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

Newsletter Supplement
National Liaison Triennial Reports 2003-2005
(countries A-M)

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

Contributions to the newsletter are gratefully received at any time.

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TRIENNIAL REPORTS FROM NATIONAL LIAISONS

The triennial reports from National Liaisons for countries A-M have been collected into this supplement, and cover the three years up to the end of 2005. Reports for countries N-Z are in a separate document.

Each report has required more or less editing, at the very least to attain a modest uniformity of style. Several reports were received in plain text email, so (unless instructions were included) modifiers of the basic Roman alphabet characters will have been absent – I doubt if I've put all of these back! If there are any mistakes or obscurities please let me know as soon as possible and I will make amends.

To enquire about specific points in a report please contact the National Liaison directly.

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ARMENIA

The following text prepared for the IAU Commission46 describes very roughly the structure of astronomical education in Armenia. To my knowledge no other report on this issue has come from Armenia to date. I hope to change this tradition in the coming years.

First ideas on astronomy pupils get in Armenia is at elementary schools during special hours prescribed for the introduction of elementary knowledge on the structure of the surrounding world. During about 10 hours they learn about the shape of the Earth, its rotation around its axis and around the Sun, and about the Solar System. The program is for 10-11 year-old children to provide them with the most general information on the subject of astronomy.

Astronomy as a distinct subject is taught at all secondary schools in the country. Teaching is conducted according to a unified program elaborated jointly by professional astronomers and astronomy teachers and finally recommended by the Ministry of Education. However both the secondary and elementary schools suffer from a shortage of astronomy teachers, which negatively affects the education quality. The point is that only one hour per week is allotted for teaching astronomy, which obviously is not enough workload to hire specialized astronomy teachers at every school. During the 1980s this problem was partially solved using the Yerevan planetarium with professional lecturers invited from the Byurakan Astrophysical Observatory (BAO) and Yerevan State University (YSU). Unfortunately since the very beginning of the 1990s the planetarium ceased to operate, and there are negligible chances for its reopening in the near future. Schools partly compensate for this lack by organizing pupil visits to the observatory where they also attend short lectures on astronomy. In some schools training is organized by amateurs for deeper learning in astronomy.

For decades, competitions on many subjects have been organized for pupils, but not in astronomy. Now this is changing. During recent years, among other subjects, annual competitions for revealing gifted pupils in astronomy are organized by the Ministry of Education in collaboration with BAO. These competitions have three rounds, namely, in schools, in districts, and a final one as a rule held at BAO. The winners successfully participate and win prestigious prizes in the international astronomical Olympiads. In September 2005 an astronomical school-competition was organized at Byurakan which took pupils from Russia as well.

At YSU a department for astrophysics was set up in 1946 by Prof V Ambartsumian (IAU President 1961-64; ICSU President 1968-72) and is still operating. This department trains specialists for a career in astrophysics. Only one or two students graduate from this department yearly at present, whilst in the 1980s a dozen specialists were trained every year. BAO serves as the scientific base for the students of YSU as well, and a

number of staff members from BAO conduct special courses for YSU students. YSU provides a masters degree in astrophysics, and BAO is granting doctorates (PhDs) since the 1970s. It is worth noting that many postgraduate students from various countries of the former Soviet Union, as well as further afield, received their PhD degrees in astrophysics at Byurakan Observatory. The teachers working at present in the secondary schools of the republic are graduated mainly from the Armenian State Pedagogical University (ASPU) and a smaller proportion from YSU. BAO organizes with the Ministry of Education at least short term regular courses for the astronomy teachers aimed at increasing their professional skills.

One of the main goals of the recently organized Armenian Astronomical Society (ArAS, 2001) is supporting astronomical education as well as propagating astronomical knowledge within the population of the country. The Society intends to use public lectures as well as opportunities given by TV channels and newspapers for achieving the goals in this particular field.

In 2004 BAO renewed summer training for the students from YSU at the observatory which were interrupted in mid 1990s. In 2005 a summer school was organized for the best students of the YSU physics faculty aimed to help them in further choosing of their specialization. Lectures on various subjects were organized for them, and also they participated in a competition to show their knowledge. BAO and YSU agreed to organize such schools annually. This year it will be combined with the First Byurakan International School already announced for young astronomers, to be held 22-31 August 2006.

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AUSTRIA

In 2003 a special working group within the Austrian Society for Astronomy & Astrophysics, founded in the year 2002 (including both professional and amateur astronomers), was established to deal with the promotion of astronomy among pupils and students. The aim of this working group is to organize nationwide activities as well as larger local projects.

Elementary school

Increasing interest in astronomy can be observed at this age level, especially during school vacation events offered (Ferienspiel) both from professional astronomers (guided tours) as well as from planetaria. These are well received.

Secondary school

Astronomy is an optional part of various disciplines, but it depends on the initiative of the corresponding teacher which proportion he grants to it. Since 2003 the Austrian Society for Astronomy & Astrophysics has run a competition for the best Austrian Fachbereichsarbeit on an astronomical topic – an optional written part of the final exams in Austria in each year. This competition is done in close collaboration with and supported by the Austrian Ministry for Science and Education. In 2005 it was noticed that astronomy related work is present in the course of disciplines other than physics (history, biology). Furthermore, a number of schools have started to offer astronomy as an optional discipline, but this initiative is currently only driven by interested individual teachers.

A broad offer of talks on various topics of astronomy for the secondary school level exists and is well received, although further activities to make the offers from the Austrian Society for Astronomy & Astrophysics more popular are needed. Very welcome was also the DVD on Hubble – 15 years of discovery made by the European Space Telescope Coordination Facility. The Austrian Ministry for Science and Education ordered a large number of these DVDs for schools at various levels. In 2005 planning for an additional extensive astronomy education for teachers started. The first lectures, all run by professional astronomers, will be offered in 2006 and will extend the existing educational programs for teachers offered both by professional astronomers and teachers.

For small groups of highly interested pupils, visits to the Department for Astronomy at the Vienna University of one to three days are offered. During these visits pupils can talk to scientists about their work and in this way get an idea how science is done in practice. There is an increasing interest in this offer, but due to limited human resources only a small number of such visits can be organized each year.

University

In order to promote the interaction between the three universities teaching astronomy in Austria, the Austrian Society for Astronomy & Astrophysics started a competition for the best diploma thesis, which has now run every year since 2003.

Venus transit

This event in 2004 was widely noticed among the Austrian public. Various activities and options for observing this phenomenon were offered by the astronomical institutes, the Austrian Solar Observatory at Kanzelhöhe. and various groups of amateur astronomers.

University meets public

There is cooperation between the Viennese Popular Education Department (Volkshochschule) and the universities in Vienna. Scholars offer lectures to the general public on astronomical topics.

Observatories and planetaria

After the reopening on 07 Nov 2002, the Vienna planetarium started full operation in 2003 after a substantial refurbishing. The instrument is the Universarium Modell IX (Carl Zeiss) supported by the projection technology ZULIP applying a multimedia approach. Astronomy and space science is thereby communicated to people from the age of 5 on. The number of visitors increased from 56 000 in 2003 to 61 000 in 2005. Highlights in 2003 were the show Mars – from Vision to Mission in cooperation with ESA, and the opening of the Austrian Science Week. In 2004 the show Secrets of the Southern Sky was presented in cooperation with ESO. In 2005 the ESA-DVD on the Hubble Space Telescope's 15 years of operation was introduced, and participation in the Long Night of Research took place.

The Kuffner Observatory (also in the network of the Vienna people's education system) was active in the popular observing campaign concerning the Mercury transit, the Martian opposition in 2003, and the Venus transit in 2004. The 150th anniversary of the birth of Moriz von Kuffner was especially commemorated at this observatory in 2004.

The oldest popular observatory in Austria, Urania-Sternwarte, built in 1910 by Max Fabian (8 years before the extinction of the Austro-Hungarian monarchy) has been refurbished substantially during the period 2002-2005 (dome and telescope, and another small dome was added). This institution reopened in June 2005 offering visitors (also from abroad, since it is located near the very centre of Vienna) guided tours and lectures on the planetary system and on space science. More than 4000 visitors were recorded in 2005, about half of the number registered at the Kuffner Observatory.

The Vienna Open Air Planetarium is a relatively new feature in popular astronomy education in Austria. Located at the western border of the city of Vienna (Georgenberg), this is a place to provide insight into the astronomical coordinate systems, including basic information on sunrise and sunset. Every month an evening presentation of the actual sky to a wide public audience is given by Prof Hermann Mucke (retired head of the Vienna planetarium and the Urania observatory). He is also managing a bureau for astronomy and has edited (for the last 50 years!) the astronomical monthly journal Sternenbote and an Austrian ephemeris booklet Himmelskalender. The Sternenbote regularly reports on activities of the Österreichischer Astronomischer Verein including all astronomical institutions and private observatories. A highlight was a series of special seminars held from March to June 2003, with international participation, at the Astrolabium. This society provides help to amateur astronomers at all levels, giving hints to solving problems concerning the purchase of telescopes and auxiliary instruments. A special subgroup is concerned with sundials.

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BOLIVIA

Overview

Astronomy was one of the sciences that suffered most during the recent social unrest in Bolivia. The Patacamaya Observatory was forced to close after threats to take over its installations by certain sectors of the local community. Also, various projects including the construction of new buildings were postponed. Social pressures also affected the educational reform process especially at the secondary school level.

Primary and secondary education

At the primary school level, Bolivia has made progress in educational reforms. Astronomy is taught through special topics that complement core subjects such as mathematics, where the module Beyond the Earth, the Universe deals with concepts such as units, distance and managing large numbers. Another module is Earth, where movement, day/night, month, are introduced. In natural sciences specific themes are taught such as the origin of our Solar System, space exploration, and movement of the planets. It is also interesting to note that in a chapter called Earth our Home, students learn about the geology of the Earth comparing it with that of other planets such as Mars.

Another important aspect has been the multicultural approach to curriculum content, designed for students of more than 30 ethnic backgrounds. As such, astronomy modules have been given a cultural perspective i.e. local astronomical knowledge is related to general astronomy.

Educational reforms have not yet been implemented at the secondary school level. Astronomy therefore continues to be taught in a traditional manner i.e. some chapters of astronomy are taught as part of physics, for example Kepler's law, gravitation etc.

