Part I

General strategies for effective teaching

Introduction

The 20 papers constituting the first day's proceedings were devoted to the first theme, "General strategies for effective teaching." After welcoming remarks, Jay M. Pasachoff, commission president, and Rosa M. Ros, who later became the commission vice-president, briefly summarized the main objectives of the Special Session, mentioning a variety of new methods of information dissemination (e.g., World Wide Web, Astronomy Picture of the Day, podcasts), the role astronomy can play in attracting young people to careers in science and technology, and the usefulness of technology both to observers and to teachers.

Former commission president John Percy of Canada next spoke about "Learning Astronomy by Doing Astronomy." Percy contrasted learning astronomy facts from lectures and textbooks and "doing astronomy" in a more intellectually engaging fashion, emulating the actual scientific process, than called for in standard activities culminating in a predetermined result. While recognizing the value of "hands-on" activities, such as making scale models of the Solar System, Percy argued that "minds-on" activities – such as involving students in meaningful ways in their teachers' professional research (even if the result is not publishable) – are more valuable. He pointed out that in labs, which should mirror actual research, students can manipulate actual data, using the same computer languages and software used by real researchers. These activities help them grasp that astronomy facts do not emerge full-blown from textbooks but are figured out by astronomers based on ongoing research. Percy spoke also of the value of having students themselves assume the role of astronomy communicators by tutoring peers or younger students or making classroom or public presentations. Percy referred to conference participant Richard Gelderman's assertion that students should be exposed to recreational science, such as science fairs, "for curiosity, interest, and . . . for fun, fellowship, and . . . mental well-being," just as they are encouraged from their earliest years to participate in recreational sports for physical and mental health. He noted, too, that even urban students can learn to understand and make the astronomical observations that underlie the religious observances of major world faiths. He concluded with the thought that "the ultimate goal of astronomy education" is to reach every student. While only a fraction will become professional astronomers, every student may become an amateur astronomer, with a lifetime passion for astronomy.

Like Percy, Roger Ferlet of France underscored the importance of engaging pupils in "observing, arguing, sharing, discussing and interpreting real astronomical data, in order to enhance autonomy and reasoning; in brief, learning science by doing science." Ferlet discussed the European Union's Hands-On Universe project as a tool to reverse the "clear disaffection for scientific studies at universities" by convincing middle and high school students that scientific understanding “can be a source of pleasure.” The project, a partnership of eight European countries under the auspices of the French University Pierre and Marie Curie in Paris, invites these younger students “to manipulate and measure images” in class, using “real observations acquired through an Internet-based network of robotic optical and radio telescopes or with didactical tools such as webcam,” assisted by scientific experts and by a select group of teachers who are trained in special workshops. The newly trained teachers go on to become “resource agents” for their own countries, with a mandate to train other educators. This European undertaking is important not only to the international scientific community but also to society as a whole, since not only does a “sustainable economy” depend on innovations by “a critical number of scientists and engineers,” but also societies that undervalue science “regress to more primitive and much less attractive” conditions. An additional social benefit of the project is that it encourages communication among students from different countries. The positive reaction to Hands-on Universe has aroused hopes that similar European initiatives will result in “‘Hands-on life’ for biology, ‘Hands-on Earth’ for geology/ecology, etc.”

Former commission president E. V. Kononovich of Russia described a manual about the Sun, the Earth, and their interactions assembled by the Sternberg Astronomical Institute of Russia for older high school students and for “students of natural faculties of universities and teachers’ colleges” with an interest in solar problems. The manual is also a useful teaching aid for courses covering solar physics and solar–terrestrial relations. The manual, which makes use of both ground-based observations and results from SOHO, Yohkoh, Ulysses, TRACE, CORONAS, and other space telescopes, is divided into three sections. The first considers the Sun as a star, solar activity, and helioseismology. The second describes the Earth in space, its structure, its atmosphere, its magnetic field, its weather and climate, and active phenomena on the terrestrial surface. The third section considers such solar–terrestrial relationships as ionospheric disturbances, solar cosmic rays, and aurorae.

