

# COMMISSION 46 ASTRONOMY EDUCATION AND DEVELOPMENT Education et Développement de l'Astronomie

# Newsletter 55 – October 2001

Commission 46 seeks to further the development and improvement of astronomical education at all levels throughout the world.

Contributions to this newsletter are gratefully received at any time.

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This newsletter is also available at the following website <u>http://physics.open.ac.uk/IAU46</u>

### **CONTENTS**

### Editorial Message from the President

### Why astronomy is useful Why astronomy should be taught in schools – resolution Report from PG 'Solar Eclipses' Report from PG 'Teaching for Astronomy Development' International Space Week

#### News of meetings

Astronomy education for the next millennium Tenth UN/ESA workshop on basic space science Photometric studies of eclipsing binaries Regional centres for space science and technology education COSPAR-IAU workshop Education session(s) at the IAU General Assembly 2003 Education session at the UK National Astronomy Meeting 2004

### **Officers & Organising Committee of Commission 46**

# **EDITORIAL**

In three articles in this issue appeals are made to the Commission 46 Organising Committee, to National Liaisons, and to the C46 membership to provide some comment and ideas. The three articles are

Why astronomy is useful

Why astronomy should be taught in schools - resolution

The International Space Week.

Please provide input either to the whole OC or to one of its members. Contact details for a few OC members are given in 'Officers & Organising Committee of Commission 46' at the end of this Newsletter. See the C46 website for a complete list.

The material received in response to the three articles could form the basis of articles in the next edition of the Newsletter.

The next edition will be in March 2002, and <u>the deadline for receipt of material by me is Friday 8</u> <u>March 2002</u>. Contributions can be sent as emails to me, either in the body of the email or as editable attachments e.g. Word, LaTeX. Illustrations should be in a common format – JPEG, GIF, TIFF – but individual picture files should not exceed a megabyte. Material can also be sent by mail or fax.

Barrie W Jones

(for contact details see 'Officers & Organising Committee of Commission 46')

# **MESSAGE FROM THE PRESIDENT**

Another half year has passed during which we worked on many items as summarised in my report in the IAU Information Bulletin number 90. Here is a short summary. The Program Group (PG) 'Advance Development' started to support the Philippines; the PG 'Teaching for Astronomy Development' supported activities in Vietnam, Central America, and Morocco; the PG 'Exchange of Astronomers' supported some young astronomer to make trips possible for their extensive research work; the 'Newsletter' PG compiled and circulated this issue of the Newsletter; the PG 'Solar Eclipses' did extensive work at the African solar eclipse in June, 2001; the PG 'Collaborative Programs' and the PG 'International School for Young Astronomers' has been preparing the long-planned COSPAR-IAU cosponsored workshop at the UN Regional Center in Brazil, which is now finally scheduled to take place in early December, 2001. This is the first real 'cooperation programme' since the Workshop at UNISPACE III.

The Organising Committee (OC) started discussions about the Special Session at the 25<sup>th</sup> IAU General Assembly (GA) in Sydney, 2003. Additional to this, the OC discussed extensively a resolution for the GA which was originally proposed by Dr Magda Stavinschi. In this Newsletter, in 'Why astronomy should be taught in schools – resolution' a version proposed by the OC is included. After receiving many comments from not only Commission 46 members but also IAU members in general, I would like to ask you to contact them on this issue. In the previous Newsletter, I expressed my intention, as President, to open our discussions to at least the OC and then to all the commission members. This resolution issue is the first case where a member brought an issue to the OC and it is now, after discussions among the OC, open to review by the members.

Our Commission 46 has worked nicely over these 40 years, but most of the extensive work was initiated by some active members. After two IAU Colloquia on Education, the first at Williams College in the USA, the second at University College London and the Open University (near London), and several Joint Discussions and Special Sessions during the past three GAs, many members expressed their voice, but once each meeting was covered there was little input to the OC from the wider membership. Now, I feel a new era of our Commission is coming and I ask for further input of your ideas to the OC.

#### Syuzo Isobe

(for contact details see 'Officers & Organising Committee of Commission 46')

# WHY ASTRONOMY IS USEFUL

This item is a preamble to the following item 'Why astronomy should be taught in schools – a resolution'. Clearly, if astronomy were not useful, in the widest sense of that word, there would not be much of a case for teaching it in schools!

In July John Percy circulated the OC with his own reasons why astronomy is useful, and these are reproduced below. Though this is a rather comprehensive list, <u>you might have significant additions</u>, in which case please send them to the OC, or at least to one of us. This invitation is extended to all members of C46, including the OC itself.

