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Challenges in Astronomy Education

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Abstract. Astronomy is an attractive subject for education. It deals with fascination of the unknown and the unreachable, yet is uses tools, concepts and insights from various fundamental sciences such as mathematics, physics, chemistry, biology. Because of this it can be well used for introducing sciences to young people and to raise their interest in further studies in that direction. It is also an interesting subject for teaching as its different aspects (observation techniques, theory, data sampling and analysis, modelling,?) offer various didactical approaches towards different levels of pupils, students and different backgrounds. And it gives great opportunities to teach and demonstrate the essence of scientific research, through tutorials and projects. In this paper we discuss some of the challenges education in general, and astronomy in particular, faces in the coming decades, given the major geophysical and technological changes that can be deducted from our present knowledge. This defines a general, but very important background in terms of educational needs at various levels, and in geographical distribution of future efforts of the astronomical community. Special emphasis will be given to creative approaches to teaching, to strategies that are successful (such as the use of tutorials with element from computer games), and to initiatives complementary to the regular educational system. The programs developed by the IAU will be briefly highlighted.

Teaching Astronomy for Development

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Abstract. The primary goals of the IAU Commission 46 Program Teaching Astronomy for Development (TAD) are to aid in "the enhancement of a country's astronomy education and astronomical research in support of education". The IAU-TAD program continues to vigorously support astronomy education, teaching, research and outreach programs in developing countries. TAD programs supported over the last few years have included the following countries: Columbia, Iran, Kazakhstan, Mongolia, Morocco, Nepal, North Korea (DPR- Korea), the Philippines, Vietnam. Examples and outcomes of some of these programs are discussed. Also discussed are the future plans for the TAD program as well as practical information on how to apply for a TAD program for your country. Additional information about the IAU/TAD program can be provided by the TAD chairs at e-mail addresses: edward.guinan@villanova.edu and marschal@gettysburg.edu. Information on TAD programs is also available on the IAU Commission 46 website.

Astronomy Education in Thailand From Junior School To University

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Abstract. In 2001 the government introduced astronomy into the natural science school curriculum. While it was an excellent idea, there was a shortage of teachers with training in astronomy! In order to educate the teachers we needed to expand the astronomy programs at the university level. In this paper we describe the historical development of astronomy from the 1600 to present day Thailand.

The first observatory was established in 1685 during the reign of King Narai. King Rama IV calculated the time and location of the solar eclipse in 1868. Modern astronomical activity started in the 80s with several graduates returning from studying overseas. The first international conference was held in Chiang Mai in 1995. The most important astronomy education government policy statement was announced in 2001 to integrate astronomy into the school curriculum. The second important government policy on astronomical research, education and outreach was the establishment of National Astronomical Research Institute of Thailand, NARIT in 2004. The education programs in the current decade will be fully described in our paper.

Teacher Professional Development

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Abstract. One challenge in providing professional development is that the teachers are unaware of what they really need to become more effective in teaching astronomy. Designing a professional development program for the naïve learner includes consideration of the science standards (what concepts their students may be tested upon), activities to make them aware of their own understanding of the topics, activities to engage them at a level above what their students need to know, and an activity to assist them in integrating their new knowledge. Specific examples of program planning and elements will be provided from Teacher Professional Development workshops offered at McDonald Observatory over the past eight years.

Papers on Astronomy Education in Proceedings of IAU Meetings: a review of 1988–2006

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Abstract. The IAU as the biggest international organization of professional Astronomy has been dedicated to questions on Astronomy Education in schools and for the general public, by means of the Commission 46 (Astronomy Education and Development). In the last 20 years, many works were presented on Colloquia and Special Sections of General Assemblies.

In this context, we reviewed the complete papers on Astronomy Education published in the IAU proceedings. We have focused our analyses on the following documents: a) The Teaching of Astronomy, IAU Colloquium 105 (1988); b) New Trends in Astronomy Teaching, IAU Colloquium 162 (1998); c) Astronomy for Developing countries, XXIV GA (2001); d) Teaching and Learning Astronomy, XXV GA (2005); e) Astronomy for the developing world, XXVI GA (2007); f) Innovations in Astronomy Education, XXVI GA (2008). A total of 322 papers were published in these events, excepting posters, and 283 papers were selectioned and analysed in this review that deal specifically with Astronomy Education.

We have selectioned the following descriptors to the classification these papers based on literature: country of the work; school level approach or public education; topics of contents in Astronomy; focus of the study; method of research; theoretical framework.

Related to the country of origin of the work, researchers from USA represents 35.6% of the total of papers, followed by United Kingdom (9.9%), India (4.9%), France (4.6%) and Canada (4.2%), among other countries.

The greatest percentage of works was related to university education (37.8%) and to public education (27.6%), what is justified by the fact that Astronomy is not a specific discipline in the curriculum in the basic education in the majority of the countries. The basic levels of school appear with very low frequency: elementary – 7.8%; secondary or middle school – 10.6%; and high school – 12.0%. There are 33.9% of works that deal on general approaches for all school levels.

Related to the focus of the study, there is a predominance to present non-school programs (28.3%) and studies of curricular discussions (26.3%). Follow the works on development and discussion of teaching materials (18.4%) and the studies of learning and teaching in astronomy education in the schools (15.5%). Other studies were related to students or teachers understanding (3.2%), teacher education (7.1%) and studies on history of Astronomy or history of Astronomy Education (4.9%).

With respect to the method of research, the great majority of the papers were classified in Research & Development (67.5%). They presented reports of education experiences of the authors or reports of the current situation in Astronomy Education in countries, typical of researchers from the hard science areas, those dedicated to present what they are doing without a more deep discussion of the theoretical framework, or even the use of scientific methodology of data gathering. Essays (20.5%), consisting of free exposition of ideas in the field of astronomy education, in almost the totality with absence of references or explicit theoretical framework follow in number. Typical methods of education research such as survey (8.8%), empirical research (2.1%), content analysis (1.4%) and review (1.1%) were not very present. In this context, studies of action research or case study were not found. Among the 283 selected papers, 87.6% did not show any explicit theoretical references in the text of the work.

With respect to the topics of contents, most studies do not deal with specific topics of Astronomy (83.4%). Much less frequent were studies of Sun-Earth-Moon System (6.7%), Stars (4.2%), Solar System (3.5%) and Sun (2.6%).

In this sense, even with the efforts to elevate Astronomy for public outreach and classrooms, these works always are oportune for the exchanges of experiences. However, from the point of view of educational research, deeper treatments that deal with epistemological questions, teaching and learning processes proper of the area of Astronomy at different school levels and theoretical framework are necessary, which could stimulate the development of scientific investigations as it happens in other areas of knowledge.