Bill MacIntyre of New Zealand presented “A Model of Teaching Astronomy to Pre-Service Teachers that Allows for Creativity in Communicating Students’ Understanding of Seasons.” (In MacIntyre’s paper, “students” are teacher trainees, not the young people they will go on to teach.) MacIntyre began by distinguishing among mental models (“cognitive notions held by individuals”), expressed models (mental models that have been communicated to others), consensus models (expressed models valued by a social group and widely used by it), scientific models (consensus models that are used by scientists for further scientific developments), and teaching models (used to provide opportunities for teachers-in-training to develop their understanding of basic astronomy along with pedagogical skills). A goal of the “investigating with models” approach is to have students understand “the limitations and strengths” not only of their own models but also of scientists’ models. Since expression of a scientifically inaccurate mental model has the potential to embarrass the student, teachers must make sure to have the revelations take place “in a small group” and “in a non-threatening way.” The exercise requires students to collect evidence that will either support or lead them to change their mental models, a requirement that guarantees they will practice “aspects of the nature of science (observations, inferences, creativity and empirically based knowledge) that relate to the systematic nature of investigating.” MacIntyre described in detail the process by which two teachers-in-training creatively developed expressed models after identifying specific aspects of their original expressed model that other members of their group had difficulty comprehending. Why is such an exercise for teacher trainees useful? “If we expect classroom teachers to cater for the creative–productive gifted students during astronomy teaching in primary and secondary schools, then pre-service teacher training must model the appropriate classroom environment that allows it to occur."

In "How to Teach, Learn About, and Enjoy Astronomy," Rosa M. Ros of Spain described "what I learnt after 10 years of the [European Association for Astronomy Education] Summer School," drawing on the questionnaire responses of approximately 600 opinions of teachers of secondary school students from over 20 countries. To make students – in this case, the teachers – "feel like actors in the teaching–learning process," she, like other Special Session 2 participants, advocates "learning by doing." During the summer sessions the teachers are exposed to a variety of approaches to the teaching of astronomy, including model-making, drawing, and playground activity. Just as a classroom teacher must be prepared to answer spontaneous questions from pupils about an astronomy topic that interests them, Ros as summer school director had to modify the activities to accommodate "the topics, matters, and methods" about which the teacher participants wanted to know more, bearing in mind always that astronomy concepts must be presented in some context, not in isolation. Instead of presenting a body of facts for students to memorize, "it is important to connect the concepts with the personalities related to the topics, with the scientific situation in the past or maybe the social implications of the subjects." One goal of the summer school is to encourage more inspired and more passionate teaching of math and physics. "If the teachers enjoy teaching, the students will also enjoy their classes." Ros lamented the fact that science museums tend to mount exhibits about science that stress the "spectacular and funny," leaving to schools "the boring science area." Nonetheless, she noted that "not everything can be fun at school," arguing that teachers must also "introduce the culture of making an effort to students." Even under-funded schools with limited resources can include creative astronomy activities in the curriculum. "All schools have a sky over their buildings. It must be used to observe and take measurements. If the school does not have tools and devices for making observations, we can encourage the students to produce their own instruments." Whatever is lost in precision by doing so is more than compensated for in student commitment.

Based on his experience as director of astronomical laboratories at the University of Colorado in the United States, Douglas Duncan advocated the use of "clickers" – wireless student response systems – as "the easiest interactive engagement tool" in teaching large lecture classes. Studies show that students enjoy using clickers, which transform students from "passive listeners" to "active participants" in the learning process. The use of clickers also enables teachers to determine their level of comprehension without waiting for test-time. Studies show that the average student in a large physics lecture course, regardless of the effectiveness of the lecturer, truly comprehends at most 30% of newly introduced concepts. To master a new concept, students "must think about the idea and its implications, fit it into what they already know, and use it." They must dislodge the misconceptions with which they enter the lecture hall. While professional scientists bounce ideas back and forth among themselves and within their own minds, students often believe "that taking notes, memorizing, and repeating material on an exam is all there is to learning." Duncan also advocated using clickers to facilitate peer instruction, since studies show that "when comparable numbers of students start with right and wrong conceptions, peer instruction usually results in students agreeing on the correct answer, not the wrong one." He cautioned, however, that "like any technology, clickers can be misused, and it is important to practice and to explain their use to students before starting."

