INTERNATIONAL ASTRONOMICAL UNION

COMMISSION 46 — TEACHING OF ASTRONOMY

NEWSLETTER

See page 12 for Program of Commission 46 meetings at IAU General Assembly

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EDITORIAL

In this issue we depart somewhat from our usual series of articles. Drs Alvarez and Campusano have written an article on problems of translating astronomical articles into Spanish and I have offered them space in our Newsletter to solicit response to their suggested standard form of translation from English to Spanish. Dr Alvarez is seeking contact with those who have a serious interest in this problem and wants positive suggestions. Please write to Dr Alvarez at Santiago directly so that he can build up a system of correspondents.

Another departure for the Newsletter is into the field of sociology. John Percy of Toronto has brought together a set of commissioned essays on Women in Astronomy. While I have some trepidation in embarking into such an emotive topic, I really cannot let the subject pass by without one comment. In the September (1981) edition of Physics Education there is an article entitled "Tracking down Sexism in Physics Textbooks". It made me wonder what we were about. I am for equality of opportunity and astronomy has a good track record by comparison with other sciences in this regard. I like to see ability whatever the form of the packaging. To get excited over alleged sexism in textbooks does make me wonder if we have our priorities right. Surely it is our aim to encourage able girls and boys to think of astronomy as a career. However, the Freudian possibilities of Physics Textbooks just had not struck me - are there hidden Freudian depths in Positional Astronomy, I wonder? However, overtones or not, the ladies have done extremely well by astronomy and long may that fine tradition continue to prosper. The figures in these reports show that astronomy, despite a good record, has no cause at all for complacency or even congratulation. **These articles comprise part 2 of this newsletter.**

Back to safer ground and an article by Claire and Everett Carr on a Video Disc Project for Astronomy. This seems to me like a very worthwhile idea and I am sure there are those among us who might like to contribute to the contents of this or future discs. It is a very compact way of keeping and accessing illustrative material.

For my contribution at this festive season let me raise the question - are we making any impact at all in advancing awareness of astronomy in the public at large? I raise this question in the light of some experience that I have become aware of in the teaching of Astronomy and Space at a UK College of Further Education.

(A College of Further Education provides for continuing education. On a formal basis it provides education to overlap secondary and tertiary education and to supplement the educational experience in certain forms of professional training. It also provides cultural evening classes from flower arranging to navigation for small boat sailors. They are valuable centres of community education.)

Because of the dreadful state of unemployment among school leavers (at 16+) a particular College of Further Education decided to mount a course for school leavers to prepare them for the world of work. A major component of the course is to identify and rectify deficiencies in basic education such as mathematics and literacy. A further component was a study of science to make the students aware of the world around them both industrially and environmentally. As part of this, there was a contribution on Astronomy and Space. By and large the response to science was poor. To set the scene very few of the students knew what fuel heated their own homes. The problem is just not astronomy alone but seems to confront the whole of science education. It should be pointed out that the students on this course already have some academic qualification.

The knowledge of astronomy among the students on the course was abysmal. There was a glaring lack of fundamental knowledge, but what was worse, no interest whatsoever. One might have thought that with the emphasis on space in the media some of it would rub off. These students had little or no interest in serious science on TV or in the newspapers. A slide show of the usual colourful astronomical slides evidenced little interest either scientific or artistic. The students simply could not see where astronomy might impinge on their everyday lives. There were exceptions. Holidays in Florida produced a mild response to Zone Time and complete surprise to learn that the same time did not pertain worldwide. Great interest was aroused by the revelation that the Romans regarded months with 31 days as lucky and with 30 days as unlucky. But as for the rest - utter apathy. Why worry about calendrical regulation - it was silly to suggest the seasons got out of step with the calendar - after all everyone could see it is spring in April (Northern Hemisphere types to a man in this class.) Perhaps with people who had difficulty understanding a train timetable, calendrical regulation is a detail.

Ladies and Gentlemen of Commission 46 the task for 1982 and the foreseeable future is great. In some respects we are the victims of our own success. We have done some things so well that the problem has disappeared from view. But some of our exciting problems of today are not penetrating the masses. We are getting through to the astronomically aware but then we always did. We are getting through to those with wide general interest. We are not getting through to the masses but that is not possible. It should however be possible to get through to students accepted for courses at a College of Further Education. It is clear that we are not.

The problem is not one that is confined to astronomy - it is a consequence of the state of education in the UK. In the first place, these particular students should not be at a College of Further Education. The College is remedying the deficiencies of school. What the students are being taught they should have learnt at school - much of it at primary school. To some extent we are not concentrating on fundamentals. It is easy to dilute teaching with new matter since it is both topical and exciting. Education has to serve several purposes. One is basic skills in communication, literacy and arithmetic (I nearly wrote mathematics). High on our priorities should be some basic understanding of science. Clearly in the UK, and I suspect elswhere, we have not provided sufficient attention to these basic requirements.

But we, as astronomers, have also failed. We have not taken a sufficiently strong stance to ensure that astronomy forms some part of basic science. For a young person with some academic qualification to be unaware at 16+ of latitude and longitude, the reasons for night and day, the seasons and the calendar is, in my view, unnaceptable. What point is there in going further to discuss phases of the Moon, the planetary system, and the nature of the Sun - again topics of which a tolerably educated 16 year old should be aware.

