



**COMMISSION 46**  
**THE TEACHING OF ASTRONOMY**  
**Newsletter 51 – October 1999**

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**The mandate of Commission 46 is “to further the development and improvement of astronomy education at all levels, throughout the world”.**

**Contributions to this newsletter are gratefully received at any time.**

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## EDITORIAL

The 11 August 1999 total solar eclipse is behind us. The path of totality crossed Europe and much of Asia. Whereas clear skies were the rule from Romania east, in north west Europe the majority of people were clouded out or had views severely compromised by cloud. Nevertheless, even cloudy eclipses can be spectacular, and useful educational work can be done (see 'Experiences of a cloudy eclipse').

A major event in 2000 will be the next triennial General Assembly of the International Astronomical Union. This will be held in Manchester in the UK 7-19 August. Manchester is an old industrial city that was once the heart of the cotton industry, and in recent years has undergone much modernisation and development. There is a weather myth in the UK that it is always raining in Manchester! This is not true. It has a typical rainfall for the north-west of England, and there are many dry, warm, sunny days in August. It is near to splendid countryside, and not far from many sites of astronomical interest - even Stonehenge and the Royal Observatory Greenwich are only a few hours travel away, and the radio-telescopes at Jodrell Bank are very close.

I think that many of us will be disappointed that the proposal from Commission 46 for a Joint Discussion on astronomy education was turned down by the scientific organising committee of the General Assembly. On the other hand we are glad that education is to be included at the General Assembly in the 2.5 day special meeting on 'Astronomy for Developing Countries'. Some other education events might take place, and I hope to be able to give you details in the next newsletter.

Barrie W Jones

## MESSAGE FROM THE PRESIDENT

These past months have been full of excitement for the teaching of astronomy. The total solar eclipse of 11 August made people all over the world eager to understand what was going on in the sky, and professionals and amateurs took advantage of the event to talk science.

UNESCO organised a meeting in Hungary that dealt with a new commitment for science. Apparently there is a world-wide rejection of science because there is a general feeling that it is responsible for pollution, ecological problems, and armaments. One of the resolutions was that it is important to make an effort to teach better science so that people truly understand what its purpose is. Astronomy was mentioned as an ideal way to convey scientific knowledge.

Prior to this meeting the International Council of Scientific Unions held a conference on the Capacity of Building Science that dealt amongst other things with innovative ways to teach science, in particular to girls. The presentations were published electronically and can be found at <http://www.teachscience.org>

The Australian and New Zealand Astronomical Societies co-sponsored a meeting on the teaching of astronomy in Australia. As you are all aware, there is a great astronomical tradition in that part of the world. It was a pleasure to talk to so many gifted teachers in that area that are not only involved in teaching but also in creating and promoting outreach programmes. The proceedings will be published in the Publications of the Astronomical Society of Australia (PASA).

The Unispace III Conference was held in Vienna. Its purpose was to enhance the peaceful uses of space. A session on the teaching of astronomy was held as one of the workshops that would lead to a series of recommendations to the assembly. The proceedings of the astronomy workshop will be published in the 'Asian Pacific Teaching of Astronomy' edited by our Vice President Syuzo Isobe.

I am more convinced than ever that the teaching of astronomy in a proper way can help us encourage youngsters not only to understand and enjoy science but also to encourage a few to pursue scientific research. I invite all astronomers to carry out some kind of outreach activity parallel to their scientific meetings. These can be of several kinds: interviews with the media, teacher workshops, or public lectures.

Julieta Fierro

## EXPERIENCES OF A CLOUDY ECLIPSE

The total solar eclipse of 11 August 1999 was probably experienced by more people than any other eclipse before. I say 'experienced' rather than 'saw' because a large proportion of Europe was covered in cloud. Nevertheless even for those of us under cloudy skies it was an awesome experience, and there are many converts to eclipse-chasing. I think that the track of totality for the next total eclipse, 21 June 2001, in southern Africa, will be crowded with people from Europe who, whilst (perhaps surprisingly) were not disappointed by a cloudy eclipse, nevertheless want to see a clear one.



A photo taken by the Mir 27 crew on 11 August 1999, with the Moon's shadow centred in the English Channel south of Cornwall. © CNES

We all know that when an eclipse crosses a region it offers enormous opportunities for school and public education. In the UK co-ordination was provided by a group from Sheffield Hallam University, led by John Parkinson, and by David Sang of the Association for Science Education. I was involved with both of these groups and also with the National Science Museum in London. Activities included

- Structure of the solar corona
- Light level measurements
- Radio wave propagation
- Shadow band observations and images
- Weather effects
- Effects on plants and animals (including humans!)

