

The IHY Schools Program

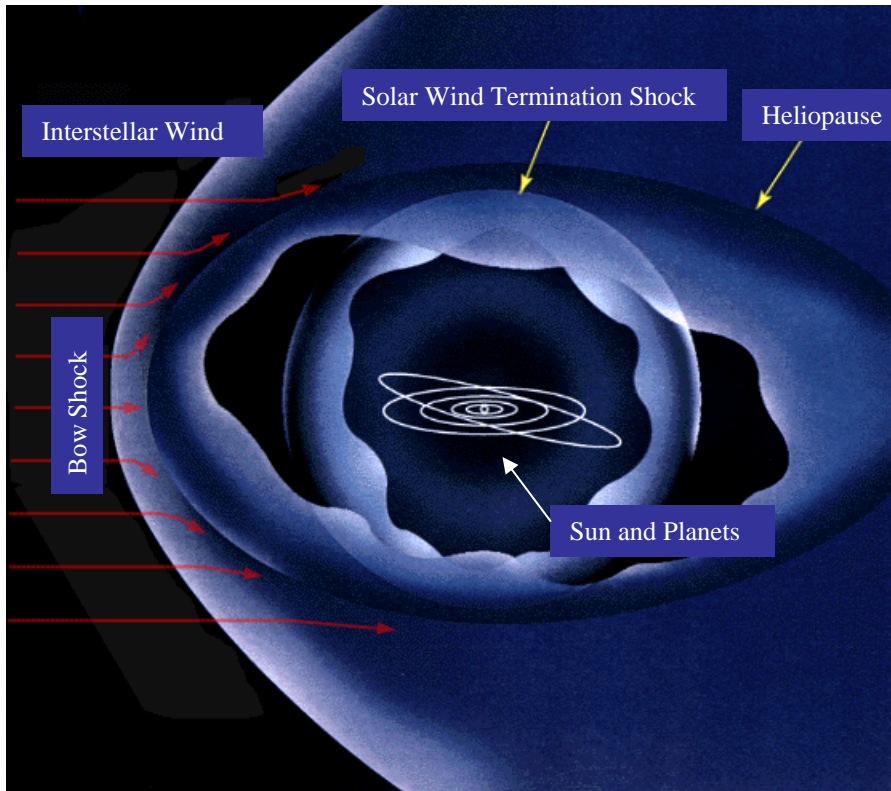


David Webb

*Boston College &
AFRL, U.S.A.*



IHY Scientific Goals



1. **Understand the relationship between external processes and planetary environments (magnetospheres, ionospheres, and atmospheres)**
2. **Understand the Sun-heliosphere system outward to the heliopause -- The new frontier**
3. **Foster international scientific cooperation in the study of Heliophysical phenomena now and in the future**
4. **Communicate the unique scientific results of the IHY to the scientific community and to the general public**



Introduction



- IHY's focus on developing new and exciting Education and Public Outreach (EPO) programs provides unique opportunities to enhance visibility & accessibility of global heliophysics outreach programs
- To address these goals IHY has formed the *IHY Schools Program*:
 - To develop series of schools in 2007- 2009
 - Goal is to educate students about Universal Processes so that they can view their own research interests in new context

Universal Processes are the organizational principles and universal laws that underlie our understanding of the universe.
 - Establishing heliophysics as a basic science requires cross-disciplinary comparative approach to understanding these principles
 - Schools may accommodate both undergrad and graduate students
- IHY Schools Program organized & operated by IHY Schools Committee
 - Consists of members of IHY Secretariat & International & National IHY Coordinators in appropriate IHY regions & countries.
 - Initially invites and support students associated with the two key elements of IHY science program:
 - 1) Coordinated Investigation Programs (CIPs)
 - 2) IHY-United Nations Basic Space Science Initiative (UNBSSI)



IHY Schools Committee



IHY Officers

- **David Webb** (Schools Coordinator)
- **Ilia Roussev**
- **Nat Gopalswamy** (IHY International Coordinator)
- **M. Cristina Rabello Soares** (IHY Outreach Coordinator)
- **Don Hassler** (IHY North America Coordinator)
- **Nancy Crooker** (IHY Steering Committee)
- **Barbara Thompson** (IHY Director of Operations)

