

COMMISSION 46: TEACHING OF ASTRONOMY  
(L'ENSEIGNEMENT DE L'ASTRONOMIE)

Report of meetings, 22, 24, 26, and 30 July 1991

PRESIDENT: Aa. Sandqvist

SECRETARY: J. Pasachoff

First Business Meeting, 26 July 1991

I. MEMBERSHIP

The commission membership, as well as the vice-presidency and organizing committee, for 1991-1994 were discussed, which resulted in the following configuration:

President: L. Gouguenheim;

Vice-president: J. Percy (Newsletter, Travelling Telescope)

Organizing Committee: J. Fierro, M. Gerbaldi (International School for Young Astronomers), L. Houziaux (Newsletter), S. Isobe, C. Iwaniszewska, J. Pasachoff (ICSU-Committee on Teaching of Science), R. Robbins (Astronomy Education Material), Aa. Sandqvist (past president), D. Wentzel (International School for Young Astronomers, Visiting Lecturers Program).

There are three types of membership in Commission 46: National Representatives with duties including national reports and liaison with home countries, regular members and consulting members.

The National Representatives for 1991-1994 are:

Argentina–A. Feinstein; Australia–A. Rodgers; Austria–A. Hanslmeier; Belgium–A. Noels; Brazil–W. Maciel; Bulgaria–N. S. Nikolov; Canada–R. Bochonko; Chile–J. Maza; China Nanjing–K.-J. Feng; China Taipei–C.-S. Shen; Colombia–E. Brieva; Czechoslovakia–J. Siroki; Denmark–H. J. Fogh Olsen; Egypt–A. Aiad; Finland–H. Oja; France–L. Gouguenheim; Germany–W. Schlosser; Greece–L. N. Mavridis; Hungary–G. Szecsenyi-Nagy; India–S. Ramadurai; Indonesia–B. Hidajat; Ireland–J. Haywood\*, Italy–E. Proverbio; Japan–S. Isobe; Korea Rep.–J.-O. Woo; Malaysia–M. Othman; Mexico–S. Torres-Peimbert; Netherlands–L. L. E. Braes; New Zealand–E. Budding; Nigeria–S. Okoye; Norway–J.-E. Solheim; Paraguay–A. E. Troche-Boggino; Poland–C. Iwaniszewska; Portugal–J. Osorio; Romania–E. Botez; South Africa–A. Fairall; Spain–M. Catala-Poch; Sweden–Aa. Sandqvist; Switzerland–L. Martinet; United Kingdom–D. Clarke; Uruguay–J. Fernandez; USA–J. Pasachoff; USSR–E. Kononovich; Vatican City State–M. F. McCarthy; Venezuela–N. Calvet; Yugoslavia–J. Milogradov-Turin.

Lucienne Gouguenheim, executing one of her vice-presidential responsibilities, had written all the members to survey them. Out of 121 members she received 79 answers. She will follow up with individual letters to redefine the active list; members not answering the follow-up letter will be terminated at the end of the triennium 1991-1994. John Percy suggested that National Adhering Organizations be notified of the National Representative on the Commission list and asked to confirm their representative.

The following previous National Representatives become regular members: S. Ferraz-Mello, H. F. Haupt and H. Zimmerman; the following are new regular members: M. T. Brück,

C. R. Fleck, M. K. Hemenway, S. Lai, Q. Li, J. Narlikar, I. Nha, L. I. Onuora, U. S. Pandey, Z. Pokorny, N. S. R. Prabhakaran, J. Sahade, M. A. Seeds, D. Sukartadiredja and S. Wang; the following members have retired from the Commission: J. Kleczek, M. Rigutti and B. Sevarlic; the following are consulting members for 1991-1994: P. S. Bretones, V. Gonzalo, B. W. Jones, J. Nevatia Chordia, R. Szostak, H. L. Tignanelli and P. Viet Trinh.

