

INTERNATIONAL ASTRONOMICAL UNION

COMMISSION 46 - TEACHING OF ASTRONOMY

NEWSLETTER

President :

L. Gouguenheim
Observatoire de Meudon
Radioastronomie
F-92120 Meudon, France

Vice-President :

J. Percy (Newsletter, TT)
David Dunlap Observatory
Box 360
Richmond Hill, Ont. Canada L4C4Y6

Organizing Committee :

L. Houziaux (Newsletter)
S. Isobe
C. Iwaniszewska
J. Pasachoff (ICSU-CTS)
R. Robbins (AEM)
An. Sandqvist (past president)
D.G. Wentzel (VLP, ISYA)

Editor :

J. Percy
David Dunlap Observatory
Box 360
RICHMOND HILL, ONT. CANADA L4C4Y6
E-mail: PERCY@UTORPHYS (Bitnet)

Printing and Distribution :

L. Houziaux
Institut d'Astrophysique
Université de Liège
Avenue de Coïnte, 5
B-4000 Liège, Belgium
Telex : 41264 ASTR LG B
E-mail: U2141LH@BLIULG11 (Eam)
Telefax : 32 41 66 94 93

Number 33: September 1991

EDITORIAL. An article by F. Graham Smith, published in the newspaper of the 1991 IAU General Assembly (reprinted on page 9) raises the question: To what extent should the IAU be involved in astronomy education? Education, of course, affects our science in two ways: through the training of the next generation of astronomers, and through the education of the taxpayers who support us. IAU Commission 46 (The Teaching of Astronomy) is concerned with both of these. It serves as a focus and channel of communication for hundreds of professional astronomers with a special interest in astronomy. This Newsletter, the meetings of the Commission at IAU General Assemblies, and especially IAU Colloquium 105 (The Teaching of Astronomy) and its Proceedings, are concrete examples of this focus and communication.

The purpose of the IAU is to promote astronomy and to develop it, especially through international cooperation. Over the many decades of the IAU's history, many countries have established programs of astronomical education and research, and have joined the IAU. Commission 46's programs in the developing countries provide a first step in this direction. The International Schools for Young Astronomers, over their 20-year history, have been quite successful. The Visiting Lecturers Program, and the Travelling Telescope Project, have the potential to make a significant impact, given time and patience. The importance of these and other programs is correspondingly greater if astronomy is regarded as more than just "big science". In addition to its cultural, historical and educational facets, astronomy includes many "small science" research projects which can be carried out in school, college, public or amateur observatories.

But could astronomy education be left to professional science educators, and to agencies such as UNESCO? I think not. Few science educators have any training in astronomy; that is one reason for Commission 46's one-day meetings between astronomers and teachers before each General Assembly. The most effective contact is at the local level. Almost every IAU member is in a position to help. There is no better ambassador for astronomy than an enthusiastic astronomer! Commission 46 encourages and facilitates this process.

TRAVELS WITH THE TRAVELLING TELESCOPE

I arrived in Singapore at about 10 a.m. on Thursday, 24 May, 1990, after a trip lasting over 24 hours, and that had taken me halfway around the world and within 3 degrees of the equator. Although exhausting, the trip had not been without its highlights - beautiful sunrise over the Atlantic, classic flightpath to the Orient over the Balkans, Istanbul, Lebanon, Saudi Arabia, the Arabian Sea, midnight stop and shop in Bombay, view of the nighttime monsoon lightning flashes from the darkened cockpit of our 747, breakfast in the company of towering tropical cumulo-nimbus clouds over the Straits of Malacca - the romantic in me was fully satisfied.

After freshening up, I directed my attention to the problem of extracting the Travelling Telescope from Air Canada, and ensuring its safe onward passage to Kuala Lumpur, its initial stop in Malaysia. I telephoned Osman Suradi, the agent who had been entrusted by our Malaysian hosts to ensure the smooth passage of the telescope through Singapore. He picked me up from the terminal by taxi and took me back to his office in the airport's cargo area, from where he determined that the telescope had in fact not arrived on my flight, and that nobody knew where it was! Shortly before departure from Toronto I had confirmed that the container holding the telescope and all its accessory cases had indeed been loaded on board the aircraft, and now we were mystified. What could have happened?

Air Canada's Singapore cargo office agreed to put a trace on the container, and after hanging about the airport for a while in the hope of an early result, I left on the SIA/MAS shuttle for Kuala Lumpur, a short 35 minute hop, minus the telescope. There I was warmly welcomed by Mazlan Othman, director of the XVIIth IAU/UNESCO School for Young Astronomers, venue for the Travelling Telescope's first foray. Naturally, I was feeling rather apprehensive about what to do without the telescope, but Mazlan seemed to take it all in stride, and did not seem to be unduly worried.

On the morning after, we drove the 40km to the Malaysian National University at Bangi, where I had the morning to sort myself out, and to start thinking about how best to introduce and use the telescope. In the afternoon I phoned Singapore, but to no avail - the telescope had still not been traced. In the meantime Mazlan introduced me to Dr. Rudin Salinger, Canadian-born director of the University's educational media centre. He suggested that we produce an instructional video recording that would show the proper way of setting up the Travelling Telescope, a project that turned out to give me some of the greatest satisfaction of my trip because I felt I was doing something really useful for which I had exactly the right qualifications.

