INNOVATION IN ASTRONOMY EDUCATION

Astronomy leads to an understanding of the history and nature of science, and attracts many young people to education in science and technology. But while in many countries astronomy is not part of the standard curriculum, many scientific and educational societies and government agencies have produced materials and educational resources in astronomy for all educational levels. This volume highlights the general strategies for effective teaching and introduces innovative points of view regarding methods of teaching and learning, particularly those using new technologies. Technology is used in astronomy, both for obtaining observations and for teaching. The book also presents ideas for how astronomy can be connected to environmental issues and other topics of public interest. This valuable overview is based on papers and posters presented by many of the world's leading astronomy educators at a Special Session of the International Astronomical Union General Assembly in Prague in 2006.

JAY M. PASACHOFF is Field Memorial Professor of Astronomy at Williams College, and was President of the Commission on Education and Development of the International Astronomical Union.

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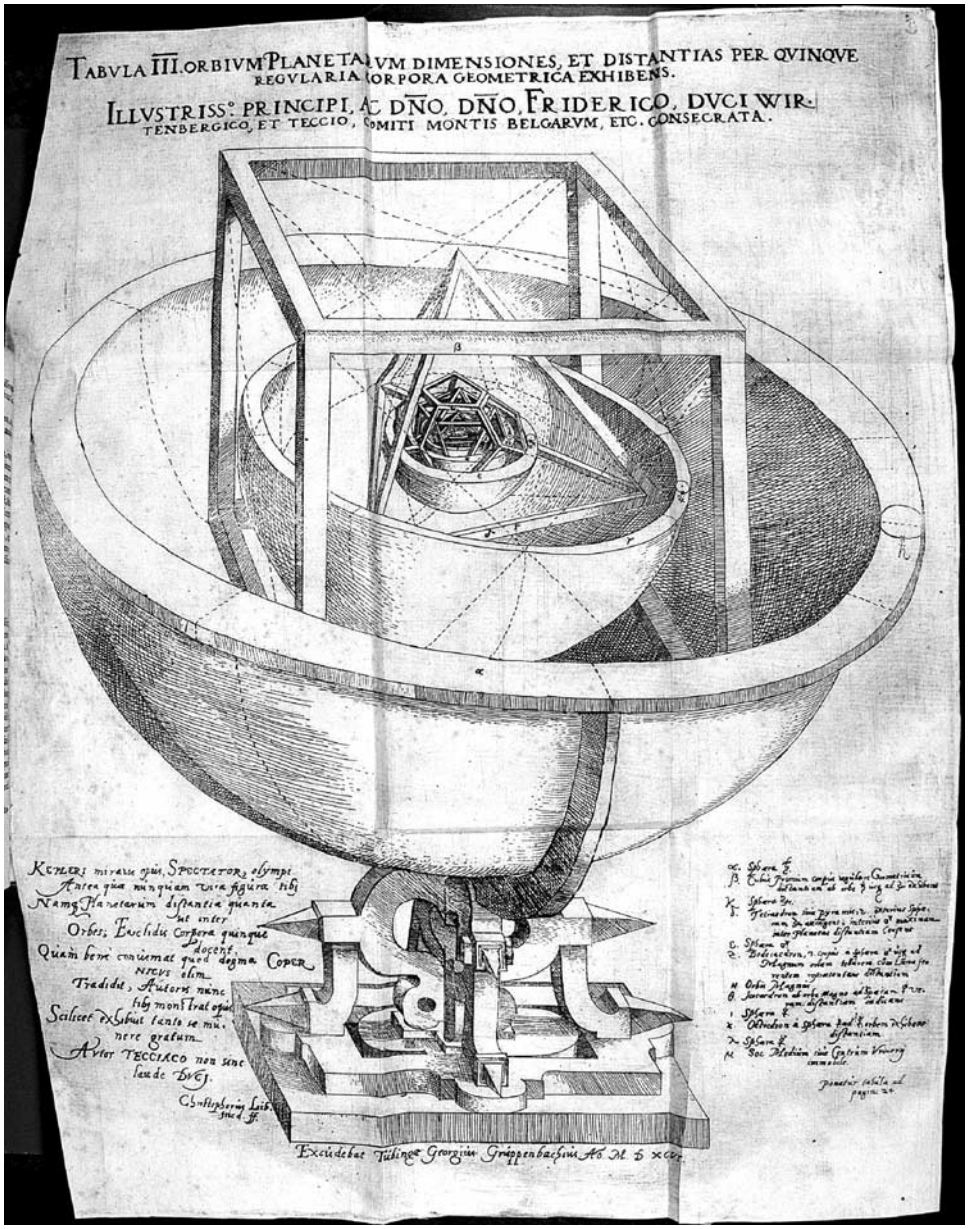
Cover: The Astronomical Clock of Prague, one of the main tourist sites in this city that hosted the 2006 International Astronomical General Assembly, in which the Special Session on which this book is based was included. The clock shows the Sun's position in the sky, the lunar phase, the zodiac, the positions of the Sun and Moon on the ecliptic, and other items of interest to astronomers. The oldest part of the clock dates back to 1410, though the clock's current appearance comes from major repairs after World War II devastation. Moving statues, for which tourists gather on the hour, were added in the seventeenth century. (Richard Nebesky/Lonely Planet Images/Getty Images)



Johannes Kepler's heliocentric idea, from his *Mysterium Cosmographicum* (1596), that the planets' spacing was determined by the Platonic solids. Kepler moved to Prague, the site of the International Astronomical Union's 2006 General Assembly at which this Special Session on Innovation in Teaching and Learning Astronomy was held, to work with Tycho Brahe, leading to Kepler's three laws of planetary motion. (Photo courtesy of Jay M. Pasachoff with the assistance of Wayne Hammond, Williams College's Chapin Library.)

