

TRANSACTIONS OF THE  
INTERNATIONAL ASTRONOMICAL  
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VOL. XIII A (REPORTS 1967)

# REPORTS ON ASTRONOMY

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INTERNATIONAL ASTRONOMICAL UNION  
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OF THE  
INTERNATIONAL ASTRONOMICAL UNION  
VOLUME XIII A - REPORTS

REPORTS  
ON  
ASTRONOMY

*Edited by*  
Luboš PEREK  
*General Secretary of the Union*

PUBLISHED FOR THE INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS  
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## PREFACE

The present volume, XIII A, contains the corrected Reports of IAU Commissions, as presented to the XIII General Assembly of the Union, held in Prague, Czechoslovakia, from 22 to 31 August 1967. The volume, entitled "Reports on Astronomy", is an authoritative, detailed, and unique survey of the accomplishments in all branches of astronomy from 1964 to 1967. For technical reasons, the volume also contains the Report of the Executive Committee 1964-1967, which originally was to appear in Volume B.

The page proofs of the present volume, assembled into the Agenda and Draft Reports, had been distributed to the Members of the Union before the General Assembly. Only errors and misprints in the Draft Reports have been corrected in the present volume: additions had to be deferred to volume XIII B in order to speed up publication.

Volume XIII B, subtitled "Proceedings of the Thirteenth General Assembly", will contain: the report of the Inaugural Ceremony and of the sessions of the General Assembly; the resolutions adopted by the General Assembly and by Commissions; the proceedings of Commission meetings, and those parts of the Astronomer's Handbook which underwent changes (i.e. representation of the IAU in international scientific bodies; composition of the Executive Committee; Symposia, Colloquia, and Publications of the Union; list of Commissions and of their membership; list of Members of the Union).

A separate volume, not numbered in the series of IAU Transactions, and entitled "Highlights of Astronomy as presented at the Thirteenth General Assembly of the Union 1967" will contain the Invited Discourses, the proceedings of the Joint Discussions, and those of one or two other meetings.

The proceedings of Symposia No. 33—Physics and Dynamics of Meteors, No. 34—Planetary Nebulae, and No. 35—Development of Solar Active Regions, held immediately after the General Assembly, will be published in the Symposium series of the Union.

The present volume is a collective work of forty Presidents of Commissions. The personal style was preserved in preference to an entirely homogenous presentation. The reports were edited by the former General Secretary, Professor Jean-Claude Pecker, during his term of office. The extremely difficult task of subediting the volume was entrusted to the experience, patience, and competence of Miss Geneviève Drouin. All those who assisted in preparing this volume, as well as the printer, Willmer Brothers Limited, and the publisher, D. Reidel Publishing Company, deserve the gratitude and appreciation of the Union and of the readers as well.

*Praha*

4 October 1967

L. PEREK

*General Secretary*

## REPORT OF THE WORKING GROUP ON PHOTOGRAPHIC MATERIALS

1. The formation of this group dates from a meeting convened during the Hamburg General Assembly, 31 August 1964, by R. H. Stoy, supported by I. S. Bowen and H. Haffner. There was a large and enthusiastic attendance, which passed with acclamation the following resolution: 'In view of the great importance to astronomy of the supply of the most suitable photographic material, this meeting of astronomers from many countries requests the Executive Committee of the International Astronomical Union to set up a working group responsible either to itself or to some nominated Commission to investigate, (a) the present supply of photographic materials and the best methods of procuring and handling them, (b) the potential consumption of specialized photographic material, with a view to interesting the various manufacturers in its production.'

2. By letter of 15 September 1964, the General Secretary conveyed the approval of the Executive Committee of the IAU to the establishment of the Working Group, with the following membership:

President: R. H. Stoy

Secretary: D. S. Evans

Members: Aly, Mme Andriolat, Bertola, Gollnow, Griffin, Haffner, Mendoza, Mikhailov, Savedoff, Sharpless, Harlan J. Smith, Steinlin, Valniček, Velghe, Wempe.