International Coordinators

- **Cristina Mandrini & Alisson Dal Lago** (Latin America - 2007)
- **R. Ramesh** (Asia/Pacific – India; 2007)
- **Chi Wang & Fan Quanlin** (Asia/Pacific – China; 2008)
- **Fairos Asillam** (Asia/Pacific – Malaysia; 2009)

Curriculum

- **Karel Schryver, George Siscoe, Roger Smith, Sandro Radicella, Pat Doherty, Keith Groves, K. E. Rangarajan, Ian Mann, Alexander Nindos, Brigitte Schmieder**



Main IHY Schools



2007:

- **Boulder, CO, USA (North America)** *Summer*
Host, NCAR; Co-sponsored by NASA Living With a Star program
Organized by Don Hassler, Karel Schryver & Dave Webb
- **Sao Paulo, Brazil (Latin America)** *November*
Host, CRAAM; ~80 students
Organized by Alisson Dal Lago & Cristina Mandrini
- **Bangalore, India (Asia-Pacific)** *December 10-22*
Host, Kodaikanal Observatory; ~50 students
Organized by Indian Institute of Astrophysics (IIA) and R. Ramesh

2008:

- **Trieste, Italy (Europe-Africa)** *March, April or October*
Host, Intl. Centre for Theoretical Physics (ICTP); ~40 students
Organized by D. Webb, S. Radicella, E. Antonucci, M. Messerotti, B. Schmieder, A. Nindos, N. Gopalswamy, H. Haubold
- **In China (Asia-Pacific)** *TBD*
Organized by Chi Wang and Fan Quanlin

2009:

- **Langkawi Island, Malaysia (Asia-Pacific)** *March*
Host, ? Theme "Living with the Sun"

DFW
Organized by Fairos Asillam & Azreena Ahmad



Other IHY-Related Schools



North America

- **Polar Aeronomy and Radio Science School, Univ. of Alaska, Fairbanks August 2007**
2 weeks long; ~40; Contact: Roger Smith

Latin America

- **Previous schools: Lima, PERU, 17-22 April 2006; 25 students**
Buenos Aires, ARGENTINA (IAFE), 25-29 September 2006; 30 students
San Jose dos Campos, BRAZIL (INPE), 23-26 October 2006; 110 students
- **Merida, MEXICO with the 8th Latin American Conf. on Geophysics (COLAGE),**
12-17 July 2007; Contact: Jean-Pierre Raulin and Alisson Dal Lago

Western Europe

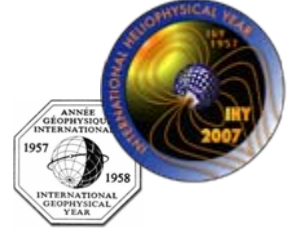
- **L'Aquila, ITALY at ISSS Advanced School in Space Environment - ASSE 2006:**
Solar-Terrestrial Physics, 10-16 September 2006

Balkan/Black Sea

- **Previous school: Baku, Republic of Azerbaijan, Tusi 3rd Summer Astr. School, 2006**
- **Azerbaijan, 4th Tusi Summer Regional Astr. School "Sun and Geosphere" and Young Scientist's Conference – 2007**
- **Bucharest, ROMANIA, Young Scientists Intl. School on "Heliosphere and Galaxy",**
May 3-5, 2007; Contact: Cristiana Dumitrache

Africa

- **Addis Ababa, Ethiopia, IHY-Africa Space Weather Science and Education Workshop,**
Nov 11-16, 2007. Follows the 2nd Africa SCINDA Workshop;
Contacts: Christine Amory-Mazaudier, Abebe Kebede



IHY Schools Curriculum



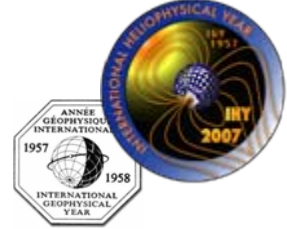
- **Development of general curriculum as a model for all the IHY schools**
 - **Includes seminars and hands-on sessions with databases acquired particularly through the CIPs and UNBSSI programs**
 - **Collaborative efforts with other affiliated groups such as CAWSES, SCOSTEP, European COST action, NASA, NSF, AFOSR, and IAU**
- **Each school encouraged to select local lecturers and students from their regions to reduce costs**
 - **IHY Regional and National Coordinators associated with each school provide logistical support & identify students & scientists in their countries to participate in that school**
 - **IHY-related science teams involved in these countries have primary responsibility for acquiring curriculum materials, organizing analysis labs & helping with lectures and student presentations**