In "Educational Opportunities in Pro-Am Collaboration," Richard Fienberg, editor of *Sky and Telescope* magazine, echoed other symposium participants in asserting that "the best way to learn science is to do science," and called, as Michael Bennett would do in a later paper, for collaborations among amateurs, professionals, and educators. "Amateurs will benefit from mentoring by expert professionals, pros will benefit from observations and data processing by increasingly knowledgeable amateurs, and educators will benefit from a larger pool of skilled talent to help them carry out astronomy-education initiatives." Noting the important contributions amateur astronomers have historically made to the field, the loss of access of professional astronomers to mid-sized meter-class telescopes, and the need to follow up on "countless interesting objects" being discovered by automated all-sky surveys, Fienberg recommended that serious amateurs – many of whom have access to digital imagers on computer-controlled mounts – be given the opportunity to do some of this monitoring. He identified the American Astronomical Society Working Group for Professional–Amateur Collaboration as a "forum for collaboration between amateur and professional astronomers." Fienberg noted that amateurs continue to make important contributions to astronomy in areas including occultations; variable stars; meteor showers; CCD photometry and astrometry; and the search for and discovery of novae, supernovae, GRB counterparts, comets, and asteroids. In addition to this important work, amateurs can also help with astronomy outreach within their local communities and over the Internet with other researchers and educators around the world.

José Maza reported on his two decades of experience "Teaching 'History of Astronomy' to Second-Year Engineering Students at the University of Chile." The course partly fills the two-course "Humanistic Studies" requirement that each engineering graduate must complete. As a result of the course, men and an increasing number of women who will go on to work at, and often become senior executives at, major Chilean companies are exposed to the basics of astronomy and to its development over history. The first part of the course, "a tour to the scientific revolution," begins with the ancient civilizations; leads up to Newton's construction of modern science; and ends with the contributions of Euler, Clairaut, Lagrange, D'Alembert, and Laplace to celestial mechanics. The second part begins with William Herschel and the discovery of the Milky Way and proceeds over several weeks to a discussion of the big bang, the cosmic background radiation, and dark energy, before culminating with a lecture on the history of astronomy in Chile. Maza would be happy to exchange ideas with other astronomy educators.

Gilles Theureau reported on his experience with coauthor L. Klein teaching a two-semester course for students with varied backgrounds and interests at the University of Orléans (France) on the "history and epistemology of the concepts of stars and galaxies" from antiquity to the early twentieth century. The cross-disciplinary approach is unusual in France, "where pupils start to be specialized" from the age of 15. The course opens with a study of world systems from the pre-Socratics to the philosophers of the Middle Ages, moves on to concepts of mechanics and planetary motion from Aristotle to Newton (and a little beyond), proceeding then to a discussion of spectroscopy and the nature of stars, and concluding with descriptions of the Milky Way and the nature of nebulae. The course emphasizes "mechanisms of knowledge," including observation, experiment, and theory, as well as mythology, theology, philosophy, metaphysics, physics, mathematics, and instrumentation, in order to demonstrate that human ideas of the Universe evolved "as a part of human history and culture," that "science belongs to the patrimony of humanity and that it has no frontiers," and that astronomy draws on both the humanities and the sciences. The course makes use of original documents that are considered in their historical context, including Aristotle on meteorology (350 BCE), Nicolas Oresme's challenge to Ptolemy's view of celestial motion (c. 1380), William Herschel's *On the Construction of the Heavens* (1785), and Agnes M. Clerke's *Problems in Astrophysics* (1903). The class also paid a visit to the Nançay Radio Observatory Astronomy Museum and Visitor Center; for the majority of students, who have "never looked at the sky," this visit provided "an impression of the questions of interest to past generations of philosophers and astronomers." Although in such a course it would have been easier to evaluate students through exams exclusively, the professors opted for the more difficult choice of assigning individual written projects in the first semester and a comprehensive exam in the second semester. The professors broadened their own cultural outlook by teaching the course, but found the presentation of material to and evaluation of such a heterogeneous group of students very challenging.

Jay M. Pasachoff spoke about "Educational Efforts of the International Astronomical Union." He described how the work of the commission, which resulted from a merger of the commissions on education and on astronomy in developing countries, is carried out in ten program groups. These groups include the world-wide development of astronomy, which sends some of its members to visit countries interested in learning about advances in carrying out astronomy and perhaps even becoming members of the International Astronomical Union; teaching for astronomy development, which provides visiting experts or lecturers to help advance a country's astronomical education; exchange of astronomers, which arranges international visits of several months or longer for people from developing countries to visit major research institutions; the International School for Young Astronomers that is held every non-General-Assembly year for some dozens of new astronomers or graduate students; a semiannual newsletter; a group charged with coordinating with international institutions such as UNESCO, and that will now work with the International Year of Astronomy scheduled for 2009; a group involved in international exchanges of journals that could aid developing countries; and a group related to taking advantage of public interest at the times of solar eclipses to spread astronomical knowledge, including but not limited to the eclipse itself. All these groups, the newsletters, and other related activities are accessible through the commission's website at www.astronomyeducation.org.