For us in Commission 46 there is no cause for complacency. We have not yet even won a battle in this war - in fact we have not truly seen the enemy. Yet we know that education must face philistinism and barbarism. That philistinism and barbarism does not begin with politicians and administrators - it starts in our own Union with our colleagues who see no point in promoting astronomy in education and even worse, those few colleagues who believe that astronomy should be vigorously ejected from education. Do we really want education which leaves those in its higher reaches unaware of basic astronomical science.

While we take stock of the achievements of 1981 and there are many which should encourage us, let us also remember those school leavers at a College of Further Education somewhere in the UK and remember the vast amount which remains to be done.

From seasonally, if unexpectedly, snowy London I wish all readers of and contributors to the Newsletter a happy, successful and prosperous 1982.

D. McNally

AN ASTRONOMY VIDEO DISC PROJECT

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In July 1980 we began work with a Pioneer VP-1000 LaserDisc and a PET computer to construct an intelligent interactive video disc learning system. The first programs were written for the MCA-Discovision disc, "What Makes It Rain", (#64-006). An adaptor consisting of a few IC chips and a pair of transistors made it possible for a computer program to control the VP-1000. All the functions of the remote control could be duplicated under program command. For example the program could search the disc for a specific frame; run the disc forward or backward for a specific time, halt for a specific time, return to the original or specified frame and repeat the process as often as required. The pedagocial design allowed reinforcement of correct answers in several ways. The words could appear in print on the computer display. The visual and audio of the disc could be repeated simultaneously. As one of our third graders who participated

in the test exclaimed, "Gee that's neat"! We tested 137 third graders with our program. Their test results were compared with 105 students subjected to a chalkboard lecture on the same material. The test results were considered identical.

We teach astronomy with a planetarium and computers. They are tools. The "intelligent" video disc is another tool, one equally at home in a class as at our planetarium. The Intelligent disc is however uniquely suited to an ideal of an educator, individualized instruction - taking a student from where they are to where they want to be in their studies. In a proper program the student is fully engaged, a necessary condition for learning. The LaserDisc, the computer and the adapter can be assembled in a quantity of one unit for just under $1300 at this writing. A VIC would be used with a 13 inch moniter. Our working premise in considering a laserdisc is that the same disc can be used at several levels of instruction just by altering the program. We also hope to explore the idea that an average interested teacher could learn a simple programming scheme and make their own programs. Failing that, the teachers could be induced to allow the system in the class room or in a center so that students could use the equipment and prepared computer programs. There are other hopeful ideas to be explored. For instance, the 750,000 NASA pictures of the planets could actually be reproduced on 7 laserdiscs. In fact JPL has already made such a disc. The results were excellent considering the bandwidth limitations of the standard TV receiver here in the US. I must guess, but if the high definition TV system comes into use the laserdisc can probably handle the bandwidth. It is possible even now however to place these seven discs in US high schools and colleges for less than $160 a set. Students then can have access to the source material planetary scientists will use for the next 20 years. It is possible for a skillful high school student to draw wind vectors on Mars dune pictures and uncover secrets of Martian weather, its soil and ice transport mechanisms.

Our work with commercial discs showed it was possible to construct useful learning modules with the disc made from a film. These discs were far from ideal however. It was difficult to branch for fast and slow students. There were no provisions for a scientific approach of observation, hypothesis and experimentation. Nor were there provisions for simulation under computer control. And there were no opportunities to use the computer as a measuring device, timer or calculator. It would be neat, as our student said to measure the major and minor diameters of an IO volcano and determine its true diameter, the altitude of an elevation from the sun angle, do a crater count in the quadrants for comparison or measure the altitude of the altitude of the eruption on the moon's limb. In fact there seemed countless opportunities for pertinent, engaging and useful studies. In fact, its boggling.

All this prompted a bold proposal to the assembled membership of the Mid Atlantic Planetarium Society, in April 1980. We asked for $1500, almost all the treasury contained, to undertake the work of producing a video disc. An interesting but not lengthy discussion took place during which it was determined that no other member of the society had video disc player and fewer than one in four thought that they would acquire one in the next two years. The affirmative vote to proceed was therefore a surprise. The officers were to determine how much would be spent however and that others should share the opportunity. The proposal was therefore presented to the International Planetarium Society in Mexico City, July 26th. Approval was given there for the production provided that at least 50 copies would be ordered of the disc at $50 per copy. At this writing we have orders for 23 copies resulting from a sample mailing about the

project. It seems appropriate to open up the opportunity to the international community since the disc will be a collector's item at the very least. Moreover it will be a bargain since we estimate it will contain the equivalent of $300 to $500 worth of equivalent slides and films. The MAPS/IPS laserdisc will contain as much planet flyby material as possible. This will include the first Moon shots thru the Voyager II mission out to Saturn. There will be a computer generated image of the Venus surface, in rotation showing both hemispheres. We will attempt some Martian 3D and a simulation of the flight down Valle Marinaris. The project is however a modest one since the only costs covered so are the direct disc production of 50 copies. The authors will supply an index and demonstration programs for the PET and VIC computers. Discs are designed for the Pioneer VP-1000 but are believed to be usable on the Magnavox, SONY, MCA Discovision Associates machine and the Philips machines if they have produced any.

Discs may be ordered from the International Planetarium Society. Checks should be payable to the Society. The authors will be happy to pass the orders on to the Treasurer. Perhaps others will care to join in the endeavor.