That evening in Kuala Lumpur I phoned John Percy in Toronto to find out if he could do anything from his end. Luckily it was still Friday morning in Toronto, and so it was possible to still make appropriate phone calls before the weekend broke in. John himself was also under some pressure as he was about to depart for Europe himself, but he reassured me that he would do what he could, and that he would try to leave word with me on his progress. Two nights later Maire Percy called to let me know that the telescope had been bumped at Heathrow to make way for a backlog of other cargo, but that there was a good chance that the telescope would arrive in Singapore Tuesday, two days hence. Luckily, Bob Garrison had warned me before departure time to be prepared for trouble even with assured cargo space reservations, and so the non-arrival of the telescope turned out not to be the shock it might otherwise have been.

By good fortune, it turned out that the Malaysian National University already owned an underutilized 8-inch Meade, and this was made available to me to act as a stand-in for the Travelling Telescope. Although not as well equipped as the IAU's Celestron (its equatorial wedge, for example, was not fitted with the fine adjustment controls required for precision alignment), its almost identical design enhanced its usefulness for interim training. I demonstrated it in class, and in the evenings we took it back to our residence in Kuala Lumpur, where the keeners used it after supper to learn how to set it up as accurately as possible, and

to try their hand at finding various objects in the sky. The weather was not entirely ideal - muggy tropical skies that had the bad habit of only starting to clear around midnight. Still, we tried our hand with the moon, Jupiter, and some of the famous clusters and nebulae of the Southern sky - omega Cen, NGC 6231, M6, M7, M8.

The Travelling Telescope did arrive in Singapore on Tuesday, 29 May, as Maire Percy had hoped, was shipped on by air to Kuala Lumpur, where its arrival was confirmed on the following day. Now came what was perhaps the most frustrating period of my stay - the daily hope that I would finally have the telescope in my hands so I could actually start training students so they would be sufficiently conversant in its use by the time I was scheduled to leave the following week. The extraction of the instrument from customs turned out to be agonizingly slow, as the necessary paperwork worked its way through the usual system of university administrators, brokers, airline agents, and customs officials. In the meantime, I introduced the telescope's instruments as best I could by means of overheads and verbal instructions, and in the evenings we continued to use the University's Meade for visual observations.

By Friday, the telescope had still not cleared its bureaucratic hurdles, and with that fact, the opportunity of introducing it before we moved south to the Malaysian Maritime Academy (ALAM) in the vicinity of Melaka also evaporated. The telescope was now set to be picked up from the Kuala Lumpur Airport on Saturday morning, and, with that purpose in mind, Professor Baharudin Yatim of the Physics Department of the Malaysian National University (UKM) and I drove out to arrange the final clearance, and to meet the van that had been despatched to drive the telescope back to the University. This was a critical moment, as it was at this time only that we would find out if the telescope would clear customs without duties or the financial guarantees that might be required to back our assertion that the telescope was only on a temporary visit and would be re-exported. We finally saw the telescope sitting in the handling agent's warehouse, but still had to wait for final clearance through various offices. After sitting around for several hours, we made a fatal error that deprived us the use of the telescope for yet another day: we decided to go and have lunch! When we got back, the University Van had come and gone and picked up the telescope for destinations unknown!

We returned to the residence in Kuala Lumpur where the members of the School were getting ready to depart for the Maritime Academy and the next stage of the programme. Phone calls to the University established that the driver of the van that had picked up the telescope had gone home for the weekend and was unavailable. While the bus carrying most of the School's participants carried on to the Maritime Academy, some of us stopped off at the University to see if we could locate the telescope. We did - in the University Vehicle parking lot, locked up in the parked van that had picked it up from the airport, and the driver gone for the weekend! Not expecting that anything further could be done until Monday morning, we set out for the Maritime Academy as well.

The next morning found a most pleasant surprise: Just as we were about to leave for a day at the beach, Professor Baharudin drove up in the notorious van and, to everybody's pleasure, delivered the telescope into our hands. Somehow, he had managed to get the keys to the van, and had had the kindness to take it on himself to drive it down to us. I could finally get down to the business of training as many people as possible, so that I could leave in place a sufficiently solid foundation to allow the telescope to be profitably used after I left.

I spent the few nights that were left until my departure giving crash courses in precision aligning the telescope, and in the use of its major instruments, the 35mm camera (a Canon F), the Optec photometer, the mini-spectrograph, and the cold camera. Here I received much support from the students who had already learned to set up the Meade back in Kuala Lumpur, and from David Allen from the AAO in Australia, who looked after the supervision of the Meade, which we were also using, and generously shared his experience with all of us. During the day, I set up the telescope on the sun, and several students took photos which they then developed in the darkroom I had set up in the kitchenette of my room. Some

successful solar photos were produced in this initial stage, and I felt the students who took them were very pleased with these concrete results of their labours. One thing we did find out was how awkward it can be to use a telescope at the equator that was designed by people with mid-latitude mindsets. Although we had built a wedge that would allow us to align all the way down to 0 deg, we ran into difficulty when we were pointing the telescope north of the equator; the camera came so close to the tripod that it was extremely difficult to get a comfortable view through the viewfinder. I imagine that with time and experience observing procedures can be developed that will ameliorate some of these inconveniences. Aligning the telescope on the opposite pole, and suitable viewfinder attachments are two examples that come to mind.