These activities were promoted through low-cost booklets; in the case of the Science Museum a subset was promoted via its website. I developed the shadow band activity, and a set of activities to do with the effects of the eclipse on weather. The Science Museum results are now in, mainly from the UK, but a few from continental Europe too.



The solar corona during the eclipse of 11 August 1999. © 1999 Wendy Carlos and Jonathan Kern. All rights reserved.

Shadow bands are an intriguing, often impressive phenomenon. These ragged bands of light and shade are often seen when the solar photosphere is all but covered. They result from the spatial variations of the refractive index of the Earth's atmosphere interacting with the illumination from a thin solar crescent. At any instant there is a static banded pattern on the ground, but the winds carry the pattern along, and the pattern also changes as the turbulence structure of the atmosphere and the shape of the crescent evolve. Shadow bands can be used to teach much about the interference of light, atmospheric turbulence, and telescope 'seeing'.

I was hoping to receive good photographs and videos of shadow bands, much needed to advance the study of the phenomenon. Unfortunately, most of the people who were to attempt imaging were under cloudy skies. So far I have received very few images, and none of sufficient quality to be of much use. I have received several visual reports from a variety of locations across Europe. A particularly full report came from a colleague, Ray Mackintosh, at Brighton (England), where the maximum eclipse was 98.6%. The bands moved at a few metres per second, were of strikingly high contrast, orderly, and lasted for several minutes. The longevity is the result of the location of the site just outside the path of totality the solar crescent being thin for a comparatively long time.

There were several weather-related projects: qualitative effects on cloud cover, and on wind speed and direction; measurements of atmospheric pressure (many schools and a small proportion of households have a barometer of some sort); measurements of temperature; and measurements of humidity (including a description of how to make and use a wet-bulb thermometer).

Most of the results of the effects on weather are in, from people of all ages, plus a few school groups. The temperature data look particularly interesting, and should add usefully to the data obtained from professionally run meteorological stations. When I have completed my analyses of the data I will make the results available to all participants. I will also put it on the Science Museum website, and write an article for the popular scientific press.

I will include a report on the outcome in a future issue of this newsletter. Meanwhile I would be glad to receive any other reports of educational activities linked to the eclipse.

Barrie W Jones

## THE INTERNATIONAL SCHOOL FOR YOUNG ASTRONOMERS

Since the last General Assembly, two ISYA have been organised successfully.

The 23<sup>rd</sup> ISYA met 4-23 July 4 1997 in the city of Zanjan, Iran, on the campus of the Institute for Advanced Studies in Basic Sciences (IASBS), at the invitation of its Director, Dr. Y Sobouti. The IAU provided travel grants to 14 foreign participants from Nigeria, Indonesia, Turkey, Lebanon, Poland, Ukraine, and Russia. Among 24 Iranian participants from 11 universities and IASBS, almost half were women (selected on criteria independent of gender).

The foreign faculty members were: Ed Guinan (USA, binary stars and their many astrophysical applications, use of small telescopes), Rajaram Nityananda (India, gravitational lenses), Michele Gerbaldi (France, stellar atmospheres, data analysis with MIDAS), Jihad Touma (USA/Lebanon, chaos in the solar system), and Don Wentzel (USA, MHD and related solar physics). Iranian lecturers from IASBS and four universities gave relatively short courses. Several participants gave short talks on their research. Mr. Arvind Paranjpye (from IUCAA, India) put the local telescope into working condition and provided his low-cost photometer for measurement of solar limb darkening. Practical exercises including several night-time observations using a CCD took place, as well as spectroscopic data analysis after the implementation of dedicated software.

(Cf IAU Information Bulletin 81.)

At the invitation of Dr Magda Stavinschi, Director of the Astronomical Institut of the Romania Academy of Science, the 24<sup>th</sup> ISYA met at Bucharest on the campus of the Faculty of Physics. (26 July - 24 August 1999). The LOC was chaired by Prof Mircea Rusu.

The travel grants provided by IAU and UNESCO allowed the invitation of 18 foreign participants, from: Algeria (2), Egypt (3), Morocco (2), Nigeria (1), Russia (3), Turkey (2), Uzbekistan (3), Vietnam (2); 23 Romanian students attended this ISYA. Half of the participants were women, the selection again being done on criteria independent of gender.

The foreign faculty members were: Attilio Ferrari (Italy, active galaxies and extragalactic jets), Michele Gerbaldi (France, stellar atmospheres and spectroscopic data reduction), Ed Guinan (USA, binary stars and their many astrophysical applications, use of small telescope), Don Wentzel (USA, MHD and related solar physics), and Jean-Paul Zahn (France, internal structure of the Sun, helioseismology).

The Romanian faculty members from the University of Bucharest were: Tatiana Angelescu (physics of elementary particles), Andrei Inonescu (planetary atmosphere), Mircea Rusu (fractals), Magda Stavinschi (time and eclipses).