Announcements

Professor L. Gougenheim, a member of Commission 46, has written a text book "Méthodes de l'astrophysique" published by Hachette, Paris, in their Laisons Scientifique Series. The text is in French and is at upper school/ pre-first year university level. Professor Gougenheim is at pains to show the interaction of physics and astronomy and has produced a very worthwhile book.

Dennis W. Sunal has edited, on behalf of the Association of Astronomy Educators, an Astronomy Education Materials Resource Guide. This guide is not a list of distributors of commercial material but is a compilation of topics and their description. Materials for these topics are available and address and cost are clearly stated for each. This is a valuable compilation since it suggests classroom activity and gives the interested teacher a source of materials with which to initiate similar lessons. The snag is that users from abroad could find difficulties in remitting small sums in US currency. (Check to ensure that the cost of the remittance does not exceed its value.) The Resource Guide is available from D.W. Sunal, Astronomy Educational Materials Project, 604-M Allen Hall C & I Department, West Virginia University, Morgantown, West Virginia, USA 26506. A charge of US $4 is made to cover the cost.

It should be noted that the initials AAE mean Association for Astronomy Education in the UK and Association of Astronomy Educators in the USA. The identical abbreviations for quite separate associations will cause confusion, especially since the aims of both groups are closely the same! Either way they are good people to know.

TRANSLATION TO SPANISH OF MODERN ASTRONOMICAL TERMS*

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Introduction

Astronomy has experienced a tremendous activity in the last two decades. This has been permitted by new technological development and by the access to parts of the electromagnetic spectrum formerly out of reach. Although the new astronomical results have been obtained in non-spanish speaking countries, the interest in astronomy as a science has grown in Spanish speaking countries. This growth was considerable if judged by the creation of new national observatories, for example in Venezuela, and by the number of Latin American astronomers that have graduated abroad, especially in the United States of America and in Europe. However, the most important evidence is the existence of periodical meetings of Latin American astronomers under the auspices of the International Astronomical Union.

This growing interest in astronomy has surpassed the purely professional media, extending to the high-school education and to the general public. In Chile, the Ministry of Education and the University of Chile have agreed to offer special courses to high-school teachers. The courses of general astronomy and other related subjects which have been offered by the Department of Astronomy have been very well received by numerous students.

Until now, and for obvious reasons, the language employed in astronomy has mainly been English, either in written or verbal communications. But the need to write and talk about astronomy in Spanish exists, and touches on several aspects. One of them is the translation of articles and books addressed to the general public. A large fraction of these translations are being done in Spain, Mexico and Argentina. Other aspects concern articles and books originally written in Spanish. Although most of the Spanish speaking astronomers publish their professional works in English, the verbal communications between them continue to be obviously in Spanish.

It is evident that the need to express the astronomical vocabulary in Spanish has greatly increased. Such vocabulary partially exists and is common to Spanish-speaking countries. However, it is at present insufficient due to a rapid increase in new astronomical terms. This problem does not only affect astronomy but all the scientific and technological disciplines as well. Naturally, each Spanish-speaking country has tried to solve this problem on its own, but this is bringing a multiplicity of translations that may eventually create confusion. The case of British, American and Australian astronomers can be quoted as an example to follow. They have a unified astronomical vocabulary even though there exist regional differences in the English language.

*Slightly modified English version of the article included in the Proceeding of the Second Latin American Regional Meeting, I.A.U. Mérida, Venezuela (Jan.1981). Revista Mexicana de Astronomía y Astrofísica. Eds. Bruzual, Fuenmayor and Peimbert (in press).

For all these reasons, we thought it would be desirable for Spanish-speaking astronomers to attempt a unification of their technical language, which should be extended to non-professionals. In late 1980 we informed our colleagues of Spain, Mexico and Argentina about our thoughts concerning such unification of modern astronomical terminology in Spanish, and proposed to discuss it at the Second Regional Latin American Meeting, sponsored by the I.A.U., to be held in Venezuela in January 1981. Before this meeting we received encouragement and suggestions from Dr. Jorge Sahade from the Instituto de Física y Astronomía del Espacio, Argentina and from Dr José María Torroja, President of the Real Academia de Ciencias Exactas, Físicas y Naturales, Spain.

At the Venezuela Meeting the authors presented this initiative and a list of terms prepared by several Chilean astronomers according to the criteria specified in a following paragraph. Since there were no contributions from other delegations we distributed our list to be used as a working document. It was informally agreed that the Latin American astronomers, through national representatives, would feed back comments to us and by successive approximations we would produce a list acceptable to most Spanish speaking astronomers. The endorsement of the I.A.U. would be sought for the final list.

After the Venezuela meeting the editors of the Proceedings (Peimbert et al.) sent us their comments on the original list that we assume represent the Mexican and Venezuelan opinion. Now there are basically two lists, one with the accepted translations and the other with translations under discussion. The first list, free of regionalisms of any kind, will be published in the Proceedings of the Meeting.

In the meantime we had an exchange of letters concerning the initiative with Dr. J. Passachoff that put us in contact with Dr. D. McNally and Dr. J. Kleczek. Dr. McNally encouraged the project and kindly offered to include this note in this Newsletter. We have written also to Dr. Kleczek since he is currently involved in producing an eight language dictionary that includes Spanish.