One addition could be that astronomy, as well as developing mathematical and scientific skills, is also an excellent vehicle for developing transferable skills such as information technology, literacy, project organisation, and group work. Its excellence in this respect is because the subject matter of astronomy is generally found to be very interesting and therefore motivating.

### John Percy's list of reasons why astronomy is useful

- Astronomy is deeply rooted in almost every culture, as a result of its practical applications, and its philosophical implications.
- Among the scientific revolutions of history, astronomy stands out. In the recent lists of 'the hundred most influential people of the millennium', astronomers are always included.
- Astronomy has obvious practical applications to: timekeeping; calendars; daily, seasonal, and long-term changes in weather; navigation; the effect of solar radiation, tides, and impacts of asteroids and comets with the Earth.
- Astronomy has advanced the physical sciences by providing the ultimate physical laboratory the Universe - in which scientists encounter environments far more extreme than anything on Earth. It has advanced the geological sciences by providing examples of planets and moons in a variety of environments, with a variety of properties.
- Astronomical calculations have spurred the development of branches of mathematics such as trigonometry, logarithms, and calculus. Now they drive the development of computers: astronomers use a large fraction of all the supercomputer time in the world.
- Astronomy has led to other technological advances, such as low-noise radio receivers, detectors ranging from photographic emulsions to electronic cameras, and image-processing techniques now used routinely in medicine, remote sensing and many other fields.
- Astronomy reveals our cosmic roots, and our place in time and space. It deals with the origins of the Universe, galaxies, stars, planets, and the atoms and molecules of life perhaps even life itself. It addresses one of the most fundamental questions of all are we alone in the Universe?
- Astronomy promotes environmental awareness, through images taken of our fragile planet from space, and through the realisation that we may be alone in the Universe.
- Astronomy reveals a Universe that is vast, varied, and beautiful the beauty of the night sky, the spectacle of an eclipse, the excitement of a black hole. Astronomy thus illustrates the fact that science has cultural as well as economic value. It has inspired artists and poets throughout the ages.
- Astronomy harnesses the deepest emotions of humanity curiosity, imagination, and a sense of shared exploration and discovery.
- Astronomy, in philosophy and education, provides an example of an alternative approach to the scientific method 'observation, simulation, and theory', in contrast to the usual 'experiment and theory'.
- Astronomy, in the classroom, can be used to illustrate many concepts of physics, such as gravitation, light, and spectra.
- Astronomy, if properly taught, can promote understanding of the nature of science, and can promote rational thinking, through examples drawn from the history of science, and from contemporary issues such as the proliferation of pseudo-science.
- Astronomy, by introducing students to the size and age of objects in the Universe, gives them experience in thinking more abstractly about scales of time, distance, and size.
- Astronomy is the ultimate interdisciplinary subject, and 'integrative approach' and 'cross-curricular connections' are increasingly important and valued concepts in modern school curriculum development.
- Astronomy attracts young people to science and technology, and hence to careers in these fields.
- Astronomy can promote and increase public awareness, understanding, and appreciation of science and technology, among people of all ages.
- Astronomy is an enjoyable, inexpensive hobby for millions of people the 'naturalists of the night'.

# WHY ASTRONOMY SHOULD BE TAUGHT IN SCHOOLS - RESOLUTION

In July this year our President forwarded a message to the OC from Magda Stavinschi of Romania in which she noted her government's move to reduce, even eliminate, the teaching of astronomy in secondary schools. She also noted that this situation is not unique, and that in several other countries astronomy teaching is in decline. By contrast the teaching of astrology and other pseudo sciences is on the increase. She therefore proposed a draft that she hoped would lead to an IAU resolution stating its position on astronomy teaching in schools.

Members of the OC have discussed the matter at some length. It has been agreed that the way forward is to develop a resolution that can be put to the Executive Committee (EC) of the IAU by March 2003. At the GA later that year there will be an education meeting (see 'News of meetings' below) at which the resolution could be modified slightly, but *not* substantially, and then go forward in final form for approval at the end of the GA. This is rather a long time scale to respond to the immediate problem in Romania; other ways have been suggested to deal with this in the short term, though in the longer term the resolution is aimed to help in all countries.

<u>The draft resolution is presented below. Please send any comments on it to the OC (or to one of us).</u> This invitation is extended to all members of C46, including the OC itself.

The draft is built on the foundation supplied by Magda. Several members of the OC have contributed to its development, but I hope that John Percy and Johannes Andersen will not mind if I mention that their contributions have been particularly extensive. Nevertheless, the draft should be regarded as coming from the OC - it is certainly not the work of one person.

