Teaching Heliophysics from a Curriculum

A. Bhattacharjee, Princeton Univ. N. A. Gross, Boston University, D. W. Longcope, Montana State University Bozeman,
K. Greb, UCAR/CEPASS, M. Guhathakurta, NASA Headquarters

Lecture Series

Core Lectures

- Provides intro to fundamentals of space physics
- Presents a small number of consistent voices

Dana Longcope, Montana State

Amitava Bhattacharjee, Center for Heliophysics, Princeton University

- Topics:
  - Solar Corona and Solar Wind
  - Magnetosphere and Ionosphere
  - Magnetic Topology and Reconnection
  - Fundamental Plasma Processes

Some Guest Lectures from 2019 Yearly Focus

- Provide Expertise on the particular focus, e.g.:
  - Fran Bagenal - Planetary Magnetospheres
  - Ben Chandran - Solar Wind: Structure and Turbulence
  - Robert Ergun - Magnetosphere: Reconnection & Substorms
  - Thomas Immel - Ionosphere: Structure and Storms

Doin' the Dungey Dance with Fran and Bob

2019 Demographics

- Diverse Class of 35 Participants Representing Institutions from 9 Countries
- About 50% from US institutions

Two African American Students with Astronaut Guest Speaker John Grunsfeld

Including 17 Women

Introduction

Since 2007 the NASA/LWS program has sponsored the Heliophysics Summer School for advance graduate students and first year postdocs. Approximately 35 participants are invited each year and well over 500 participants have attended.The summer school curriculum covers a different research area each year, but also provides a broad overview of all aspects of heliophysics ranging from solar dynamos to planetary and exo-planetary atmospheres.

Yearly Focus:

- 2020: Explosive Space Weather Events and their Impacts
- 2019: Heliophysics Exploration
- 2018: Comparative Heliophysics

Previous Deans

- Karel Schrijver - Lockheed Martin
- George Siscoe - Boston University
- Fran Bagenal - CU Boulder
- Jan Sojka - Utah State

Participants working on a lab

Lab Activities

- Participants work in groups to explore data and models.
- Topics include: space weather event analysis solar/stellar dynamo, solar wind, comparative magnetospheres, structure of the ionosphere, solar irradiance,
- Heterogenous groups allows participants to draw upon each others' specialization
- Groups encourage networking

Group Workspace

Resources

- Text Books: 5 Vol. Heliophysics Textbooks Series - https://cpaess.ucar.edu/heliophysics/resources/textbooks
- Lecture Videos and Slides - Lecture videos and slides available on the web with thousands of downloads. https://cpaess.ucar.edu/heliophysics/resources-textbook-1
- Lectures organized by book chapter, topic, and speaker

Professional Development Activities

- **Elevator Speech Exercise** - participants have opportunity to hone and practice a short introductory speech.
- **Student Short Talks and Poster Session** - participants have an opportunity to give a short (5 minute) research talk or present a poster.
- **Career Panel** - early and mid-career scientists are invited to speak about their career path and take participant questions. A diverse set of panelists are recruited from alternate career paths (educators, industrial and government labs, entrepreneurs).
- **Networking Opportunities** - The summer school schedule provides significant opportunities for participants to network with each other and with the instructors.

Evaluation Results

- From post workshop survey: 95% (22/23 respondents) respondents report being "Very Likely" to "recommend the school to someone."
- Word Cloud Below from Prompt, "Please summarize your overall experience during the summer school."

Student Quotes

- "The overall experience that I had during the summer school was amazing. I learned a lot about different topics in Heliophysics and especially in domains that are not my main area of expertise. […]"
- "It was a wonderful experience. It has really elevated my professional understanding of the field and boosted my confidence significantly.

A Tale of Two Summer Schools

CISM/Boulder Space Weather Summer School

- *Focus: Space Weather and its Impacts*
- *Target Audience: early career graduate students just starting research in the field*
- *Funding: NSF*
- *https://www2.hao.ucar.edu/SWSS*

Heliophysics Summer School

- *Focus: Focus on current research in the Heliophysics*
- *Target audience: advanced graduate students and postdoctoral researchers*
- *Funding: NASA/Living with a Star*
- *https://cpaess.ucar.edu/heliophysics/summer-school*