Unfortunately, we continued to be plagued by trouble. After operating smoothly for a couple of days, the Travelling Telescope's drive began to act up, operating only intermittently, and then not driving at all. The noises it was making suggested a mechanical problem at first, but I could find no obvious evidence for this. Professor Baharudin suggested that the problem was electronic, and centred in the drive control circuit located in the paddle. He seemed to think this was not unusual, and agreed to follow this up at the University's electronics shop, and with a local Celestron distributor. The other mishap occurred with the regulated power supply that is used to charge the large deep-cycle battery that powers the telescope and all its accessories. On our first charging attempt, we suddenly noticed black smoke billowing from the charging unit, and discovered that one of the large capacitors in the power supply had blown. This too did not perturb Professor Baharudin, who seemed to regard this as a normal occurrence. I had to leave both these problems in Professor Baharudin's hands, as I was leaving the next day, and so have no idea how they might have been caused. The suggestion was made that the tropical temperatures might have been responsible - I recorded a temperature of 54C in the sun - but I can't help wondering whether in the case of the power supply we overlooked some important design consideration in making the system 220v-compatible. This part of the story will have to be filled in by others.

I do not know to what use the telescope was put after I left, or what sort of results were obtained with it. I am therefore unable to make an overall assessment of the telescope's trip. I can, however, report two ways in which I felt the telescope had a positive and substantial impact. Two students attending the School had been assigned specific agendas relating to small telescopes. One had been asked to explore ways of developing the potential of the Malaysian National University's (UKM) 8-inch Meade; the other student, from Bandung Observatory in Indonesia, had the task of making recommendations to his institution for the purchase of a small telescope. Both were thus keenly interested in the Travelling Telescope and its capabilities, and spent much time with me, helping not only to set up and dismantle the telescopes (both the UKM Meade and the IAU's C-8), but also poring over the manuals and literature I had taken with me, and making copies of all my notes and overheads.

The other major impact my presence with the Travelling Telescope had was the production of the instructional video that I have already mentioned above. For this we used UKM's Meade, and filmed each stage of the setting-up procedure, with suitable closeups where appropriate. The production of this video had the additional benefit of also training the two technicians of the Physics Department who had responsibility for the telescope, and who acted as the stars (in the cinematic sense) of the video. This activity was a real pleasure, as the technicians showed great interest and keenness in picking up the finer points of setting up that I was able to communicate to them. According to Professor Baharudin, a major area of need at UKM was the development of better training and opportunity for technical staff, and it seems to me that this may be an additional way in which the Travelling Telescope may be effectively used.

I conclude with two suggestions for further consideration. One is the possibility of issuing an ATA Carnet for the telescope in order to facilitate its passage through customs. This would require the posting of a bond with the Canadian Chamber of Commerce, for which funds matching the telescope's value would have to be found, but it would relieve the host country of any similar financial onus. On its Malaysian trip, the major holdup turned out to be the airline (Air Canada) and not customs, but we did not know until the

telescope had cleared customs in Kuala Lumpur whether the telescope's Malaysian hosts would have to come up with a \$10,000 bond. Because no other arrangement had been made (no funds, no time), our Malaysian hosts, on the advice of Malaysian customs, had been reluctantly prepared to post such a bond. In the event, it was not needed, but this outcome was by no means certain.

The other suggestion I have is that either the person travelling with the telescope, or somebody connected with the school or programme to which it is being sent, be somebody with experience and motive for the work that is to be done with it. This would mean a faculty member who can supervise the use of the telescope for the entire duration of its stay in a host country, possibly working with only a small group of students, so that usable results are produced. I feel this aspect of the telescope's Malaysian trip was not well prepared for or coordinated, and, at least for the duration of my 10-day stay, general interest in the telescope notwithstanding, no clear focus for its use emerged. In addition, I believe if the telescope is to be actually used for serious research, it must remain in one location for a much longer period of time than the three weeks' duration of a School for Young Astronomers.

Dieter W. Brückner
University of Toronto

VATICAN OBSERVATORY SUMMER SCHOOL

Every two or three years, the Vatican Observatory holds an intensive Summer School on Astronomy and Astrophysics for graduate students from all over the world. Scholarship assistance is provided for students who need it. If you (or one of your students) is interested in attending the 1993 Summer School, please write for information to the Vatican Observatory, I-00120 Citta del Vaticano.

IF YOU WISH TO CONTINUE TO RECEIVE THIS NEWSLETTER ...

All members of IAU Commission 46 will receive this Newsletter. All other individuals and institutions who wish to receive this Newsletter in the future must complete this form and send it to the Editor: Dr. John R. Percy, Erindale Campus, University of Toronto, Mississauga, Ontario, Canada L5L 1C6.

I wish to receive the Newsletter of IAU Commission 46

Name:

Address:

.....

.....

.....

A STUDY OF STUDENT TEACHERS' IDEAS ON SIMPLE ASTRONOMICAL CONCEPTS

In this study we worked with twenty nine (29) student teachers in the last year of their studies, with ages ranging from twenty to thirty-four years old. It consisted of three parts. The first was a pre-course diagnostic in which we asked the students to write and to draw about what they thought were the reasons for the occurrence of day and night, the seasons and the phases of the moon. This diagnostic was then followed by personal Piagetian-type interviews, extending the written part.

The second part was an eighteen hour (18h) course, distributed in six weeks, in which the treatment of the three phenomena had this sequence: i) description of the observable daily phenomena; ii) astronomical explanation, iii) interpretation of the observable daily phenomena from the astronomical point of view, iv) realization of very simple observational and classroom activities (sundials, moon observations, construction of models to scale, measures of the varying intensity of received radiation with solar altitude, etc.), and v) discussion and didactical proposals to possibly transfer to primary school.

The last part was a post-course diagnostic with the same structure as the pre-course diagnostic.

This was a great experience in which we learned a lot; we found very interesting models used by the student teachers to explain those phenomena. We continue working in 1991 on a very similar plan in order to improve the future application of this study.