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Preface

This book is based on the proceedings of a conference on education in astronomy. On August 17 and 18, 2006, the International Astronomical Union's Commission on Astronomy Education and Development held a Special Session at the IAU General Assembly in Prague. The session, on Innovation in Teaching/Learning Astronomy, was organized around four themes: (1) general strategies for effective teaching, (2) connecting astronomy with the public, (3) effective use of instruction and information technology, and (4) practical issues connected with the implementation of the 2003 IAU Resolution that recommended including astronomy in school curricula, assisting schoolteachers in their training and backup, and informing them about available resources. Approximately 40 papers were presented orally; in addition, 60 poster papers were displayed.

Some of these topics had been considered in the Special Session at the 25th General Assembly in 2003 in Sydney, the subject of a book published in 2005, Jay M. Pasachoff and John R. Percy, *Teaching and Learning Astronomy: Effective Strategies for Educators Worldwide* (Cambridge University Press, 2005). But it is necessary to continue and extend the work started then in order to increase the quality and quantity of astronomy in schools.

The Organizing Committee for the conference consisted of:

Rosa M. Ros (Spain, co-chair), *Spanish National Liaison to IAU Commission 46; Vice-President of the Commission 2006–2009*

Jay M. Pasachoff (USA, co-chair), *President, IAU Commission 46*

Michael Bennett (USA), *Executive Director, Astronomical Society of the Pacific*

Julieta Fierro (Mexico), *Former President of IAU Commission 46*

Michele Gerbaldi (France), *Chair, IAU International Schools for Young Astronomers Program Group*

Petr Heinzel (Czech Republic), *Astronomical Institute of the Czech Academy of Sciences*

Bambang Hidayat (Indonesia), *Bosscha Observatory, Institute of Technology Bandung, Past Vice-President of the IAU*

Syuzo Isobe (Japan), *Former President of IAU Commission 46*

Edward Kononovich (Russia), *Russian National Liaison to IAU Commission 46*

Margarita Metaxa (Greece), *Greek National Liaison to IAU Commission 46*

John R. Percy (Canada), *Former President of IAU Commission 46*

Magda Stavinschi (Romania), *Astronomical Institute of the Romanian Academy of Sciences; President of the Commission 2006–2009*

Richard West (Germany), *Former Chair, Department of Outreach and Education, European Southern Observatory*

Lars Lindberg Christensen (Germany, webmaster), *PIO/Head of Communication, ESA Hubble/James Webb Space Telescope, IAU Press Officer*

The meeting was supported not only by Commission 46 on Education and Development but also Commission 41 on the History of Astronomy and Division XII on Union-wide Activities.

Over 400 astronomers and educators from 63 countries registered for this conference. The conference was part of the triennial General Assembly of the International Astronomical Union, which this year gained notoriety from the resolution defining the word "planet" and putting Pluto and some other objects in a new category of "dwarf planet." One of the papers in this symposium, by Lars Lindblad Christensen, dealt with public-information aspects of that situation – which may wind up continuing until the next IAU General Assembly to be held in Rio de Janeiro in 2009.

We thank all the authors and other contributors.

Prague was a particularly apt site for a conference on astronomy, since Tycho Brahe and Johannes Kepler did so much important work there. It is particularly suitable that this book is available in time for the International Year of Astronomy (www.astronomy2009.org), which commemorates the 400th anniversary of the 1609 work of Galileo and Kepler.

We acknowledge the generous support of the International Astronomical Union and its Executive Committee, both in the form of travel grants for some participants and in the form of moral support for the importance of education. Many other participants received support from their institutions or countries, and we are grateful to those who made sure that these individuals could attend and participate.

We dedicate this book to Syuzo Isobe of Japan, past President of Commission 46 (2000 to 2003), who died on 31 December 2006. Accounts of his life and work appeared in the March 2007 edition of the Commission 46 Newsletter, which is accessible through the Commission's Website at www.astronomyeducation.org.

We thank Javier Moldón of the University of Barcelona for helping to organize the Special Session. We thank Madeline Kennedy for her assistance at Williams College with the preparation of this book and for compiling the index. We are grateful for some financial support from Williams College for work carried out on the educational activities of our International Astronomical Union Commission on Research and Development. The participation of one of us (J.M.P.) in the Prague General Assembly was supported in part by a research grant from the Planetary Sciences Division of NASA and by a travel grant from the US National Science Foundation through the American Astronomical Society.

At Cambridge University Press, we thank our acquiring editor, Vince Higgs, for his support of this project. We are pleased with the excellent assistance there of Lindsay C. Barnes, Eleanor Collins, and Bethan Jones. Frances Nex has proven to be a most capable copy editor.

Jay M. Pasachoff
Rosa M. Ros
Naomi Pasachoff

Attendees photographed during the meeting in Prague. (Photo by Robert L. Hurt, Spitzer Science Center, Caltech.)