IHY Schools Curriculum - 2



- **Overall scope of the school → *heliophysics***
 - **Universal Processes**
 - **Sun's interactions with the Earth and other planets**
 - **The outer heliosphere**
- **Lectures and data labs cover cross-disciplinary studies of Universal Processes, responses to external drivers, achieving international scientific cooperation, preserving history and legacy of IGY, public outreach & global studies with emphasis on science in developing countries.**
- **Curriculum includes lectures in Universal Processes & each of the 5 IHY science themes:**
 - 1) **Evolution & Generation of Magnetic Structures & Transients**
 - 2) **Energy Transfer & Coupling Processes**
 - 3) **Flows and Circulations**
 - 4) **Boundaries and Interfaces**
 - 5) **Synoptic Studies of 3-D Coupled Solar-Planetary-Heliospheric System**



IHY Schools Curriculum - 3



- **Lectures by science disciplines:**

- Solar Physics
- Solar sources of heliospheric variability
- Energetic particles, & acceleration & propagation through Heliosphere
- Atmospheric studies of planets, involving ionospheres, thermospheres, & mesospheres
- Interaction of energetic particles with magnetospheres (Earth and planets) & their effects in planetary atmosphere
- Coronal Mass Ejections & Space Weather
- Solar Irradiance and Climate

- **Topics treated from theory & modeling aspects**

- **Observations focusing on new instruments & missions**

- STEREO, Hinode, THEMIS and IBEX

- **Lectures on these IHY programs:**

- The IHY-UNBSS program and annual Workshops
- The IGY History and Legacy (Gold) program
- Education and Public Outreach (EPO)
- Science goals and results from PI and host groups of IHY UNBSSI projects & IHY Campaigns, including CIPs



Curriculum Structure



- **School structure:**

- 10 full days or 2 full weeks of class time
- Brief morning & afternoon breaks
- Longer day and evening breaks for socializing and off-time
- ~4 sessions per day → each session ~1.5 hours
- Data analysis labs; Time devoted to labs depends on number of students & amount of pertinent, analyzable data available

- **Advance preparation:**

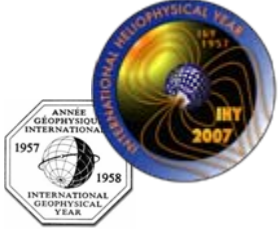
- Involves students and IHY science team
- Students decide on own research topic using “Universal Process” guidelines
- IHY science teams identify several research activities & find Guest Mentors”
- Mentors provide research papers, etc. & discuss project with student

- **During school:**

- Student given individual attention and encouragement
- Paired with workshop coordinator or lecturer & guided in research topics
- At end of school: Students submit poster presentation to on-line session, maybe a videoconf. to discuss their work

Heliophysics community invited to “attend” conference

Later student can present paper at an IHY or other scientific meeting



Curriculum Structure - 2



Lectures	Presentations on a broad range of topics spanning heliophysics, delivered by experts in the field. All regimes in the heliophysical domain will be represented, with emphasis on Universal Processes.
Data & Analysis Labs	1.5-3 hour hands-on exercises familiarizing students with data analysis and modeling resources.
Guest Mentors	Students interact with researchers in heliophysics who study the same Universal Process as the student, but in a different regime.
Student Presentations	An online poster session featuring presentations prepared by the students. All members of the heliophysics community are “invited” to attend. Presentations at an IHY or other scientific meeting.

Week 1

Week 1					
Mon	Tue	Wed	Thu	Fri	Sat
<ul style="list-style-type: none"> • Check-in • Welcome • Logistics 	Solar Physics Lectures	Planetary Ionospheres Lectures	Universal Processes II	Universal Processes III	Free Weekend; Local activities <i>Local scientists invited to attend</i>
Introduction to IHY	Solar Wind and Heliosphere Lectures		Using Online Abstract Services as a Research Tool (ADS, Google)	Space Weather Tutorial	
Heliophysics as a Basic Science	Space Physics Data Facility	Online Forecasting Tools		Guest Mentor Session II	
Student Introductions (including descriptions of their research topics)	Planetary Magnetospheres Lectures	Guest Mentor Session I	Possible Tours of Local Facilities	Open Laboratory Time Students can ask questions of workshop organizers and lecturers, and continue working on this week's lab activities	
	Space Physics Modeling (CCMC)	Heliobiology Lectures			
Universal Processes Overview-I		Open House/ Reception <i>Local scientists invited to attend</i>			
Social Hour for students & lecturers					