In commenting on this draft please bear several points in mind.

- Whose attention are we trying to attract?
- Which arguments are likely to interest them?
- Who will be active in the follow-up of the resolution?
- The difficulty/impossibility of covering all local circumstances, given that the draft is probably slightly too long as it stands.

The most important thing is to have a resolution that will have the best chance of having some positive effect on astronomy teaching in the schools.

### Draft resolution, for comment

The International Astronomical Union

Considering

- 1 that scientific and mathematical literacy and a workforce trained in science and technology are essential to maintain a healthy population, a sustainable environment, and a prosperous economy in any country
- 2 that modern astronomy, when properly taught, nurtures rational, quantitative thinking and an understanding of the history and nature of science, as distinct from rote learning and pseudo-science
- 3 that astronomy has a proven record of attracting young people to an education in science and technology and, on that basis, to careers in space-related and other sciences as well as industry
- 4 that the cultural, historical, philosophical and aesthetic values of astronomy help to establish a better understanding between natural science and the arts and humanities
- 5 that, nevertheless, in many countries, astronomy is not present in the school curriculum and astronomy teachers are often not adequately trained or supported, but
- 6 that many scientific and educational societies and government agencies have produced a variety of well-

tested, freely-available educational resource material in astronomy at all levels of education Recommends

- 1 that national educational systems include astronomy as an integral part of the school curriculum at both the elementary (primary) and secondary level, either on its own or as part of another science course
- 2 that national educational systems and national teachers' unions assist elementary and secondary school teachers to obtain better access to existing and future training resources in astronomy in order to enhance effective teaching and learning in the natural sciences
- 3 that the National Representatives/Liaisons in the IAU and in Commission 46 call the attention of their

national educational systems to the resources provided by and in astronomy, and

4 that members of the IAU and all other astronomers contribute to the training of the new, scientifically literate generation by assisting local educators at all levels in conveying the excitement of astronomy and of science in general.

Barrie W Jones (for contact details see 'Officers & Organising Committee of Commission 46')

# **REPORT FROM PG 'SOLAR ECLIPSES'**

The total solar eclipse of 21 June 2001 swept across southern Africa, and provided partial phases for all of Africa south of the Sahara. The Working Group on Eclipses of the Solar Division of the IAU maintained a homepage at <u>www.williams.edu/astronomy/IAU\_eclipses</u> that provided links to maps, information about observing eclipses, and information on eye safety at eclipses. Jay Pasachoff lectured about watching eclipses safely at a Professional-Amateur Conference on Solar Eclipses held at Antwerp in November 2000 and at various venues in Zambia in March and June 2001.

In spite of the best efforts of all professionals and educators concerned, confusion reigned about when to look at the eclipse through filters and when directly. The growing popularity of solar viewers of Mylar in eyeglass form has probably contributed to the confusion. We are working with the makers of such glasses and viewers to label the products more clearly, assuming people do not read accompanying instructions. In spite of numerous interviews, newspapers continued to print incorrect information how to observe eclipses.

Solar filter material was distributed at low cost or no cost to universities in Zambia and Zimbabwe, and representatives of many countries in the zone of partial eclipse were advised on safe observing methods. No eye injuries have been reported, to my knowledge. National Liaisons were appointed in Zambia, Zimbabwe, and South Africa, and they did their best to provide accurate information.

The forthcoming annular eclipse of 14 December 2001 in Costa Rica will provide partial phases from northwestern South America through Central America to all of the United States except for the east. The 10 June 2001 annular eclipse will provide partial phases for viewers in western Asia (including Japan, China, Russia, and Korea) and western Australia and then range across the Pacific Ocean to the western United States and Canada. The 4 December 2002 total eclipse will provide partial phases across all of Africa except its northern rim and, at sunset, western Australia. Information about the safety of partial phases of eclipses should be widely disseminated in those regions. Maps are available on the website given above.

Jay M Pasachoff

(for contact details see 'Officers & Organising Committee of Commission 46')

## **REPORT FROM PG 'TEACHING FOR ASTRONOMY DEVELOPMENT'**

This report from the C46 PG 'Teaching for Astronomy Development' (TAD) covers the period September 2000 to September 2001.

#### Vietnam

The new Vietnamese-English textbook 'Astrophysics' (authors Donat G Wentzel, Nguyen Quang Rieu, Pham Viet Trinh, Nguyen Dinh Huan, Nguyen Dinh Noan) has been published by the Educational Publishing House of Vietnam. It is used in ten universities.