College and University

Bolivian universities do not offer astronomy as a degree subject. However, the physics department of the state university of La Paz, Universidad Mayor de San Andres (UMSA), teaches astronomy and astrophysics as modules within its degree course. Thus, astronomers in Bolivia have a physics background or have studied astronomy overseas.

It is important to note that most of the astronomical activities and the planetarium are under the state university system.

Outreach activities

Much of the astronomy team's time and activities was taken up by providing support to the Physics World Year 2005. Other activities were as follows.

Courses

- Second Bolivian Course on Cosmology and Astrophysics sponsored by the Abdus Salam International Center for Theoretical Physics and The Physics Institute UMSA, 1-5 September 2003
- First School of Cosmic Rays and Astrophysics, 9-20 August 2004
- Third Bolivian Course on Cosmology and Astrophysics sponsored by the Abdus Salam International Center for Theoretical Physics and The Physics Institute UMSA, 26-30 September 2005

Conferences

- Towers, Dolmens and Pyramids: Astronomy and Culture in the Ancient Mediterranean, Dr Juan Antonio Belmonte, Canaries Astrophysics Institute, Spain, 1 July 2003

- The Discovery of Other Worlds: The Exoplanets, Dr Ramiro de la Reza, Observatorio Nacional de Rio de Janeiro, Brazil, 5 May 2004
- From the Infinitely Small to the Infinitely Large, Dr Oscar Saavedra, Turin University, Italy, 2 August 2004
- Impact and Extinction Craters, Dr Alvaro Crostá, Instituto Nacional de Pesquisas Espaciales, Brazil, 5 April 2005

Observatories and planetaria

Currently there is only one operating planetarium, 6 metre diameter and a capacity of 40. Its equipment is obsolete, a Spitz Nova III. The planetarium is based in La Paz and its main public comes from the cities of La Paz and El Alto, which have a school population of approximately 800 000 students. The planetarium is named after its founder Dr Max Schreier and is administrated by UMSA. The Max Schreier planetarium was closed during the last three years due to new construction work.

UMSA also administered the Patacamaya Astronomical Observatory located in the Altiplano, one and half hours drive from La Paz. The Observatory was however forced to close down due to threats and pressures from the local population. It is planned to move the observatory to the UMSA Campus at Cota Cota.

The National Observatory of Santa Ana in Tarija, southern Bolivia, was built thanks to an agreement between the National Science Academies of Russia and Bolivia. The Japanese Cooperation Agency is planning to install a planetarium as part of the observatory.

Other public events and activities, including outreach and public understanding of science

A number of tourism agencies and local communities are operating their own observatories aimed at the tourist market. The Alajpacha Observatory is located on the shores of Lake Titicaca and is run by Crillon Tours. Alajpacha means 'sky' in the local language Aymara. On the shores of the salt lake of Uyuni a similar observatory is being built and will be administered by the local community of Coqueza. The German government is supporting this project.

As well as religious and private institutions that have small observatories, there is a growing body of local amateur astronomers who are playing their part in promoting and popularizing astronomy in Bolivia.

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BRAZIL

Overview

The talks and poster contributions presented during the meetings of the Brazilian Astronomical Society (Sociedade Astronômica Brasileira, SAB) are the best indicators of the growing participation of professional astronomers in educational projects during the last years. This report is based on the abstracts published in SAB's bulletins related to the XXIXth (2003), XXXth (2004), and XXXIth (2005) annual meetings. Some of the abstracts, written in English, are available in electronic form and can be found in the ADS. It is interesting to note that the last three years correspond to a very fruitful period of projects on astronomy education, having an average number of 23 projects per year. Bretones et al. (2004) analysed all the contributions to the SAB meetings during the 1977 to 2003 period. They verified that a total of 133 abstracts correspond to educational projects (5 contributions per year, on average). Canalle et al. (2004) reported that after the creation of the SAB's Teaching Committee (Comissão de ensino da Sociedade Astronômica Brasileira CESAB), in 1993, the fraction of educational contributions rose from 3% to 8.8%, as compared with the total number of talks and posters presented in the annual meetings in a period of ten years. These are very promising numbers, since they are comparable to the fraction of contributions in research fields such as Cosmology (8%), Dynamics/Astrometry (9%), Interstellar Medium (10%), Solar System (10%), while the Extragalactic and Stellar Physics areas have almost 25% each of the total number of contributions.

Another interesting aspect of the Brazilian educational projects in astronomy is their geographic distribution correlated to the social condition of the region. While some institutions are developing high technology projects (remote observations with robotic telescopes, for example), most of the researchers are working on kits of cheap didactic devices, basic literature, and teachers training programs. Few groups are working in projects involving very poor people or those who have special needs. I give some details of some of these works in the following sections. The references to the works are given as a function of the year of the SAB's meeting and the page number in the respective Bulletin (2003 vol 23, 2004 vol 24, 2005 vol 25). Finally, there is an important contribution of amateur astronomers, not presented during the SAB meetings, but fully available in dedicated web sites. The work of some of these groups is described in the Observatories and Planetaria section.

College and University

A new college course with an important component of astronomy teaching has been created by the University of São Paulo (Universidade de São Paulo, USP), which has been offered in the Faculty Escola de Artes, Ciências e Humanidades (EACH), recently installed in a new campus. EACH receives about one thousand students per year, and all of them attend the same basic courses during the first year, following specific courses in the other three years, according to the chosen career. One of these careers is Licenciatura em Ciências da Natureza, a program to train teachers in the field of natural sciences.

As a complementary option, a very successful course dedicated to graduated teachers has been offered by the Programa de Pós-Graduação em Ensino de Ciências Naturais e Matemática (a masters degree), in the Universidade Federal do Rio Grande do Norte (UFRN). Several educational projects and studies concerning the inter-relation between astronomy and social sciences, as anthropology, archeology, environmental problems, etc., have been presented by Jafelice and collaborators (2003 p72, 2004 p80). In 2003 the Astronomy Bachelor Course, offered by Observatório do Valongo (UFRJ) was self-evaluated on the basis of data indicators used to quantify the impact of curriculum and institutional improvements on the student's background and career development in the last 30 years. The results, as compared with the rate of growth shown by SAB, are presented by Arany-Prado (2003, p70). Some universities are developing e-learning projects on astronomy, for example the hypertext Fundamentos de Astronomia e Astrofísica, by Saraiva & Oliveira (2004 p5), and the Astroclass project, by Amaral et al. (2005 p99).

Bretones & Megid (2003 p7) from Universidade de Campinas (UNICAMP) made a compilation of Brazilian PhD thesis and master degree dissertations on astronomy education. They verified that most of the theses were developed after 1995, indicating that this is a very young field of research in the country, but strongly promising, since the aspects related to elementary schools, the main thesis thematic, are rich in variety of issues according to the geographic regions and different social conditions.

Secondary school

Most of the educational projects for secondary schools are focused on teacher training, mainly to offer alternative methods of science learning. Dottori et al. (2003 p83, 2004 p74) have described interesting results on the Observatório Educativo Itinerante, which gives to students of the small-towns the opportunity to observe the sky and to have a first contact with astronomy. This group, from Universidade Federal do Rio Grande do Sul (UFRGS), has been traveling thousands of kilometers per year taking a telescope to small towns and offering courses to the teachers. Santiago et al. (2005 p96) reported that 36 courses have been already realized, with duration varying from 20 to 180 hours each. The efficiency of the courses has been verified by comparing the previous knowledge of the teachers, by tests before the course, with tests applied after the course. The analysis of these tests indicates that the adopted methodology has been successful, considering that a higher level of quality in the answers is achieved after the course.

The National Center for Spatial Research (Instituto Nacional de Pesquisas Espaciais (São Paulo State), INPE) has an Astrophysics Department that annually offers a winter course for teachers. Zodi et al (2004 p86) describe the activities during classes as well as night sky observations using the recently inaugurated mini-observatory of INPE (Milone, 2004 p9). In Bahia, the teacher training courses have been based on data acquisition and other activities developed by researchers from the Universidade Federal de Feira de Santana

(UEFS) in the Observatório Astronômico Antares, a place to be used for astronomical education and science outreach in both elementary and secondary schools (Martin et al. 2003 p80, Poppe et al. 2004 p83). Other hands-on activities, based on astronomical images have been proposed by researchers from Universidade Federal de Santa Carina (UFSC) (Schlickmann et al. 2003 p84), Universidade de Brasilia (UnB) (Ferreira, 2004 p74) and USP (de Santana & Shida, 2003 p77). Lunas et al. (2005 p89) proposed a project of scientific initiation for secondary grade students using the astrophotography method.

Elementary school

Due to the importance of the astronomy education at levels 1-8, several authors report the results of statistical analysis related to: (i) the learning process and the science curriculum in different Brazilian regions (de Campos & Araujo, 2003 p75, de Mello et al., 2004 p76, Alves & Jafelice, 2005 p79, da Cunha et al., 2005 p83, de Campos & Roberto, 2005 p85) and (ii) frequent errors in didactic books (Segundo et al., 2003 p85, Bezerra & Sobreira, 2004 p81).

Most of the scholastic educational projects are focused on building models and devices, which need to be both cheap and didactic. Canalle (2003 p71) presented a simplified version of a Galilean telescope, one of his astronomical experiments based on material easily found in the market. Couto da Silva (2003 p79, 2004 p70, 82) and collaborators from Universidade Federal do Mato Grosso (UFMT) have produced simple devices to explain the celestial movements and seasons, for example. Bretones et al. (2004 p71) presented a game based on astronomical questions & answers (a kind of Bingo) that has been successful among the kids as an attractive way of learning. Bretones & Cardoso de Almeida (2005 p80) have shown the importance of simple devices, such as eclipses demonstrations, being constructed by the students themselves.

A team from Universidade Federal do Rio Grande do Sul (UFRGS) have developed didactic materials related to laboratory activities. More recently, they prepared an annual sky map with a double aperture, which can be used in a straightforward way by teachers and students (Saraiva et al. 2005 p87). Other simple experiments have been proposed by teams from Universidade Estadual de Londrina (Pananá State) (UEL) (de Lima et al. 2005 p90) and Universidade Federal do Espirito Santo (UFES) (dos Reis et al. 2005 p94). Santos & Chiaradia (2003 p78) present interesting work dedicated to preparing basic literature on cosmology, specially aimed at geography teachers. Many other efforts to prepare basic texts have been driven by several institutions. A compilation of some of these works has been presented in two CD-ROMs organized by the coordinators of the educational project Observatórios Virtuais during the pilot phase, which currently is called Telescopios na Escola (TnE). The TnE didactic material – available in pdf format for printing – is at www.telescopiosnaescola.pro.br. This project allows students and teachers to develop simple scientific projects by the use of CCD-equipped telescopes through the Internet.