Magda Stavinschi of Romania, who became commission president at the end of the Prague general assembly, argued that astronomy is an integral part of human culture, in the evolution of which it often played a significant role. The discoveries of archaeoastronomers have proven that prehistorical civilizations pondered cosmological questions and wondered about the place of humankind in the Universe. From the beginnings of history people across cultures have recorded significant events through markers that include not only human events, such as wars and the births and deaths of leaders, but also cosmic events, notably comets and eclipses. Stavinschi called attention to the often overlooked relationship between politics and astronomy, noting the post-World War I confirmation of Einstein's general theory of relativity by the Englishman Sir Arthur Eddington. During the war, Germany, Einstein's native land and the country that employed him, was a bitter enemy of England. This scientific collaboration not only served as "a perfect proof of scientific internationalism" but also helped reincorporate German scientists into the scientific community after the war. After briefly mentioning the links between astronomy and geography, mathematics, physics, chemistry, meteorology, technology, medicine, and pharmacology, Stavinschi pointed out some famous examples of the incorporation of astronomy in art, music, heraldry, folklore, and literature. She spoke of the importance of astronomy education: those with an appreciation of the Universe understand the need to protect Earth from manmade devastation "much before its natural end."

While the mass media have succeeded in educating the public through coverage of space missions, and television programs featuring scientists like Carl Sagan have popularized astronomy, the media also are responsible for disseminating misinformation about astronomy. After briefly reviewing the history of astrology, she pointed to the astronomers' "moral duty" to "prove the quackery of astrology." She concluded by arguing that "there is no conflict between science and religion," since they are "two different ways of considering the world," and dismissed the usefulness of arguing the relationship between astronomy and philosophy, since "all that defines philosophy intimately contains the Universe and especially man in the Universe." Astronomy can continue to play a role in the development of culture in pointing humanity in the direction of "what it has to do from now on."

Margarita Metaxa of Greece, where she teaches at the Arsakeio High School in Athens, spoke about "Light Pollution: a Tool for Astronomy Education," which can help motivate not only students but also "the public, government officials and staff, and lighting professionals." Like Duncan, Metaxa noted that students "hold misconceptions about the physical world that actually inhibit the learning of scientific concepts" and that "students can remember less" than their teachers often assume. She called attention to a two-year program on light pollution sponsored by the Greek Ministry of Education and Religion, with backing from the EU; to the Internet Forum on Light Pollution, sponsored by the netd@ys Europe project, a European Commission initiative in the area of education, culture and youth for the promotion of new media; and to a UNESCO-backed conference on "Youth and Light Pollution" held in Athens in autumn 2003. Outside of Europe, Chile has played a significant role in educating students about "the effects of light pollution on the visibility of stars in the night sky." She concluded by emphasizing that bringing both astronomy and light pollution to the world's attention in order "to protect the prime astronomical places and the 'dark skies' as a world heritage" represents a significant challenge. It is one, however, that astronomers can meet by working "together with interested organizations."

On behalf of a group of collaborators, S. P. S. Eyres of the UK described worldwide online distance learning from astronomy courses prepared by the University of Central Lancashire. The student subscribers to these online courses range in age from 16, though most are over 21. They include a retired industrial professional with a doctorate in chemical engineering, an English teacher with a deep interest in astronomy, an employee of an examinations board responsible for school astronomy curricula, a high school student preparing for university entrance exams, a primary school classroom assistant working toward a degree, among others. While all students share an interest in astronomy, they differ in what they hope to achieve through participating in the online distance learning program. Although distance learning in the UK is often associated primarily with the Open University, the University of Central Lancashire (UCLan) has been offering adult education courses in astronomy for about a decade. It is now possible to earn an honors bachelor of science degree in astronomy through UCLan. Eyres explained why the traditional "teacher-focused" astronomy education, in which an "expert in the subject decides what the student needs to know at the end of the course, and works backwards from there to determine where they must start," is inappropriate to distance learning. The framework of modules in the UCLan program enables students to determine if they are capable of higher-level work before they sign up for a lengthy course of study. Students are able to study modules provided by other institutions and use them for UCLan credit. They may also receive credit for skills they may already have in such fields, for example, as IT or math. Students correspond with their tutors both through e-mail and through "discussion and chat tools on UCLan's virtual learning environment." With the introduction of competitive tuition fees at UK brick-and-mortar universities, the honors bachelor of science degree available through UCLan has the potential "to attract students from the traditional 18- to-21-year-old UK degree market." Even students who can pay the tuition fees at traditional universities may choose to take distance courses as a way of drawing attention to their qualifications and making themselves stand out from other applicants for admission. UCLan is also thinking of entering the teacher training market.