## II. INTERNATIONAL SCHOOL FOR YOUNG ASTRONOMERS (ISYA)

Eighteen schools have been held on four continents since ISYA was inaugurated in 1966: Africa, Asia, Europe and South America. They were in Argentina (twice), Brazil, China, Cuba (in 1989), Egypt, England, Greece, India, Indonesia (twice), Italy, Malaysia (in 1990), Morocco (in 1990), Nigeria, Portugal, Spain and Yugoslavia. Their purposes include advancing astronomy in astronomically developing countries by broadening the perspective of students and making local astronomy prominent. The secretary for all 18 schools has been Josip Kleczek, who is now retiring. *The Commission voted to express its appreciation to Josip Kleczek for the tremendous amount of work he has done over the years on behalf of the Commission and the IAU, and to send him a letter on this matter.* Donat Wentzel was then appointed as the new secretary for ISYA and Michelle Gerbaldi as assistant secretary. Hosts for future ISYA are China (summer 1992), India (tentatively in December 1992) and Egypt (under discussion).

## III. VISITING LECTURERS PROGRAM (VLP)

Don Wentzel, the coordinator of the VLP, presented the status of the Peru and Paraguay VLPs. The IAU pays only travel support for the VLP. For VLP lecturers, the host organization often pays supplements, including housing. Such lectureships are for 3-month periods, and it is often difficult to get suitable lecturers. There is some concern about how to assess the long-range effects of the programs. The chairman, W. N. Christiansen, of the organizing committee of a possible future China VLP has retired and will most likely be replaced by J. Wampler.

## IV. TRAVELLING TELESCOPE (TT)

John Percy, who is the project coordinator, reported on the Travelling Telescope. The TT was funded in 1986 by the Canadian Commission for UNESCO and exhibited at the IAU Colloquium #105, Williamstown, and the IAU General Assembly, Baltimore, in 1988. Packed in 4 crates weighing 300 kg, it travelled to ISYA in Malaysia in 1990. The transport for the telescope and an accompanying technician was provided by Air Canada; limited success was achieved due to some technical problems with the telescope. In 1991, repair and refurbishment of the TT were needed. Some new instrumentation was required and well over \$ 1000 were raised from private sources and the IAU. The TT will travel to the Paraguay VLP this coming autumn and winter. Some funding is needed, possible sources include American Airlines. In 1992, the TT may travel to ISYAs in China and/or India; funding is sought from national airlines in the form of free transport for the telescope and technician.

Some problems were discussed: • Funding; national airlines may be the best solution. • Liaison; a good contact person is needed in each host country. Attempts to get the TT to the ISYA in Cuba failed, and there is still no satisfactory contact person in Cuba. • Lack of a technician. • Limited time and energy of the present coordinator. Wayne Osborn has volunteered to work with John Percy on the TT project and may take over after the triennium.

## V. MISCELLANEOUS

Syuzo Isobe reported on the October 1987 Asian-Pacific meeting in Beijing. He is publishing an Asian-Pacific Teaching Bulletin, three issues have been published so far

(February 1990, September 1990, and March 1991), with #4 due in October 1991. A meeting on Teaching of Astronomy in the Asian-Pacific Region was held on 18 July 1990 in Australia.

Reports were presented on the meeting for the Teaching of Astronomy in Barcelona in September 1990 and on planetaria, including the new Tycho Brahe Planetarium in Denmark.

The comprehensive course on astronomy, compulsory for the majority of all Grade 10 pupils in the German Democratic Republic, has ended with the demise of that country.

### Second Business Meeting, 30 July 1991

#### I. NEWSLETTER

John Percy, the editor, reported on the Commission 46 Newsletter: The Teaching of Astronomy. Issues appeared as follows - # 26: November 1988 (AEM); # 27: January 1989; # 28: August 1989; # 29: February 1990; # 30: November 1990; # 31: April 1991 (National Reports); # 32: April 1991 (AEM). The following issues are scheduled: # 33: August 1991 (General Assembly issue); # 34: December 1991. The desired rate of publication is twice a year. The upgrading of the Newsletter to a journal was discussed. The usual problem exists: a lack of material to publish. Possible solutions are (1) ask the National Representatives to supply at least one short item (in addition to the National Reports) each three years; (2) encourage members of the Organizing Committee to submit articles or reports on their areas of responsibility; (3) appoint regional correspondents to provide news from their areas; (4) publish abstracts of education articles from other sources. Jay Pasachoff reported that *Astronomy* magazine in the United States tried an alternate version with some pages on education for a few months, but that version did not attract enough subscribers for them to continue it. Other suggestions were that the Newsletter should just include a bibliography of all teaching of astronomy articles; National Representatives should get a mailing list within a country. Everybody should send abstracts of published articles to the editor.