Also related to the TnE project, Wuensche et al. (2003 p10), present hands-on science activities that researchers from INPE have developed in collaboration with Escola MOPPE de São José dos Campos (São Paulo State) (MOPPE) – a partner elementary school – using astronomical aspects to stimulate the interest of the young students about introductory physics and chemistry concepts.

Observatories and Planetaria

Very significant was the contribution of the Vitae Foundation to the realization of several small observatories and planetaria, as the above example of the project TnE mentioned, in which four institutions (INPE, USP, UFSC, and UFRJ) have started operation of their telescopes for education proposals. In Paraná State two universities were benefited with financial support from Vitae for the construction of the Observatory of Ponta Grossa and the Planetarium in Londrina (Trevisan et al. 2005 p82). In São Paulo city the Ibirapuera Planetarium has received funds to develop an exposition center for astronomy education (Amaral et al. 2005 p88). A second planetarium in São Paulo has been recently inaugurated in the east downtown. In Rio de Janeiro, the Museu de Astronomia e Ciências Afins has created new space for multimedia expositions (Caretta et al. 2003 p8). Pereira et al. (2003 p81) describe an educational project developed by the Planetarium Foundation that uses differential photometry, appropriate to cities with high light pollution. Sobreira (2005 p98) presents the software Observatório Astronômico Atlas Estelar, providing a new tool in the Portuguese language for classroom activities.

Several groups of amateur astronomers have developed experiences for scientific outreach using web sites. (Araujo 2005 p80) lists the activities of three of these groups: Urânia Brasil, ENAST (National Meetings of Astronomers), and macroCOSMO.com, an electronic magazine developed in collaboration with both professional and amateur astronomers. I also mention here CASP, a group of more than 200 participants, created in 2001, and also the efforts of the group BRASS in the search for supernovae.

Other Public events

In 2004, the first National Week of Science and Technology promoted the meeting Olhando para o Céu relating to the lunar eclipse that occurred 24 October (Canalle et al. 2005 p99).

The Rio de Janeiro Planetarium Foundation inaugurated in 2003 the Praça dos Telescópios, having four domes with 3.5 metre diameter, each one containing small telescopes available for night-sky observation and data acquisition, to be used in public events or educational projects (Santos Jr. et al. 2004 p84). An international event involving public schools in Rio de Janeiro and Portugal has reproduced the Eratosthenes experiment, where children of both countries were able to estimate the Earth's diameter to a very good approximation (Pereira et al. 2004 p11) .

Attendance at the Brazilian Astronomical Olympiad (Olimpiada Brasileira de Astronomia, OBA), managed by CESAB with the collaboration of UERJ researchers, had an amazing growth in the last few years. In 2002 the Vth OBA received more than 60 thousand students, from 1469 schools (Villas da Rocha et al. 2003 p87). In 2003 (VIth OBA) there were more than 76 thousand from 1565 schools (Canalle et al. 2004 p73), and in 2004 (VIIth OBA) about 123 thousand from 2713 schools (Canalle et al. 2005 p81).

Finally, I list some of the few, but very promising efforts at science outreach from the poorest part of our population and/or those with handicaps. Klafke (2003 p86) have constructed mechanical devices for people with visual deficiency. Bretones (2003 p70) reports educational activities developed for children living in the streets of Limeira (São Paulo). Afonso (2003 p69) and Jafelice (2004 p81) have reported studies on astronomical concepts related to the Brazilian indigenous culture.

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CARIBBEAN GROUP

Overview

The last triennial report was published in the C46 newsletter in 1999. Subsequently there was a report of the developments in astronomy in Trinidad and Tobago in 2003. This report has now been broadened to include the Caribbean Group due to developments since then. In 2003 Shirin Haque became the national liaison for the Caribbean Group and not just Trinidad and Tobago, because the outreach work had now begun to span beyond Trinidad. Clearly, due to being centrally located in Trinidad and Tobago, most of the developments take place there, however sincere efforts are being made to reach out to the larger Caribbean.

Elementary (primary) school

Some astronomy is found on the syllabus of the primary schools in recent times. However, it is not clear how much is being taught. CARINA (the Caribbean Institute of Astronomy, based in Trinidad) continues to try and reach out to primary school children, and a few of the CARINA executive routinely go into primary schools to give talks to children. The topics have ranged from a tour of the Universe and Solar System to 'aliens' (life) on Mars.

Secondary schools

Up until a year ago, the high school physics syllabus for A-levels (normally taken at 18) carried an option in astronomy. Surveys we ran showed that not many teachers taught it due to lack of confidence in the topic.

The Caribbean region now has a local exam called CAPE. There is no astronomy component in this. However at the levels of Form 2 and 3 (early secondary), there is a small astronomy component dealing mostly with the Solar System. A few selected schools have astronomy clubs. CARINA has taught courses in astronomy to high school students in the afternoon.

College and University

The University of the West Indies is a regional University with campuses on three islands – Trinidad (St Augustine), Jamaica (Mona) and Barbados (Cavehill).

Jamaica
Jamaica used to have 2-3 astronomy staff and a course used to be taught in the undergraduate program in the Dept of Physics. However, currently there is one professional astronomer on the staff there who is on leave, and so astronomy is not being taught there anymore. Their observatory was damaged in one of the hurricanes and has not been repaired. The outlook for astronomy at the university there is currently bleak.

Trinidad & Tobago
In Trinidad, astronomy is thriving and growing. There still continues to be only one professional astronomer in the University's Dept of Physics. However, there is quite a regular stream of visitors in astronomy to the Department from foreign institutes. Currently the Department is engaged in observational and theoretical astronomy. In observational astronomy the astronomers are part of an international collaboration with the University of Turku, monitoring quasar variability with the 0.4 metre Meade Telescope at SATU observatory at the University. Recently, they have begun doing research in astrobiology in collaboration with the University of Washington and Villanova University. In December 2005, Prof John Hearnshaw, chair of the C46 Program Group for the World Wide Development in Astronomy visited for a week to assess the situation there and to give public lectures. Astronomy also has a presence in Tobago, in the form of the private observatory SEAS which currently houses a 0.3 metre telescope. This facility is run by CARINA staff. It should be noted that two undergraduate students and one postgraduate student from the University of Trinidad, attended the ISYA summer school held in Mexico in 2005. Undergraduate students also went to Sonnenburg Observatory in Germany and the NOT (Nordic Optical Telescope) on La Palma, Canary Islands, in 2004 and 2005 respectively, for research related work.

Barbados
Barbados has no astronomy being taught at the University. However, CARINA had an initiative in January 2004 when they ran workshops in astronomy there for the students who had obtained a 0.28 metre Celestron. It appears that perhaps activity has declined since.

Guyana
A visit was made to Guyana in July 2004 and there was no astronomy at the University of Guyana, but there was interest among the community and the library staff there.

Observatories and planetaria

Astronomy through astronomical societies have a greater presence in the Caribbean than in the universities. Jamaica, Barbados and Trinidad all have active and long existing astronomy societies. They respectively own 0.5, 0.3, and 0.3 metre telescopes, with the society in Trinidad having a CCD camera as well. This is not the case in the other societies. Barbados Astronomical Society celebrates its 50^{th} anniversary this year, and several events are planned all year long to mark it. Other popular astronomy efforts are scattered e.g. St Lucia had activities in Astronomy Week a couple of years ago.

In Trinidad, at the National Science Center, astronomy has become more developed and organized. They have obtained a 0.3 metre telescope within the last few years, and CARINA held training workshops for them, and they now routinely have viewing sessions for the public twice a month. They also hold 1-day and 2-day astronomy camps for children.

Other public events

CARINA launched its first star party in 2003, which was a huge success. Since then this has become an annual event much looked forward to by the public. Last year they had 400 people at the party, limited by the managing capability of CARINA and the number of telescopes available.

CARINA also has started series of public lectures in astronomy in conjunction with the University of the West Indies. Public lectures in the last three years have been on the topics of cosmology, astrobiology, and time & evolution in the cosmos.

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CHINA

In China, more than twenty universities have astronomy education and research. In four key universities, a complete series of educational programs of undergraduate, master's, doctoral and post-doctoral levels has been formed. After four-year study at the undergraduate stage, students can be enrolled in master degree specialties. Three years later, some of them begin their three-year PhD education. Only a few students enter into post-doctoral programs. Masters and doctoral education systems are also established in the Chinese Academy of Sciences. In this report, we give a description of university astronomy education in China. After introducing the global situation, teaching materials, graduate degree courses and facilities are described. Some problems and prospects for the new century are also discussed.

1 Introduction

After rapid development in the 1990s, more than twenty universities in China have established astronomy education and research. In these universities, there are courses of astronomy for the students in astronomy departments and/or over whole university. Some groups of amateur astronomers have been organized. Also, since the end of 1970s, astronomy education at masters and PhD levels have been developed in the Chinese Academy of Sciences (CAS). Different from some other countries, students can get their masters and PhD degrees at the CAS. Nowadays, more than one third of masters and PhD students come from the CAS. However, the education system is more or less similar to that in universities. Thus, here we will concentrate on the astronomy education in universities in the main land of China.

Among the twenty universities, there are four universities being the key ones and have relatively long histories. After a description of the astronomy departments in these four key universities in Section 2, the astronomical education system is described in detail in Section 3. The astronomical activities of students are illustrated in Section 4, followed by a brief discussion on the problem and prospects of the education system in Section 5.

2 Astronomy Departments in Four Key Universities

There are four key universities, namely, Nanjing University (NU), Beijing Normal University (BNU), Beijing University (BU), and the University of Science and Technology of China (USTC), in all of which astronomy departments (AD) or an astronomy specialty (AS) or a Center for Astrophysics (CFA) have been established. Table 1 gives some information on each of them.

Table 1. Astronomy Departments in Four Key Universities

University	Date of Set Up	Num. of Prof.	Num. of Underg.	Num. of M.S.	Num. of Ph.D.
AD of NU	1952	18	80	20	10
AD of BNU	1960	5	70	15	10
CFA of USTC*	1978	7	20	10	9
AS of BU**	1960	3	30	14	4
Total		**33**	**200**	**59**	**33**

∗ Since 1999, Astronomy Department has been established.
∗∗ In 2000, Astronomy Department has been established.