A universal history of astronomy as a teaching aid

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Abstract. Human beings are born astronomers. Astronomy is more than a branch of modern science. It is a symbol of the collectivity and continuity of humankind's cultural heritage. This mixture of science and culture is astronomy's strength as well as dilemma. Strength, because support for astronomy transcends all boundaries; dilemma, because this support transcends science also. History is an exercise in reconstructing the past, carried out in the present with an eye on the future. Thus paradoxical as it may seem history is an instrument that converts the past into a bridge between the present and the future. More specifically, history of astronomy is an enquiry into how human perception of their cosmic environment has evolved with time. It is relatively an easy matter to discuss the history of modern astronomy as western astronomy. But if we wish to advance the cause of astronomy and see its development world-wide, we must place

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post-Galilean developments in a wider spatial and temporal context. The 19th century historiography consciously projected modern science (including modern astronomy) as a characteristic product of the Western civilization decoupled from and superior to its antecedents, with the implication that all material and ideological benefits arising from modern science were reserved for the West. As a reaction to this, the orientalized East has often tended to view modern science as "their" science, distance itself from its intellectual aspects, and seek to defend, protect and reinvent "our" science and the alleged (anti-science) Eastern mode of thought. This defensive mind-set works against the propagation of modern astronomy in most of the non-Western countries. There is thus need to construct a history of world astronomy that is truly universal and unselfconscious, but at the same time rigorous. The universal history of astronomy would be placed what we may call the framework of Cultural Copernicanism. Just as Copernican principle in cosmology tells that the universe does not have a preferred location or direction, Cultural Copernicanism would imply that no cultural or geographical area or ethnic or social group can be deemed to constitute a benchmark for judging and evaluating others.

Within this framework, modern astronomy should be seen as the current end of a cultural and intellectual cumulus to which different cultures and regions have contributed at different epochs. The past should not be pitted against the present, but evaluated in its own right and as leading to the present.

Astronomy Education in the Maya region, some past and future lessons

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Abstract. Increasing has become now the education of topics of Astronomy in the schools and colleges of Central America, particularly in Honduras, where an astronomic observatory works from the late nineties dedicated to the development of Astronomy and Astrophysics, Space Science and Archaeoastronomy, as part of the academic university activities. It worries nevertheless how, teaching and learning of fundamental topics such as the seasons of the year, or rotation and revolution of the Earth around the Sun are done, because they do not contribute fully to understand related environmental conditions. Textbooks and bibliographic information available to teachers and students, places emphasis on understanding the concepts of equinoxes and solstices as isolated terms, leaving out entirely the zenith sun passages, the apparent motions of the Sun or, the amount of solar radiation that every day we get in different dates of the year for the fact of living in the tropics. Our studies in Archaeoastronomy reveal how the apparent motion of the Sun do not pass unnoticed among the ancient Mayans, who, on the contrary, knew and used this knowledge to measure divisions of day and to mark relevant dates of the tropic year to anticipate the arrival of the rainy seasons or the time for land preparation for agricultural purposes. This paper takes a number of archaeoastronomical discoveries in the Maya region of Copan, in Honduras, as astronomical lessons from the past that should be teach nowadays, as present and future lessons among children, young students, and population, to let them to understand how the analogy between the ideas of astronomy with aspects of everyday life help to improve living conditions and preserve the environment.

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Experience in Astronomy Education made by the OAVdA with the Schools in the Aosta Valley

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Abstract. The Astronomical Observatory of the Autonomous Region of the Aosta Valley (OAVdA), in the italian Alps at the border with France and Switzerland, was opened in 2003. A formal agreement of cooperation with the italian National Institute of Astrophysics (INAF) has been established in 2006. Since then, scientific research has been the main activity in OAVdA, but we are probably among the few observatories where researchers and scientists dedicate 30% of their time to initiatives of public outreach and education.

In order to open a channel between schools and the OAVdA, we decided to emphasize the principle that the knowledge that is being studied at school now is the result of the scientific researches made by scientists 10, 100, 1000 years ago. So the knowledge that will be studied at school tomorrow is the result of the scientific researches of today, including the ones made at the OAVdA.

From this principle it follows that the astrophysicists working at the OAVdA are necessarily involved in initiatives to transfer their scientific results to students, and education activities are based on research methods and original data collected at the OAVdA.

Since 2006, thanks to the support of the local administrations and institutions, students of the schools of the Aosta Valley, 5 to 18 years old, have been exposed, at different levels, to the world of scientific research. The most successful examples are:

• The multi-year education activity *Saint-Roch Étoiles* (*Stars of Saint-Roch*, 2008–2013), where pupils from 5 to 12 years old of the Istituzione Scolastica Saint-Roch in Aosta are introduced to the world of scientific research through *meet the scientist* sessions (see the website http://www.scuole.vda.it/stroch/progetto_etoiles/frame2.htm)

• The education activity *Oltre Galileo... La Vallée guarda lontano* (*Beyond Galileo... The Aosta Valley is looking far*, 2008–2009) where 18 years old students of the Istituzione Scolastica Binel-Viglino in Pont-Saint-Martin and in Saint-Vincent faced a real problem of scientific research: the calculation of the heliocentric distance of an asteroid at the opposition from an original data set collected during the research activity at the OAVdA (see Carbognani 2008).

• The education activity *Tutti pazzi per Marte* (*There's Something About Mars*, 2008–2009) where 18 years old students of the Istituzione Scolastica Binel-Viglino in Pont-Saint-Martin and in Saint-Vincent made the unique experience of calculating Mars' distance with the parallax method during the December 2007 opposition. Actually this education activity, done in cooperation with the Astronomical Association of Southern Africa (ASSA), was a real research project. The method we developed with students and teachers resulted in a paper published on an international peer-reviewed journal (see Cenadelli *et al.* 2009).

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Universe Awareness: Innovations in Astronomy education and communication

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Abstract. Universe Awareness (UNAWE) started in 2005 with the aim of inspiring young children in underprivileged environments with the scale and beauty of the universe. The goals of the programme are to broaden children's minds, awaken their curiosity in science, demonstrate the power of rational thought and stimulate tolerance and world citizenship.

The programme brings a stimulating international dimension and its aims are of an educational and social nature. The methods to achieve the vision of UNAWE are devised locally by communities in over 20 countries, leading to a dynamic network of open source education and a vast body of know-how and best practice. The success of UNAWE in diverse environments and the commitment of volunteers and partners throughout the world show that comprehensive citizen participation can reach and engage the public in ways never before applied in science communication.

The Starlight Reserve: a route towards public education in astronomy and light pollution control – the New Zealand experience

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[2] - *UNESCO N.Z. national commission*
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Abstract. We have produced a case study proposal for the Tekapo region surrounding Mt John Observatory in the central South Island of New Zealand to become a Starlight Reserve. The proposal has been made to UNESCO's Starlight Initiative. A Starlight Reserve would be an excellent means of promoting awareness of the night sky amongst the public, as well as an additional way of helping control light pollution in the neighbourhod of our observatory. In the 24 months since we have discussed the idea of a Starlight Reserve in New Zealand (since early 2007) there has been intense media interest in this proposal.

National Network of Public Outreach in Astronomy CIDAUNAWE

Enrique Torres
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2 - Universe Awareness

Abstract. CIDA has been carrying out, for several years now, astronomy workshops for school teachers. In 2007-2008 a complete astronomy workshop has been implemented complete with support material, with an emphasis on teaching and pedagogical techniques that will convey astronomy to children in a fun way. In addition, we are working in collaboration with the UNESCO Universe Awareness (UNAWE) program. So, there have been build a National Network of Public Outreach in Astronomy with growing impact in schools all around the country

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AGA Regulations and the Future of Astronomy in South Africa

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Abstract. South Africa intends to exploit its strategic advantages of geography and infrastructure by encouraging the development of large telescopes operating at radio and optical wavelengths. In order to ensure that conditions remain optimal for doing astronomy, some wide ranging legislation, Astronomy Geographic Advantage (AGA) Act, has been formally declared. This will be discussed with the main focus on the development and implementation of the regulations that are meant to protect astronomy advantage areas against light pollution and increased dust levels (optical astronomy) and radio interferences (radio astronomy). I will also discuss what all this mean for the future of astronomy research and development in South Africa.