TAD mainly supported the earlier conferences to bring the teachers up-to-date and one of the two conferences in 2001 which provide teacher support.

TAD and Davis Planetarium (Baltimore, USA) sent to Vinh Planetarium two planetarium shows (slides, text, and sound). These have been translated and culturally adjusted and are being shown to Vinh City public and schools.

TAD partially supported the first issue (12 pages) of the new quarterly Vietnamese journal 'Popular Astronomy' by the Vietnamese Astronomical Society. Some included items were translated from 'Universe in the Classroom' (Astronomical Society of the Pacific).

Journals and books on astronomy and astrophysics, as needed by three universities, were provided.

#### Morocco

Computational capabilities: participation in an Italian-sponsored interdisciplinary workshop in Casablanca on data and image analysis; a contribution to a laptop computer needed for an IAU-provided telescope and the educational capabilities of the astronomy program.

TAD supported travel of John Danziger from Trieste to Casablanca 15-22 April 2001 for a short course, discussions with students, and advice on developing astronomy.

TAD supported the travel of Michele Gerbaldi from Paris to Casablanca 7-9 September 2001 for professional planning of astronomy teaching at several schools in Casablanca (expecting to be using a privately donated small telescope).

TAD enhanced a library in astrophysics and mathematical physics.

#### **Central America**

TAD provided travel grants for seven delegates from the universities of Nicaragua and Panama to attend the Sixth Central American Course on Astronomy, at the University of Costa Rica 26 March to 6 April 2001, including the meeting of the Central American Astronomical Assembly (the organisation adhering to the IAU). Some meetings expenses were also provided.

TAD provided three student travel grants: for Alfredo Gomez, student in Central American MSc program, to travel from Nicaragua for MSc thesis research with Dr Nidia Morrell, La Plata, Argentina (local living costs provided privately); for Maria Quiroz, student in a Central American MSc program, to travel from Honduras for MSc thesis research with Dr Silvia Fernandez, Cordoba, Argentina (local living costs were provided by National University of Cordoba under an agreement with Central American Suyapa Observatory, Honduras); for Eduardo Rubio to travel from Guatemala for BSc thesis research with Dr Armando Arellano, Mexico (additional support was via a fellowship from the Guatemalan CONCYT and SENACYT and an assistantship from National University of Mexico).

Donat G Wentzel wentzel@astro.umd.edu

# **INTERNATIONAL SPACE WEEK**

The United Nations has declared 4-10 October of each year as World Space Week (WSP). This is a celebration at the international level of the contribution that space science and technology can make to the betterment of the human condition. Spaceweek International Association supports the United Nations in the global coordination of WSP.

By synchronising public outreach and education activities around the globe a news story is created. In this way, more people can be efficiently reached. Using this strategy, WSP is now the largest annual public space outreach event in the world.

On behalf of the United Nations, I wish to invite the IAU to participate in WSP. It offers the IAU and its members an efficient means to promote popular understanding of astronomy and encourage astronomy education in the world's schools.

I request that Commission 46 endorse WSP and ask all IAU members to participate, by organising educational events at their institutions, giving public lectures, and by encouraging teachers to use astronomy in their classrooms. IAU members can also play a leadership role in the coordination of WSP in their regions and countries.

I would be delighted to provide any further information or assistance that you might require. Detailed information on WSP can also be obtained at <u>http://www.spaceweek.org</u>

Dennis Stone, Volunteer President, Spaceweek International Association, <u>dstone@spaceweek.org</u>

(Comments on how C46 should respond to this, particularly ideas about how we could get involved, should be sent to the OC of Commission 46 please. Barrie W Jones)

# **NEWS OF MEETINGS**

#### ASTRONOMY EDUCATION FOR THE NEXT MILLENNIUM

I have pleasure in reporting that a very successful meeting related to astronomy education was held at the University of Western Sydney Nepean in Kingswood, Sydney, Australia, 11-13 July 1999. The meeting was entitled 'Astronomy Education for the Next Millennium' and was hosted adjacent to the joint scientific meeting of the Astronomical Society of Australia and the Royal Astronomical Society of New Zealand. A meeting of the Global Hands-on-Universe was also hosted in this period.