Donald Lubowich of Hofstra University, on New York's Long Island, USA, demonstrated how he has successfully used "Edible Astronomy Demonstrations" to motivate students of all ages and to enhance their understanding of such varied concepts as differentiation, plate tectonics, convection, mud flows on Mars, formation of the galactic disk, formation of spiral arms, curvature of space, expansion of the Universe, and radioactivity and radioactive dating. His materials have included chocolate, marshmallows, candy pieces, nuts, popcorn, cookies, and brownies. Echoing other participants' comments that passionate and joyful teachers are effective teachers, he urged symposium participants to be "creative, create your own edible demonstrations, and have fun teaching astronomy."

In "Amateur Astronomers as Public Outreach Partners," Michael A. Bennett, executive director of the Astronomical Society of the Pacific (ASP), which is based in San Francisco, USA, identified "a huge, largely untapped source of energy and enthusiasm to help astronomers reach the general public" as volunteer science educators and urged astronomers and astronomy educators around the world "to consider more formal cooperation with amateurs." The ASP has estimated that, if one defines "amateur astronomer" as one who has joined a club of like-minded people, there are over 50 000 "affiliated amateur astronomers" in the US alone. It has also estimated that US amateur astronomers "reach some 500 000 members of the general public every year" through public star parties, classroom visits, community fairs, and museum/science center events. In March 2004 the ASP, with funding from the Navigator Public Engagement Program at NASA/JPL, launched its NASA Night Sky Network (NSN) to provide amateurs "with tested Outreach ToolKits on specific topics that can be used in a wide variety of ways with many different types of audiences," as well as training in how to use these resources. Amateur clubs must meet certain criteria in order to become members of NSN, and approximately 200 clubs had joined by summer 2006, representing approximately 20 000 amateur astronomers who have participated in over 4500 public outreach events. NASA funding is expected to continue for this effective program. Bennett urged astronomers around the world to identify ways to engage "outreach amateur astronomers" in their own countries.

Underlying the paper of former commission president Syuzo Isobe of Japan about "Does the Sun Rotate Around Earth or Does Earth Rotate Around the Sun?: an Important Aspect of Science Education" is the conviction that effective astronomy teaching must begin with the consideration of four variables: the pupil's class year, ability, level of interest, and future career. While of course it is more accurate to teach that the Sun does not rotate around Earth, it is not quite correct to teach that Earth rotates around the Sun, since "Solar System bodies rotate around a gravity center different from the center of the Sun." While for most students the assertion that Earth is a sphere is adequate, students who have a higher interest level and students who may go on in scientific professions should know that Earth "is an ellipsoid or a geoid."

Fernando J. Ballesteros and his colleague Bartolome Luque, both of Spain, made a case for "Using Sounds and Sonification" – and not merely impressive astronomy photographs – "for

Astronomy Outreach." The authors have a successful weekend radio program, "The Sounds of Science," broadcast on the national radio station of Spain. Sometimes, in fact, as with pulsars, "the images are not very spectacular but the sounds are strangely attractive." Astronomical sounds are also available to blind people in a way that images are not. [Editors' note: At least four books of astronomy images are available to the blind: Noreen Lawson Grice's *Touch the Stars, Touch the Universe: a NASA Braille Book of Astronomy*, *Touch the Sun: a NASA Braille Book and Touch the Invisible Sky*. Pasachoff reviewed the first three in the US college honor society Phi Beta Kappa's *The Key Reporter*, spring 2006, pp. 15–16, downloadable at www.pbk.org.] Ballesteros identified a number of Internet resources for astronomy sounds, the computer software "Sounds of Space," available for both PCs and Macs, and the possibility for professional astronomers to "sonificate" their own data, by passing them "to an audible format." Addressing the issue that there is no sound in the vacuum of space, Ballesteros notes that this fact represents a teachable moment in itself, since "in many cases the sounds will be radio signals passed to sound," as is the case with both pulsars and aurorae. Similarly, black holes, lightning storms on Saturn, and ionization tracks from shooting stars also emit radio signals. Ballesteros noted that in some cases there are real sounds, such as "when a shooting star crosses the sound barrier"; in other cases the sound may be inaudible but can be indirectly reconstructed, as in the case of "sound waves crossing the solar surface," which the vacuum of space prevents from reaching Earth, but which SOHO instruments can record indirectly and reconstitute after the fact.