Popularisation of Astronomy by Organising the Second IOAA

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Abstract. In 2006, Indonesia was appointed to host the second International Olympiad on Astronomy and Astrophysics (IOAA), after the first one in Thailand. The realisation of the appointment into actual event was done in August 19-28, 2008, during which the second IOAA was performed in Bandung city. The participants were high school students under 20 years old from 22 countries. The event has been held successfully with publication in printed media, internet and television. The event has attracted more students to astronomy which was indicated by significant increase of applicants to the department of Astronomy in 2008.

Acknowledgements

We would like to thank The Ministry of Education of the Republic of Indonesia for supporting the IOAA event, Institut Teknologi Bandung and Het Leids Kerkhoven-Bosscha-Fonds for providing travel support.

The COSPAR Capacity Building Programme:concepts, objectives, experience, future

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Abstract. The COSPAR Capacity Building Workshops have been conceived to meet the following objectives:

- to increase knowledge and use of public archives of space data in order both to broaden the scope of research programmes in developing countries and also to ensure that scientists in those countries are aware of the full range of facilities that are available to them,
- to provide highly-practical instruction in the use of these archives and the associated publicly-available software, and
- to foster personal links between participants and experienced scientists attending the workshops to contribute to reducing the isolation often experienced by scientists in developing countries.

Since 2001 a total of nine workshops have been successfully held in different scientific areas (X-ray astronomy, Space Optical and UV Astronomy, Magnetospheric Physics, Space Oceanography and Planetary Science) in nine developing countries (Brazil, India, China, South Africa, Morocco, Romania, Uruguay, Egypt and Malaysia). Last year COSPAR started a fellowship programme to enable young scientists who have participated in a Workshop to build on skills gained there, by carrying out a 2-4 week research project at one of the several collaborating institutes.

We will discuss the modalities of the workshops, the so-far gained experience, and the future including collaborations with other institutions sharing the aim of increasing the scientific activities in developing countries.

Outreach, heritage and innovation

Julieta Norma Fierro Gossman *Instituto de Astronomia, UNAM*

Abstract. It is easier to build knowledge and develop skills when they make sense to us. Many nations have an extraordinary heritage and must make use of it to convey knowledge using elements such as national pride. In order to run outreach programs funding is fundamental. Using the media in fresh ways is a great tool to innovate ways for the general public to appreciate astronomy.

The South African National Astrophysics and Space Science Programme (NASSP)

Patricia Ann Whitelock
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2 - Astronomy Department University of Cape Town

Abstract. South Africa has some major astronomical facilities, in-use and on the drawing board, but a very small indigenous astronomy community. In 2002 the national observatories and the major universities combined their resources to start a unique collaborative training programme. This takes students with a BSc in physics or related discipline and prepares them to do a PhD in astrophysics. It has attracted students from all over Africa and most recently African Americans through a collaboration with the USA National Society of Black Physicists. This presentation will describe NASSP, it successes, its aspirations and its challenges.

Past, present and future of graduate astronomy education in Mexico

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UNAM, Mexico

Abstract. A brief historical review of the graduate astronomy program at UNAM is presented. The strengths and weaknesses of the present program are assessed and a new program, soon to be implemented, is presented. Experiences from the graduate astronomy programs at other Mexican institutions are also discussed.

Early approach to Astronomy and the digital gap.

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Abstract. Uruguay has had the tradition of having Astronomy as a curricular discipline in High-school for the past 100 years. In 2009, together with the International Year of Astronomy, topics of Astronomy will be added to the Primary School's national curriculum, from kindergarden to 6th grade (3 to 11 year-old-children). We believe this conjunctural situation is a unique oportunity to work with teachers, give them update courses and perform follow-up activities about the success of the different enterprises, considering both the results from Montevideo (the country's capital city) and the provinces. In addition, the Plan CEIBAL (www.ceibal.edu.uy/) was implemented in Uruguay in 2007, under the motto 'one laptop per child', in an effort to attenuate the digital gap between children who could access to computes in their scholls and/or homes and those who couldn't. In 2009 every child attending to a state school possesses one laptop especially designed for Plan CEIBAL. In this work, and given the particular situations in the Education of Astronomy previously outlined, and through the corner stone Project of the IYA 2009 UNAWE-Uruguay (www.unawe.edu.uy), the multicultural origins of modern astronomy are illustrated in an international effort to enrich children's minds, awaken their curiosity in science and stimulate global citizenship and tolerance. Games, songs, hands-on activities, comics and live trades on the Internet are devised for children of age 4 and up in a coordinated manner with other UNAWE communities around the world.

UNAWE-Uruguay is aimed at the exchange of ideas and materials through the establishment of a network devoted to teacher's update and interdisciplinary workshops.

Astronomical Education in Tajikistan. Present and Future

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Abstract. The centre of astronomy in Tajikistan is the Institute of Astrophysics of the Academy of Sciences of Tajikistan. This Institute makes a valuable contribution to science and training astronomical personnel and in astronomical education. Now in Tajikistan the reform of education continues. Now astronomy is studied in schools together with physics. It creates the certain difficulties in teaching astronomy at schools. The astronomy at schools is necessary for studying as an independent subject. At physical and mathematical faculties of universities the astronomy, but in various volumes also is studied. From 1999 it is most full astronomy and astronomical objects are studied at the Tajik National University (TNU) at specialty Astronomy. In 2008 TNU are introduced degree Baccalaureate, Specialist and Magisterial. At the Tajik State Pedagogical University in 2007 are restored training teachers in the specialty Physicist and astronomy. At universities also there are problems with teaching astronomy and astronomical subjects. At universities of Tajikistan there is no independent astronomical base (observatory), little the educational literature in a state language (Tajik). The level of knowledge of the pupils acting in universities on physical and mathematical faculty is low. Therefore it is necessary to undertake additional measures. In 2006 is restored the Small Academy of Sciences (SAS) of Tajikistan. At the Institute of Astrophysics of Tajik Academy of Sciences acts the section Astrophysics SAS for scholars. In Khujand city acted the Planetarium. In 2006 the Institute of Astrophysics, TNU and the Astronomical Society of Tajikistan, with the support IBSP of the UNESCO, on the base of Hisar astronomical observatory organized Training Methodical Center (TMC) Tajastro on astronomy. The listeners of center are students, graduate students, young scientists of Institute of Astrophysics and universities, teachers of physics and astronomy of secondary schools. It is necessary develop this TMC and organize Training-Methodical-Centre for Central Asian countries on the base Hisar astronomical observatory.

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Progress of the Southeast Asia Astronomy Network (SEAAN)

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2 - National Astronomical Research Institute of Thailand
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Abstract. The initative of the establishment of the Southeast Asia Astronomy Network (SEAAN), was presented in the Special Session 5: Astronomy for the Developing World during the IAU XXVIth General Assembly. The aims are to establish effective mechanisms for nurturing and sharing the development and experiences in astronomy research and education among Southeast Asian countries. The first meeting of the Southeast Asia Astronomy Network (SEAAN2007) was held during the Thai National Astronomy Meeting (TNAM2007), 22-24 March 2007, hosted by NARIT and Ministry of Science and Technology, Thailand. We report here on the progress of the network and future plans.