Lectures	Student Presentations	Data & Analysis Labs	Guest Mentors
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Week 2

Mon	Tue	Wed	Thu	Fri	Sat
Universal Processes IV	Electronic Data Access Tools & Virtual Observatories (joint with eGY)	Free Morning Students may arrange to meet with local researchers, work on laboratory exercises, explore local area, etc.	Continue working on final presentations, consult with workshop organizers	Panel Discussion: "Careers in Heliophysics"	
Guest Mentor Session III	International Polar Year & the Ionospheric "window" into space			Open Laboratory or Additional Guest Mentor Session	Online Poster Session <i>Heliophysics Community invited to attend</i>
Universal Processes V	Begin working on final presentations	IHY CIPs Students identify a CIP to join or design their own	Student presentations local "premiere"	Final Discussions, Q & A	
Adaptive Modeling Techniques (e.g. CISM)	Education & Outreach in Heliophysics <i>Hosted by IHY-U.S. National Outreach Committee</i>	<i>Earth Sciences for Society: International Year of Planet Earth</i>		Open House/ Reception <i>Local scientists invited to attend</i>	Closing Session, Graduation
Topical Lecture on "System" Science (e.g. CAWSES, LWS)	Panel Discussion: IGY Retrospective	The "New" Space Age			



What Does the Student Take Away?



- **The schools provide students with two unique opportunities:**
 - The chance to develop their studies as part of a new research discipline
 - The ability to work with researchers active in the field during the summer school as a means of broadening their research.
- **After the school the Graduates:**
 - Will be familiar with new topics
 - Will have made fundamental connections with & undergone personal mentoring by several leading researchers
 - Will have identified new areas to apply their own knowledge in the future
- **To enhance the experience of each student & guide them after the school:**
 - A CD or DVD containing the presentations and additional material will be made available to participants at end of the School
 - Copies of one or more books related to IHY science will also be made available
E.g., NASA LWS “Plasma Physics of Local Cosmos” book
 - Continuing contacts between lecturers/mentors & students encouraged to help them solidify their first exposure to this new scientific discipline



IHY and the IAU



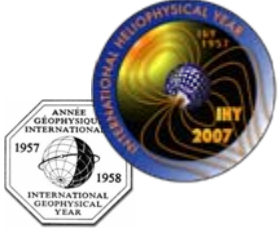
- **The IAU supports these aspects of astronomy in common with IHY:**
 - **Strong collaborations with other international scientific organizations**
 - **Organization of international observing campaigns**
 - **Promotion of educational activities**
 - **Promotion of future international facilities**
 - **Organization of scientific meetings: Symposia, Regional, General Assemblies**
 - **Promotes education & research in developing countries - UN**
- **Ideal for bringing IHY science to an international focus & for forging alliances among all scientists who want to participate anywhere in the world.**
- **IAU Division II provides a forum for studying a wide range of phenomena related to the structure, radiation and activity of the Sun, and its interaction with the Earth & the rest of the solar system – “Heliophysics”.**



IHY and the IAU



- Dave Webb is the **IAU Representative to IHY**
 - Under IAU Division II (Sun & Heliosphere); am Past-President
 - Chair: WG on **International Collaboration on Space Weather**
- Nat Gopalswamy is Chair of WG subgroup on IHY
 - Collaboration with similar organizations to boost synergy & avoid duplication of efforts
 - SCOSTEP/CAWSES & Intl. School for Young Astronomers (ISYA)
- IHY Activities at IAU General Assembly in Prague, August 2006:
 - IHY sub session of Special Session 5 on “Astronomy for the Developing World”
 - IAU Division II Space Weather WG meeting with emphasis on IHY
- Proposed IAU Symposium on Universal Physical Processes (IHY) in 2008
 - Cuts across many astronomical topics
 - Broad geographic coverage (SOC, Speakers, Papers)
 - Prestigious publication (Cambridge University Press)
 - Decision in April or May



THE END