Commonly called AstroED99, the meeting was attended by about 70 delegates from 7 different countries. About 50 papers were presented, and social activities included a bus tour of the Blue Mountains, conference dinner in Katoomba, and an informal evening in Sydney with dinner at Sydney Observatory. Eighteen of the papers presented have been published in a special edition of the Publications of the Astronomical Society of Australia, Volume 17, Number 2, August 2000 (ISSN 1323-3580). An electronic version of this publication is available at <a href="http://www.atnf.csiro.au/pasa/17\_2/">http://www.atnf.csiro.au/pasa/17\_2/</a>

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#### TENTH UN/ESA WORKSHOP ON BASIC SPACE SCIENCE

This was held at Reduit, Mauritius, 25-29 June 2001. The Workshop title was 'Exploring the Universe: Sky Surveys, Space Exploration, and Space Technologies'. It was hosted by the University of Mauritius on behalf of the Government of Mauritius.

The Workshop was attended by 65 astronomers and space scientists from 28 countries: Austria; Canada; Chile; China; Denmark; Egypt; Ethiopia; France; Germany; Hungary; India; Italy; Japan; Mauritius; Mexico; the Netherlands; Norway; Romania; Russian Federation; South Africa; Spain; Sri Lanka; Syrian Arab Republic; Uganda; United Kingdom; United States of America; Yemen; and Zambia.

The co-organisers of the UN/ESA Workshops on Basic Space Science are: the Austrian Space Agency (ASA); the Committee on Space Research (COSPAR); the European Space Agency (ESA); the French Space Agency (CNES); the German Space Agency (DLR); the National Astronomical Observatory of Japan; the International Astronomical Union (IAU); the Abdus Salam International Institute for Theoretical Physics (ICTP; Italy); the National Aeronautics and Space Administration (NASA); the Planetary Society (TPS; USA); and the United Nations (UN).

Previous UN/ESA Workshops on Basic Space Science have been held in India (1991) and Sri Lanka (1995) for Asia and the Pacific, Costa Rica (1992) and Honduras (1997) for Central America, Colombia (1992) for Latin America and the Caribbean, Nigeria (1993) for Africa, Egypt (1994) and Jordan (1999) for Western Asia, and Germany (1996) and France (2000) for Europe.

The presentations made during the Workshop, of which there were more than 50, focused on

sky surveys the Mauritius Radio Telescope (MRT) solar satellite missions and their data bases: SOHO, Yohkoh, Ulysess, and TRACE solar physics and helioseismology solar eclipse science astronomy with networks of small telescopes the Astrophysics Data System (ADS).

All UN/ESA Workshops on Basic Space Science make efforts to accommodate in their programmes so-called groundbreaking results in space science. This time, two such results led to hot debates among participants.

First, Angola, Zimbabwe, Mozambique, and Madagascar were on the total solar eclipse path across Africa that occurred on 21 June 2001. Many observations were made to understand better how the solar corona is heated to two million degrees Celsius, and to plug the gap in the coverage of the Sun's outer atmosphere available from spacecraft. Beyond photon astronomy, such a solar eclipse can make significant contributions to neutrino and gravitational astronomy as well, as was shown in presentations during the Workshop. Second, on 18 June 2001, the Sudbury Neutrino Observatory (SNO) announced their first findings regarding the puzzle of the missing solar neutrinos, a 30-year old mystery concerning the physical mechanisms on how the Sun generates energy. Strong evidence for neutrino oscillations is now available.

Both events were directly relevant to the Workshop's one-day solar sessions that comprehensively

reviewed the current theoretical and observational status of the understanding of the internal structure and atmosphere of the Sun based on results from the four solar satellite missions SOHO, TRACE, Ulysses, and Yohkoh. Demonstration of availability, access, and analysis of the data from the solar missions and recommended software for their analysis was a highlight of the Workshop programme. Expectations for the observations of solar gravity modes are running high.

The Mauritius Radio Telescope (MRT) was primarily designed to undertake a survey of the southern sky at 151.5 MHz with a sensitivity of 150 mJy. The MRT is a joint project of the Indian Institute of Astrophysics, the Raman Research Institute of India, and the University of Mauritius. The visit to MRT, located in the Bras d'Eau forest in the rocky north-eastern part of Mauritius, left a deep impression on all participants. Already three surveys of the southern sky have been finalized with about 300 gigabytes of raw data collected. MRT is mapping the Milky Way and continues to observe pulsars. The final construction of MRT was completed in 1992 and the telescope has been operational since then. More than ten presentations during the Workshop addressed all aspects of MRT.

A permanent topic of the Workshops is NASA's Astrophysics Data System for free access to astronomical literature on-line and through e-mail (<u>http://ads.harvard.edu</u>). In particular, astronomers and space scientists from developing nations are utilizing more frequently the four databases with abstracts in astronomy, instrumentation, physics/geophysics, and the LANL preprints, with a total of over 2.2 million references. Everybody agreed that ADS and CDS (Strasbourg Astronomical Data Centre) have considerably eased the day-to-day work of the international astronomical community.