The Brazilian Olympiad of Astronomy and Astrophysics and the International Year of Astronomy

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Abstract. The Brazilian Olympiad of Astronomy and Astrophysics (OBA in Portuguese) is the biggest program in the South hemisphere of popularization of Astronomy and Astrophysics. It begun in 1998 and in 2009 we are organizing the XII OBA. In the last year took part in the XI OBA 437.000 students belonging to all the Brazilian states and involved 5.535 schools. The final number of participants in the XII OBA will be presented in this panel. But the main point here is just to present the relations between the OBA and the International Year of Astronomy (IYA). From the federal government it was possible to get twice the normal money that we spend annually. So we prepared a huge divulgation of the XII OBA between all the schools of Brazil, but the media also helped us in these efforts, so that almost 10.000 schools begun to participate in the Brazilian Olympiad in 2009, which summed with the 15 thousand that was already taking part in the OBA, in these year we will have 25.000 schools in the event. We prepared some didactic and entertaining material to the students. We sent to each schools, for example, a nice puzzle with a beautiful image of the solar system; a stellar watch and the complete orientation on how to reproduce it in large scale and how to use it; the complete instruction how to construct a solar watch; a domino using planetary images. We initiated a program to detect meteorites using the help of students to find them. We sent to each school a small star with powder of meteorites inside it. We sent annually to all schools of the OBA some practical challenge. In this year we asked them to determine the mass of the Earth (using the mass of the Moon as unity). We asked them also to make models of spheres to represent the planets and the Sun on the same scale just to see the proportion between planets and the Sun. We will give them a huge yellow ball to represent the Sun. As in 2009 we can celebrate the first Moon landing we asked them to launch a rocket to the sky using very simple materials. We also organized a contest of draws between the students. We are buying galileoscopes to give them to each school that is taking part in the XII OBA. It is probable that almost 1.000.000 of Brazilian students will take part in this event. Finally, on last October, in Montevideo with the presence of astronomers representing many countries of South and Central America, and Mexico we founded the Latin American Astronomy and Astrophysics Olympiad. The first one will take place in Brazil October 2009.

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Education of Astronomy in Argentina: a Global Vision and the study of special cases of no-formal education

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Abstract. With its foundations in Mathematics and Physics, Astronomy is a scientific discipline that cuts transversally all others: is possible to establish links with Biological Sciences, Social Sciences, Earth Sciences, and Technology. In Argentina, the teaching of professional Astronomy has less than a century. With two traditional schools (Cordoba and La Plata), and a recently one (San Juan), the country has only 175 professional astronomers recognized, and around 30 PhD students. Despite this small number of scientists, Astronomy in Argentina has produced remarkable discoveries. By contrast, in middle and primary levels of education, Astronomy opens a way with great difficulty, and there are only a few activities in the classroom, related to its contents. However, some experiences in the field of non-formal education, but developed by professional scientists, give results that are even surprising. This proves, in our view, there is no better diffuser of a discipline that one for which it is part of their daily activity, and ends with the myth that, in general, and with some exceptions, scientists are poor communicators. This presentation describes the current state of Education in Argentina, from a historical perspective, with a projection towards the new challenges, taking into account the capabilities and needs of the country, in terms of human resource training, and will show a series of experiences, developed in Universities and Institutions devoted to Astronomy and Astrophysics research, with a significant social impact.

Learning astronomy as a lifetime experience

Magda Stavinschi
Astronomical Institute of the Romanian Academy

Abstract. The main goal of this special session is to know how the Rate of Astronomical Discovery can be accelerated. Is it really possible? The last centuries elapsed since Galileo and especially the last decades of incredible progress of space and ground based astronomy seem to indicate a positive answer. However, there is a factor which can not only stop the speed at which the universe can be known and discovered but which can even lead to a dramatic regress through false research interpretations, by overlooking the possible implications of these discoveries for humanity and last but not least, by affecting or even destroying humanity. Naturally, it is education. As long as the young people are not systematically informed about the universe, do not know the stages when it was discovered and do not know their own astronomical history, they do not know how to preserve their astronomical heritage, to interpret the knowledge they have, not only for the progress of astronomy, but also for that of science in general. Thus, not only the rate of astronomical discovery, but even the very future of mankind might come to be questioned.

Coining Sign Language for Astronomy and Space Science Terminology

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Abstract. Teaching science to school children with hearing deficiency and impairment can be

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a rewarding and valuable experience for both teacher and student, and necessary to society as a whole in order to reduce the discriminative policies in the formal educational system.

The one most important obstacle to the teaching of science to deaf or hearing impaired students is the lack of vocabulary in sign language to express the precise concepts encountered in cientific endeavor. In an ongoing collaborative project between Centro de Investigaciones de Astronomia "Francisco J. Duarte" (CIDA), Universidad de Los Andes (ULA) and Unidad Educativa Especial Bolivariana de Maturin (UEEBM) initiated in 2006, we have attempted to fill this gap by coining new signs for the terminology of astronomy and space sciences. During five two-day workshops with deaf or hearing impaired students a total of 296 concepts of mathematics, astronomy and space sciences were coined into sign language using an interactive method which we describe in the text. These new signs have been made available to the Deaf Community through the interactive web page www.cienciaensenas.org for their use and evaluation. The goal of the project is to incorporate these terms into Venezuelan Sign Language (LSV) and provide the vocabulary for the communication of science among the Deaf Community.

Bringing the Universe to a confined world: Astronomy in prison

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Abstract. Since more than a decade, some french astronomers go in prisons to talk and discuss about astronomy with the prisoners. The words "astronomy" and "prison" placed side by side represent at least two paradoxes: first, it is astonishing that people with a very distressing past and who live in very hard conditions are interested in something which corresponds to pure knowledge and without any direct utility; secondly, the aim of astronomy is to open the world in all its infinite totality whereas, in prisons, the audience is locked and confined as much as possible. However, the audience shows a strong interest, as it can be seen by the size of the audience and the numerous questions asked. Many reasons exist to go in prisons to speak and discuss about astronomy. We quote mainly: it is important for prisoners who sometimes could have a feeling that they are abandoned by the society, that professional scientists move for them; it is interesting to take advantage of a special time in the life of these people so that they meet and discuss with scientists whom they would rarely have the opportunity to meet outside; this prison time can also turned to account by the discovery of a new field of knowledge or the extension of already acquired knowledge; the discovery of a new pure and disinsterested knowledge can help to bear the prison regime which could be very hard and distressing, physically as well as mentally; as for any popularisation talk, it is the duty of astronomer to give people an account of tax money; the last but not the least, we have to not neglect the pleasure for the speaker to talk about a subject of which we are fond in front of interested people. More we give to the prisoners information to think, more they will have some tools to choose their way and become reintegrated in society after they came out of prison. We give some points of information about features of audiences: as in any lecture, the audience is very heterogeneous, however rather surprisingly a certain number of prisoners use their prison time to learn and think. We give some information about prisons in France. It is sometimes difficult to obtain authorization to enter in prison, that corresponds to a third paradox: to come into prison is complicated. The present prison overpopulation rate complicates even more the process, due to the extra work of warders implied by this overpopulation. We briefly review what is done to day in France in this domain: several initiatives exist in the Paris region concerning various prisons and a very interesting and active work is done in the South-West in France. As a conclusion, we do insist on the importance to bring culture and knowledge to some people who could feel to be rejected by the society, and by this way, to give them some tools and elements to think, to light the way, and finally to help them to take the good decisions after prison time.