A small telescope was loaned by the Astronomical Institut for the duration of the ISYA, and Ed Guinan adapted a photometer to it, brought for that purpose. The totality phase of the solar eclipse on 11 August has been observed.

The computing facilities at the University were used to do practical exercises on data reduction, spectroscopic and photometric. Half of the participants gave short talks on their current research work.

(Cf. IAU Information Bulletin No.85)

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## A LISTSERVER FOR RESEARCH IN ASTRONOMY EDUCATION

As a result of discussions at recent meetings, I have created an email listserv for astronomy education research discussions. This electronic community will focus on research into: students' misconceptions, technical issues in measurement, assessment and evaluation, comparisons of instructional strategies, and research design in the context of pre-kindergarten through graduate level and informal astronomy education. For instructions on how to join this electronic community see

<http://solar.physics.montana.edu/aae/astrolrner/>

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## **AN APPEAL FOR ASTRONOMY EDUCATION MATERIALS**

I am still seeking both astronomy education materials and sources of need. I continue here at Luther College as an adjunct and am now the President Elect of the Iowa Academy of Sciences and as such feel a personal responsibility to share resources with those needful of them in the developing countries. Anyone wishing to assist with materials should contact me at my email address. I provide the shipping costs when they are distributed from here, or, in some cases where the needs are clearly known and the resources are clearly available, I will ask for direct shipment between donor and donee.

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## NEWS OF MEETINGS

### **PARTNERS IN ASTRONOMY, TORONTO 1-7 JULY 1999**

From 1-7 July 1999 I had the pleasure of hosting 'Partners in Astronomy', the first ever joint meeting of the Astronomical Society of the Pacific, the Royal Astronomical Society of Canada, and the American Association of Variable Star Observers. The meetings were held at the University of Toronto, in downtown Toronto, with side trips to the Ontario Science Centre, and the David Dunlap Observatory, just north of the city. The meeting had many components. As well as the individual scientific and business sessions of the three societies, there was: a three-day Teacher's Workshop (attended by 270 elementary and secondary school teachers on a holiday weekend!); a workshop on partnerships between astronomers (both professional and amateur) and school teachers; two days of non-technical public lectures by 20 of the best astronomy communicators in North America (with Geoff Marcy as the keynote speaker); a day of lectures on the history of astronomy; and a three-day symposium on 'Amateur-Professional Partnerships in Astronomy Research and Education'. The Proceedings of this Symposium will be published in the ASP Conference Series, with me as the editor.

The Teachers' Workshop was an outstanding success. What was the secret? For one thing, astronomy is now part of the elementary and secondary school science curriculum, and the teachers are desperate for support. We also had some of the best presenters in North America: Andrew Fraknoi, Philip Sadler, and Dennis Schatz - not to mention Canada's first woman in space, Roberta Bondar. There were about two dozen other presentations, with parallel sessions for elementary and secondary school teachers, including several workshop-type sessions.

The Symposium, attended by almost 200 professional and amateur astronomers and educators, highlighted some of the technological and organisational developments which will enable amateur astronomers to increase the quantity, quality and variety of their contributions to astronomy; these contributions are already outstanding! One day was devoted to issues in astronomy education, and the importance of partnership. A feature of this Symposium (which I would recommend to others) was the use of panel discussions and general discussions to enable many people to contribute. There were also 80 posters presented. The discussions, and summaries of the posters, will be included in the Proceedings.

We are especially grateful to NASA, the US National Science Foundation, the Canadian Space Agency, and the University of Toronto, for funding travel grants for many of the non-professional participants.

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### **IAU-COSPAR-UN WORKSHOP ON EDUCATION IN ASTRONOMY AND BASIC SPACE SCIENCE, UNISPACE III, VIENNA 19-30 JULY 1999**

The Third UN Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), held in Vienna, Austria 19-30 July 1999, attracted some 2700 delegates. The main sessions were accompanied by some 40 technical workshops, several of them on astronomical topics. The IAU and COSPAR organised a 2.5 day workshop designed to show that basic science and basic science education should become an integral part of how countries build up the scientific capacity to conduct projects in space, and to outline the guidelines that might be developed by the IAU and COSPAR in order to help these activities. A typical audience was about 40 people.

Reviews of actual situations included

- how basic science fares in countries with no scientific tradition (Mazlan Othman, Malaysia)
- the need to recognise the limited science capabilities in any one such country and the need to adjust international co-operation to take account of that limitation. Space activities should be viewed not only as a solution for environmental problems but as a way to enhance the general scientific understanding, and an opportunity to identify and train the most talented people needed to solve the country's problems (Bambang Hidayat, Indonesia)
- the progress possible when a country has a national leader supporting science (Marcos Machado, Argentina)
- some of the strategies that countries have used to initiate and develop the basic physical sciences (Don Wentzel, USA).