Participants of the Workshop split into four working groups to review observations and recommendations of past UN/ESA Workshops on Basic Space Science

space exploration sky surveys education, training, and services space technologies.

Two private companies took the Workshop as an opportunity to discuss the utilisation of ground-based robotic telescopes and small satellites, respectively, for basic space science, particularly in developing nations.

Evening Working Group sessions addressed basic space science facilities in developing nations. They also addressed the current status of the publication of regional astronomical newsletters: African Skies/Cieux Africains (http://www.saao.ac.za/~wgssa) for Africa; Teaching of Astronomy in Asia-Pacific Region for Asia and the Pacific; Astronomia Latino Americana (http://www.astro.ugto.mx/~ala/) for Latin America and the Caribbean; and the forthcoming newsletter of the Arab Union for Astronomy and Space Sciences for Western Asia. The evening workshops also discussed SOHO and Ulysses data utilization. In this regard the participants also took note of the forthcoming establishment of an African Institute of Space Science (AISS) as a distributed organisation, which would act as a source of vision and strategy to promote the development of basic space science throughout Africa. AISS may benefit from the previous experience obtained in the respective regional Centres for Space Science and Technology Education, affiliated to the United Nations.

The AAVSO's 'Hands-On Astrophysics' material for operating small astronomical telescope facilities (<u>http://www.aavso.org/</u>) and the manuscript 'Astrophysics for University Physics Courses' (available on the UN/ESA Workshop web site given below) were provided to Ethiopia, Honduras, Jordan, Morocco, Paraguay, the Philippines, Sri Lanka, Uganda, and Zambia.

This Workshop initiated a study and assessment of the achievements of the past UN/ESA Workshops in the period 1991 to 2001. Proceedings of the Workshop will be published in Astrophysics and Space Science (Kluwer Academic Publishers).

During the Workshop, the Space Agency of Argentina (CONAE) announced the hosting of the Eleventh UN/ESA Workshop on Basic Space Science at the Institute for Higher Space Studies, 'J Mario Gulich' at Cordoba, in cooperation with the University of La Plata, 9-13 September 2002, Cordoba, Argentina.

More information on this series of Workshops is available at <u>http://www.seas.columbia.edu/~ah297/un-esa/</u>

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### PHOTOMETRIC STUDIES OF ECLIPSING BINARIES

With the support of our long-standing Visiting Professor Ed Budding we organised a very fruitful workshop: 'Photometric Studies of Eclipsing Binaries' at Çanakkale, a small city very close to old Troy and Dardanos, between 30 July and 3 August 2001.



Participants at the workshop 'Photometric Studies of Eclipsing Binaries' held at Çanakkale, Turkey, between 30 July and 3 August 2001

Altogether 17 MSc and PhD students participated in the workshop. All participants (22 in total) were accommodated at the Dardanos Campus of the Çanakkale University. Dardanos, by the way, is the original home of King Dardanos, the founder of Troy. His last resting place (according to tradition, and some partially explored evidence) is within a couple of hundred metres of the accommodations on the side of the Dardanelles which connects The Mediterranean and The Marmara seas.

The lecturers, Ed Budding, Osman Demircan, Ahmet Erdem, and Zeki Eker, delivered a 15 hour theoretical course on the interpretation of the light curves of close binary systems. The participants had plenty of time for discussion before and after dinner at the Dardanos Campus where they also visited the grave of King Dardanos.

In the second half of the day about seven hours of practical work was done on the computers. Five groups were formed and five light curves were given to the groups. The group leaders Ahmet Erdem, Caner Çiçek, Sacit Ozdemir, Faruk Soydugan, and Esin Soydugan, plus the lecturers, supervised the groups on the applications of practical light curve analysis. On the fifth day the groups discussed the results and wrote short communications which will be published in the next two issues of the 'Southern CCD and Photometry Group: Communique'. Thus, six articles came out of the workshop. The experienced students received their certificates before leaving.

Osman Demircan, Çanakkale Onsekiz Mart Univ., Astrophysics Observatory, TR17100 Çanakkale, Turkey demircan@comu.edu.tr

### **REGIONAL CENTRES FOR SPACE SCIENCE AND TECHNOLOGY EDUCATION**

The United Nations Office for Outer Space Affairs organised, in cooperation with the European Space Agency, the UN Expert Meeting on 'Regional Centres for Space Science and Technology Education: Status and Future Developments', 3-7 September 2001, Frascati, Italy. The meeting was hosted by ESA's European Space Research Institute (ESRIN) in Frascati.