3 Education system

A complete series of educational programs at undergraduate, masters, and doctoral levels has been formed since 1950s, and highly improved in recent years.

Undergraduate education
Based on a national examination, students are enrolled in universities according to their scores. There is strong competition. Every year, about 90 students are admitted to astronomy departments. After entering in universities, four-year undergraduate education begins. The universities have been perfecting the credit system, and have introduced the major-auxiliary course program and the dual bachelor's degree system. During four years, students have to get 150 credits, with 60% achieved in the important necessary courses. In astronomy departments, all students study mainly math and physics during the first two years. The main astronomy courses during the next two years are as follows:

1 General astronomy
2 Astrometry
3 Celestial mechanism
4 Practical astrophysics
5 Theoretical astrophysics

Masters degree specialties
Students can be enrolled in masters degree specialties through recommendation, which is only for a few excellent student, or by passing university examinations. In recent years, about 70 -80 students over the whole of China are admitted to astronomy master degree specialties. They have to spend 2.5-3 years to study the courses of master degree program. The main courses are as follows:

1. Radiation mechanisms* 2. Stellar structure and evolution*
3. High energy astrophysics 4. Plasma dynamics
5. Radio astrophysics 6. Galactic structure and evolution
7. Physics of cosmology 8. Physics of solar active regions
9. Numerical simulation in astrophysics 10. Molecular astrophysics.

The courses with * are optional. The students need to obtain 30-35 credits (30-35) and publish at least one scientific paper. If they successfully defend their thesis, the student can get their masters degree.

PhD program
Based on university examination and oral tests, masters degree students can be enrolled in the PhD program. In recent years, about 30-40 students have been admitted every year to the astronomy PhD programs of the universities. Within 2.5- 3 years they must study a few special courses, such as:

Physics of γ-ray bursts Pulsar physics
Supernovae and their remnants Physics of compact stars
Observational cosmology Physics of active galactic nuclei, etc.

However, the main requirement in the PhD program is to do research. Students have to publish 1-3 scientific papers in main astronomical journals. By the end of study, the student should write a comprehensive thesis, which has to be evaluated by about ten scientists, and successfully defend it. They then get their PhD.

Post-doctoral program
Based on application and competition, only a few students can be accepted in the post-doctoral program. Generally, it takes 1.5-2 years and universities provide special funds and accommodation for them. The people in the post-doctoral program can do any research work they like, and must provide a report at the end of their study.

4 Astronomical Activities

Some student astronomical societies have been organized in universities. They attract not only the students in astronomy departments, but also many amateur astronomy students. A variety of astronomy activities, such as astronomical lectures, observations of celestial phenomena, and popularization of astronomy etc., have been launched. The students in astronomy departments participate frequently in society activities. They

contribute to the popularization of astronomy, including organization of astronomical lectures, and responding to enquiries and problems on astronomy raised by people.

Outside universities, remarkable developments have also occurred in the popularization of astronomy. The number of planetariums and science halls, which include the popularization of astronomy, has reached dozens and hundreds respectively. Beijing planetarium, the biggest among them, was renovated in 2004 and equipped with the most advanced equipment.

5 Problem and Prospects

In recent years astronomy education in China has been greatly improved. It should be mentioned that, besides in universities, there is also an education system of graduate students in CAS. Every year there are about 50-60 graduate students obtaining astronomy masters degrees in CAS, whilst about 20 students get astronomy PhD degrees in CAS. Thus, we have several sources of well-educated students in astronomy. However, one problem is the loss of quality young people. After getting masters degrees, some excellent young students go abroad, especially to the United States, to enrol in PhD programs. Unfortunately, after obtaining their PhD degrees, many of them have no chance of getting jobs in astronomy. This is probably a common problem in the developing countries. It is hoped that this situation will improve in future.

We place great emphasis on basic science research and teaching, and on consolidating the student's theoretical foundation and astronomical surveying skills. Special training is offered to students of greater creativity in an attempt to turn them into quality personnel. While continually reforming the graduate degree courses, we have adopted the running of consecutive undergraduate and masters, masters and doctoral, or undergraduate, masters and doctoral programs.

Interdepartmental, inter-institutional, and international joint training program have been offered to students, especially joint programs between universities and the CAS, which have been recently strengthened. Two astrophysical centers have been established: one is in Beijing University as a joint program between BU and the CAS, and the other is in Nanjing as a joint organization between NU, USTC, the Purple Mountain Observatory and the Shanghai Observatory.

In summary, in China, a complete series of educational programs at undergraduate, masters, doctoral and post-doctoral levels has been highly improved. They provide a continuous good source of Chinese astronomers engaging in teaching, research and popularization of astronomy. We would much like to learn the experience of foreign countries, especially of developing countries, and to develop further the education system in China.

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CROATIA

General Information

The school system in Croatia consists of obligatory elementary school (8 years), secondary school (3-4 years) or gymnasium (4 years), and universities. From this year on, new educational curricula adapted to the Bologna declaration are used at most Croatian universities. In this European-wide system, there are 3 phases of study. Undergraduate courses take 3 years and end with a bachelor degree, followed by 2 year graduate studies which end with the masters title, followed by post-graduate studies which last around 3 years and end with a PhD. In primary and secondary schools astronomy can be offered as a non-obligatory course, depending on the teachers' desire to offer it. There are also new possibilities in studying astronomy at the University of Split. Croatian astronomers and teachers involved in teaching astronomy are gathered around the Croatian Astronomical Society (CAS) which currently has around 100 members, 80% of whom are scientists, and the rest are mostly professors and teachers.

Elementary school

Basic astronomical facts are included in courses on life science, geography, physics, and mathematics. The astronomy can be offered as a non-obligatory course from the first school year up to the final 8th year. A curriculum for such courses is prepared by CAS in coordination with the Croatian Ministry of Education and Sport. A few basic books targeted at pupils of various ages do exist, and new ones appear from time to time. There is also a good collection of translations of popular books from all parts of the world.

Secondary school

Again, basic astronomical facts are included in courses of geography and physics. Astronomy can be offered as a non-obligatory course and the curriculum produced by CAS is of modular design, starting with basic astronomy and covering celestial mechanics, the Solar System, galactic astronomy, and astrophysics. The modules can be chosen by the teacher so that he or she can adjust the content and the level of his lectures to the students. Several books targeted at secondary schools are widely used, and all schools now have Internet access, so part of the learning can be done on Internet-available material, both in Croatian and in English.

Teacher training

It is organized as courses, each several days long, co-organized by the Ministry of Education and CAS. There are several such courses yearly.

Gifted children

These are being cared for by special programs supported and supervised by the Ministry of Education, and carried out mostly by CAS staff, and in many cases also by members of the national association of amateur astronomers. Astronomy contests for pupils from elementary and secondary schools are organized yearly. The contests have 3 levels (municipal, regional and state). Children are required to show their knowledge of astronomical facts and to present their own practical work at the regional and state contests. The most successful pupils at the state contest are invited to participate in one of several summer schools of astronomy that are offered by several different organizations in Croatia.

The traditional summer school of astronomy, organized by the CAS and the Ministry of Education and Sports, is now in its 36th year and offers courses in basic practical astronomy to pupils from 5th class of the primary school up. The public observatory of Visnjan recently founded a non-profit organization devoted to education in natural sciences, astronomy included. Among the courses is the traditional Visnjan school of astronomy which is targeted to more advanced pupils (secondary school and university age). This school is international in character and hosts participants and lecturers from Croatia and abroad. Students are also given access to the resources of the Visnjan observatory to carry-on their own projects. Former participants in Visnjan activities form a solid mentor base open to the students that need professional advice.

University education

In the study of physics at the University of Zagreb a few astronomical courses are offered in the final year of graduate study. The University of Split now offers graduate study in astronomy, with a strong international base of guest lecturers. The pre-requisite is the BSc in physics, which can also be obtained at the same university, or some other university in the country. Geodesic astronomy is an obligatory course at the Geodesic Faculty of the University of Zagreb. Some observational work is also possible at the Hvar Observatory. The public observatory of Visnjan offers access to the equipment and professional support free of charge.

Public education

Croatia has one planetarium (Zagreb) and four public observatories (Visnjan, Kutina, Rijeka and Zagreb). In addition, there are about a dozen amateur astronomical societies scattered all over the country. These societies also offer observing and other astronomy-related activities to the general public from time to time.

Croatia also has a long tradition of an Astronomy Day, with many activities organized for the general public by the CAS and amateur societies countrywide.

Internet

All schools and universities can use extensive Internet resources (usage is free of charge for all educational and scientific institutions), and several Croatian Internet sites devoted to the natural sciences, including astronomy, exist and are constantly expanded and updated.

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CUBA

Elementary and Secondary School

During the summer vacations in Havana, the elementary schools in La Lisa take their students to the planetarium located in this municipality. Conferences are prepared in accordance with the student level. It is possible to suppose that in the other municipalities where the planetaria are located, this activity is a common one too. (For planetaria locations see the table below). The regular courses do not consider astronomy as a singular or specific area of knowledge.

College and University

During the period covered by this report there were obtained three PhDs related to Astronomy.

Mendez Berhondo, A L	Thesis on Solar Magnetic Structures Evolution
Quiros Rodríguez, I	Thesis on Scalar fields and Conform Transformation in Gravitation
Cárdenas, R	Thesis on Modifications to Kaluza-Klein Theory

and a new doctoral thesis was initiated

Rodríguez Flores, E R	Thesis on Symbiotic Stars Systems

Dr Quiroz's thesis received the Academy of Sciences 2003 Award from the Cuban Academy of Sciences.

Education Conferences

The Cuban government is promoting a general increase of qualification and knowledge in the population. Cuba has a very complex educational system that includes TV lectures for elementary and secondary schools (junior and senior levels) in the formal structures of the courses, but there are college level courses in the Old Adult University and informal courses by TV too. Included in this effort there is a series of TV programs named Universidad para Todos (University for Everybody). One of the courses broadcast by the Cuban TV during 2005 is Elements of Astronomy. It consisted of 30 TV programs of 1 hour duration each, covering a wide spectrum of topics. The course is accompanied by a tabloid with the more important information of the lectures. The volume of the tabloid is of about 100 letter type pages including the figures.