The summary of existing activities included those of the IAU (mostly but not solely Commission 46), of COSPAR, and of various regional astronomy and space physics associations (e.g. the Working Group on

Space Sciences in Africa), and placed emphasis on the (recently initiated) UN Centers for Space Science and Technology Education. This workshop was the first time that the Directors of the four Centers (India, Brazil, Morocco and Nigeria) were present at one meeting. The occasion led to productive discussions not only among the Directors but also with the representatives of the IAU, COSPAR and the UN, and to a decision to form a Contact Group among them for future co-ordination and possible joint initiatives.

A day was spent on the main ideas that should be contained in, for instance, future workshops aimed at creating guidelines and producing materials for countries wishing to improve their basic science via astronomy and space science. Julieta Fierro (Mexico) outlined the goals and opportunities to reach the public, Michele Gerbaldi (France) discussed astronomy in the French schools with emphasis on teacher training, Isabel Hawkins (USA) and John Percy (Canada) outlined the benefits, challenges, and limitations in bringing actual space science data to the high schools.

The workshop closed with a set of recommendations, which were forwarded to the UNISPACE III meeting.

1 That countries should support education in astronomy and basic space science as a key element in a strategy to promote science education in general.

2 That a constructive collaboration between the UN Regional Educational Centers in Space Science and Technology, and the IAU and COSPAR, should be encouraged and supported:

3 That the people thus trained should get jobs(!).

4 That we (the IAU) should start collecting, in a systematic way, our experience both with long-term strategic planning in a number of different environments, and with various types of educational material that exist to teach astronomy at various levels.

The recommendations were discussed, modified, and submitted to the main UNISPACE III Conference, and all essential elements of them were included in the final Report and 'Vienna Declaration' of the Conference. With the expected endorsement of the Report by the UN General Assembly in late 1999 they will thus become part of the recommendations of the United Nations for the next 2-3 decades. The IAU hopes to continue to develop these themes outlined above under the aegis of Commission 46, with increased funding and in collaboration with COSPAR and the United Nations.

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### **SPACETIME 2000, WELLINGTON 14-17 APRIL 2000**

There will be a special meeting of the Royal Astronomical Society of New Zealand, 'Spacetime 2000', to be held at the Central Institute of Technology, Upper Hutt, Wellington, New Zealand, 14-17 April 2000. We hope to have a good public outreach and educational content at this meeting. The detailed plan can be found at

<http://astronomy.wellington.net.nz/st2000/index.htm>

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### **ASTRONOMY FOR DEVELOPING COUNTRIES, MANCHESTER 14-16 AUGUST 2000**

On the proposal of the Working Group for the Worldwide Development of Astronomy, supported by Commissions 5 (Documentation and Astronomical Data), 38 (Exchange of Astronomers), and 46 (Teaching of Astronomy), the IAU Executive has agreed to set aside time during the Manchester 2000 General Assembly for a special session, to last 2.5 days, on 'Astronomy for Developing Countries'. This session will be held on Monday 14 August, Tuesday 15 August, and the morning of Wednesday 16 August. A full programme has been arranged (subject to modification) and is presented in IAU Information Bulletin 85, now being circulated to members and soon to be available on the IAU web page. All those interested are urged to consult one of these sources. It is understood that there will be opportunities for the presentation of poster papers, but the arrangements for these are not yet known.

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## TRIENNIAL REPORTS

### AUSTRIA

*General information* Astronomical topics have been present in mass media in enhanced quality during this period due to remarkable events culminating in the solar eclipse on 11 August 1999 which was observable in totality over a great part of Austria.

*Public understanding and outreach* Prepared by the rather short visit of comet Hyakutake during spring 1996, the Austrian public observed with significant emotion and participation the appearance of comet Hale Bopp in 1997. They were assisted by numerous guided tours in universities, and by popular education in observatories and planetaria, as well as by special articles in the new media. One of the best selling newspapers in Austria 'Kurier' engaged a famous private astronomer (M Jaeger) on its staff, thereby guaranteeing first class information to the public not only for this event, but continuing since then.

The total solar eclipse on 11 August 1999 was the absolute highlight of the summer, as stated by the weekly magazine 'News'. During July and August public interest in Austria was focussed on an astronomical event as never before during this century. Although some people used it to propagate ideas on the end of world, referring to the famous 1999 quatrain of Nostradamus, the vast majority concentrated their feelings on the astronomical event itself and on its accompanying phenomena. The society-wide influence of the eclipse was also visible in big streams of tourists from abroad and from inside the country moving into the totality zone and causing significant traffic jams.