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Learning astronomy as a lifetime experience

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Abstract. It is well known that all of us are learning throughout our lives. This includes learning languages, learning how to use computers, learning to dance... but normally people never think that we could also include learning about astronomy. Why not? Astronomy is in the very basis of our lives and astronomers are taking giant steps forward, as a consequence it is important that our society knows more and more about astronomy and new challenges in this field.
From primary school pupils to retired people, everybody is interested in astronomy and can be attracted to this area of science if the kind of presentation is appropriate. Of course lectures and videos are a few simple ways of involving people in astronomy, but it is necessary to think of a set of different possibilities in keeping with the kind of public who will receive the presentation. A set of tales and plays to children can be more attractive than only using a film. Children love to take part in animated activities, moving their bodies and using their imagination. Competitions and challenging ways are appropriate for teenagers and university students and may be some excursions can be a good idea to get retired people involved in astronomy. A set of examples of these experiences will be taken into account in this presentation.

Astronomy for African Development: A Review of Activities

Kevin Govender
1 - South African Astronomical Observatory
2 - Southern African Large Telescope

Abstract. This presentation will review activities dealing with both the development of astronomy in Africa and the utilisation of astronomy for African development. To address the former, the progress on the development plan for astronomy in Africa will be discussed. The latter will focus mainly on the progress in the case of the SALT (Southern African Large Telescope) Collateral Benefits Programme (SCBP) which was set up to ensure African societal benefit from astronomy.

Astronomy in Equatorial Africa

Johnson Ozoemenam Urama
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Abstract. Africa lies astride the equator and extends almost equal distances (~ 37 deg) north and south of the equator. Equatorial Africa, here, refers to those countries in the continent that lie within about 20 degrees north and south of the equator. Nearly 80% of the countries in Africa lie in this region. Not much is known about modern astronomy here, and there is no astronomical research facility, of any type, in this region. However, their ancient architecture, folklore, myths, religion, calendar, etc. are quite rich in astronomy. One of the ways of creating awareness and interest in astronomy in this region is by unearthing the body of traditional knowledge of astronomy possessed by peoples of the different ethnic groups in equatorial Africa and to bridge the gap between this cultural astronomy and modern astronomy by providing scientific interpretation to deserving cosmogonies and ancient astronomical practices. Here, we discuss the prospects and challenges for popularizing astronomy in this region through cultural astronomy and other methods.

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Ethnoastronomy: a fancy subject or a non-western epistemological breakthrough?

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UFRN, Brazil

Abstract. Non-western views of the skies are inevitably an ethnocentric designation, not because of the "non-western" adjective, but mainly because of the assumption that cultures which are not closely related to the western one have "views of the skies", as if "sky" was in fact "something apart from earth" - and, by extension, "from life" - as westerns are convinced it is. As the separation between scientific and humanities cultures keeps widening, most astronomers and - what is the most worrying - most astronomy teachers assume that "the importance of non-western views of the skies for astronomy teaching in both developing and developed countries" are meant to supposedly supply cultural illustration, but not to introduce other significant and original epistemological contributions - as if, at the end, all world views had better reduce to the western one. We argue that the main importance of those generic "non-western views of the skies" for astronomy teaching, wherever it takes place, should be to deconstruct the conception that the scientific thought is epistemologically privileged and to contribute for an honest support to cultural and epistemological diversities. One notices, however, that pedagogical approaches usually adopted strengthen the wishful thinking of an ontological superiority of the scientific epistemology and regards all other human possibilities of knowledge construction amusing and culturally interesting, although useless in the modern technological world. Such a posture contributes: to widen the separation between those two cultures; to reinforce cultural prejudices; and to drive people away from science. That way, the science teaching programme efficiently helps to maintain everything the way it is - including all prejudice and exclusion procedures. The western thinking values the cognitive approach to knowledge matters and interprets any human psyche attribute other than reason - like affection, intuition, etc. - as a hindrance to the process of conquering the objective knowledge. Our ethnographic research shows that those other psyche attributes are the essentials of the epistemological process as a whole, particularly that concerning autochthon or traditional knowledge. The anthropological and biological approaches to the knowledge process demand a complete revision of our concept of epistemology. We present educational interventions we have developed and applied in Carnaúba dos Dantas (RN, Brazil) aiming: 1) the integration between generations - the one of older members of the community, formed by experts on traditional knowledge, the one of teachers, and the one of youngsters; and 2) the inclusion of traditional environmental knowledge - naturally including those which our culture segregates as belonging to the astronomy domain - into everyday school activities. We further present some guidelines on procedures for those interested in introducing a more humanitarian world view through the inclusion of local traditional knowledge to environmental education and generation integration, which can truly favour a comprehension and an authentic acceptance of diversities, including epistemological ones. (This work is supported by the Brazilian agency CNPq.)

Hawaii Students' Authentic Astronomy Research Projects

Mary Ann Kadooka, Michael Nassir, James Armstrong
University of Hawaii – Institute for Astronomy

Abstract. Since 2007, HI STAR, the Hawaii Student Teacher Astronomy Research, residential summer program has been striving to equip 12-17 year old students with the necessary research skills and background to conduct original research projects. Students with a passion for astronomy have been recruited through mini-workshops conducted on five out of six islands since 2005.

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For one week in June, the students with their teachers have thrived on physics and astronomy lectures and image processing, photometry, and light curve lessons. They also learn to do remote observing with the 2 meter Faulkes Telescope located on Haleakala, Maui and the 16 inch DeKalb Observatory Telescope in Auburn, Indiana. The HI STAR participants then work in groups with inspiring astronomer mentors who have developed projects on comets, asteroids, galaxies, nebulae, variable stars and extrasolar planets using image data sets. Our students continue to be supported by their mentors so their projects are entered in Science Fairs the following year. Our major goal of encouraging students to have college majors in science, technology, engineering and mathematics fields is slowly being accomplished. Key to this endeavor is continuous mentoring even when they become college students. The favorable outcomes of our program are attributed to our network of enthusiastic astronomer mentors, committed teacher advisers and motivated students.

Guided School Visits to the Astronomy Museum in Brazil: new approaches

Flávia Requeijo[1], Cecília Maria Pinto do Nascimento[2], Andréa Fernandes Costa[2], Maria das Mercês Navarro Vasconcellos[3]

1 - Instituto de Geociências, Universidade Estadual de Campinas, Hawai

2 - MAST/MCT

3 - Museu da Vida

Abstract. Museums and schools are distinct learning environments, but can act together to expand their educational opportunities. In Brazil, while schools have a daily presence in our lives for at least 10 years, the museums are rarely visited. We propose that museums and schools should work together in a partnership, so that a school's visit to a museum doesn't become a single, one-time ocurrence. This work presents a study of the recently conceived guided tour "Where Do We Live?", which includes elements of Astronomy and its history, and discusses a few relationships between science and society. In order to elaborate the tour, or "trail" as we call it, a few exhibits from the museum were selected according to goals previously set by a team of educators from the Museu de Astronomia (MAST). Also, the communication pattern during the tour, which used to be rather unidirectional (guide-to-visitor), is now based on group discussions mediated by the guide. Students' reactions during the visit to the MAST's scale model of the Solar System suggest that the discussion promoted therein motivates a deep reflection on our place in the universe and on the sustainability of life on Earth. Results from questionnaires applied to teachers indicate that our suggested activities are frequently performed at the school before the visit. This, we believe, profoundly enhances the students' experience at the museum. Also, it suggests that a partnership between our museum and the schools is actually taking place, and that our planned school visit may be more than just a "leisurely field trip", but an event capable of generating reflection before and after it occurs. Thus, we emphasize Astronomy's large potencial to the construction of a more critical view of our actions and their consequences over planet Earth.