The President presented a report on the printing and distribution of the Newsletter. Leo Houziaux has been in charge of printing and distribution for the last 6 years. This triennium, about 150 pages were published at a cost of \$5344 for a mailing list with about 500 addresses. A budget of about \$7500 is needed for the next triennium. Houziaux is ready to pass on the job to anyone interested. After discussion, it was decided that the regular issues will be continued to be edited by John Percy, who will also be responsible for their printing and distribution for the next three years. Leo Houziaux, in collaboration with the new president, Lucienne Gouguenheim, will be responsible for publishing and distributing the National Reports and the Astronomy Educational Material. Julieta Fierro has volunteered to help working on the Newsletter publication with the possibility of taking over after the next triennium.

#### II. ASTRONOMY EDUCATION MATERIAL (AEM)

The Astronomy Education Material (AEM) consists of large lists of books, atlases, magazines, lecture notes, films, slides etc. together with addresses of distributors and other relevant information. At the 1988 Baltimore meeting, the AEM was revised to include only four languages: Part A English (R. R. Robbins), Part B Russian (C. Iwaniszewska), Part C French (M. Gerbaldi) and Part D Spanish (J. Fierro). Parts C and D have been published in the Newsletter #32 (April 1991). Part B has not materialized due to the lack of communication with the Soviet Union. Part A will be published in the fall of 1991.

In a letter to the President, R. Robbins has suggested that Part A be replaced this year by "Astronomy Education and Instructional Aids" prepared by H. J. Augensen, Widener University, Chester, Pennsylvania, USA for Springer-Verlag's future compendium *Astronomy: A Handbook*. Robbins suggested that the overlap with Augensen's work was too great this time to make it effective to publish a separate study. Also, he enclosed a set of booklets from

the Astronomical Society of the Pacific. Though they are not complete in coverage, they select important materials and so may be of special use in the developing world. Robbins furthermore suggested assembling a volume of reprints of book reviews (or, if there is a problem with gaining permissions, abstracts of book reviews). The President presented the results of his negotiations with Augensen and Springer and recommended to the Commission to adopt Augensen's chapter as a replacement for this triennium's AEM Part A. This recommendation was approved and Jay Pasachoff then moved a vote of thanks to H. J. Augensen, which was carried. The cost of distributing the Augensen report, which is 76 pages long, through the Newsletter will be about \$2000; the IAU is contributing \$1000, so another \$1000 must be found from a Foundation or elsewhere. Leslie Onuora suggested that, for financial reasons, the booklet of Augensen's materials be distributed only on request. John Percy reported that there is a questionnaire in the next Newsletter about continuing an individual's Newsletter subscription, and that he can add a question about receiving the report. David Crawford stressed the Astronomical Society of the Pacific's educational function. Jay Pasachoff mentioned their Newsletter available to teachers on request, with a circulation reported by Mary Kay Hemenway to be 13,000 per issue.

The President then raised the question whether Part B (Russian) should be stopped. Jay Pasachoff suggested suspension since there might exist some future opportunity to continue this project. A vote for suspension was carried.

For Parts C and D, Julieta Fierro suggested a minimum library of books for a Spanish-speaking library rather than a complete set of references. Michelle Gerbaldi reported on French materials, and said that there has been little published recently. She reported that the French version is already done.

### III. EUROPEAN ASTROPHYSICS DOCTORAL NETWORK (EADN)

The President reported on the European Astrophysics Doctoral Network (EADN) which started in 1988. The aim of the EADN is to stimulate the mobility of graduate students who are preparing their doctoral theses within Europe. Students are encouraged to spend from three to twelve months at a foreign EADN university and receive about a 20% subsidy for extra expenses caused by their foreign studies. The EADN also organizes summer schools for graduate students at the beginning of their doctoral research in astrophysics. Four summer schools have been held so far in Les Houches - France, Ponte de Lima - Portugal, Dublin - Ireland, and Graz - Austria. The 1992 EADN Predoctoral Astrophysics School will probably take place in Berlin - Germany, and the 1993 School possibly in Greece. The General Coordinator of the EADN is Jean Heyvaerts, Observatoire de Meudon - France.