Though the eclipse has been the overwhelming astronomical event in the public area, it would be unfair not to mention other public activities, e.g. the opening in 1998 of the 'Sternengarte' (star garden) in the outskirts of Vienna which has been realised by the Astronomical Society of Austria and Prof M Mucke for basic orientation in the sky. The state award of an honorary medal to members of the Astronomical Working Group at Linz for their numerous detections of asteroids has also encountered favourable attention by the public.

*Secondary school* Astronomy is taught within the framework of physics (sometimes within other disciplines), but it depends on the initiative of the corresponding teacher what proportion (s)he grants to it. The activity of the EAAE (European Association for Astronomy Education) has nonetheless significantly contributed to awareness about astronomy, both by the organisation of 'Astronomy On Line' weeks in November 1996 and 1997, and by the 'Sea and Space' Competition in the autumn of 1998. Dr G Rath, teacher at the Keplergymnasium, Graz, and Head of the Austrian EAAE affiliation, organised the Austrian contribution to this competition. An Austrian pupils team took part, and Austrian Minister of Science (Dr C Einem) headed the prize awarding session for the national participants.

*University* Astronomy is being taught at the Universities of Wien, Graz and Innsbruck. Both a master's degree in astronomy and a doctorate can be acquired at these universities. In addition, the University for Technology of Vienna offers courses on nuclear astrophysics and meteoritic research. In terms of institute size and the number of teachers, the majority of astronomy teaching is provided at the University of Vienna.

*Public education* In addition to activities by members of the astronomical institutes (who offer courses in high schools, realise guided tours at their observatories, answer 'phone questions, are present in TV/radio spots, shows and reports as well as in newspaper articles), education is provided by 15 planetaria and public observatories all over Austria, including the activity of the Austrian Astronomical Society. Journals edited in Austria for the public are 'Der Sternenbote' and 'Star Observer' (which is also distributed in Germany and Italy).

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### BRAZIL

*General information* The ratio of professional astronomers to the Brazilian population is almost 1:300 000. Strong efforts to improve the teaching of astronomy over the whole country, against the difficulties, have resulted in a particularly large increase in educational activities in the last three years. Most of this progress is due to the worthy contribution of the Teaching Committee of the Brazilian Astronomical Society (CESAB), the only professional astronomical society in the country. Since its creation CESAB has advanced a better approach between the scientific community and the general public, and it is recognized by the Brazilian Education Ministry, through the participation in both the design of the new national school programmes and the analysis of all the national textbooks with astronomy content. This report describes some of the educational projects developed by the main professional astronomical centres in Brazil, in state and federal universities. From south to north they are: Rio Grande do Sul (UFRGS); Paraná (UEL), São

Paulo (USP), Rio de Janeiro (UFRJ, UERJ); Minas Gerais (UFMG), Bahia (UEFS); and Rio Grande do Norte (UFRN). There are also the observatories and a spatial research center: *Observatório Nacional* (ON), *Laboratório Nacional de Astrofísica* (LNA); *Instituto Nacional de Pesquisas Espaciais* (INPE). Six of these institutions offer graduate studies in astronomy and astrophysics.

*Astronomy for teachers* Almost all the above-mentioned centres have provided long (over 40 hours) to short (8 hours) duration courses for teacher training. Only the courses which are frequently offered are mentioned here: Summer Courses, 'Astronomy: a general overview' (USP); Winter Courses, 'Fundamental Astronomy and Astrophysics' (INPE); 'Itajubá Winter Schools' (MCT/LNA, EFEI, PMI/SEMEC, SEEMG/15<sup>a</sup>SRG); CESAB's courses offered during the annual meetings of the scientific societies SAB (Angra dos Reis, 1997; Barra Bonita 1998) and SBPC (Belo Horizonte, 1997; Natal, 1998); and Educational Symposia (SNEF - Belo Horizonte, 1997).

*Public understanding and outreach* The collaboration between amateurs and professional astronomers has significantly increased, as shown by the number of annual meetings dedicated to the amateur teaching of astronomy, e.g. 'Encontro Nacional de Ensino de Astronomia' (Campinas, 1996; Porto Alegre, 1997; Belém, 1998) and *Encontro Regional de Astronomia* (Rio de Janeiro, 1998). Most of the astronomical centres have programmes providing sky observations, exhibits and lectures to the general public. In particular, a science museum has been recently created at Rio de Janeiro (*Museu do Universo*), which offers to the general public several astronomical exhibits, and the largest planetarium of the country.