We are members of the "Grupo ESQUEL de Educación en Física" from the Universidad Nacional de la Patagonia, and we live in Esquel, a small city (23000 inhabitants) 2000 kilometres to the south of Buenos Aires, in the Los Andes mountain range. Esquel is an important educational centre in west Patagonia with a University, seven secondary schools, a tertiary level school which trains primary teachers and several primary schools.

We will be pleased to share this work and future work with anyone who is interested. If you want, please contact us at this address.

Néstor Camino and Jose Cracco
Universidad Nacional de la Patagonia
(9200) Esquel, Chubut

EDUCATION AT THE 1991 IAU GA

The following articles appeared in the daily newspaper of the 1991 IAU GA, edited by Patrick Moore.

International Colloquium in Montevideo

From 16 to 20 July an international colloquium, "Astronomical Culture in Modern Society," was held in Montevideo, Uruguay, with more than 100 active participants and a large number of other people. Though this was not an official IAU colloquium, many IAU members were present, representing eleven countries. Messages from others were received, regretting their inability to take part.

Almost 60 papers were presented, all of which will be published in *Proceedings* in the near future. The colloquium was bilingual (English and Spanish) with simultaneous translation. Topics covered included the popularization of astronomy, ecological problems, the teaching of astronomy, and the role of the amateur in astronomy today.

Gonzalo Vicino
Inspector of Secondary Education, Montevideo

Working Group on the Worldwide Development of Astronomy

In one sense, the IAU has always been concerned about the worldwide development of astronomy, so why do we now need a working group devoted to that topic? The answer can be seen by looking at the growth of the Union - not in terms of individual members, but in terms of adhering countries. In recent years many of the countries joining the Union are newly-independent, small and supporting only a few astronomers, who have few facilities for research and often feel isolated from colleagues. Even well-established astronomical communities, in some of the larger countries that have long been self-governing, sometimes experience difficulties because of political and economic circumstances, particularly the non-convertibility of currencies. Those of us fortunate enough to be free of these difficulties often forget the problems that so many of our colleagues have to overcome. The new Working Group, established at the last GA in Baltimore, aims to help colleagues less favourably placed, to support the beginnings of astronomy in countries not yet adhering to the Union, and to increase the awareness of the rest of us of the worldwide situation of astronomy. We will be holding a meeting to introduce the Group to the whole Union. We want to tell you what the Union is already doing, for example by Visiting Lecturers Programmes and Schools for Young Astronomers. We also want you to hear what astronomers in various parts of the world are doing to help themselves - there will be particular reference to India and to Latin-America. Above all, we want the meeting to act as a sounding-board for the concerns of the people whom we most want to help. The world has enough people in it who know what is good for everyone else, and we do not want to be like the Boy Scout who helped the old lady to cross a road that she did not want to cross. We hope, therefore, that the programme will stimulate discussion both during the meeting and after, that some of you will join the new Working Group, and that all of you will help us to define our task more clearly.

A.H. Batten
Herzberg Institute for Astrophysics, Canada

Astronomy in the Media

A meeting of astronomers, Argentine journalists and other representatives of the news media was held in the National Senate in Buenos Aires on Friday, 19 July. It was convened and organized, to coincide with the General Assembly, by Dr. Laferriere, President of the Science and Technology Committee of the Argentine Senate: the theme was "the popularization of astronomy". There were four speakers: Dr. Horacio Tignanelli (La Plata Observatory), Horacio de Dios and Diane Cazaux (Argentine journalists) and Patrick Moore (Britain).

There was an interesting exchange of views. All the speakers were in agreement that the spread of astronomical knowledge is extremely important, and that it is essential to present scientific facts in language which can be understood by those who have no previous knowledge. Dr. Tignanelli, who has written several popular books, emphasized the need for introducing young people to science, and he regretted that astronomy was not taught in Argentine schools. Mr. de Dios felt that there was still a "generation gap" in language, and that it was important to concentrate upon teaching the teachers. Patrick Moore discussed the popularization of astronomy in Britain, particularly with regard to television, and pointed out that the forthcoming General Assembly would present a great opportunity for the Argentine news media. He hoped that the Assembly would be fully covered in the Press and on television.

Following a question-and-answer session, Dr. Laferriere closed the meeting by thanking all those who had taken part. He agreed that the General Assembly should be fully reported, and was sure that it would be of great help in popularizing astronomy in Argentina.

Amateurs and Professionals Meet

As a preliminary to the opening of the General Assembly of the IAU, a joint meeting of professional and amateur astronomers was organized on Sunday, 21 July at the Fundación Campomar in Parque Centenario, Buenos Aires. The main guest speakers were Dr. David Crawford ("Past, present and future of amateur-professional relations"), Dr. Patrick Moore ("The work of the amateur in modern astronomy"), and Dr. William Liller ("Hunting for novae for pleasure and for little money").

David Crawford stressed that amateur astronomers carried out their work for enjoyment, and were not paid for doing so; amateurs came from every walk of life - historians, lawyers, even politicians. Very valuable work could be done, and in addition there were some people who could be regarded as semi-professionals, such as planetarium staff and science writers, who were directly connected with astronomy and yet were not professional astronomers. There were many excellent organizations to coordinate amateur work. Dr. Crawford then turned to the question of light pollution, which was, he said, a very serious problem; we were in danger of losing our view of the night sky, and unless action were taken it might be that future generations would be restricted entirely to theoretical astronomy. He referred to the International Dark-Sky Association (IDA), whose membership was steadily increasing, and appealed for extra support.