### IV. ICSU-CTS AND THE INTERNATIONAL SPACE YEAR (ISY)

Lucienne Gougenheim reported on the International Council of Scientific Unions - Committee on the Teaching of Science (ICSU-CTS). This committee met in April 1989 and May 1991 in Paris. In January 1991, a group met in Zimbabwe to prepare the "Innovational Teaching Materials for Science Education" for African schools. Their new project concerns "Strengthening Science Training and Research in the Third World". Gougenheim has been the IAU representative on ICSU-CTS for 9 years and is now retiring from this committee. The President announced that she will be replaced by Jay Pasachoff. A vote of thanks was moved and passed for Gougenheim.

Gougenheim also reported on the International Space Year (ISY), which will be 1992. There will be a Space Science Project for Teachers of Science. An inventory of available and locally produced material is being issued by J. P. Stoltman, Department of Geography, Kalamazoo, Michigan 49008-5053, USA, FAX (618) 387 0958.

## V. MISCELLANEOUS

(1) John Percy reported on six free subscriptions to *Sky & Telescope* that are distributed to places in the developing world. Six additional free subscriptions are being added, for distribution in Eastern Europe. The Smithsonian Astrophysical Observatory, Cambridge, Mass., through James Cornell, is making available 25 sets of the new set of 125 slides of astronomical objects across the spectrum. The Commission voted to send letters of thanks.

(2) The President reported that the Strasbourg catalogues are now available on CD-ROM. The problem was raised that they may not be free, and that the developing countries are less likely to have CD-ROM players available.

(3) The Commission discussed a future Colloquium on the Teaching of Astronomy. John Percy suggested a Joint Discussion at the next General Assembly, an idea that met with overwhelming approval. Most of the members of the IAU are involved with education in some way and a Joint Discussion would bring more prominence to the teaching function. Perhaps another IAU Colloquium could follow that Joint Discussion.

(4) Gonzalo Vicino reported on the Uruguay meeting, *La Cultura Astronomical en la Sociedad Moderna*, held in Montevideo 16-20 July 1991.

(5) Julieta Fierro reported on plans for a new science museum in Mexico. Two exhibits on astronomy at subway stations have been very well received.

(6) David Crawford requested a liaison with Commission 50 on the preservation of observatory sites and stressed the importance of education. He suggested Syuzo Isobe, a member of both Commissions, as liaison, which was approved. He also commented that the International Dark-Sky Association (IDA) will be translating certain information sheets.

(7) The President discussed a link with the International Planetarium Society (IPS). Jay Pasachoff is an IPS member and will serve as liaison. Julieta Fierro said that such a link is important particularly in Mexico where most planetariums are chaired by non-professionals.

#### Scientific Meetings, 24 July 1991

The topic of a two-session scientific meeting on the afternoon of 24 July 1991 was Introducing Modern Astronomy and Astrophysics into Classroom Exercises - At High School, University Undergraduate and Graduate Levels. The first session was chaired by the President, the second session by the Vice-President. Abstracts of the papers presented are printed below:

#### I. UNDERGRADUATE EXERCISES IN MODERN ASTROPHYSICS (L. BOTTINELLI)

(1) The distance of the cepheid star RS Puppis is determined through a geometrical method using the difference of phase between the light curve of the star and those of two nebulae surrounding the star and reflecting the star light (data from *A. & A.* 16, 252). (2) Discussion of the detectability of cepheid stars according to their periods, through the period-luminosity relationship, by using the Hubble Space Telescope, in relation with the extragalactic distance scale. (3) Given the location of (i) white dwarf and (ii) supergiant stars, in a mass-radius diagram, discuss the location of other classes of stars (main sequence, neutron stars and black holes) and comment on the mean stellar densities. (4) Jean's criterion is established in terms of mean density as a function of temperature, total mass and chemical composition; the contraction of interstellar clouds, leading to star formation, is then discussed in a mass-mean density diagram according to various physical conditions relevant to the interstellar medium. (5) From the observed radial velocity curve of the visible component of the variable double star V616 Monocerotis, and that of the accretion disk of the unobserved

compact component, the mass derived for this last component is discussed and it is concluded that this component is most probably a black hole (data from *Ap.J.* 345, 492 and 359, L47).