Space science and technology education can be pursued at the elementary, secondary, and tertiary levels. In space-faring nations, elements of space science and technology have been introduced into the science curricula at those levels. Such an innovation has not taken place in many developing nations, partly because the benefits of space science and technology have not been appreciated enough, and partly because the facilities and resources for teaching science and technology at educational institutions in those nations are not yet well developed.

Education in space science and technology in industrialised nations has become highly interactive. In

those countries, the World Wide Web and other information technologies have become useful tools in education programmes at all levels. International cooperation in the area of education can be encouraged to enable developing nations to develop their own education programmes. This was the main objective of the meeting for four distinctive disciplines in space science and technology – remote sensing, meteorology, communications, space science – at the university level and across cultures. The meeting took into account that the condition of education varies significantly across nations, and across institutions within the same nation. Those different conditions lead to differences in space science and technology education curricula in terms of course content and modes of presentation. To the great advantage of the meeting, such problems had been resolved in a meeting on the Development of Education Curricula in Spain in 1995.

The infusion of elements of space science and technology into university level science curricula can serve a dual purpose for industrialised and developing nations. It can revitalise the educational system, introduce the concepts of high technology in a non-esoteric fashion, and help create national capacities in science and technology in general. Moreover, all nations can take advantage of the benefits inherent in the new technologies which, in many cases, are spin-offs from space science and technology.

There are many challenges in the teaching of science at university level, both in developing and industrialised nations, but the challenges are of a higher magnitude in developing nations. The general problem confronting science education is an inability of students to see or experience phenomena being taught, which often leads to the inability to learn basic principles and to see the relationship between two or more concepts and their practical relevance to problems in real life. Added to those problems are a lack of skills in the relevant aspects of mathematics and a lack of skills related to problem-solving strategies. There are also language problems in nations where science is taught in a language different from the mother tongue. Over the years, industrialised nations have overcome most of the basic problems, except perhaps the psychological problems that students have about science being a difficult subject. In developing nations, however, the basic problems still linger, exacerbated by the fact that there are not enough academically and professionally well-trained teachers.

#### **Regional Centres**

The UN GA, in its resolution 45/72 of 11 December 1990, endorsed the recommendation of the Working Group of the whole of the Scientific and Technical Subcommittee, as approved by the Committee on the Peaceful Uses of Outer Space (COPUOS), that 'the United Nations should lead, with the active support of its specialised agencies and other international organisations, an international effort to establish regional centres for space science and technology education in existing national/regional educational institutions in the developing countries'.

The UN GA, in its resolution 50/27 of 6 December 1995, also endorsed the recommendation of COPUOS that 'these centres be established on the basis of affiliation to the United Nations as early as possible and that such affiliation would provide the centres with the necessary recognition and would strengthen the possibilities of attracting donors and of establishing academic relationships with national and international space-related institutions'.

Such regional centres have been established under the auspices of the Programme on Space Applications, implemented by the United Nations Office for Outer Space Affairs, as follows: in India for Asia and the Pacific (CSSTEAP, <u>http://www.cssteap.org</u>); in Morocco (CRASTE-LF) and Nigeria (ARCSSTE-E) for Africa; in Brazil and Mexico for Latin America and the Caribbean; and in Jordan for Western Asia. The objective of these Centres is to enhance the capabilities of member states, on a regional and international level, in different disciplines of space science and technology that can advance their scientific, economic, and social development. Each of the Centres provides postgraduate education, research, and applications programmes with emphasis on remote sensing, satellite communications, satellite meteorology, and space science for university educators, as well as research and application scientists. All Centres are implementing four Education Curricula (remote sensing, satellite communications, meteorological satellite applications, space and atmospheric sciences) for nine-month postgraduate courses that emanated from a UN Expert Meeting on the Development of Education Curricula, held at Granada, Spain, in 1995 (available at <u>http://www.oosa.unvienna.org/SAP/centres/centres.htm</u>). Since 1995, these Education Curricula have been presented and discussed at regional and international educational meetings.

The Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), held in 1999 at the UN Office at Vienna, through its Vienna Declaration on Space and Human Development (available at <a href="http://www.oosa.unvienna.org">http://www.oosa.unvienna.org</a>), emphasised that collaboration should be established between the regional Centres and other national, regional, and international organisations to strengthen components of their education curricula.