Patrick Moore, the next speaker, outlined the work of the amateur, which was, he said, of tremendous importance; amateurs could undertake observations which professionals did not want to do, had no time to do, or genuinely could not do. He described observations of the Moon (his own special subject) and then the planets, but stressed that the modern amateur, unlike his predecessor, has to be really specialized, and will probably make use of highly sophisticated electronic equipment - though there are some "dinosaurs" (such as himself) who continue to concentrate upon visual observations of bodies in the Solar System. He commented that the important white spot on Saturn had been discovered in 1990 independently by two American amateurs.

William Liller (speaking in Spanish) described the ways in which novae and supernovae are discovered by amateurs, who now have an enviable record in this field. Early detection of novae and supernovae is important, because professionals can then take photographs of their spectra during the early stages.

Following a short interval, there were papers from Latin-American amateurs of the Amigos de la Astronomía. These dealt with the photometry of asteroids (R.G. Hutton), the observation of supernovae (M.L. Alvarez), variations in the atmospheric activity of Jupiter (R. Mackintosh and G. Rodríguez), variable star work (E.R. Minniti), and radio astronomy at 612 MHz (G. López). Finally, David Crawford discussed the concept of a global network of astronomers, including those equipped with small telescopes.

At the end of the meeting, a reception was held at the oldest observatory in Argentina, now the headquarters of the local Society, which is equipped with a 23-cm refractor originally brought to Argentina to observe the transit of Venus of 1882 (though, unfortunately, the skies on the day of the transit were cloudy). In conclusion, the Chairman said that the meeting had been a great success, and he looked forward to continued close cooperation between the amateurs and professionals in Argentina and elsewhere.

Comment: Education in Astronomy

The IAU is primarily an association of research astronomers, meeting to promote astronomical research and to plan international cooperation. Part of the international cooperation is to assist members with limited resources to join in front-line research away from home, either by attending conferences or, occasionally, by spending some time in a host observatory. Commission 38 has given twenty-five travel grants for this purpose since the last General Assembly. The IAU has had little difficulty in persuading member countries that part of their financial contributions may properly be used in this way.

A more contentious area of the IAU activity and expenditure is directed towards education in astronomy in countries where there is little or no effective astronomical research. The intention is to encourage the teaching of astronomy, especially at a level which might produce young research astronomers. Commission 46 has had some success in this, through the Visiting Lecturer Programme and the International Schools for Young Astronomers. These programmes are, however, necessarily very limited in scope, and the IAU has to decide whether to continue providing finance for them.

Personally, I hope that the IAU will direct its efforts toward international organizations such as UNESCO, and toward the national adhering organizations, persuading them of the value of including astronomy as a part of education at all levels, from primary school to graduate research. It is the hard truth that we cannot ourselves have any significant impact on the world-wide need for education by sending our own astronomers out to teach. But we could, and should, make the case for astronomy in education on every possible occasion, both nationally and internationally.

Our practical programmes could then be in response to the needs of any organization that is persuaded by our case. Rather than take on the burden of educating the world, we could demonstrate the way in which it should be done, preferably without adding to the financial burdens of the IAU.

F. Graham-Smith
University of Manchester, UK

LISTING OF ASTRONOMICAL SOFTWARE

An annotated listing of astronomical software, featuring information about more than 150 different programs (organized by type), is now available from the nonprofit Astronomical Society of the Pacific. The listings include simulations, planetaria (or star charts) on computer, databases, calculation aids, games, telescope and observing aids, tutorials, lesson plans, and solar system displays. Also included are addresses and telephone numbers of vendors, sources and dates of reviews, and a good introductory reading list of books and articles about astronomical software.

To receive a copy of the 10-page packet, send a donation of \$4.00 to cover costs of printing, mailing, and handling to: Astronomical Society of the Pacific, Software List Dept., 390 Ashton Avenue, San Francisco, CA 94112. Outside the US please add \$3.00 to cover additional postage.

VIDEO ON ROBOTIC ASTRONOMY

A new video program from the ASP documents the revolution in astronomy now being achieved with the use of robotic (automated) telescopes - which can operate all night without the need for a human attendant. Made by the South Carolina Educational TV Network, the 60-minute video was shot on location at observatories around the country and profiles both professional and *amateur* astronomers who are pioneering the use of robotic instruments for research and education. The program shows how a group of engineers, without much formal training in astronomy, is using new developments in computers and electronics to make small robotic observatories affordable for hobbyists and schools; thus encouraging a much wider group of people to participate in astronomical research and discovery. The VHS format video is accompanied by a booklet with background information, a good introductory reading list, and a set of educational activities. To order send \$29.95 (which includes postage and handling) to the ASP at the address above. California residents, please add sales tax. Outside the U.S., please add \$4.00 to cover additional postage and remit in U.S. funds.

VIDEO ON MAPPING THE GALAXIES

A new videotape showing and explaining the surprising new maps of the large-scale structure of the universe that astronomers are constructing is now available from the ASP. The 8-minute video is narrated by one of the project's directors, Dr. Margaret Geller, of the Harvard-Smithsonian Center for Astrophysics, where the film was produced. After explaining the project, the video focuses on a dramatic computer-animated tour of the deep "slices" through the universe astronomers have mapped and the remarkable soap-bubble-like structures (with filaments of galaxies surrounding great voids) that they have found. The video (in VHS format) is accompanied by a nontechnical article about the mapping project by Margaret Geller and an introductory bibliography on the origin and structure of the universe. The package is available for \$32.95 (which includes shipping and handling) from the ASP at the address above. California residents must add sales tax. Outside the U.S. please add \$3.00 for postage and remit in U.S. funds.