Observatories and Planetaria

The working observatories are the Optical Solar Station located in Cacahual (in the outskirts of Havana), the Astronomical Observatory located in Arroyo Naranjo, and the Havana Radioastronomical Station, devoted to the solar radio-patrol. There is an observatory in the University of Havana campus, administrated by the Faculty of Mathematics, that is used sporadically by different amateur astronomers groups. The amateur astronomers have a project to develop an amateur observatory in the city of Sancti-Spíritus. During 2005 the Mexican project MEXART included Cuban participation in the radiotelescope construction and adjustments. This is a good example of South-South collaboration. The operational situation of planetaria is detailed in the table. Planetaria not yet installed have no schedule to be operative, and the project of the Cultural and Scientific Centre is still in a development stage.

Public planetaria locations

Province	City	Technical Description	Comments
Havana City	Havana	ZKP-2	Operative
Havana City	Havana	ZKP-2	Nat. History Museum Not installed
Havana City	Havana	GOTO	Cultural and Scientific Centre Project in development stage
Pinar del Río	Pinar del Río	ZKP-2	Cult. Centre Not installed
Youth's Island	N. Gerona	One hemisphere	Operative
Sancti-Spiritus	Sancti-Spiritus	One hemisphere	Operative
Santiago of Cuba	Santiago of Cuba	One hemisphere	Operative

Other public events and activities, including outreach and public understanding of science

Amateur astronomer meetings have taken place periodically in different cities during the period. Generally the meetings take place in summer and in autumn in the cities where there are amateur astronomer groups supported by the local cultural institutions like libraries or museums. During the few last years the meetings were mainly in Sancti-Spíritus and Havana.

The Department of Sciences of the Ministry for Science, Technology and Environment organizes an annual Scientific Culture Journey meeting. In 2005 year it was devoted to the World Year of Physics, and the lectures were mainly devoted to cosmology and gravitation.

The Cuban Committee for the peaceful use of the outer space organizes an annual Space Science Workshop. It is a national meeting to present the state of the working groups in Cuba making use of space techniques and developing space research of any kind. The attendance from the provinces is still poor.

The Institute of Geophysics and Astronomy and the Congress Geociencias organized the 2005 Symposium on Astronomy and Space Geophysics. Foreign scientists from Spain, Austria and Iran attended the meeting.

The Astronomical Data for Cuba bulletin was published in 2003 and 2004. In 2005 it was not published. This bulletin includes not only data for Cuba but includes popular level articles on astronomical themes, and reports on amateur astronomical activities.

The Institute of Cybernetics, Mathematics and Physics is actively working in astronomical themes. They are involved mainly in Condensed Matter Theoretical Research. They are very active and invite prominent people to Cuba to bring conferences.

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ETHIOPIA

Education is an essential component for a secure and far reaching development of any society. The Ethiopian government recognizes this and places great importance on educating its citizens giving emphasis to the reduction and possible dissolution of the country's current economic and other problems. However, education will only play the best possible role in changing the scientific outlook and way of life of society as

we find even in some developing countries if its goals and programs are so defined with reasonable ambition. We are living in the space-age where Man, in the face of Earth's dwindling natural resources and other reasons for concern, is aspiring to get to other hospitable planets that will serve as replacements for his current home. In light of all this and more I hope the government takes the initiative to make reforms in its educational policy and lay down the basic infrastructure to launch the effort for the dissemination of Basic Space Science Education in Ethiopian schools.

There are no well structured programs in astronomy education in Ethiopian elementary and high schools. At the university level there are research programs in the space sciences and related fields that are only a few years old. The pulsar group at the Addis Ababa University (AAU) has so far trained seven masters students in the field. Two of these have already started working on their PhD theses. The group has collaborations with South African research groups in the field. In the last three years the group has sent four Ethiopian graduate students to the National Astrophysics and Space Science Program (NASSP) at the University of Cape Town, South Africa, for training as possible future astronomers. Another went to UCT mid-January, 2005. The group has also submitted an application for a Japanese 0.45 metre reflector. The application is pending.

There is also a small scale research program in solar science at the Baher Dar University. The group has a facility containing a magnetometer, photometer etc., at one of the heights close to the city of Addis Ababa (Entoto Mountain).

The outreach program in Basic Space Science Education that the pulsar group at the AAU has been conducting on national radio and weekly papers in the last couple of years, has created awareness in many Ethiopian schools and the Ethiopian public at large. As a result, astronomy clubs have now started popping up in schools. Two of the most active so far are the astronomy club at the AAU, which has members in the hundreds, and that at Jimma University. The Astronomy club at AAU has a 0.2 metre Cassegrain reflector telescope that it uses for night time viewing sessions.

On 25 December 2005 the physics department at the AAU has celebrated the 2005 Physics Year. At the occasion, the Ethiopian Space Science Society (ESSS) presented its goals and what it has been doing since its formation in October 2004. It has opened an office at the Technology Faculty (AAU). It hopes to use its office for coordinating its Basic Space Science outreach educational programs.

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FINLAND

General Information

Astronomy is maintaining its popularity in Finland, and the membership counts in amateur astronomical societies keep rising.

Elementary and Secondary Schools

In elementary schools, astronomical subjects are only touched on in the geography or physics courses. At secondary level, many schools give special astronomy courses; two textbooks have been published for that use. Astronomical Association Ursa has organized an astronomy exhibition for schools in Helsinki museum of technology that was visited by 14 673 pupils in 2004. Some fifty school classes have visited Tuorla Observatory every year, and professional astronomers have given many short courses in astronomy in several schools.

University Education

Finland became a member of ESO in 2004, and this may be reflected in research and teaching activities in the universities. Nearly 150 students attended the latest yearly basic course of astronomy in Helsinki

University, and similar courses are lectured in Turku and Oulu Universities, as well as in half a dozen other localities.

Public Education

Ursa Astronomical Association continues its strong role in public astronomy education, and its membership has risen to over 13 000 at the end of 2005. Ursa organized an international astronomy and space exhibition in November 2003 together with ESA and ESO, which was attended by about 10 000 visitors in just three days. Attendance at Ursa's portable planetaria has been 3000-5000 yearly. Ursa's popular internet site is found at www.ursa.fi/

In 2004 Tuorla Observatory started to plan a visitor centre to meet the increasing demand for public lectures and displays.

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GREECE

Astronomy Education in Greece is the result of the effort of all universities in Greece (Athens, Thessaloniki, Crete, Patras, Ioannina), the National Observatory of Athens, but secondary education as well since astronomy is taught in the Greek schools as an optional lesson in the 2nd year of Lyceum. In that way kids are given a refreshing new look at the latest discoveries in astronomy and space science. As a result the Universe comes into the classroom, and makes it fun to learn.

Public Outreach

The Venus transit in 2004 constituted good opportunities and attracted a large public to a better knowledge of the Universe. The effort was co-ordinated locally by the universities and the Greek branch of the European Association for Astronomy Education.

Secondary Education

One of the most serious efforts in the creation of educational material is connected with the program EU-Hands on Universe, bringing frontline interactive astronomy to the classroom. EU-HOU is now on-going in seven European countries for over two years, since 1994. EU-HOU is in keeping with the general goal of renewing the teaching of science. A re-awakening of interest in science in the young generation is foreseen through astronomy and the use of new technologies, which should challenge middle and high schools pupils. The primary target group will thus be the school teachers, who will be involved through a pilot school scheme widely advertised. The Greek partner is Filekpaideutiki Etaireia, an educational organisation since 1836, leading in Greece astronomy education. The co-ordinator is the Pierre & Marie Curie University in France. For more information see http://www.euhou.net

University Education

Staffing data refers to the period 2003-2005.

Dept of Astrophysics, Astronomy and Mechanics, National & Kapodistrian University of Athens
The staff of the Department consisted of 20 professors (2 full professors, 7 associate professors, 11 assistant professors), 3 lecturers, 4 secretaries and 1 technician. There were 3 postdocs, 15 PhD students and about 25 masters students. Members were involved in teaching undergraduate and graduate courses in the University of Athens, whilst doing research in the fields of theoretical and observational astrophysics, as well as in solar and space physics. Their work has been funded by national and international research grants, and in 2005 it resulted in several tens of papers published in international refereed journals and in the proceedings of international conferences. Moreover, the following laboratories belong to the Department of Astrophysics,

Astronomy and Mechanics, and their infrastructure is used for educational and research purposes.

Laboratory of Astronomy
The Astronomy laboratory supports education with laboratory exercises in the following courses: Astronomy I (for mathematics students), Applied Optics (for physics students), and Methods of Astronomical Observation & Data Processing (post-graduate). More than 200 students are educated annually.

Laboratory of astrophysics
This laboratory serves the educational needs of the physics students (approximately 400 annually) within the compulsory course Introduction to Astrophysics. The students are educated by conducting specially selected laboratory exercises, on the basic topics of astrophysics, and familiarize themselves with all astronomical objects, and the methods of study applied to astronomical phenomena.

Laboratory of the Gerostathopoulion University Observatory
At the dawn of the new millennium the National and Kapodistrian University of Athens obtained his own window to the Universe. The new telescope is located on the top of the building of the Faculty of Physics on the Zographou campus. The new telescope is a basic tool for high-standard astronomical education, at both undergraduate and graduate level. The new telescope is also used for basic acquaintance with astronomy of pupils and lay persons, since the Faculty offers guided visits to the observatory including night-time observation, seminars and talks during special Open Nights. For more information see http://www.uoa.gr/uoauk/uoaindex.htm

Section of Astrophysics, Astronomy, and Mechanics at the Department of Physics of the University of Thessaloniki
This Section consisted of two independent and closely collaborating units: the Laboratory of Astronomy, and the Division of Mechanics. The staff of the Section consists of 3 emeritus professors, 3 professors, 7 associate professors, 4 assistant professors, 2 lecturers, 28 postdocs and graduate students and 5 technicians. Members of the Section are involved in teaching undergraduate and graduate courses in the University of Thessaloniki, while doing research in the fields of theoretical and observational Astrophysics. Their work has been funded by national and international research grants. Once a month, when the Moon is between 4 and 8 days old, the Observatory of the University of Thessaloniki, opens its gates to the public. If the sky is clear, a series of observations of the Moon, the bright planets, and several other astronomical objects, galaxies, stellar clusters, etc, can be marvelled through the 0.2 metre refractor of the Observatory. Four conferences were organised and more than 30 lectures were given. For more information see http://www.astro.auth.gr