## II. UNDERGRADUATE PROJECTS USING ASTROPHYSICS AND ASTRONOMICAL DATA BASES (M. GERBALDI)

We shall present activities that my colleagues and myself have developed these last years for science students at the Paris XI University, at two different levels: (1) second year students (2) fourth year students. (1) The students develop a project using a large computer where an Astronomical Data Base has been implemented. They first use a software package to select observational data from this Base for a selected sample of stars that they have previously defined according to their project. Then they analyse the data with a Fortran program written by themselves. All of them have learnt a computer language the year before. The assessment of their projects gives the students credit for adequate work done in programming and for ability to draw astrophysical conclusions from their analysis. (2) The students develop a project using Macintosh microcomputers. These projects are developed using the Astronomical Data Bank "SIMBAD" in order to get the student familiar with a real and large Data Base. As in (1) the student selects specific data which are then analysed in terms of astrophysical parameters. Such analysis tries to exploit fully the large capacity of this PC in terms of software. The project done in this frame is considered as an introduction to a research project.

## III. UNDERGRADUATE ASTRONOMY LABORATORY EXERCISES (M. K. HEMENWAY)

The University of Texas offers laboratory experiences to a wide range of students. Non-science majors meet two hours per week for 15 weeks (one credit hour) to perform both indoor and outdoor laboratories. A six hour per week course (three credit hours) is offered in two formats: for the future science teacher and for experienced teachers. These courses are offered using a modified Keller-method of self-paced instruction. This allows both intensive student-teacher interaction and reduces the demand for equipment. Astronomy majors in their third year of studies use a 41-cm telescope with modern equipment for their one credit hour course. They can perform observations with eyepieces, a filar micrometer, a camera, a spectrograph, a photometer, and a CCD-camera. The benefits and problems associated with teaching these different classes will be discussed. This work is partially supported by the NSF under grant TPE 9050289. Reference: Hemenway, M.K. and Robbins, R.R. *Modern Astronomy: An Activities Approach*, second edition, University of Texas Press, 1991.

## IV. DATA DISTRIBUTION THROUGH TELEPHONE-LINKED PERSONAL COMPUTER (S. ISOBE)

Our section of amateur astronomer education is promoting some programs: (1) Exchanging of astronomical data with the Central Bureau for Astronomical Telegrams of the IAU. (2) Confirmation of newly discovered celestial objects. (3) Spring school for leading amateur astronomers. (4) Arrangement of open house of our observatory. (5) Collection of materials for future exhibition center. (6) Response to questions from the general public through telephone calls and letters. Since number of telephone calls increases up to 30 per day, on some busy days our staff has to answer continuously. Moreover, needs for our services become very wide, and some amateur observers claim data just relating to their observations. Therefore, we started a new service from December, 1990, which is data distribution program through telephone-linked personal computers. In Japan, we easily transfer data through the telephone lines. Our system is composed of a PC personal computer with 40 Mbyte data disk connected with telephone line by a 2400-bps modem. One who has a similar system can connect by dialing our telephone number. At the moment, all the data can be accessed without any restriction. However, we have a plan to give user's identification number to registered users

who can see some special data. The number of connected users is increasing and was 20 connections per day in May and June. Many users enjoy seeing the IAU Circular which should be the case for future negotiation in charging for the data. We are intending to develop our services to the general public in different ways.

#### V. THE AAVSO AND VARIABLE STAR ACTIVITIES AND PROJECTS FOR SCHOOLS AND UNIVERSITIES (J. A. MATTEI)

The American Association of Variable Star Observers (AAVSO) is the largest organisation of variable star observers in the world with members in 42 countries. The purpose of the AAVSO is to coordinate variable star observing, mostly by amateur astronomers, evaluate the accuracy of these observations, compile, process, and publish them, and make them available to astronomers, researchers, and educators. Over 6.5 million observations have been compiled since the AAVSO was founded in 1911. About 250,000 observations are submitted to and archived by the AAVSO each year. Over 200 requests are made by astronomers and educators for AAVSO data and services each year. The AAVSO has been helping teachers and students on an ad hoc basis in setting up observing programs and science projects on variable stars. Now the AAVSO has embarked on a new education initiative of developing a flexible set of hands-on educational activities and projects based on its unique electronic database of variable star measurements. Students will be able to experience the excitement of doing real science with real data - making new measurements and new discoveries. By carrying out all aspects of the research process, they can develop and integrate skills in science, mathematics, physics, and computer science. If the project is funded, together with John R. Percy at University of Toronto, Canada, we will prepare a package of information, consisting of computer-readable AAVSO data, computer programs for data analysis, Students and Teachers' Manuals, instructional video tape, set of slides, and finder charts, and test them in Teachers' workshops and selected classrooms before it is ready for distribution.