The Lists

The original list was prepared by the Chilean group headed by the authors and included several members of the Department of Astronomy, University of Chile, especially A. Gutiérrez, J. May, J. Maza and H. Moreno. The method employed consisted in the examination of a list of astronomical terms in English, which were collected from the index or glossary of texts published after 1960, and from papers published in the last few years. The proposed translations were discussed according to certain criteria that, the experience showed, could not be very rigid. As a first step, we tried to find an existing Spanish term taken from the Dictionary of the Royal Academy of the Spanish Language (1970). If the existing term was of common use, then it was accepted, otherwise we preferred to adopt the original English term or to create a new Spanish word from it (for example, dumbbell galaxy = galaxia dumbbell). If a Spanish term did not exist, we either adopted the English term (blanketing = blanketing) or a Spanish version of it (quasar = cuasar). During the work we consulted books originally written in French which could help us to decide (BL Lac Objects = lacértidos). In general, we tried to keep the original root of the word (remnant = remanente). Several terms have been coined very recently and they do not appear even in English dictionaries (scintar). We had problems with the English usage of forming new adjectives by the simple juxtaposition of adjectives and nouns (cosmic microwave radiation background). In some instances

we could not avoid a translation which in Spanish sounds s tly ridiculous (tadpole galaxy = galaxia tipo renacuaja). However this may simply be due to a lack of familiarity; for example we are used to speaking of "crab remnant" (remantente tipo cangrejo). In other cases the original non-English terms (bremsstrahlung, plage) were maintained.

We are including two lists at the end of this Newsletter. The first is very closely the one that will be published in the Proceedings of the Venezuela Meeting. The second contains the terms that are under discussion and all the alternatives for possible translations proposed by Peimbert et al and the Chilean group. We hope the publication of these translations will stimulate Spanish-speaking astronomers to contribute by indicating their preferences, by suggesting new translations or by calling our attention to words we may have overlooked. This can be done by writing to any of the authors at the address in the title of this article.