TEACHING OF ASTRONOMY IN THE ASIAN-PACIFIC REGION

Bulletin #3 of this publication contains articles on "Teaching SETI: Where the science of Astronomy meets the science society" by D.E. Tarter, "Astronomy careers in Australia" by R. Otrupcek, "Planetariums in Japan - An Overview" by Y. Yamada, "Introducing astronomical elements in secondary schools in Poland" by C. Iwaniszewska, "A difficulty in teaching planetary motion" by D.V. Sathe, "Teaching of astronomy in the planetariums" by S. Itoh, and "Report on permanent seminar of astronomy in Catalonia (Spain) by R.M. Ros. This publication can be ordered from Dr. Syuzo Isobe at the National Astronomical Observatory, Mitaka, Tokyo 181, Japan.

NATIONAL REPORTS (continued)

TEN YEARS OF ASTRONOMICAL EDUCATION IN CHINA

Astronomical education in China was generally at a recovering stage during 1977 to 1981 and its principal aim was to cultivate undergraduate students at that time. Since 1982, some graduate programs leading to either Master's or Ph.D degrees have been established in many institutes; these institutes include the following four universities and five observatories, which are Nanjing University, Beijing Normal University, Beijing University, Chinese University of Science and Technology, Beijing Observatory, Purple Mountain Observatory, Shanghai Observatory, Yunnan Observatory and Shaanxi Observatory. The programs established in these institutes are listed as follow: there are four doctoral programs of Astrometry and Celestial Mechanics, six doctoral programs of Astrophysics and three postdoctoral programs of Astronomy and Astrophysics. On the other hand, about 400 students have graduated from universities with their B.S., more than 300 graduate students with M.S. and nearly 60 graduate students with Ph.D have graduated from these mentioned four universities and five observatories in the past ten years. As well, some excellent persons with Ph.D degrees either from this country or from others have been enrolled in postdoctoral programs. Being youthful, well-trained and creative, all these graduate students and postdoctoral fellows have been an indispensable force to each astronomical institution in its education and its scientific research. They have instilled new blood to the astronomical cause of China.

As a kind of educational reform, the curricula and the teaching materials for undergraduate students were constantly renewed and more than 20 kinds of new teaching materials were formally published in the past ten years. These universities paid much attention to the cultivation of students' capabilities of experiment and computer use as well as to the fundamental education of mathematics, physics and astronomy. As well, a complete system of cultivation of graduate students has gradually formed. The institutes each established a graduate education group with its overall educational plans; each offered a two-level graduate degree curriculum. The emphasis of the curricula was laid not only on the fundamental knowledge, but it was also laid on the nature of science and its advancement. The bulk of these courses were principally adapted from the latest results of international standards in the corresponding areas. All these graduate degree curricula were often arranged to be concentrated in one or one and a half years. Especially, some of these courses usually became part of the tutors' programs so that the students could also be trained to do some research work in their systematic studies. In fact, some graduated students have already undertaken the bulk of these programs. The institutes also offered young people the opportunities of entering high-level academic communications. For example, they often sent specialists to give lectures to each other, and often invited foreign specialists to give lectures in China. All this broadened the young people's knowledge and let them contact the advancement of their research field as soon as possible.

Communication with other countries was also highlighted. Many young persons have been systematically sent abroad for Ph.D programs in some famous universities and some of them have been back to work with their degrees. However, to cultivate young people in this way is still problematical and needs further study and development. In a word, a varied approach in the cultivation of young people will lead astronomical education in China to an international standard in every education level, so that it will be viable in the fast-developing astronomy world.

L. Liu
Department of Astronomy
Nanjing University
Nanjing 21008
China

COLOMBIA (addendum)

In January of 1989, I began teaching courses in astronomy, at the university level, for Physics and other science students. During that year, I developed a plan for the Astronomy Concentration within the Department of Physics that included a cycle of introductory Astronomy courses for upper level Physics majors and several potential research projects. During the last six years a great deal of interest in Astrophysics has been stimulated in our department by the activities of the university's amateur Astronomy club, the Centro Halley, and in the last two years, several dozen students have attended the Astronomy courses, and four of these are considering graduate level education in Astrophysics. One Physics student is working under my guidance in order to complete his undergraduate thesis based on a study of polarization and flux variable extragalactic radio sources, and another has recently completed a small project in which he has identified the magnitudes and colors of a sample of approximately 100 young stars and their companions in the Taurus-Auriga cloud complex. We have been extraordinarily fortunate to have had very generous and considerate contacts in the United States and elsewhere who have supplied us with data, software, and a great deal of literature, including a partial collection of Astrophysical Journals from the 1980's. This semester I am teaching Stellar Astrophysics and an Astrophysics Seminar for the most advanced students and they would like it to be known that the statement in your Newsletter, "No essential change in astronomy education in Colombia has happened in the period reported.", is rather far off the mark! Precisely during the period reported we have been working very hard to improve (to create!) astronomy education here in Colombia. For the sake of these students, I would appreciate it greatly if you could publish this brief addendum.

Lisa A. Prato
Departamento de Física
Universidad Industrial de Santander
AA 678
Bucaramanga, Colombia

ASTRONOMY EDUCATION IN PARAGUAY

GENERAL INFORMATION

Much of the efforts to improve our Astronomy education are from few active interested university professors, students, and some amateur astronomers. IAU has helped much through the VLP, and provides us useful reading materials. It is sad to say that little help and support for astronomy are provided from the government. Although changes toward democracy are much supported, still much should be done to improve basic science education at all levels in this country.