#### VI. THE INCLUSION OF CONTEMPORARY ASTRONOMY INTO THE STUDY PLANS OF ASTRONOMY (J. M. PASACHOFF)

We describe methods of including the exciting results of contemporary astronomical research into courses on all levels, including elementary school, junior-high and high school, and university. We have included such results in our textbooks on all these levels, including the elementary-school set *Discover Science*, which exists in a Spanish-language translation (*Descubre las ciencias*). We also describe the current efforts in the United States to place more emphasis on teaching astronomy, including concrete steps recommended in the decennial report on astronomy and astrophysics released in 1991 and the establishment of a prize for education and of a new Working Group on Astronomy by the American Astronomical Society. Finally, we discuss methods of obtaining illustrative materials in the form of slides, videotapes, or overhead transparencies to show recent discoveries.

#### VII. ACTIVITIES FOR AN ASTRONOMY UNIT IN A SENIOR HIGH SCHOOL PHYSICS COURSE (J. R. PERCY)

Within the grade 12 physics course in the Ontario school science curriculum, there is a 10-hour astronomy unit which includes such "physical" topics as: the Sun, telescopes, spectroscopy, parallax, the inverse-square law of brightness, physical properties and classification of stars, their structure and energy sources, nucleosynthesis and supernovae. We have developed and tested a set of a dozen activities which can be used in this astronomy unit, or in other senior high school physical science courses. Copies of the activities are available on request.

### VIII. THE SUN AND SOLAR ACTIVITY - A LABORATORY EXERCISE ON SOLAR PHOTOS (D. G. WENTZEL)

Using five sheets of photographs (taken on or within a few days of the total eclipse of 7 March 1970) - a corona picture taken during the eclipse, an X-ray photograph, sheets of spectroheliograms, and a magnetogram - the student is expected to

- (1) Observe and recognize various solar features on several types of photographs.
- (2) Relate the appearance of features seen against the dark sky to the appearance of the same features in front of the solar disk.
- (3) Relate the various features to each other by tracing the influence of sunspots through several layers of the solar atmosphere.

### IX. UNDERGRADUATE LABORATORY EXERCISES WITH A CCD DETECTOR (D. MCNALLY)

We have installed a CCD detector on our 24" reflector and we find that it allows us to image extended nebulous objects - we have not been able to do this photographically for 15 years in the bright skies of Mill Hill. Exposure times have dropped from hours to minutes and real observing projects are once again possible. There are optimists who talk about research..... We allow the undergraduates to use STARLINK reduction packages on a microVax. The reaction has been encouragingly positive from the undergraduates. We mainly carry out spectroscopic studies rather than direct imaging.

The meeting was closed with brief presentations by N. S. Nikolov on a new Bulgarian text book for high school astronomy, and by B. Monsignori-Fossi on the Italian Astronomical Society.

#### Astronomer-Schoolteacher Meeting, 22 July 1991

The traditional astronomer - local schoolteacher meeting was held at the Buenos Aires Planetarium in the afternoon of July 22, 1991. The subject of the meeting was *Methods and Means of Teaching Modern Astronomy* and there were about one hundred participants. They included astronomy teachers from both elementary and high schools, staff members from the Buenos Aires and Rosario (Argentina) and Montevideo (Uruguay) Planetariums, astronomers directly interested in educational aspects, and also astronomy students from La Plata Observatory and amateurs. The speakers were: J. L. Sersic (Argentina), R. M. West (ESO), J. and N. Pasachoff (USA), S. Torres-Peimbert (Mexico), R. Garrison (Canada), M. Gerbaldi (France) and J. Fierro (Mexico). The audience participated actively, and there were very interesting discussions following every talk. Books and educational material were exhibited by Pasachoff and Fierro and given in donation to Argentine institutions. J. C. Muzzio (Argentina) organized the meeting, in close collaboration with the Presidents of IAU Commission 46, Aa. Sandqvist (Sweden), and of the Local Organizing Committee of the IAU General Assembly, R. Mendez (Argentina).