Astronomy Education and Research in Colombia: Achievements and Challenges for the Next Decade

Juan Rafael Martinez Galarza

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Abstract. Despite its human, geographical and historical advantages, Colombia remains today a country that does not produce significant astronomical research. However, a continuously growing professional community, most of them part of a scientific diaspora, supported by an

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active amateur community, has started an ambitious program to transform Colombia into an astronomically active nation, with specific goals to achieve in the coming 10 years. I describe the current status of astronomical research and education at all levels in the country, the recent history of its astronomical society, the educational achievements (including the first undergraduate program in astronomy), and the proposed projects which will lead the future development of this science in the country. I emphasize the need for suitable astronomical infrastructure as a mean to educate the next generation of Colombian professional astronomers, and the role that the international astronomical community could play by supporting these projects.

The impact of IAU educational programs on Peruvian astronomy

Ivan Ramirez
Max Planck Institute for Astrophysics, Garching, Germany

Abstract. By year 1996 there was only one professional astronomer born in Peru, Maria Luisa Aguilar, who was also the first Peruvian IAU member. In 1997 the number of Peruvians holding a doctoral degree in astronomy was only 2. Today, the number has increased to about 10, with possibly another 10 being added to the list within the next 5 years. This exponential increase has been in part due to educational programs by the IAU. I will summarize the status of astronomers from Peru, emphasizing the impact of IAU programs on their professional careers and provide a suggestion to encourage the return of those who are currently working elsewhere.

Astronomers Without Borders: Worldwide Connections through Astronomy

Mike Simmons
Astronomers Without Borders

Abstract. Astronomers Without Borders (AWB) is a new global organizational that furthers understanding and goodwill across national and cultural boundaries using the universal appeal of astronomy, a common language spoken by all those who share an interest in the sky. A growing network of Affiliate organizations brings together clubs, magazines and other organizations involved in astronomy and space science. Forums, galleries, video conferences and more interactive technologies are used to connect participants from around the world. Projects include Sharing Telescopes and Resources (STAR), which gathers telescopes and other resources in developed countries and donates them to clubs in undeveloped countries. The World at Night (TWAN), an IYA2009 Special Project, has built a team of specialty photographers who create wide-angle images of the night sky in important natural and historic settings around the world that dramatically demonstrate the universal nature and appeal of the night sky. AWB has a lead role in organizing the IYA2009 cornerstone project and that key project's legacy will be carried on AWB through IYA2009 and beyond.

Ten years of the first mobile science program in Brazil

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Abstract. Observatório Educativo Itinerante (Mobile Educational Observatory, OEI) is an educational program meant to provide background to elementary and high school teachers who want to use Astronomy to enhance their teaching skills in sciences in general, most specially Physics, Maths, Geography and Chemistry. OEI is the first mobile science program in Brazil, having started its activities in June 1999. It is therefore completing ten years on the road. During this time, it has taken Astronomy to about 1300 school teachers in more than 40 locations in the South of Brazil. The teachers courses last from 20 hours to 180 hours and are usually taken on weekends. An emphasis is given on simple experiments, which can be reproduced with little cost, and in astronomical observation. OEI also visits schools and other public places offering lectures and stargazing. The program makes frequent use of information technology, including public applets, desktop simulations, and web based educational material (www.if.ufrgs.br/oei).

Need and possibilities of astronomy teaching in school

Irma Talvikki Hannula
University of Helsinki, Finland

Abstract. The purpose of the work is to create a research-based foundation for planning the structure, content and methods of astronomy teaching in the Finnish comprehensive school. At first, a critical analysis of the significance of astronomy teaching from the point of view of the educational aims was made, in order to verify the need of it and to find significance factors, which would offer a basis for defining principles of astronomy teaching. The significance of astronomy teaching is defined to consist of all such factors through which astronomy teaching can promote the educational aims of school. Secondly, the conceptual structure of astronomy, which forms the core of teaching, was analysed in view of extracting principles for astronomy teaching. Construction of the pupil's world picture requires that teaching must follow the line of 'creation of meanings' in the development of astronomy. Thirdly, the preconditions for astronomy education were searched by a query sent to teachers, plus overviews of present textbooks, curricula and teacher training programmes, supported by own experiences from over twenty years at school, from teacher education and international work in preparation of recommendations for astronomy teaching. Finally, the principles resulting from the studies of significance and conceptual structure were gathered and concretised into a suggestion for planning guidelines of astronomy teaching.

Hands On Universe Education In China

Hongfeng Guo
National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012, China

Abstract. This presentation will give a brief introduction on the status and demands of astronomical education in primary and middle schools, the application of Hands On Universe education program in China and the recent developments of China Hands On Universe education projects. The Galileo Teacher Training Program in China will be also mentioned in this presentation.

Astronomy Teacher Training for Elementary Schools: a Multidisciplinary Approach

Gustavo de Araujo Rojas, Adilson J. A. de Oliveira, Alexandra Bujokas Siqueira
Universidade Federal de São Carlos, UFSCar, Brazil

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Abstract. We report the results of a two-week teacher training course held at Universidade Federal de São Carlos, Brazil. The course focused on using artistic and Web 2.0 tools to share knowledge about Astronomy among both teachers and pupils. During the first week, the students (19 Physics teachers from Primary, Secondary and Undergraduate levels) attended a series of lectures where topics such as World Models, Earth-Sun-Moon System, Stellar Evolution, and Large-Scale Structure of the Universe were discussed. The second week consisted of a five-day workshop where four abilities were worked out:
1) how to edit a blog; 2) how to produce a webvideo using classical narrative structures and some professional screenplay techniques; 3) how to share pictures and create social bookmarking; and 4) how to play a Role Play Game themed on Astronomy.
Those tools were selected because they support the pedagogical approach of multiliteracies, which means to be able to select content about a specific theme (Astronomy in this particular experience) and shape that content in order to share it with a wider community, using different languages. After the workshops, the teacher´s production was evaluated according to three categories: quality of content produced; ability to shape information about Astronomy; and motivation. The results suggest that the group was able to select meaningful topics and related trustful information, but they were not still prepared to make good use of the interactive tools. Thus, we conclude that learning about how digital media language and Web 2.0 tools work also must be taught on teacher training curriculum, in order to innovate on Astronomy teaching and learning.