UNIVERSITY

IAU - VLP has been established at the Universidad Nacional de Asuncion and Universidad Catolica N.S. de la Asuncion in 1987. It has started with two general courses: "General Astronomy and Astrophysics" by Dr. Elsa Recillas (UNAM, Mexico) and "General Radio Astronomy" by Dr. Maria Cristina Martin (IAR, Argentina). A second agreement has been signed in 1989 for an extension of the VLP for two more years. The Universidad Catolica N.S. de la Asuncion has not signed it, but happily some of their students still continue taking the VLP courses. Two other courses were given at the Instituto de Ciencias Basicas, (now, renamed Facultad de Ciencias Exactas y Naturales) Universidad Nacional de Asuncion. "Galaxies and Cosmology", the third VLP has been given in the spring of 1989 by Dr. Jose Luis Sersic (from Universidad Nacional de Cordoba, Argentina) has been a most successful course (for comments see Commission 46's Newsletter and IAU Bulletin No. 64). Last spring 1990, another course on Radio Astronomy has been taught by Dr. Carlos Olano, (IAR, Argentina). Also two radio engineers from IAR came each for two weeks to

instruct and advise a project to build a small radiotelescope. About a dozen students attended these lectures; most of them are from the Physics Department; others are engineering students. Most of them got good marks in the exams. But these courses are going somewhat slowly because of the difficulties of our chief Dr. Sahade to find instructors for two planned courses (the next is about Optics and Instruments for Astronomy). One of the VLP students and an Electronic Engineer from F.C.E. y N. have been invited as passants at two Argentina astronomical institutions. We expect then to do their best.

Next August, we expect Dr. Donat G. Wentzel to visit. He will deliver four exciting lectures on Sun and MHD for our VLP. IAU has promised to provide funds in order to buy a P.C. for our VLP students. We thank Dr. Kozai, Dr. McNally, and Dr. Sahade for their efforts to help us. We expect to have the IAU Travelling Telescope before the end of the year. Dr. John Percy is doing his best for it. We thank Dr. Batten and Mr. Brückner for the many useful books they sent. These books are a gift from the Canadian Astronomical Society (CASCA). We also thank ESO which has sent a donation of three years of the Astrophysical Journal, and to Sky and Telescope which gives free issues to our program.

SECONDARY SCHOOLS

The current curriculum contains topics about some basic Astronomy. These are, the seasons, the phases of the Moon, eclipses, the Solar System, and other components of the Universe, ideas about the theories of the formation of the Solar System and Cosmology. These are integrated with other topics of science through three National Science courses which are given for the first three years of high school. In the last year of Mathematics, some Astronomy is given as cosmography, motions of the Earth, Moon and Solar System bodies.

The Instituto Superior de Educacion of the Ministry of "Educacion y Culto", offers two course for training high school teachers in Astronomy for one semester. The training instructor is the one who writes this report.

ELEMENTARY SCHOOL

Very little Astronomy is usually given at this level. This depends on the interest of the teacher and the contact they have with amateur astronomers or people trained at an upper level. Few primary schools have a library. The students of lower economic levels and those who live in the country often use newspapers' "scholar pages" to find some information about Astronomy and general sciences.

PUBLIC EDUCATION

Amateur astronomers are quite active through newspapers, radio and T.V., teaching about astronomical events. The "Club de Astrofísica del Paraguay" offers short summer and winter courses for the interested public. Also, they offer star parties to our people at appropriate times (eclipses, planetary conjunctions, and other celestial events). There is a private observatory open to the interested public close to Asuncion. It is named "Buenaventura Juarez", after a XVIII Jesuit priest, the first astronomer of this continental region. "Astrococos", an astronomical magazine, is periodically published by the Club members.

Alexis E. Troche-Boggino
Facultad de Ciencias Exactas y Naturales
Universidad Nacional de Asuncion

THE NEW ASTRONOMY PROGRAM OF STUDIES AT LA PLATA UNIVERSITY

INTRODUCTION

The origin of La Plata Observatory goes back to 1883; it became part of La Plata University when the latter was created in the early years of this century. The School of Astronomy and Related Sciences was founded in 1935, and reshaped in 1950 with separate careers of Astronomy and Geophysics. During its 55 years of existence the School has educated about one hundred and fifty astronomers, and almost two thirds of them have obtained the PhD degree. Although the number of graduates has remained stable and close to its historical mean of about three per year.

Several different programs of studies were successively used since the creation of the School. The one in use over the past few years had several shortcomings: 1) A rather encyclopedic character that demanded many different courses and, thus, a long time to complete them; 2) A somewhat rigid structure that allowed only two possible choices (either Astrophysics or Astrometry and Celestial Mechanics; 3) The most modern topics of Mathematics and Physics had not been incorporated in the program.

Accordingly, the Academic Council of the School appointed a Committee (formed by the authors of the present note) to design a new program of studies. The proposal of the Committee was approved by the Academic Council of the School and by the Superior Council of La Plata University in 1990, and adopted as the new program since March 1991.

THE NEW PROGRAM

The basis of the new program is a three-year mandatory set of courses with strong emphasis on Mathematics and Physics. After that, with the guidance of an advisor (a professor), the students have ample freedom to choose the courses they prefer to complete their career. This second phase of the career includes five one year courses (or the equivalent one-semester courses), a seminar (where the lectures are given by the students themselves, under the guidance of a professor), and an MSc thesis.

The above requirements make for a five-year period, on the average, to get the MSc degree. Later on, after completing additional courses and a PhD thesis, the students can obtain the PhD degree.