LIST Nº 1, Terms to be published in the Proceedings of the Venezuela meeting

A

ablation ablación

accretion acrecimiento

antenna pattern patrón de la antena

aperture abertura

apodize (to) apodizar

array formación, arreglo

astrochemistry astroquímica

asteroid asteroide

B

background radiation radiación de fondo

Balmer jump discontinuidad de Balmer

barred galaxy galaxia barrada

beam area (antenna) área del haz

beam broadening (antenna) ensanchamiento del haz

beam instability inestabilidad de haz

beam width ancho del haz

beaming mechanism mecanismo de direccionalidad de haz

big-bang *gran explosion*

black hole hoyo negro

blink microscope *microscopio de parpadeo*

blister (HII) ampolla de HII

BL Lac Objects lecértidos

blue straggler rezagada azul

bound-free transition transición ligada-libre

braking index índice de frenaje

bremsstrahlung bremsstrahlung

C

carbon star estrella de carbono

charm encanto

chondrite condrita

chondrule cóndrulo

chromosphere cromósfera

chromospheric mottling moteado cromosférico

circumstellar envelope envolvente circunestelar

cocoon star estrella capullo

coherency matrix matriz de coherencia

collapse (to) colapsar

coronal fans abanicos coronales

coronal hole hueco coronal

coronal loop *bucle coronal*

coronal streamer *banderola coronal*

count *recuento, cuenta*

count rate tasa de cuenta

cross-correlation correlación cruzada

curvature radiation radiación de curvatura

cut-off corte

cyclotron radiation radiación ciclotrónica

diffraction pattern patrón de difracción

diffusion difusión

dispersion dispersión

dispersion measure medida de dispersión

E

emission measure medida de emisión

ergosphere ergosfera

eruption erupción

event horizon horizonte de eventos

equant ecuante

exit cone cono de salida

F

facula fácula

fan beam haz en abanico

feed alimentador

fibril fibrilla

filled-aperture (radio-telescope) *radiotelescopio de abertura completa*

flare ráfaga

flare star estrella ráfaga

flash phase fase de relámpago

flash star estrella relámpago

flocculi flóculos

force-free field campo libre de fuerzas

fringe *franja*

fringe pattern patrón de franjas

fringe washing function *función de alisamiento de franjas*

funnel prominence protuberancia tipo embudo

G

galactic bulge *bulbo galáctico*

gegenschein gegenschein

grating lobe (antenna array) lóbu ḷ de difracción

gray hole hoyo gris

grism grisma

guiding center centro de guía

gyro frequency girofrecuencia

gyro resonance giroresonancia

H

halation ring aureola

half-power beam width ancho del haz a media potencia

Haro galaxy galaxia Haro

Hayashi track trayectoria de Hayashi

hedgerow prominence prominencia tipo seto

helium flash fogonazo del helio

helmet streamer banderola tipo yelmo

horn antenna antena tipo corneta

hyperon hiperón

I

Image dissector disector de imagen

interloper intruso

interpulse interpulso

L

Lambda doubling desdoblamiento lambda

laser láser

light cone cono de luz

light cylinder cilindro de luz

line receiver receptor de línea

line splitting desdoblamiento de línea

M

magnetic nozzle tobera megnética

map (to) cartografiar

Markarian galaxy galaxia Markarian

maser máser

massive de gran masa

microwave background fondo en microondas

microwave background radiation radiación de fondo en microondas

mixing length longitud de mezcla

moonquake temblor lunar, selenemoto

mottle mota

N

N galaxy galaxia N

noise temperature temperatura de ruido

nonthermal radiation radiación no térmica

O

optical depth produndidad óptica

oscillator strength fuerza de oscilador

P

particle bunching amontonamiento de partículas

pencil beam haz delgado

phase switching conmutación de fase

photosphere fotosfera

pinch estrangulamiento

pixel pixel

planetesimal planetesimal

planetoid planetoide

plasmon plasmón

plerion plerión

polar+ pólar+

+ Sustantivo femenino

polar crown corona polar

polar plumes penachos polares

protoplanet protoplaneta

protostar protoestrella

puff soplo

pulse broadening ensanchamiento del pulso

Q

quasar cuasar

quasi-stelar cuasiestelar

quiescent quieto

R

radiation braking radiación de frenaje

radioastronomy radioastronomía

radiofrequency radiofrecuencia

radiogalaxy radiogalaxia

radio map++ radiomapa

radio source radiofuente

radiostar radioestrella

radiotelescope radiotelescopio

reversing layer capa de inversión

++ La palabra "radio-" seguida de un sustantivo se traduce al castellano como una sola palabra.

rotation measure medida de rotación

runaway star estrella fugitiva

S

scale height altura característica

scanner espectrógrafo de barrido, escáner

scintar cintar

self-absorption autoabsorción

Seyfert galaxy galaxia Seyfert

shell star estrella con cáscara

shooting star estrella fugaz

solar prominence protuberancia solar

source function función fuente

spallation astillamiento

speckle interferometry interferometría de manchas

spherule esférula

spicula espícula

spin espín

spinar espinar

square-law detector detector cuadrático

starquake temblor estelar

steady-state theory teoría de estado estacionario

steradian estereoradián

sudden ionospheric disturbance (SID) perturbación ionosférica repentina

supernova envelope envolvente de supernova

supernova remnant remanente de supernova

surge oleada

swept frequency interferometer interferómetro de barrido en frecuencia

switched receiver receptor de conmutación

synchrotron radiation radiación sincrotrónica

syzygy sicigia

T

tachyon taquión

tadpole galaxy galaxia tipo renacuajo

tapered distribution distribución adelgazada

tearing mode instability inestabilidad tipo rasgadura

thermal térmica

tracer trazador

tracking interferometer interferómetro de rastreo

turnover frequency frecuencia de inversión

two-stream inestability inestabilidad de doble flujo

W

wave trapping confinamiendo de ondas

white hole hoyo blanco

Z

Zeeman splitting desdoblamiento Zeeman

LIST N°2, Terms under discussion.

aerial smoothing	suavizamiento por efecto de antena
backwarming	recalentamiento
blanketing	efecto de cobertura, efecto de zarpa, cobijamiento, efecto de invernadero
blocking	bloqueo
burst	burst, pulso, explosión, brote, estallido
collapsar	colápsar, estrella colapsada
compacity	compacidad, compactibilidad
damping	amortiguación, amortiguamiento
dumbell galaxy	galaxia dumbbell, galaxia tipo palanqueta, galaxia de la mancuerna
fringe visibility	visibilidad de las franjas, visibilidad límite o marginal
galactic spur	espolón galáctico, estribo galáctico
glitch	glitch, rayón, jalón
image converter	convertidor de imagen, convertidor de imágenes
image tube	tubo de imagen, tubo de imágenes
lobe sweeping interferometer	interferómetro de lóbulos barrientes, interferómetro de barrido de lóbulos
local standard of rest	sistema de referencia local, sistema de reposo local
optically thick	ópticamente grueso, ópticamente denso
optically thin	ópticamente delgado, ópticamente tenue
outburst=burst	Ver "burst"
pitch angle	ángulo de paso, ángulo de lanzamiento (de tiro, o de inclinación, según el contexto)
plage	plage, playa
primeval nebula	nebulosa primitiva, nebulosa primeva
primordial fireball	bola de fuego primordial, bola de fuego primeva
pulsar	púlsar, pulsar, pulsor
radio wave	radioonda, onda de radio
scattering	scattering, desparramo, dispersión
seeing	seeing, turbulencia atmosférica
spray	spray, rocío
survey	exploración, sondeo

SESSION ON ASTRONOMY EDUCATION
at the IAU Second Asian-Pacific Meeting in Astronomy
Bandung, Indonesia, 27 August 1981
Summary by Donat G. Wentzel

At the request of Commission 46, the Organizing Committee of this meeting kindly agreed to include a half-day session on astronomy education.

The main theme of the session was the need for astronomy teachers to convey more than merely the logic and conclusions of science, and especially of astronomy. The logical structure familiar to scientists may not be at all evident to the student when his cultural background does not include the scientific mode of thinking. One anecdote concerns the Asian graduate student in physics who considers an earthquake to be due to fate and not subject to scientific explanation.

Dr. D. Joesoef, Minister of Education and Culture of Indonesia, stressed the change in the scientific attitude with time from one seeking "truth" to one devising "models" of nature, the latter being a substantially more modest goal of science. There has been a corresponding evolution in the relation of science to faith, a topic frequently raised in connection with astronomy. Culture is man's way of living, of making necessary decisions even if science has not rigorously explained all related processes, and the related world view. Astronomy and physics are both cultural and scientific disciplines, and both need to be transmitted to the student. On the ultimate core of faith, science will of necessity be silent, but it is a silence of humility not a silence of disdain.