University of Crete, Dept. of Physics, Section of Astrophysics & Space Physics
The staff of the Section consisted of 7 faculty of the Physics Department, 3 postdoctoral researchers, 3 graduate students, and 4 technicians. Two additional tenured researchers were also affiliated with the Section. Members of the Section were involved in teaching undergraduate and graduate courses in the University of Crete, while doing research in the fields of theoretical and observational astrophysics, as well as in atmospheric and ionospheric physics. Their work has been funded by national and international research grants, and in 2005 it resulted in 38 papers published in international refereed journals. Significant efforts were also devoted to the operation and improvement of the infrastructure and hardware at Skinakas Observatory and the Ionospheric Physics Laboratory. More information can be found at http://www.physics.uoc.gr/en/menu/astro.php

University of Ioannina, Dept. of Physics, The Section of Astrogeophysics, Laboratory of Astronomy
The staff of the Section consisted of 4 faculty of the Physics Department, and 1 technician. Members of the Section were involved in teaching undergraduate and graduate courses in the University while doing research in the fields of theoretical and observational astrophysics. Their work has been funded by national and international research grants. Significant efforts were also devoted to public and student education, and around 500 people benefit from these activities annually. More information can be found at: C:\WINDOWS\Desktop\LABORATORY OF ASTRONOMY, UNIVERSITY OF IOANNINA.htm

Institute of Astronomy and Astrophysics of the National Observatory of Athens

The staff of the Institute consisted of 9 researchers, 5 postdoctoral researchers, 4 graduate students, and 8 technicians. Members of the Section are doing research in the fields of theoretical and observational Astrophysics. Their work has been funded by national and international research grants. The Institute operates a 1.2 metre Cassegrain telescope, currently the main observing instrument. It is located in the Astronomical Station Kryoneri in the Northern Peloponnese. The station is on the top of the mountain Kilini (1000 metres above the sea level), at about 110 km westward from Athens. The new telescope of the IAA, a 2.3 metre Ritchey-Chretien reflector, is under final tests by Carl Zeiss Jena. The new site that hosts the telescope, is located on the top of Chelmos mountain (2350 metre) in Northern Peloponnese, at about 150 km westward from Athens. The Institute of Astronomy and Astrophysics effectively performs a number of educational activities. These activities are oriented to young astronomers, to physics teachers, and to students from high schools, as well as to lower level schools. The Institute also organises open days for schools/general public to visit the facilities of the Institute. More information can be found at http://www.astro.noa.gr/iaa_main.htm

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HUNGARY

Overview

Following the tremendous public excitement initiated by the total solar eclipse in the summer of 1999 there came some quiet years but other cosmic phenomena and the ever increasing hunger of the electronic media for exciting news resulted in other nationwide observing campaigns. The most important one which attracted the greatest public interest was the transit of Venus that happened also in pleasant summer climate and under crystal-clear sky on the 08 June 2004. This date is near to the end of the school year in Hungary, and for this reason children and teachers were all happy to go out in order to follow the event. What is more, Venus transits have a great reputation here for the historical observations of Miksa (Maximilian) Hell on 03 June 1769 from the island of Vardö (Northernmost Scandinavia), which provided an invaluable contribution to the determination of the accurate value of the solar parallax in the XVIIIth century.

Another important period of public interest was the outcome of the great Mars opposition, the transit of Mercury, a partial solar and an umbral lunar eclipse in 2003. To keep with it the Hungarian Astronomical Association declared May 2003 as the Month of Astronomy. Everywhere in the country portable telescopes were erected and observing possibilities and proper explanations of the astronomical phenomena were offered. All of these events received ample coverage in the media too. An extraordinary natural phenomenon at the latitude of Hungary (45-48 deg north) – the aurora borealis painted the sky green-red for hours during the night of 20-21 November the same year. Although many astronomers in the Northern countries may call aurorae a kind of light pollution, here we enjoyed it for the rarity. and amateur astronomers could be most successful in recording the auroral light in colourful pictures mainly by digital cameras. This focused the public interest once more to the activity of astronomy clubs and their members.

The affordability of state-of-the-art information technology devices (DVD-enabled notebook computers and video projectors first of all) made the organization of public open air shows, lectures and performances easier, and this became a powerful method of dissipating astronomical knowledge to the wider public during the warmer months.

Primary school

There has not been regular and specific astronomy education in Hungarian primary schools. A few schools incorporated substantial astronomical knowledge into the curriculum and offered afternoon and/or evening practice for children blessed with special interest. Some of the luckier schools erected their own observatories.

Secondary school

In the curriculum of our secondary schools – although very variably – basic astronomical knowledge is present, as part of the disciplines of geography, environment, or physics and its extent varies according to local conditions, mainly governed by the ambitions of the professor. The Hungarian Astronomical Association (HAA) has been organizing special courses of astronomy in the capital and some other towns too. HAA in collaboration with the Loránd Eötvös Physical Society and the Hungarian Astronautical Society, organized nationwide competitions for secondary school and college pupils in various fields of astronomy and space science during the 2003-2005 period. Professional astronomers from the Konkoly, Baja and Szombathely Observatories and the staff of Eötvös University of Budapest as well as that of the Szeged University, acted as jury chairperson and jury members. It is a pleasure for us that private companies started to participate in such occasions and to contribute to the prizes offered to winners of the competitions. Many young people received their first but quite powerful telescope and won free participation at summer camps of astronomy.

College and University

Astronomers are trained and a PhD degree is awarded in astrophysics at the Loránd Eötvös University of Sciences, Budapest and at the University of Szeged (the latter being a town near to the border between Hungary and Serbia). Theoretical and practical teaching and training lasted five years until now and had to be completed by producing some kind of research work and presenting a written thesis about it. The combined average number of students who graduated in astronomy in Hungary in the past years is about a dozen. The total number of the people enrolled exceeds one hundred. About ten percent of the students (practically half of the applicants) were successful and have been granted fellowships for full semesters at universities in Belgium, Germany, the Netherlands, and the United Kingdom.

Various astronomical subjects are being taught at many colleges and universities of the country by learned astronomers and university professors (e.g. people from Baja Observatory offer three full semester courses at Pécs University and accept students for summer practical training, staff from Konkoly Observatory are lecturers at the Eötvös University, and at Szeged and Debrecen Universities too. Fellows from the Gothard Observatory of Eötvös University give lectures and run practical training work at the D Berzsenyi Teacher Training College of Szombathely.

Doctoral schools have been organized at both universities. At the Eötvös University, astrophysics and particle physics run together, and the combined outcome of the three-year cycle was twenty PhD degrees. The number of PhD students at the Szeged University Observatory is half a dozen. The staff of the Konkoly Observatory of the Hungarian Academy of Science is particularly active in the teaching of PhD students at both sites and the Laboratory of Astrophysics of Konkoly at Budapest is an important training centre of the PhD school of Loránd Eötvös University of Budapest.

Telescope time is allocated to PhD students at all the larger Hungarian astronomical observatories e.g. Konkoly Observatory of the Hungarian Academy of Science both at Budapest and at Piszkéstetö Station, Baja Observatory of Bács-Kiskun County and Astronomical Joint Department of Pécs University, Gothard Observatory of Eötvös University at Szombathely and the Heliophysical Observatory of Konkoly at Debrecen and Gyula Station, and many of them received shorter or longer fellowships in major foreign and international astronomical institutes.

A recent modification of the Act of Higher Education – in concordance with the common resolution of the European Union – is pressing us and predicts the alteration and overall restructuring of the Hungarian way of teaching would-be astronomers for decades. The three plus two years scheme is to be introduced this autumn with the possibility for our students to get a BSc degree in astronomy and astrophysics after three years of successful studies and the opportunity to continue their training at the masters level. Having completed four more semesters and the thesis work they will be entitled to hold the masters. degree in astronomy and astrophysics. Every member of our staff is working on the perfection of the curriculum with full capacity.

Education conferences

National PhD conferences are held regularly at Eötvös University in astronomy and astrophysics and an international one was organized in Pécs on the astrophysics of variable stars in September 2005 by the Baja

Astronomical Observatory and Pécs University. The very diligent staff of Baja AO organized the National Meeting of Variable Star Observers at their site in October 2004 with huge success.

Observatories and planetaria

There are public astronomical observatories in almost every county of the country. One of the most active is the Polaris Observatory, built on the top of a public educational centre in the north of Buda, on the hilly side of the capital. Since large blocks of houses are in its surroundings, the small observatory often receives visitors. Polaris is the headquarters of HAA too and a substantial part of the printed astronomical material is regularly edited there. Observing camps for schoolchildren as well as for students and adults are organized by the volunteers of the association in cooperation with the only employee of the HAA.

In Hungary there are two public planetaria, a large one in Budapest and another with limited capacity at Kecskemét not far from the geometric centre of the country. Both projectors are old, the Carl Zeiss instrument of the bigger planetarium being a technical relic constructed approximately half a century ago although the whole building and the auditorium is twenty years younger.

On the roof of the Northern Bloc of the Lâgymányos Campus of the Eötvös University a huge silver globe (more precisely covered with aluminum plates) attracts the attention of tourists who navigate on the Danube. It is an almost perfect planetarium too, built for large groups of students and has a nice spherical screen covered with the finest material ever developed for this purpose. Only one thing is missing – the projector. The Department of Astronomy moved into the building eight years ago but has not been able since to purchase the device. We do not dream about an optomechanical or laser-powered wonder, but even a hemispheric computer projector with the necessary optics and light flux is somewhere in the heavens for us, and who knows how long yet. Any suggestions to solve our problem will be highly appreciated at the email address below.

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INDONESIA

Overview

Modern astronomy set its foot in Indonesia more than 80 years ago. A lot of science has been produced, but not as much as could have been hoped for. That education and development of science are being put in low priority seems to be the main cause. In the last five years a fresh breeze has brought in new hope and encouragement, and Indonesian astronomers put their act together to keep up with the fast progress of world astronomy.

This report is concerned mainly with activities in the education sector of astronomy in Indonesia in the past three years, in which Indonesian astronomers were directly involved.

In the current curriculum, some aspects of astronomy are included in science classes in elementary schoola and in physics classes in secondary schools. In both cases the time allocated for astronomy is very small and most teachers do not feel comfortable teaching it as they do not have enough knowledge of the material themselves. This has caused an outcry, in particular since, outside of school, astronomy is actually gaining popularity, thanks to media coverage on various astronomical events and images. The Department of Astronomy of the Institut Teknologi Bandung with its Bosscha Observatory in Bandung, and the Jakarta Planetarium have put in a lot of effort to help the situation. Most of the effort is to change the mode of learning from mere memorizing real understand by providing better lectures, supported by activities and visualization. Equally important is to impart the idea that astronomy, like other sciences, is an on-going process, such that one should be open to new discoveries and development.