The mandatory courses of the initial three-year period are as follows: FIRST YEAR: Calculus I (one-year), Algebra (1-y), General Astronomy (1-y), Physics I (one semester), Physics II (1-s); SECOND YEAR: Calculus II (1-s), Linear Algebra (1-s), Physics III (1-s), Computation (1-s), Modern Physics (1-s), Special Mathematics I (1-s), Spherical Astronomy (1-s), First English Exam; THIRD YEAR: Special Mathematics II (1-s), Analytic Mechanics (1-s), Stellar Astronomy (1-s), Numerical Analysis I (1-s), Celestial Mechanics I (1-s), Stellar Systems (1-s), Introduction to Theoretical Astrophysics (1-s), Applied Statistics (1-s), Second English Exam.

The last two years include three one-year (or their equivalent one-semester) courses in the FOURTH YEAR, and two one-year (or their equivalent one-semester) courses and a Seminar in the FIFTH YEAR.

The students can choose the courses in the last two years with great freedom; they can take them at other schools of La Plata University, or even at other universities. To mention just a few possibilities, within La Plata University itself are offered, for example, courses on Quantum Mechanics, Electromagnetism and Statistical Mechanics (at the Physics School), and on Numerical Analysis II (at the Mathematics School). Besides, the School of Astronomy and Astrophysics itself offers many courses which, although not mandatory, can be chosen by the students to complete the fourth and fifth years. They are: Electronics I, Stellar Atmospheres, Stellar Interiors, Stellar Dynamics, Astronomical Optics, Radioastronomy, Differential Equations, Celestial Mechanics II and Practical Astronomy.

CONCLUSION

The new program has several features that are not very common at Argentine universities, even though they are standard at foreign universities. Rigid programs tend to be the norm in Argentina, and when students are allowed to choose courses, these usually make up only a tiny fraction of the total number of (mainly mandatory) courses; besides, the possibility to choose courses, when offered, is usually limited to students who already have an MSc degree and are working toward their PhD. Perhaps as a result of that, the student advisor is also infrequent at Argentine universities. Although our plan, with its many possibilities to choose different courses, clearly demanded advisors, we had also another motivation to introduce them in our proposal. In Argentina there are almost no possibilities open to an astronomer other than to work in scientific research and, at least during the initial years of their careers, our young PhDs have to work under the guidance of an advisor. We thought that the student advisor had the additional benefit of establishing an early contact between students and professors who, later on, could become their MSc thesis advisors, PhD thesis advisors, PhD fellowship advisors, and so on. We reasoned that if a student-professor pair do not feel comfortable working together it is better to realize that as early as possible in the student's career.

The new program eliminated a large number of mandatory courses which, although well in line with the Argentine tradition of encyclopedic teaching, demanded many years of study and considerable effort from the student. In our opinion, much greater benefits will be obtained by applying that effort to fewer subjects which are of direct interest to the student. For example, it is obvious that a student who wants to work in Radioastronomy should take courses on Electronics, but we doubt very much that a course on Electronics could be of any use to somebody who wants to work in Theoretical Astrophysics and who might find of much greater value a course on, say, Stellar Interiors. With the old program, both the future radioastronomer and the future theoretician would have had no choice, but to take both Electronics and Stellar Interiors; with the new program, each one can choose the course that is best suited to their interests. We expect that the smaller number of courses and their stronger specialization will result in young astronomers with, perhaps, less encyclopedic knowledge but a better grasp of the subjects they actually need for their work. Besides, they will get their degrees earlier and will begin to work at a younger age, when more original ideas can be expected from them!

Let us end with a word of caution. The new program of studies should be regarded, in a way, as a computer program: the programmer goes several times through a new program and tries to find as many bugs as possible; nevertheless, the final test is to run the program in the computer and check whether it works as it should. Similarly, while we tried to eliminate from the new program any likely causes of trouble, the final test will come when, now and in the years ahead, it is used and the results come out; in all likelihood, several (hopefully minor) problems will then appear and demand some further improvements. The new program adopted at La Plata is certainly no magic cure to old illnesses; we do believe, however, that it is a more efficient tool than older programs to prepare the new generation of bright astronomers that our country needs.

C. Brunini, J.C. Muzzio and A.R. Plastino
Facultad de Ciencias Astronomicas y Geofisicas
Universidad Nacional de La Plata, Argentina

TABLE OF CONTENTS

Editorial	1
Travels with the Travelling Telescope	2
Vatican Observatory Summer School	5
A Study of Student Teachers' Ideas on Simple Astronomical Concepts	6
Education at the 1991 IAU GA	
International Colloquium in Montevideo	7
Working Group on the Worldwide Development of Astronomy	7
Astronomy in the Media	8
Amateurs and Professionals Meet	8
Comment: Education in Astronomy	9
Educational Material from the Astronomical Society of the Pacific	
Listing of Astronomical Software	10
Video on Robotic Astronomy	10
Video on Mapping the Galaxies	10
Teaching of Astronomy in the Asian-Pacific Region	10
Ten Years of Astronomical Education in China	11
National Report: Colombia (Addendum)	12
National Report: Astronomy Education in Paraguay	12
The New Astronomy Program of Studies at La Plata University	14

AN APPEAL FOR CONTRIBUTIONS

Contributed articles are gratefully received at any time. The articles should be short (four pages or less) and should be interesting and/or useful to readers of this Newsletter. Most readers work at the university level, but are involved or interested in astronomy education at all levels. Possible contributions include.....

- short articles or notes about innovative projects, programs, curricula, courses, activities, equipment, software...
- progress reports on programs and projects of IAU Commission 46
- summaries of conferences
- letters to the editor
- references to articles in other publications (which may be reprinted with the permission of the author and publisher)

Please send your contributions to:

Dr. John R. Percy
 Editor: IAU Commission 46 Newsletter
 Erindale Campus
 University of Toronto
 Mississauga, Ontario
 Canada L5L 1C6