#### The meeting

In plenary sessions, the meeting reviewed the status of the operation and establishment of the regional Centres with a view to enhance cooperation among the Centres. Subsequently, the experts gathered in five working groups to focus on the following specific topics: A Management issues of the Centres, B Remote sensing, C Satellite meteorology, D Satellite communications, and E Space science, to achieve an update of the respective education curricula. The format of the Working Groups was based on real time discussion and debate, drawing on the participants' knowledge and expertise, thereby taking into account results of past nine-month post graduate courses, particularly those organised since 1996 at CSSTEAP and since 1998 at CRASTE-LF and ARCSSTE-E.

The devised course syllabi of the four education curricula differ from most of those available in literature and on the World Wide Web. They are based on physics, mathematics, and engineering as taught in many universities around the world. They are not tailored to any specific space-related project or mission that may have been or will be executed by any specific institution.

Pyenson emphasised in his recent work titled 'Servants of Nature' that both geographical decentralisation and interdisciplinary innovation have become watchwords in academic science. Electronic information-processing to some extent obviates the necessity for a scientist or scholar to reside at an ancient college of learning. Universities everywhere have adapted to new socio-economic conditions by expanding curricula. They have always responded in this way, although never as quickly as their critics would like. Measured and deliberate innovation is one of academia's heavy burdens. It is also a great strength. Emerging fields of knowledge become new scientific disciplines only after they have found a secure place in universities. We look to universities for an authoritative word about the latest innovations. New scientific ideas emerge in a variety of settings, but they become the common heritage of humanity only when processed by an institution for advanced instruction like the modern university. There is hope that this meeting and the previous meeting in Spain (1995) made a contribution to this process in the developing world.

Experts from following countries participated in and contributed to the meeting: Algeria, Austria, Bolivia, Brazil, Canada, France, Germany, India, Indonesia, Italy, Japan, Jordan, Mexico, Morocco, the Netherlands, Nigeria, Sweden, United Kingdom, and the United States.

The updated education curricula that emanated from the meeting will be published in a UN report which will be made widely available to appropriate educational institutions and the academic community responsible for implementing cooperative programmes in space science and technology education, throughout the world, and will be posted at http://www.oosa.unvienna.org/SAP/centres/centres.htm

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#### **COSPAR-IAU WORKSHOP**

Two IAU Commission 46 Program Groups – Collaborative Programs and the International School for Young Astronomers – have been preparing the long-planned COSPAR-IAU cosponsored workshop at the UN Regional Center in Brazil, which is now finally scheduled to take place in early December 2001. This is the first real 'cooperation programme' since the Workshop at UNISPACE III. The contact person is Peter Willmore (apw@star.sr.bham.ac.uk).

#### Barrie W Jones

(for contact details see 'Officers & Organising Committee of Commission 46')

#### EDUCATION SESSION(S) AT THE IAU GENERAL ASSEMBLY 2003

The Organising Committee of Commission 46 is developing a proposal for a 2-3 day Special Session on astronomy education to be held towards the end of the  $25^{\text{th}}$  IAU General Assembly (GA) in Sydney, July 2003. It is expected that the proposal will be considered by the Executive Committee of the IAU in the next few months. If a Special Session is not granted then a Joint Discussion would be sought. John Percy prepared an outline proposal some months ago, on astronomy in the schools – rationale, research, resources. This outline has been discussed, mainly by OC members, and the proposal is now being put in final form. It is

possible that the session, in whatever form, will be linked to a 'teachers day' after the end of the GA, and also to any education sessions of other commissions during the GA itself.

Though the Special Session would include astronomy in the developing world, a suggestion has been made by Alan Batten in conjunction with Athem Alsabti that there should also be a half-day session specifically on astronomy in developing countries. This would be at the level of promoting research in astronomy and space science, with collaboration as an important theme. The proposal is under development.

There will be more news on these sessions in future editions of this Newsletter.

Barrie W Jones (for contact details see 'Officers & Organising Committee of Commission 46')

### **EDUCATION SESSION AT THE UK NATIONAL ASTRONOMY MEETING 2004**

The UK National Astronomy Meeting in 2004 will be held in late March and early April at the Open University, and I am chair of the Organising Committee. NAMs in the past have been almost entirely concerned with research in astronomy, but astronomy education and public understanding have featured to a small extent. I hope that a somewhat more substantial session on education/public understanding will be part of the 2004 NAM.

Barrie W Jones

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Organising Committe	This presently consists of the President, Vice-president, Past-president, a representative from the IAU Executive Committee, the chairs of the program groups, and the vice-chair of the program group Exchange of Astronomers. For details of the OC, and for the other members of the program groups, see the website below, and also Newsletter 53, under Section B of the item, The Business Meeting of C46 2000.
National liaisons	These are listed on the website <u>http://physics.open.ac.uk/IAU46</u>