Basing their argument on successful activities offered for school students at Sydney (Australia) Observatory, Nick Lomb and Toner Stevenson contend in "Teaching Astronomy and the Crisis in Science Education" that the trend in some countries to shun careers in math and science can be overcome by using astronomy "as a tool to stimulate students' scientific interest." The matter is of some importance, since if the trend is not offset, "there may not be enough people with Science, Engineering and Technology (SET) skills to satisfy the demand from research and industry." Not only will it be necessary to replace retirees from the "baby boomer" generation but also burgeoning industries including nanotechnology, biotechnology, and information technology will require workers with SET skills. In Australia, however, studies show a decline in the number of high school students studying advanced mathematics and both the life and physical sciences. Data from other countries are similarly dispiriting. Unless their parents have a positive attitude toward science, students often shun the physical sciences because they think of them as boring and irrelevant. Many students perceive science to be so difficult that only highly gifted students can succeed at them. Even those with high aptitude sometimes enroll in science courses only to improve their chances at excelling in university entrance exams. Lomb and Stevenson assert that planetaria and public observatories can improve student attitudes to science by engaging students' interest in a personal way.

In "Astronomy for All as Part of a General Education," J. E. F. Baruch *et al*. discussed the pluses and minuses of using www.telescope.org, a Web-based education program in basic astronomy available free of charge to anyone with Internet access. The authors explained the advantages of truly autonomous robotic telescopes, such as the Bradford Robotic telescope, which can "deliver the initial levels of astronomy education to all school students in the UK" over remotely driven telescopes that reach only "a tiny percentage . . . of students." They also discussed "practical solutions" for assisting teachers lacking not only a deep knowledge of basic astronomy but also confidence in working with information technology.

See also short descriptions of posters, pages 132–143.

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Main objectives for the meeting on innovation in teaching/learning astronomy

Jay M. Pasachoff and Rosa M. Ros

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Abstract: The aim of Special Session 2 on "Innovation in Teaching/Learning Astronomy" was to contribute to the implementation of the recommendations included in the 2003 International Astronomical Union resolution on the Value of Astronomy Education, passed at the General Assembly held in Sydney, Australia. These recommendations introduced innovative points of view regarding methods of teaching and learning. Astronomers from all countries – developed or developing – will be interested. Astronomy attracts many young people to education in important fields in science and technology. But in many countries, astronomy is not part of the standard curriculum, and teachers do not receive adequate education and support. Still, many scientific and educational societies and government agencies have produced materials and educational resources in astronomy for all educational levels. Technology is used in astronomy both for obtaining observations and for teaching. In any case, it is useful to take this special opportunity to learn about the situation in different countries, to exchange opinions, and to collect information in order to continue, over at least the next triennium, the activities related to promoting astronomy throughout the world.

In 2003, after much effort by members and officers of the International Astronomical Union's commission on education and development, and spurred on by Magda Stavinschi of Romania, the IAU was placed on record as endorsing worldwide astronomy education in a variety ways that we will specify in Part IV of this book. At the Prague General Assembly of the International Astronomical Union, held three years after the passage of the resolution, it seemed to be time to assess what progress had been made in the intervening years. We were also able to bring together a wide variety of astronomers and astronomy educators from around the world, including many who had not been able to go to Sydney. We were also glad to have the participation of some astronomers from developing countries who were new to our educational projects.

(1) In the IAU resolution on the Value of Astronomy Education, passed by the IAU's General Assembly in 2003, it was recommended:
  - to include astronomy in school curricula,
  - to assist schoolteachers in their training and backup,
  - to inform teachers about available resources.

(2) New methods of dissemination of information are making big changes in the opportunity of spreading astronomical knowledge.
  - The World Wide Web continues to expand its reach.
  - The Astronomy Picture of the Day (antwrp.gsfc.nasa.gov/apod/) reaches the home-page of millions.
  - The new phenomenon of podcasts is spreading rapidly.

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