GLOBE at Night and Citizen-Science: Providing an Effective Trigger for Astronomy and Light Pollution Education

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Abstract. One of the most productive programs in the International Year of Astronomy's (IYA2009) Dark Skies Awareness Cornerstone Project has been GLOBE at Night. The GLOBE at Night program has endeavored to promote social awareness of the dark sky by getting the general public to measure light pollution and submit results on-line. During IYA2009 alone, over 15,700 measurements from 70 countries were contributed during the 2-week campaign period. That amount is twice the number of measurements on average from previous years. This included digital meter measurements, which were used to measure quantitatively the sky brightness in magnitude/square arcsecond. 73% of all measurements were from the U.S. (all 50 states). 900 measurements were from Chile. There were over 200 measurements each from the Czech Republic, Hungary and the United Kingdom. 13 other countries reported more than 100 measurements (Argentina, Australia, Canada, Colombia, Finland, Germany, Macedonia, Mexico, Poland, Romania, South Africa, Spain and Turkey).

The GLOBE at Night website explains clearly the simple-to-participate-in 5 step program and offers background information and interactive games on key concepts. Teacher (and Family) Guides come in 13 different languages. And to help advertise the campaign, there are downloadable postcards and flyers (in Spanish too). The report page is user-friendly and map page has data in various formats. The program has been expanded to include trainings of the general public, but especially educators in schools, museums and science centers, in unique ways. Education kits for Dark Skies Awareness have been distributed at these training workshops. The kit includes material for a light shielding demonstration, a digital "Sky Quality Meter" and "Dark Skies Ranger" activities. The activities are on how unshielded light wastes energy, how light pollution affects wildlife and how you can participate in a citizen-science star-hunt like GLOBE at Night. In addition, projects are being developed for what to do with the data once it is taken.

There were particularly spirited and creative GLOBE at Night campaigns around the world

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in 2009. One such "poster child" was carried out by 6500 students in northern Indiana. The students produced 3,391 GLOBE at Night measurements. To visualize the magnitudes of dark sky lost to light pollution, these students removed over 12,000 of the 35,000 stacked LEGO blocks that represented an ideal night sky across the school district.

This is a glimpse into the many accomplishments of GLOBE at Night this year and we will endeavor to continue the program beyond IYA2009. For more information on GLOBE at Night, visit `www.globeatnight.org`, and on any of the citizen-science star hunts, visit `www.darkskiesawareness.org`. This work was supported by a grant from the U.S. National Science Foundation (NSF) Astronomy Division. The U.S. National Optical Astronomy Observatory is operated by the Association of Universities for Research in Astronomy, Inc. under cooperative agreement with the U.S. NSF.

Solar eclipses and the International Year of Astronomy

Jay M. Pasachoff

Abstract. Abstract missing

The IAU Strategic Plan for Development of Astronomy

George Miley
Leiden Observatory, the Netherlands

Abstract. A short presentation of the IAU decadal strategic plan has already been given in SpS2 p 604.

Closing remarks

Jean-Pierre De Greve
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There is no way that I could give you a resume with highlights of this meeting. For that, it was too diverse and too rich. But then, what did we learn during this meeting? Let me tell you what I learnt.

First of all, both the talks, but certainly the posters, showed how much dedicated effort astronomers give to astronomy education throughout the world. These different experiences with different local contextual settings must give me enough food for thought to improve on my own efforts. By-the-way, the posters of Special Session 4 are the only ones that can remain on display during the whole two weeks of the GA.

Secondly, the large variety, but also the large amount of astronomers involved, gives me strength to continue what I'm doing. I'm not alone. There is a whole community of astronomers working on that double objective: using astronomy education to gain interest for science and to make this world a better world.

Thirdly, both posters and presentations convinced me that we should use each others initiatives, products and competences more than we do today, because sometimes we re-invent the wheel, or spent too much time on something that could be done more efficient with input from another initiative. So, stronger networking in Astronomy education seems to me a must.

And last, as was indicated by Irma Hannula, there is not enough in-depth research on astronomy education in the educational systems.

If we want to convince ministries, administrations and the educational world as a whole of the benefits of astronomy education, we have to come up with studies that show that astronomy education does work to reach the earlier mentioned objectives: gaining interest in science, and contributing to a better world.

I very heartedly thank all participants for their contributions, posters, presentations, comments and questions. It made this a lively session. With that I close Special Session 4.

SpS4 - Posters

Adapting high-tech into simple classroom activities

Adrielli E. O. Pereira[1], Ana P. A. Benassi[1], Maria Clara Amon[1], José Osvaldo de Souza[2], Vera Jatenco-Pereira[2]

[1] *Escola Estadual Patriarca da Independência, Vinhedo, SP, Brazil* [2] *Universidade de São Paulo*

First Steps to Prepare Radioastronomers in Uzbekistan

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Exploring the Stars: Astronomy Outreach at The University of Western Ontario

Alyssa M Gilbert, Margaret D Campbell-Brown

The University of Western Ontario, USA

Power of not knowing

Aniket Sule

Homi Bhabha Centre for Science Education, India

The Scientific Work Done By The 30 inch Reynolds Reflector At Helwan

Ashraf Ahmed Shaker

National Research Institute of Astronomy and Geophysics (NRIAG), Helwan, Cairo, Egypt

Planetario Malargüe, a bridge between knowledge, current research and scientific development withthe general audience

Beatriz Garcia[1,2], *Marisa Marañon*[3], *Andres Risi*[3], *Roberto Bandiera*[3]

1 - Consejo Nacional de Investigaciones Cientificas y Tecnicas, Argentina

2 - UTN - Facultad Regional Mendoza, Argentina

3 - Planetario Malargüe

Astronomical facts in movies: rigurosity, speculation and fiction

Beatriz E. García[1,2], *Estela M. Reynoso*[3,4]

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2 - UTN - Facultad Regional Mendoza, Argentina

3 - Institute for Astronomy and Space Physics, Argentina

4 - Departamento de Física, FCEN-Universidad de Buenos Aires

The use of Photometric Techniques in Teaching Science Projects

Bruna F. dos Santos[1], *Cíntia P. Tomaz*[1], *Emerson L. Medeiros*[1], *Maria Clara I. Amon*[1], *Osvaldo de Souza*[2], *Jane Gregorio-Hetem*[2]

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Astrophysics in Burkina Faso

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Astronomy Virtual Exposition at University of Brasilia's Virtual Museum

Carlos Eduardo Quintanilha[1], Jose Leonardo Ferreira[1], Gilberto Lacerda Santos[1], Cassio Costa Laranjeiras[2]
1 - Institute of Physics University of Brasilia, 2 - IF/UnB, Brazil

A High School science project: looking for Milky Way doubles in SDSS

Caroline Soares Mello , Danilo Macedo da Silva , Walter Augusto Santos , Laerte Sodré Jr.
IAG-USP, University of São Paulo, Brazil

Itinerant Planetarium: A Cultural Activity in the Realm of Astronomy Diffusion and Popularization.