The difficulties for grasping the steps in the scientific method caused by the Indonesian cultural background were further discussed by J. I. G. M. Drost (Jakarta) and B. Suprapto (Bandung). Discussion suggested that cultural background also influences the chance of success for students in Europe and North America. According to R. Bhavilai (Bangkok), meaning and purpose of the Universe are provided by man's intelligence, and thus culture, rather than by scientific logic. E. Müller (Geneva) argued that the nature of astronomy and astronomy research must be carefully pointed out to students seeking intensive astronomy study, even if these students are well oriented towards science, and the astronomer should assure both facilities like a library and early participation of the student in research. For a teaching program of any size, R. Wilkinson (Melbourne) pointed out, one should ask oneself six questions before starting to teach, to avoid hidden invalid assumptions; for example, one needs to determine the students' possible culturally based misconceptions.

The original organisation of this session included a workshop, in which participants were to divide into five discussion groups to recognize common interests, exchange information, and identify common needs. There was no time for this workshop, but I list here the five planned topics, with the hope that similar discussions may take place at future regional IAU meetings. The first two topics are closely related to the main scientific themes of the Bandung meeting. 1) How do you teach galactic structure in an up-to-date manner? 2) What new topics should be included in a course on stellar dynamics because of high-energy astrophysics? 3) Is it time to introduce exercises using micro-computers? 4) What new exercises should be included in a new version of Minnaert's book "Practical Work in Astronomy"? 5) What astronomy education is needed in countries with no more than three astronomers?

PLANS FOR MEETINGS OF COMMISSION 46 AT THE IAU GENERAL ASSEMBLY in Patras, August 1982. Four sessions are proposed.

Session 1: General business; membership, publications, etc.

Session 2: Discussion of the Working Group for the education of astronomers from developing countries, specifically a proposal to seek funds for a series of lecturers visiting a country that now has no astronomy and seeks to develop astronomy.

Session 3: Training of school teachers in astronomy. Invited speakers include C. Iwaniszeweska, Poland, and B. Hauck, Switzerland.

Session 4: Three invited topics. "Is it time to introduce microcomputers in astronomy teaching?", D. McNally, UK; "Reaching the public by television", H. van der Laan, Netherlands, "Practical work in elementary astronomy", J. Kleczek, Czechoslovakia.

Opportunity to make short contributions to the topics of sessions 3 and 4: There will be time for discussion at these sessions, but if you cannot attend you are invited to send brief contributions to the respective speakers, who will try to either mention them in their talks or distribute a written summary. Send these contributions as soon as possible; allow a month for airmail!

Address for session 3: Dr. C. Iwaniszewska, Institute of Astronomy, N. Copernicus University, Chopina 12/18, 87-100 Torun, Poland. Please send copy to D. Wentzel, address on front of this newsletter.

Addresses for session 4: Dr. D. McNally, address on front of this newsletter. Dr. H. van der Laan, Sterrewacht Leiden, Postbus 9513, 2300 RA Leiden, Netherlands. Dr. J. Kleczek, Ondrejov Observatory, 251 65 Ondrejov, Czechoslovakia.

DONATIONS OF JOURNALS AND BOOKS FOR DEVELOPING COUNTRIES.

The American Institute of Physics has established a program to facilitate the donation of physics journal and book collections to colleges and universities. (Astronomy is included in the interests of the Institute and thus presumably also in this project.) AIP will keep a file of names of institutions that wish to receive donations. The American Physical Society Committee on International Scientific Affairs will assist in finding institutions outside the USA (and this newsletter note is also intended for that purpose). This project is organized to provide a channel for the many inquiries AIP gets from physicists and their families interested in assisting schools, particularly those in developing and third-world countries.

Representatives of institutions desiring donations and others who know of such institutions should write to Lewis Slack, AIP, 335 E. 45th St., New York, NY 10017, USA. Descriptions of their needs will be matched with offers from donors as they are received. A variety of ways of defraying the costs of shipment from donors is being explored. The institutions desiring donations should explore possible help from their country's embassy or consulates.

Source: Physics Today, June 1981, p. 58.

INTERNATIONAL ASTRONOMICAL UNION

COMMISSION 46 — TEACHING OF ASTRONOMY

NEWSLETTER

No. 10 - December 1981 - part 2

WOMEN IN ASTRONOMY

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What is the status of women in astronomy in different parts of the world? What percentage of astronomers are women? What special problems do women encounter when they train to become astronomers? How can these problems be solved? These are questions which should be of interest and concern to Commission 46, because able, interested women are an important source of "manpower" for astronomy, now and in the future, and no unnecessary barriers should be placed in their way.

With the permission of the Editor of this Newsletter I have solicited short articles on "women in astronomy" from various parts of the world. Four articles were submitted; they are printed below, and represent the current status of women in astronomy in four of the more astronomically-active parts of the world. Readers from these and other parts of the world are welcome to write short letters to the Editor of this Newsletter, commenting on these articles and describing the status of women in astronomy in their own country.

