORITHMS**
- Discussion Leader: **Francisco Esquembre** (University of Murcia)
- 7:30 pm - 8:10 pm **Dennis Rapaport** (Bar-Ilan University)

“Enhancing Molecular Dynamics Simulation with Interactive Visualization”

8:10 pm - 8:30 pm Discussion

8:30 pm - 9:10 pm **Alexander Hartmann** (University of Oldenburg)
“Combinatorial Optimization in Physics Research and Teaching: Interesting Problems and Useful Algorithms”

9:10 pm - 9:30 pm Discussion

FRIDAY, JUNE 13, 2008

7:30 am - 8:30 am Breakfast

9:00 am Departure