*Astronomical olympics* Brazil has solid experience in Mathematical Olympics. Motivated by their good results, and trying to select candidates to attend the III International Astronomical Olympics in 1998 (Moscow), the first Brazilian Astronomical Olympiad (OBA) was then organized with modest resources and low financial support, having engaged only few States because of the lack of available time. Five students were in Moscow to enjoy the International Olympics in 1998. For 1999, 430 representatives over the whole country are organizing the II OBA and hoping to select a more representative sample of students attending this event.

*Undergraduate education* Several of the astronomical centres belong to universities which have undergraduate physics courses, most of them offering astronomy and astrophysics courses. Valongo Observatory (OV/UFRJ) offers the only undergraduate astronomy programme. A small staff supported this high quality course, until recently when new job opportunities for young PhD astronomers have been created. The physics undergraduate course specializing in astronomy offered by IAG/USP started two years ago and has had successful results. According to a private communication from the coordinator of the physics programme, IAG's courses are the most sought after by the students, only equaled by the engineering courses.

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## ROMANIA

*Elementary Schools* Astronomy is not taught in elementary schools. However, some descriptive notions are included in the geography course. There is experimental work for raising interest in astronomy in the physics curriculum.

*Secondary Schools* In the first year of secondary school some descriptive notions of astronomy are taught within the geography course. Also, some notions about the movements of planets and artificial satellites are included in the chapter on mechanics of the physics course.

*University Education* Generally, in faculties of mathematics, astronomy is taught in the 3<sup>rd</sup> year, and several courses are taught in the higher years. The Faculty of Mathematics of Cluj-Napoca University has granted the title of master of astronomy beginning in 1996. At the Physics Faculty of Bucharest University there are several astrophysics courses. Not one of our universities has a department of astronomy, only some professors of astronomy included in different departments.

In 1997, 1998 and 1999 there were organized intensive one-week courses in astrophysics, with invited professors from French universities. The courses were organized by the Astronomical Institute of the Romanian Academy, in cooperation with the Faculty of Physics of the Bucharest University and with the help of the Cultural Department of the French Embassy in Bucharest. Beginning in 1998, the Faculty of Physics of the Bucharest University, in cooperation with the Astronomical Institute of the Romanian Academy, joined the Socrates/Erasmus programme (the exchange of students between Romania, France, Italy and Greece).

Between 26 July-15 August 1999 the 24<sup>th</sup> ISYA (International School for Young Astronomers) was organized in Bucharest University at the Faculty of Physics. The co-directors were Michele Gerbaldi and

Magda Stavinschi. There were 40 participants from many countries with developing astronomy, e.g. Egypt, Vietnam, Uzbekistan, Morocco, Algeria.

Between 9-20 August 1999 the NATO Advanced Studies Institute meeting 'Advances in Solar Research at Eclipses from Ground and from Space' was organized at Bucharest. The co-directors were J.P.Zahn and M.Stavinschi. This postdoctoral level summer school had 65 participants, from more than 20 countries.

*Public Education* The Romanian Astronomical Society for Meteors (RASM) has carried out prodigious activity, and is highly appreciated within the IMO. RASM has branches in several towns and organises an annual camp to observe the Perseids, where young amateur astronomers are trained. Some new amateur astronomer associations appeared in the last years, such as URANIA, from Bucharest, which has good co-operation with the Children's Astronomical Observatory (included in the National Children's Palace, Bucharest).

The Astronomical Institute of the Romanian Academy gained the support of the authorities for the construction of a public planetarium with 150 seats (15 m diameter), in Bucharest, very near the Astronomical Institute.

*Total Solar Eclipse of 11 August 1999* Until now, the educational system in Romania did not have sufficient teachers even with minimal astronomical qualification, to ensure a continuity of interest in this science, and to have a cultural environment which includes astronomical communities. The lack of astronomy departments in our universities makes it impossible to change this from within the system. That's why an institution like the Children's Astronomical Observatory, in spite of its good endowment and activity (a coudé refractor telescope 15 cm diameter, a 10 cm diameter refractor, a horizontal coelostat for solar observations etc.), has only a small cultural influence; it is almost unknown to the school population in Bucharest. Obviously, without a satisfactory endowment, we cannot have an astronomical cultural community; without such a community, we cannot exploit satisfactorily any future endowment.

Apparently, there is a simple solution: we must obtain the endowment, put it to work, and create the astronomical school environment by qualifying more and more teachers. OK, but how can we *motivate* these teachers? They are not stimulated by our universities, which have no astronomy departments; they are not stimulated by the Ministry, where bureaucracy has no place for astronomy. The task of learning a new scientific discipline rests with the individual teacher. But Romania in the last two decades has not been a place for achieving this.

The eclipse offered an opportunity to change something, because it provided

- the opportunity to obtain funds for some endowment
- a strong social motivation for teachers' efforts
- a significant starting point for teachers for developing a future school astronomical environment.