Cássio Costa Laranjeiras[1,2], Carlos Eduardo Quintanilha[1,3], Marina Leite da Silveira[1], Robson Evangelista[1], Camila Jéssica Letti[1], Victor Souza Magalhães[1], Ana Carolina Salvatti[1], Davi Araújo Quaresma Lemos[1], Murilo Timo Neto[1], Décio Cardozo Mourão[1], Gabriela Cunha Possa[1], José Leonardo Ferreira[1], Rayssa Bruzaca de Andrade[1], Leila Lobato Graef[1], Adriana Eliza Correa[1]
1 - Institute of Physics, University of Brasilia, 2 - Museum of Science and Technology of Brasilia, 3 - Brazilian Space Agency, Brazil

Building the bridge between astronomy research and education with SOFIA

Cecilia Scorza
Max Planck Institute for Astronomy, Germany

Hypathia of Alexandria

Doina George Ionescu
1 - Astronomical Institute of the Romanian Academy, Romania, 2 - Arkansas Space Center, USA

Astronomy Outreach at Outdoor Music, Movie, or Theatre Events

Donald Lubowich
Department of Physics and Astronomy, Hofstra University, USA

Motivating the public about the usefulness of scientific thinking

Enrique Vazquez-Semadeni
1 - Universidad Nacional Autonoma de Mexico, 2 - Centro de Radioastronomía y Astrofísica, Universidad Nacional Autónoma de México

PInE: an easy-to-use astronomical image processing software for the Telescópios na Escola project

Evandro Luquini[1], Alberto Krone-Martins[2,3], Laerte Sodré Jr.[2], Osvaldo de Souza[2]
1 - Depto. de Engenharia Elétrica, Universidade Presbiteriana Mackenzie, 2 - IAG-USP, University of São Paulo, Brazil, 3 - Observatoire de Bordeaux-France

Children of the Sun, Children of the Moon - An Exhibition on the Native

Flavia Pedroza Lima
1 - Fundação Planetário da Cidade do Rio de Janeiro
2 - Instituto de Geociências, Universidade Estadual de Campinas, Brazil

Be an Astronomer for a week-end

Gonzalo Tancredi[1,2], Herbert Cucurullo[1], Sebastian Bruzzone[1], Santiago Roland[1], Raul Salvo[1], Mariana Martinez[1]
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100 Hour Certificate Course in Astronomy and Astrophysics

G.S.D. Babu
M.P.Birla Institute of Fundamental Research, 43/1 Race Course Road, Bangalore 560001, India.

The recent capabilities of the 74 inch Kottamia telescope of Egypt

Hamed Abdelhamid Ismail
Zentrum fur Astronomie, Universitat Heidelberg, Germany

Modern Astronomy Education

Irina I. Kumkova, Veniamin ladimirovich Vityazev
Sobolev Astronomical Institute, Saint-Petersburg State University, Russia

Chankillo (Peru): Astronomy and society in Americas' earliest known solar observatory

Ivan Augusto Ghezzi[1,2], *Clive Ruggles*[3]
1 - Pontificia Universidad Catolica del Peru, 2 - Yale University, USA, 3 - University of Leicester, UK

Program Offerings in Astronomy in the Philippines

J.R.F. Torres[1] *& M.B.N. Kouwenhoven*[1,2,3]
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The Colombian Undergraduate Program in Astronomy

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Astronomy for Beginners

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Star Week - A Successful Campaign in Japan

Junichi Watanabe
National Astronomical Observatory of Japan, Japan

Review of Education and Popularization of Astronomy in Korea

Kang Hwan Lee
Gwacheon National Science Museum, Korea

Using a Sundial to Teach Astronomy

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Kyiv Republican Planetarium and problems of astronomical education in Ukraine

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Stimulating Astronomy in Developing Regions - African Focus

Lolan Naicker, Kevin Govender
SAAO, South Africa

University students and school teachers understanding Moon Phases

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In search of Brazilian meteorites

Maria Elizabeth Zucolotto[1], *João Batista Garcia Canalle*[2]
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A public-private partnership in Astronomy Education and Outreach: Building the "Haus der Astronomie" in Heidelberg

Markus H Poessel
Max Planck Institute for Astronomy, Heidelberg, Germany

Exploring the Solar System with a Human Orrery

Melanie A. Gendre, Peter Newbury
University of British Columbia, Canada

International Astronomical Search Collaboration In China

Minchen Zhou
National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012, China

Brazil, Uruguay and Argentina joint observation of March 2009 equinox

Néstor Camino[1,2], *Alejandro Gangui*[3,4], *Andrea Sanchez*[5], *Maria Helena Steffani*[6,7], *Maria de Fátima Saraiva*[8], *Thais Cortellini Abrahão*[9], *Luciana da Cunha Ferreira*[10], *Odilon Giovannini Junior*[11], *Luiz Carlos Gomez*[12], *Antônio Kanaan*[13], *Gentil Bruscato*[12], *Juan Manuel Martinez*[2], *Cristina Terminiello*[1], *Esteban Dicovskiy*[14], *Leonor Bonán*[4,15], *Javier Feu*[16], *Maria Iglesias*[4], *Nora Luján*[17], *Héctor Méndez*[18], *Hilda Suárez*[15], *Cynthia Quinteros*[4], *Herbert Cucurullo*[19], *Renzo Valentini*[20], *Zilk H. Meurer*[21], *L. Felipe Tamborena Barros*[22], *Roberta Moretti*[22], *Leonardo Decker*[22], *Graziela L. Costa*[22], *Anelise Audibert*[22], *Antonio P. Ourique*[23], *Fabiano Berte*[23]

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Astronomy education connecting graduate and undergraduate studies and public outreach

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A review of IYA activities in Nigeria vis-à-vis the role of CBSS

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The role of Internet resources in astronomical education; the experience of developing the largest astronomical site in Russia

Oleg Sergeevich Bartunov
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Astronomy Communication of a new kind: Creating Ultra-sophisticated Astronomical Observatories in the Resorts for Everyone: Experiences, Challenges and Opportunities for Tomorrow

Parag Shankar Mahajani
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The Teaching of Astronomy During the Last Years of Elementary School: A Proposal of Didactic Material for Teacher Support

Patrícia Amaral[1,2], Cássio Costa Laranjeiras[3,1]
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The Cultural Value of Astronomy: The Application of Sky Knowledge in the Weather Prediction and Administration of Traditional Medicine amongst The Luo Tribe of East Africa.

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Geographic Cosmography: a new area of studies of Astronomy in the Brazilian Geography teaching

Paulo Henrique Azevedo Sobreira
Planetário da Universidade Federal de Goiás

Astronomy with an 8-inch

Rabindra Kumar Bhattacharyya
Calcutta University, India

The diffusion and education of Astronomy today: Planetaries, observatories and society. There is a consent?

Rafael Santiago Girola
Universidad Nacional de Tres de Febrero, Argentina

A Solar Station in Ica - Mutsumi Ishitsuka: A research center to improve education at the university and schools

Raul Andres Terrazas
Solar Station Ica

Astronomy Education with the NURO Telescope and the SARA Telescope in Remote Observing Mode

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The atmospheric conditions of some astronomical educational observatory sites in Uzbekistan

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Student Astronomical Society of Shiraz University and similar societies
Sara Khalafinejad , Saeed Hojjatpanah , Fatemeh Kamali
Shiraz University, Iran

Fun and interdisciplinary solar astrophysics for middle and high school students
Silvia Calbo Aroca, Cibelle Celestino Silva
Instituto de Física de São Carlos

San Luis Coelum: Observing and Learning Astronomy in Schools
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The Planetarium of the Goiás Federal University: a life history in the Central Brazil
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Activities for the sky observation and its identification adapted to visually impaired people
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Argentine Eratosthenes Project 2009
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So equal and so different: the physics in different environments
Yamila Miguel[1,2] , Patricia Rey[2] , Claudio Quiroga[2] , Andrea Torres[3,2] , Stella Ramírez[2]

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Astronomy in Saudi Arabia: Future Vision of KACST

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