It is apparent, from these and other articles, that there are many factors which may affect the status of women in astronomy. These range from possible (but controversial)differences in natural scientific and mathematical ability, through social factors mitigating against women becoming interested in science, to problems associated with combining marriage, child-raising and a scientific career. Nevertheless, women enter carriers in astronomy in reasonable proportions especially in Europe. However, in all the countries surveyed, women are often prevented by various factors from reaching the highest levels of the astronomical community. There are exceptions, of course: Drs. Edith Müller (Switzerland), Margharita Hack (Italy), Irmela Bues and Waltraut Seitter (Federal Republic of Germany, and Margaret Burbidge (USA) are prominent examples.

More detailed discussions of the status and problems of women in astronomy (at least in North America) are contained in the references below.

Cole, J.R. 1981: American Scientist 69, 385.

Kistiakowski, V. 1980: Physics Today 33, #2, 32.

Liller, M.H. 1980: Bulletin of the American Astronomical Society 12, 624.

Percy, J.R. 1981: Journal of the Royal Astronomical Society of Canada 75, 210.

WOMEN IN ASTRONOMY IN FRANCE

Dr. Lucienne Gouguenheim
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French astronomers belong to three different groups: National Centre for Scientific Research (CNRS), observatories (civil servants working full time in astronomical research) and universities (civil servants). The highest wages are obtained at CNRS, the lowest in observatories.

Each of the three groups is divided into four ranks: they are indicated in Table 1 by increasing level. The two lower ranks constitute the lower category (B) and the two higher constitute the higher category (A). The population of each rank is given in Table 2.

Table 1

Category	Rank	CNRS	Universities	Observatories
B	1	Attaché de Recherche	Assistant	Assistant
	2	Chargé de Recherche	Maître Assistant	Aide Astronome
A	3	Maître de Recherche	Professeur (2nd class)	Astronome adjoint
	4	Directeur de Recherche	Professeur (1st class)	Astronome

Table 2

Rank	CNRS*			Universities			Observatories			
	Tot	W	%(W)	Tot	W	%(W)		Tot	W	%(W)
1	48	9	19	20	4	20	a)	9	4	44
							b)	51	10	20
2	129	43	33	37	17	46		57	18	32
3	43	10	23	9	3	33		65	14	22
4	15	2	13	16	1	6		32	4	12

*including External Geophysics
a) lower category; b) higher category

General Comments

In the last five years the number of positions in any of the three groups has considerably decreased. As a consequence very few women have been engaged: none in the universities, 4 among 23 in the observatories and 4 among 42 at the CNRS. Up to now, access to category A was the more difficult. The larger percentage of women in rank 2 is a direct consequence of this difficult access to rank 3.

A more detailed investigation has been performed in the observatories. Among the 34 astronomers who entered rank 2 less than 10 years after entering rank 1, there are only 7 women. But among the 18 astronomers who entered rank 2 after 10 years or more, there are 7 women.

A similar result is obtained concerning the access to the higher rank. Only one woman among 18 astronomers entered rank 4 after less than ten years and four of them, among 13, entered after 10 years or more.

The distribution of ages is also informative:

	Astronomers Born After 1935		Astronomers Born Before 1935	
Rank	W	M	W	M
3	2	27	12	11
4	1	5	3	23

This illustrates the greater difficulty for women to attain higher ranks.

Level of Responsibilities

French astronomers receive their funding from the Ministry of Universities and from the CNRS. There are eight observatories depending on the Ministry of Universities and 29 laboratories depending on the CNRS. Only two laboratories and no observatories are directed by women.

THE EDUCATION AND ASTRONOMICAL CAREERS OF WOMEN IN POLAND

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The education of children begins of course at home and later is continued at kindergarten and preparatory schools. There is no separate educational system in Poland for boys and girls. It is now the most common family model for both parents to work and the care of children to be left to state institutions. Although new regulations give mothers the benefit of a yearly unpaid leave (after the three-month paid maternity leave) so that very small children can be brought up by their mothers, only a few of them really have enough financial resources to be able to live on only one (the father's) salary. Some families are happy enough to find a reliable woman to come daily and care for their child, but her pay may take up to 50 to 70% of the mother's salary. Finally, some parents may get help from grandmothers but these are usually still working themselves, as the age of retirement for women is 60.

When children leave primary schools at 15, they enter various kinds of secondary schools, either general (lycées) or technical (electrical, chemical, economic, etc.). Both boys and girls may study in these schools, but it is customary to have more boys in the technical schools, while girls prevail in lycées. Pupils may begin university studies independently of their secondary school education; they have to undergo entrance examinations. Astronomical courses lasting five years are now available at five Polish universities. The proportion of girls studying astronomy is about one-third; this is exactly true for our Toruń University, as we have had exactly 33% women in the course for more than 30 years and I suppose it is also statistically true for other Polish universities.

What do the women do when they finish their university education? First of all, some 80% get married, usually during their fifth academic year, and then they have to follow their husbands when these get settled and look for such work as they can find in the vicinity of their new homes. Women usually prefer to teach at secondary schools (they are prepared to teach astronomy and physics) as working hours are shorter than elsewhere while holidays are longer. Some women work at scientific libraries, meteorological institutes and computing centres. Only about 20% of women graduating in astronomy begin a scientific career in astronomy. They are in no way handicapped; they can get salaries equal to those of men, yet in practice, if they have their own families, then they can't spend as much time as they should working on astronomical problems. It is still worse if they have to spend some nights at the observatory and must leave the care of children to the husband, a paid baby-sitter, or perhaps grandmother. And while children are small, it is nearly impossible for a woman to attend scientific conferences, either here or abroad, or to go abroad for a scientific stay. Such a stay usually enables a young astronomer to get more observational material for the preparation of his doctoral thesis. Hence the time for obtaining a doctor's degree is normally much longer for a married woman than for a man. Therefore I think that an astronomical career is much more difficult for a married woman than, for instance, the career of a physicist or a mathematician also working at a university.