Based on this idea, some professional astronomers created the Romanian Committee for Education through Astronomy (CREA, president G Vass, email below) and worked long enough to formulate a good, realistic, educational project, based on the efficient use of the small numbers of Romanian astronomers, in conjunction with the existing infrastructure of the educational system. Two years before the eclipse, the project was proposed to the Ministry of National Education, in the name of Bucharest University and Astronomical Institute. The Ministry did not adopt the project.

But the emotional resonance of the event and the social motivation created by it worked stronger than we expected. Someone from inside the educational system, acting independently, adopted the project, asked CREA's help for assistance and obtained important financial support (\$(US)120 000) from the 'Soros Foundation for an Open Society'. The manager of the project (the person who adopted it and obtained the financial support) is the director of the Eforie South High School, Florin Serbu - [florin@lefo.sfos.ro](mailto:florin@lefo.sfos.ro)

Until the eclipse, the project - named 'The Astral Hour of Romania' (AHR) - achieved almost all the proposed tasks

- the creation of six strong centres for astronomy education on the path of totality
- the continuous qualification of teachers in a cascade system, initially for the preparation of the school population for the total eclipse
- the integration of various teachers (physics, mathematics, geography, computer science and schoolmasters) in these activities
- the distribution, in the AHR centres, of the various written, modular materials created by CREA
- the setting up of an informational infrastructure inside the AHR network (using the Internet)
- last, but not least, the endowment of each AHR center with five different Meade telescopes (LX50, SC203, ETX, 3.5" refractor and a 8" Dobsonian), 30 in total, plus accessories, including film cameras, CCD cameras and computers.

In spite of all financial, bureaucratic, commercial (the nearer Meade dealer is in Germany) and organizing problems, all the 30 instruments were installed by just-qualified teachers. Consequently, thousands of students saw the sky through astronomical instruments. More than that, all AHR centers observed the eclipse and obtained a lot of photos, many of them absolutely remarkable; all of these will be included in a volume which will appear before the end of this year.

The “outsiders” - the professional astronomers of CREA - made an important effort and provided many written materials for the starting activities of the AHR centers. We were inspired by the excellent ‘Fiches Pedagogiques de Clea’, edited by Cahier Clairaut from France. We hope that these initial efforts will be continued by the teachers, in order to provide a normal presence of astronomy in the schools.

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## TRINIDAD AND TOBAGO

*General information* Trinidad and Tobago, the most southerly twin islands in the Caribbean with a population of about 1.3 million are located 10° north of the equator. There is a wonderful spread of the skies here. Astronomy in Trinidad generally does not enjoy much priority which is quicker given to areas that have immediate impact on the Caribbean peoples’ lives. Interest in astrology among the general population often draws them to astronomy. The University of West Indies possesses three campuses located in Trinidad, Barbados and Jamaica.

*Public understanding and outreach* There is a local astronomical society, and the president regularly writes on current issues in astronomy in the daily papers. Meetings are held once a month which include a viewing session if the night is clear and a guest speaker on some topic of interest in astronomy or a related field. The society often holds classes in astronomy for interested persons. There are presently about 100 members. There is also a government organisation called NIHERST (National Institute for Higher Education, Research, Science and Technology) which runs a National Science Center and possesses a small planetarium.

*Primary education* Astronomy is non-existent at this level since there is tremendous pressure on the kids to prepare for a very important entrance examination at age 11 for high school. Since there are not enough high schools and few “prestige schools”, competition is very stiff. Personal interaction however, with kids in primary school, has shown that they are strongly interested in learning about astronomy.

*Secondary school education* Astronomy is not formally taught at the lower levels (Forms 1 to 5, ages 12-15), but at A Level (pre-University) there is an option ‘Astrophysics and Cosmology’. Surveys conducted by the University Department of Physics have revealed that only a small fraction of schools actually offered this option to students. This choice was not dictated by the students’ interest but rather by what the teacher felt comfortable teaching. It was also found generally that teachers who opted to teach it were in the age range 21-30, i.e. the younger ones. Almost three-quarters of the ten schools surveyed had little or no facilities for the teaching of the option in terms of computer or visual aids or even star charts. A surprisingly large number of students surveyed, 83%, felt that there was benefit in offering astronomy as an option to physics students in the Caribbean. There are plans underway to offer a two day astronomy workshop to teachers of A Level Physics.

*Undergraduate education* In the Dept of Physics at the St Augustine campus, there is a 13-lecture astronomy course-hybrid with an optics course. Classes generally tend to be small with about 15 students. It seems that lack of applicability of the course to the job market keeps students away. There were no observing facilities until very recently when in collaboration with Tuorla observatory at the University of Turku, Finland a 16" Meade telescope has been acquired equipped with CCD imaging. This is to be used for undergraduate teaching and research work as well. Every year, two to four students do an astronomy research project as part of their undergraduate programme which until recently was necessarily confined to theoretical projects on topics ranging from quasars to the large scale structure.