Elementary (primary) school

The part of astronomy included in the science class at the elementary school level is limited to the Solar System, with more emphasis on the Earth-Moon-Sun interaction to understand the earthly phenomena such as seasons, climate, the calendar system, etc. However, much of the class still uses memorizing as the learning process. For example, it seemed to be more important for the students to memorize the number of satellites Jupiter has, rather than to understand how the phases of the Moon come about. Since 2001 professional astronomers have visited schools in a number of provinces in Indonesia to help with simple class activities to support the astronomy part of the science class. This proved to be fruitful as the students enjoy the class more, understand more, and the teachers are less stressed. This activity is to be maintained with better teamwork. More astronomers are called for and more creativity is required.

Secondary school

At the secondary school level astronomy material is incorporated in physics classes, which is good because astronomical phenomena can be used to give simple visualization of the physics law to be described. Although in some schools the realms of stars and galaxies are introduced, most schools only teach the Solar System. A number of good schools (usually in big cities) have extracurricular activities that include science clubs which regularly team up with amateur astronomers for their outdoor activities. A few students graduated from these high schools continue to take astronomy at the Institut Teknologi Bandung and show good academic achievements.

A currently popular, and government supported, activity is the science (of various kinds) Olympiads. Working together with the Ministry of National Education, the Department of Astronomy and the Jakarta Planetarium have for three years organised the National Astronomy Olympiad and trained the Indonesian team for the International Astronomy Olympiad (IAO). The Indonesian teams have fair well in the last three IAOs.

College and University

As of today only the Institut Teknologi Bandung offers university degree (bachelor and master) in astronomy and astrophysics in Indonesia. With this condition we must refer to international standards for astronomy and astrophysics education for the curriculum and competence benchmarking. Collaborations in education and research with various astronomical institutes around the world have been essential in the progress of astronomy in Indonesia.

A number of astronomy courses are quite popular and are taken also by non-astronomy students, particularly physics students. Some of them even continued to work on their final year projects supervised by astronomy lecturers/professors.

Since 2003, in addition to the masters program for astrophysics, a masters program in astronomical education has been initiated and is currently going very well. This is in good concordance with the University of Education in Bandung, which is developing an astronomy subprogram in their physics program. This is to answer the aforementioned problem of teachers' inadequacy in elementary and secondary schools.

Education conferences

In October 2003 a series of seminars was held in the occasion of the 80th birthday of the Bosscha Observatory. One of the seminars was on the education of astronomy and space science in schools. Practitioners of education (teachers, science club trainers, etc.), the Curriculum Commission of the Ministry of National Education, amateur astronomers, professional astronomers, and mass media representatives, were all asked to contribute their opinions on the evaluation and future goals and efforts on the education of astronomy and space science in school. It received very good response.

In the 9th Asian-Pacific Regional IAU Meeting in July 2005 a special session on education and popularization of astronomy was set. It was very well attended and it enabled sharing of ideas and experiences among astronomers, education practitioners, and students from various nations.

Observatories and planetaria

The Bosscha Observatory

There is only one astronomical observatory in Indonesia which is fully functioning in accommodating research, education, and public service, namely the Bosscha Observatory of the Institut Teknologi Bandung. Variable stars, double stars, solar physics, and planetary sciences are the current main fields of research conducted at the Bosscha Observatory and for which data are also produced locally. For other fields of research, the Observatory and the Department of Astronomy are supported by the newly upgraded computer and internet facilities, for which we are grateful to the Leids Kerkhoven Bosscha Fonds of the Netherlands. These facilities, in addition to the extensive library, enable Indonesian astronomers and relevant scientists to access updated information and data.

The bachelor and masters programmes require some course work (e.g. Laboratory Astronomy I and II) to be conducted at the Observatory. Each year a number of students choose to work at the Observatory for their final year research projects or masters thesis. Students can also do internship work in some on-going research projects during their long vacation period. Work on Bosscha astronomical instrumentation (detectors, control system, etc) have been attracting not only astronomy students, but also students from electrical engineering and applied physics from various universities.

The Bosscha Observatory receives on average about 60 000 visitors per year, ranging from school children to adults. Regular day programmes are from Tuesday to Saturday throughout the year with lectures and visits to some of the telescopes. Evening programmes (Public Nights), set for 3 nights per month between April and October every year, offer public observation using small telescopes. Additional programmes include Astro Camp, arranged for weekends in June-July-August (school vacation period), in which participants are invited to experience the work of real optical astronomers. This programme started three years ago and has been very popular and has always been fully-booked. Specific activity/lectures can be tailor-made upon request for group-booking. The Bosscha Observatory also participates in the International World Space Week Programme by having an Open House for a week every October.

In addition to planned activities mentioned above, the observatory also provides information and consultation via other media (telephone, facsimile, internet, newspapers, radio, television, etc) on various astronomical issues. One of the most important issues is on calendar. The dates of many religious holidays are determined by the observed position of celestial bodies. In October 2003 a seminar on calendar systems (solar, lunar, and lunar-solar calendars) was organised by the Bosscha Observatory.

The Bosscha Observatory is basically the hub for the Indonesian astronomical community. Various astronomy-related functions are held throughout the year.

There are 2 solar observatories, managed by the National Institute for Aeronautics and Space (LAPAN), which serve research purpose only.

Planetarium Jakarta

The Jakarta Planetarium and Observatory, under the administration of the Secondary and Higher Educational Service (Jakarta Capital City Government), has been in service since 1964. To respond to the demand for astronomical education, Planetarium Jakarta equipped itself with basic planetarium facilities and designed a large number of activities throughout the years. Among others, there are the following.

The Exhibition Room: This is used for displaying astronomical pictures and learning aid demonstration.

Observatory and Observing the Sky for the General Public: There is a portable telescope, a Coude type, 0.15 metre aperture and 2.25 metre focal length. This is the main instrument of the Observatory, made by Carl Zeiss Jena and placed on the roof (11 metres in height). In addition there is a 0.16 metre Newtonian Telescope, a 0.2 metre heliostat, and other portable ones. The public viewing nights are arranged during the whole year to meet the interests of visitors on popular astronomy.

The program for the public is established in a permanent schedule since 1994. This is not popular on a daily basis, but has proved to be a mass activity during special astronomical events. There is hope to upgrade the facilities and observation activities to be more attractive.

Workshops for Students: There are occasional workshops for students to make and use simple astronomical apparatus such as sundials, pinhole cameras, etc. This activity needs redesigning to be more motivational.

Upgrading for Teachers of Earth and Space Sciences: This was established in 1995 to aid elementary and high school teachers in understanding the astronomical material in the curriculum and in their teaching preparation. For this activity the Planetarium works together with the Department of Astronomy of the Institut Teknologi Bandung.

World Space Week: Established since October 2000, and organized every year based on the resolution of The United Nations, this activity is co-organised with The Jakarta Amateur Astronomers Association, the Department of Astronomy and the Bosscha Observatory, both of Institut Teknologi Bandung, and the National Institute of Aeronautics and Space.

Classroom Lectures: The lecture material is designed upon request from schools or other institutions; and delivered at Jakarta or the requesting school/institutions. Of particular importance is the guidance and consultation in astronomy for students of higher education for their mini-thesis to obtain their bachelor degrees.

Amateur Astronomy: The Jakarta Amateur Astronomers Association (HAAJ), established in 1984 at Planetarium Jakarta when the Comet Halley appeared, is a crucial (yet independent) component in the running of all the activities of Planetarium Jakarta. In August 2004, they exposed their activities in the form of talk shows and exhibitions at the Russian Center for Science and Culture, and this will be tried every year.

Planetarium Tenggarong (East Kalimantan)

This is a new planetarium which is currently finishing their staff training session and hardware preparation. Once their programmes are developed, this planetarium will cater for the public in Kalimantan and its surroundings.

Other public events

The Jakarta Planetarium and the Bosscha Observatory always arrange for public viewing for any observable special astronomical events. Most notably was the Mars opposition in August 2003 for which both locations were flooded by the public.

The Institut Teknologi Bandung Astronomy Student Association invites the public twice to thrice per year for films, talk shows, etc., on popular topics in astronomy such as black holes, newly-found planets, dark energy in the Universe, etc. These events are always well attended, although mostly by college/university students.

The growing interest in serious dialogue between culture, religion, and science is met by a newly established forum, hosted by the Department of Astronomy and supported by the Metanexus Institute (in affiliation with the John Templeton Foundation). The forum consists of relevant experts in the three aspects above from various universities (main members) and regular members (faculty members, students, etc). The forum members meet once a month for a review talk by a relevant expert amongst the main members (or invited speaker) followed by a thorough discussion. Public lectures for a much wider audience are held twice a year. This has been going for a year with steady serious member participation.

The 9th Asian-Pacific Regional IAU Meeting in Bali in July 2005 had a side programme that was co-organised with the Jakarta Planetarium, the Jakarta Amateur Astronomer Association, and the Astronomy Student Association. In this programme we managed to interact with students from about 30 high schools in Bali (over 3 days) in which amateur astronomy training was given. In the final evening of the meeting, a

public observation was held. Since it was a huge success and highly appreciated by the school system, we are seriously thinking of organizing such a programme in a more regular manner.

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JAPAN

General

Reformation of the school curriculum, usually carried out around every 10 years, were completed for the elementary schools in 2001 and for the high schools in 2002. School hours for science are reduced to teach only easy items that most of the school students will be able to understand. For example, at the elementary schools only two but not three phases of the Moon can be taught. However, after a two-year trial, the government realizes that the performance level of school students has become lower at the OECD evaluation test, and therefore they are trying to change to teaching much more widely.

Since the Subaru 8 metre telescope on Mauna Kea summit in Hawaii produced many interesting astronomical images, which have been in different media, many of the public, including school students, have a good impression of astronomy. Japanese space missions have failed several times during the past two years, but the recent success of the Hayabusa mission to the asteroid Itokawa brought much excitement to the public.

Astronomical Society of Japan

The Astronomical Society of Japan holds an education workshop twice a year, including a session where senior high school students present their paper, with a collaboration with the Society of Teaching and Popularization of Astronomy. These activities become triggers for developments of many groups to promote astronomical education.