If in her astronomical career a woman is given a chair in astronomy in one of the universities, then she may work till 70, which is the age of retirement for professors, both women and men. Generally speaking, there is no legal difference in rights between men and women. Women may be elected to parliament, they may be given the posts of ministers, of directors in various branches of industry, or university presidents, and everywhere they get salaries equal to those of men.

Finally, I ought to mention Emeritus Professor of Astrophysics, Miss Wilhelmina Iwanowska, former Director of our Institute of Astronomy in Toruń, Royal Astronomical Society and many other scientific societies, past Vice-president of the International Astronomical Union, who is now retired, but still is taking an active interest in Polish astronomical life.

WOMEN IN ASTRONOMY IN THE U.S.

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Women astronomers in the United States comprise almost 9% of the membership of the American Astronomical Society. This percentage is down from a maximum of about 17% in the early 1940's, but the figure has been slowly increasing since the early 1970's. The total is now approximately 300 women. The representation of women on college and university astronomy faculties is more dismal. Fewer than 5% of the tenured or tenure-track professors of astronomy in the U.S. are women, a total of fewer than 30 women. Women are especially underrepresented in high ranking professorial positions, although the age distributions for men and women in astronomy are similar. By 1979, the average salary differential between men and women had increased to $3,500 from $3,300 in 1973.

The AAS has twice appointed an ad hoc Committee on the Status of Women. The reports of these Committees are published in the Bulletin of the AAS (12, 624, 1980; and 6, 412, 1974) and those reports are the source of the data presented here. The AAS has since appointed a standing Committee on the Status of Women to help promote the full participation of women in the AAS and in the U.S. astronomical community.

One of the problems most frequently faced by women in astronomy is the difficulty of being part of an "astronomical couple". Fully half of our women astronomers are married to other astronomers or to spouses working in a closely related field. A woman astronomer must often take whatever employment she can find near her husband's place of work. Frequently these positions are lower ranking lecturer or research appointments. Affirmative action procedures in the U.S. occasionally compound this problem because such procedures increase the difficulty in hiring astronomical couples.

The National Science Foundation proposed two new programs to increase the participation of women in astronomy research. The first provided reseach initiation funds for women who recently received their doctorates or who are re-entering the research community after a career interruption. The second supports visiting professorships for women for up to two years at academic institutions. Unfortunately funding for both programs has been withdrawn.

During the 1970's, the recognition of the contributions of women to astronomy increased. More women are now serving as officers of the AAS, on astronomy advisory committees and as referees for journals. More women are asked to give invited papers at AAS meetings, and at least one woman has been honored with a prestigious Society award. However, this improvement has not yet been matched with a significant increase in the percentage of astronomers who are women or in their representation on astronomy faculties.

WOMEN IN ASTRONOMY IN THE U.S.S.R.

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It is well known that in the U.S.S.R. women enjoy equal rights with men in all fields of social, political and cultural life. There is only one exception:

it concerns women's nature and their family position and child care. In this respect women have special privileges. Possessing natural abilities equal to those of men, women have free access to science in the U.S.S.R. Their number is about 40% of the total scientific staff and in astronomy as well. It is rather difficult to specify the absolute number of women in astronomy, but one may suggest this number to be about, say, seven to eight hundred. About 30 to 40% of these women have a doctor's degree, nearly the same percentage as men. In this respect, women's scientific position is equal to that of men. Needless to say, women and men are paid equally.

There is a second doctor's degree which, being of a higher rank, is usually awarded to the most prominent scientists whose contribution includes the development of some new scientific trend. The number of specialists of such rank is about one tenth of all those holding a doctor's degree. Usually women cannot afford to devote all their life to obtaining this degree. Nevertheless one can find dozens of such highly qualified women among Soviet astronomers.

It seems that the reasonable and natural proportions of men and women in science and astronomy in particular are due to the situation existing in the college and university educational system. In school, girls and boys study together. Their proportion corresponds to the natural demographic proportion, due to the obligatory nature of the educational system.

Astronomy is a separate course in the Soviet school programme, and boys and girls in their teens regard astronomy romantically. After graduating from secondary school, they can choose their future speciality. Boys and girls who prefer astronomy have equal chances to enter a university.

In the main universities (Moscow, Leningrad, etc.), girls represent more than 25 to 35% of students in astronomy. This accounts for the existing percentage of women among astronomers.

There have been many outstanding women in Soviet astronomy. Their names are well known in many countries: V.F. Gase (1899-1954), N.N. Sytinskaya (1906-1974) and A.G. Masevitch in astrophysics, L.P. Tseraskaya (1855-1931), R.A. Bartaja and K.A. Barkhatova in stellar astronomy, A. Ja. Bougoslavskaya (1899-1960) in astrometry, N.F. Rein (1905-1942) and E.I. Kazimirchak-Polonskaya in celestial mechanics. We find women in all branches of astronomy.

Is there any branch which attracts more women than others? It is difficult to say. But there is evidence that many women solve problems in celestial mechanics, discover minor planets, novae and supernovae, and make many other contributions to observational study.