*Postgraduate Education* There is currently one astronomer on the staff in the Dept of Physics which has an academic staff of 10. Until recently all astronomy work for the past 20 years has been theoretical by virtue of lack of observing facilities as mentioned. Research interest has been predominantly in extragalactic astronomy. Observational work can now be done using the Meade telescope and CCD system which initially will involve investigating the intensity variations in certain BL Lac objects in the southern sky. In the last ten years there have been two postgraduate students in astronomy of which one did not completed locally.

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## UNITED STATES OF AMERICA

*Societies* Education continues to be an increased focus of the American Astronomical Society

(<http://www.aas.org/~education/index1.html>). The Education Officer, appointed since the last IAU report, is Bruce Partridge of Haverford College. The Education Coordinator is Douglas Duncan, who is based in Chicago ([aased@aes.org](mailto:aased@aes.org)). Duncan has organised sessions at the biannual AAS meetings for new graduate-student teaching assistants and other new teachers to learn ideas about laboratories and demonstrations, for example. A meeting of Department Chairs discussed undergraduate and graduate curricula. The Harlow Shapley Visiting Lectureship program continues to bring astronomers for brief visits to underserved universities. The AAS publishes a brochure for students: 'A New Universe to Explore, Careers in Astronomy' ([aased@aes.org](mailto:aased@aes.org)).

The Astronomical Society of the Pacific ([www.aspsky.org](http://www.aspsky.org)) continues its national and international reach. 'The Universe in the Classroom' is a quarterly newsletter for free distribution to teachers. Project ASTRO, which expanded to 11 national sites, pairs amateur and professional astronomers with teachers in elementary and junior-high-school grades. Its 'Universe At Your Fingertips' is an 800-page notebook of hands-on activities, resulting from a National Science Foundation (NSF) project. Education symposia on 'Teaching Astronomy to Non-Science Majors' and 'Amateur/ Professional Partnerships in Education', and workshops have been organised at the ASP's yearly national meetings, usually in June or July. The ASP and The SETI Institute are cooperatively developing and managing the Educational and Public Outreach program for NASA's SOFIA flying infrared observatory, scheduled to begin in 2002.

At the Lawrence Berkeley Laboratory, 'Hands-On Universe' students can use archived images on disk, or request images from a growing network of small telescopes. They use the images for astronomical investigations in this NSF-sponsored project. HOU students have discovered Kuiper and Main Belt asteroids, detected the first light from supernova, and are currently measuring characteristics of other variable objects.

The American Association of Variable Star Observers continues its proselytizing for variable-star studies. The package of material distributed in their NSF-sponsored 'Hands-On Astrophysics' program provides data for high-school students to use, and can be adapted for younger or older students. It is also being used in astronomically-developing countries as a way of introducing students to real science and to real astronomical data.

The American Association for the Advancement of Science provides public sessions on interesting astronomical topics at its annual meetings, usually held in February. Their Project 2061 continues to develop materials to implement their plans for unified science.

The American Association of Physics Teachers provides coverage of astronomy at its biannual meetings and in its journals 'The Physics Teacher' and 'American Journal of Physics'. The American Physical Society has tried to broaden the coverage of its Forum on Education to include astronomy.

*Governmental and quasi-governmental organisations* NASA's 'Initiative to Develop Education through Astronomy' (IDEA) is a research-grant program. Information is available from [idea@stsci.edu](mailto:idea@stsci.edu) or <http://www.stsci.edu/EPS/education.html>

The Space Telescope Science Institute continues outreach programs, including topics for high-school and university students. [www.stsci.edu](http://www.stsci.edu).

NASA requires an Education and Public Outreach part of all its proposals. Each of the major spacecraft in orbit thus has education liaison with the public. The Chandra X-ray Observatory, though, has a smaller budget than the Space Telescope Science Institute for educational purposes. Still, [chandra.harvard.edu](http://chandra.harvard.edu) and [chandra.nasa.gov](http://chandra.nasa.gov) provide on-line information and images.

*Planetariums* The Hayden Planetarium in New York has destroyed its 1930s structure and completely rebuilt itself, with the latest Zeiss projector and an innovative starball using advanced computer techniques. It reopened early in 2000. A new wing of the Adler Planetarium in Chicago was available for the centennial meeting of the American Astronomical Society, held in Chicago in June 1999.

A major renovation of the Griffith Observatory in San Francisco, including a new planetarium theatre and restoration of the existing structures, will take place from 1 January 2002 to 2003.

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