Public observatories and planetariums

The number is still very high, in the order of a few hundred in the whole country, and this number is the 2nd largest in the world. Activity levels depend strongly on what motivation those staffs have. Recently, reflecting budgetary difficulties of supporting local governments, some of them shut down and the number is gradually decreasing.

Universities

Fortunately, the proportion of universities having staff with an astronomical background to the total ones is gradually increasing. However, the percentage of students having knowledge of science and mathematics is quite small, and therefore astronomical staff are facing a difficulty regarding what level of astronomy they should teach.

Senior high school

Since most of the universities do not request Earth science (including astronomy) for their entrance examination, only 5 percent of student take a course of Earth science. Although textbooks of astronomy are rather good, the number of students is small.

Elementary school and junior high school

As stated above, a simplification of educational items is underway, and many schools try to teach sciences with a great variety of content. What results will come out will be apparent in s few years. Recently, some astronomical educators published a report stating that nearly half of students believe that the Sun rotates

around the Earth. This created a great sensation through various media, and stimulated various discussions pro and con regarding the status of astronomy education.

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MALAYSIA

Overview

Astronomy education and development in Malaysia have been aggressively promoted by the Malaysian Government through their respective agencies i.e. the Ministry of Science, Technology and Innovation (MOSTI), the Ministry of Education Malaysia (MOE) and the Ministry of Higher Education Malaysia (MOHE). The National Space Agency (NSA) under MOSTI is the agency that is responsible for promoting space science programs in Malaysia. Their main task is to encourage and create awareness of space science in schools, colleges, universities and among the public. The NSA working closely with the MOE organized quiz and short stories competitions for primary schools, and rocket launching technology, astronomy projects and short stories competitions for secondary schools. They also organized workshops for teaching astronomy for primary and secondary schools teachers. The NSA encouraged students and lecturers in colleges and universities to participate in competitions for the best masters and PhD theses in astronomy and astrophysics, and articles published in journals, seminars and conferences. The NSA, universities and non government organizations (NGOs) such as the Astronomical Society of Malaysia (ASM) and the Starhunter of Selangor and Federal Territory of Malaysia, organized star gazing party, seminars, conferences, and workshops in astronomy.

Elementary (primary) school

In the elementary school curriculum for school children at the age of 11 to 12, the basic astronomy courses are taught. These basic courses introduced the Earth, Moon, Sun, night and day, tides, the Solar System, constellations, stars and galaxies.

Every year a National space science quiz competition for elementary schools is organized by NSA and MOE with its main sponsor NESTLE products. Before 2005, this competition was conducted on the basis of entries all over elementary schools in Malaysia. The preliminary round was conducted in four different zones in Malaysia whereby the schoolchildren were answering a set of questions prepared by NSA and MOE. The best schools from each zone competed in the final which was held in Kuala Lumpur. For the year 2005 the format for the quiz was changed. The schoolchildren were selected from various schools in Malaysia through screening their ability and knowledge in astronomy. Then these schoolchildren were invited to participate in a space camp program. The space camp program exposed these schoolchildren to space science – astronomy, astrophysics, satellites, space exploration, and space technology. These schoolchildren then had to design a model of a spaceship for a specific mission to a chosen planet. They had to explain the suitability of their model for that mission to the judges during the final quiz competition in Kuala Lumpur. Such exposure enhanced and encouraged these schoolchildren to further explore space sciences in the near future.

There was also a short story and essays competition for primary schools in the year 2004. The topics were about astronomy and space exploration and technology. This competition is held every two years.

Secondary school

For secondary schools, the NSA, MOE and University of Malaya organized a rocket launching technology competition. This competition was started in 2003 as a pilot program by invitation to secondary schools in the state of Selangor and Federal Territory only. About 48 secondary schools took part in this competition. The students are aged between 13 and 18. The following year, 2004, the competition was open to all secondary schools in Malaysia. For the preliminary round each state had to organize the competition in their respective state to select their three best schools to compete in the grand final held in the University of Malaya. More than 400 secondary schools competed in this competition in the various states, and 45 schools

competed in the grand final. The competition is for the furthest trajectory and the longest duration of the parachute staying in the air. This competition is a yearly affair. For the year 2005 the winner of this competition represented Malaysia in the international rocket launching technology competition organized by Japan in Fukuoka. There are also short stories/essays and astronomy project competitions for secondary schools. The essay competition is every two years and open to all, while the astronomy project competition is for the astronomy club in schools.

College and Universities

For the colleges and universities, the promoting of astronomy education and development is mainly through organizing seminars, workshops and conferences. The astronomy seminar is organized every two years. The last astronomy seminar was conducted in 2004. However the Institute of Physics Malaysia (IFM) organize annual national physics conferences that include a section on astronomy and astrophysics. In the year 2005, the IFM organized the International Meeting of Frontiers in Physics 2005 in conjunction with the international year of physics. The conference attracted 8-10 speakers from various part of the world to talk about astronomy and astrophysics. The conference also attracted about 150 local and international participants. Beginning in 2004 the competitions for best masters and PhD theses and articles published in journals, seminars and conferences has been introduced. This competition is open to postgraduate students and lecturers at the colleges and universities. The winner of this competition will be able to attend one international conference with all expenses paid for.

The University of Malaya constructed an observatory in 2005 complete with a 0.36 metre Celestron telescope and a robotic equatorial mount (GT Paramount ME). This observatory is used to train undergraduates and postgraduates students in the techniques of observation for photometry and spectroscopy using equipment such as photometers, filters, spectrographs and CCD cameras. They also learn to use image processing software such as IRAF, MIDAS and AIP.

Observatories and planetaria

Malaysia has three observatories and three planetariums. One observatory is at the National Planetarium in Kuala Lumpur, the other two are the Al-Khwarazmi in Melaka, and the Kolej Agama Sultan Zainal Abidin (KUSZA) in Terengganu. The three planetaria are the National Planetarium in Kuala Lumpur, the planetarium Iskandar in Kuching and the planetarium in Terengganu. They are mostly for the purpose of educating schoolchildren and the public about space science. They organize public talks, shows and exhibitions in the planetariums or go to schools, whilst the observatories organize star gazing parties for special astronomy phenomenon such as Mars's close approach, Venus transit, comets, and eclipses of the Moon. The national planetarium invites guest speakers from overseas, such as Professor Jocelyn Bell, to give public talks to schoolchildren, the public, and professional astronomers separately. Such initiatives are good to encourage awareness in the public and schoolchildren. The NSA is building the National Observatory in Langkawi Island. It is supposed to be completed by the end of 2005. However it is now due to be completed by the end of March 2006. This observatory is equipped with a Christian-Richey 0.5 metre telescope and a robotic equatorial mount (GT paramount), a spectrograph, CCD camera and various filters. It also houses a solar telescope. It is hope that the National Observatory will serve the purpose of educating school children, teachers, undergraduates, postgraduates, lecturers, researchers and the public, about the importance of astronomy education and development in Malaysia.

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MEXICO

Overview

There have been improvements as well as new problems in astronomy education in Mexico. In this country there are national as well as state programs for all levels of education. Most of the country uses the same content in elementary schools.

One of the more positive advances is a new law for compulsory pre-school and secondary level, that is to say kindergarten and middle school. It is clear that the economic situation and wealth distribution of the country does not allow this education to take place everywhere, and the quality varies according to local economic conditions. Nevertheless the official recognition of the need for twelve years of basic education is important.

Among the education problems that have not been solved is that the different school levels are not structurally unified (kindergarten, primary, secondary and teachers' schools).

Elementary (primary) school

In pre-school the phases of the Moon and seasons are addressed. Astronomy is taught in elementary school through the geography courses, mainly eclipses, the Solar System and our place in the Universe.

Secondary school

At this level, there is an imminent change that will reduce the science courses. This unhappy situation will no doubt reduce the time devoted to astronomy. Astronomy will be taught during the geography and physics courses, most likely our place in the Universe and the Earth's motions.

High school

During high school a small amount of astronomy is addressed during the physics and geography lectures. There is now a non-compulsory astronomy course in some schools, and teacher training has been going on for several years as well as the production of learning materials. A masters for teachers of this level has been running for two years and a few teachers are writing their theses on telescope construction and other astronomical topics.

College and university

The situation at college and university levels is very positive, in that there is a significant increase in the number of universities that offer physics courses. A general astronomy course is taught as part of the physics curricula, and students from other disciplines can attend it. Astrophysics courses are given for physics undergraduate students at our National University. The number of graduate programs has also increased, although there is a significant shortage of jobs for the trained astronomers.

Education conferences

Astronomy is a very attractive science, and therefore there is an increasing demand for public talks at all levels. The professional astronomers try to cover this activity, recognizing that it is a window to other possible physics, engineering and mathematics interests. Radio programs and interviews are also produced for the general public. In particular, the National Academy of Sciences has maintained a conference program for all disciplines; this program has been in effect for 16 years and has been effective in maintaining continuity in the different regions.

Observatories and planetaria

Professional observatories
Resources have recently been increased. The Large Millimeter Telescope (jointly between the Instituto Nacional de Astrofísica Óptica y Electrónica (INAOE) and the University of Massachusetts) is advancing in its construction. The National University of Mexico has its observatory at San Pedro Martir (2.1, 1.5 and 0.84 metre telescopes) and recognizing its extraordinary good site, is trying to construct larger facilities. INAOE also has a site in Cananea, Sonora (2.1-m). There are several smaller observatories, including solar ones (University of Sonora, and a radiotelescope at the National University of Mexico).

Private observatories and astronomy clubs
There are several private observatories, at least two of them well equipped.

Planetaria
There are more than 20 planetaria that have continuous activities. They have organized a society where they meet and exchange ideas (Asociacion Nacional de Planetarios). In this triennium Papalote Museo del Ninõ has installed an IMAX 3D mega screen where they include astronomy films.

Science centers

Several science centers have permanent exhibits on astronomy. In particular, Universum in Mexico City has just undergone a major update of its astronomical exhibits. Also, a new astronomy hall has been opened in La Semilla in the northern state of Durango.

Amateur astronomers

There are several organizations, including the Asociación para la Divulgación de la Astronomía en México that have frequent activities. Some of the astronomy clubs are very active and have web pages.

Magazines and other public resources

There is a good monthly magazine on general science for the public ¿Cómo ves?, and one for teachers Correo del Maestro, that includes astronomical articles.

With the increased use of the Internet, the number of sites in Spanish rich with astronomical information and news have become more popular.

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FOR COUNTIES N-Z SEE SEPARATE DOCUMENT