3. The operations of the Working Group so far undertaken, demonstrate the great extent of the problems involved. Some of these are capable of being solved almost immediately by the action of astronomers themselves. Others require consultation with manufacturers. Yet others, which are concerned with problems of currency allocation, the possibility that some materials may be designated as of strategic importance by manufacturing countries, and so forth, may require discussion at governmental level. It is clear that there is a continued necessity for the work of the Group, and that numbers of problems will require a long time for their evaluation even before solutions can be sought. The investigations undertaken so far have been admirably supported by the manufacturers of photographic materials, and by a considerable number of observatories. The number of the latter is, however, not as great as it should be. It must be emphasized that, in order to get meaningful statistics describing the supply position, it is just as important for observatories not now facing difficulties, to report their situation, as it is for those who have problems in need of solution.

We take this opportunity of thanking those manufacturers and observatories who have collaborated in the work of the Group, and urge those who have not yet sent in reports to do so.

The foregoing remarks make it clear that the present report cannot be comprehensive. Its aim is to draw attention to a few of the problems which have revealed themselves, in the hope that these can be tackled first, leaving others for the continuing work of the Group.

4. A circular letter was sent to all manufacturers known to be active in the production of photographic materials suitable for astronomical purposes. A report incorporating their replies was produced in January 1966 and circulated with a questionnaire to a large proportion of the world's observatories. Copies of these documents and of an analysis of the replies may be had on request from the Cape Observatory.

5. The American Astronomical Society has set up a Committee of its own in the same general field. It should be clear that because of the relatively close proximity of the U.S. and Canadian observatories to the Kodak works at Rochester, N.Y., and because of the large numbers of observatories and astronomical departments of universities in these two countries, the problems encountered are somewhat different from those in the world at large. Nevertheless there are

problems, many of which have been discussed at an expert level in the admirable memoranda prepared for private circulation by Mr William C. Miller of Mount Wilson and Palomar Observatories. It is evident that the U.S. and Canada constitute a natural area for the establishment of a system of cooperative ordering and supply, and the practical problem is one in which the IAU Working Group as such can have very little constructive role, except to offer encouragement.

It is understood that a cooperative ordering scheme is being operated in West Germany and one may be begun in Australia.

A Joint Meeting of the AAS and IAU Groups was held in 1966 July 29, together with representatives of Eastman Kodak, Rochester, at the Mees Observatory, Naples, N.Y. Members of the Working Group who attended were Evans, Sharpless, Smith and Savedoff. The discussion ranged over the whole field of supply and storage. Items from the conference summary which are of particular interest are incorporated in the report referred to in paragraph 4. It seems desirable for the Group to organize discussion leading to definite recommendations on particular topics.

The obvious first choices would seem to be:

- (a) Standardization of plate sizes for astronomical purposes.
- (b) Canalization of demand for emulsion varieties to reduce unnecessary diversity.
- (c) Definition of the next tasks to be undertaken by the Group.

#### 6. Publications.

It is understood that Mr William C. Miller may be contemplating the production of a book. At the moment his vast experience and knowledge of photographic emulsions as applied in astronomy is scattered through various published papers and memoranda produced for private circulation. The Working Group considers that a book by Mr Miller would be invaluable, and wishes him success in his labours.

The following is a list of some publications likely to be of interest in the field:

- F. Bertola, Sull'aumento di rapidità delle lastre fotografiche per uso astronomico, *Contr. Oss. astrofis. Univ. Padova Asiago*, No. 154, *Mem. Soc. astr. ital.*, **35**, no. 2, 1964.
- I. S. Bowen and L. T. Clark, Hypersensitisation and Reciprocity Failure of Photographic Plates, *J. opt. Soc. Am.*, **30**, 508, 1940.
- J. D. Fernie, A New Photographic Developer for Astronomical Use, *Publ. astr. Soc. Pacif.*, **74**, 238, 1962.
- J. D. Fernie and Sandra Holm, Studies in Astronomical Photography. I. On the Use of baked IIa-O Spectroscopic Plates, *J. R. astr. Soc. Can.*, **58**, 13, 1964.
- II. On the Use of Diafine Developer, *Ibid.*, **58**, 201, 1964.
- A. A. Hoag, Cooled-Emulsion Experiments, *Publ. astr. Soc. Pacif.*, **73**, 301, 1961.
- William C. Miller, The Application of Pre-Exposure to Astronomical Photography, *Publ. astr. Soc. Pacif.*, **76**, 328, 1964.
- : A Pre-Flasher for Photographic Plates, *Ibid.*, **76**, 433, 1964.
- : Memorandum: The Mount-Wilson Palomar Photographic Plate Speed System.
- : Preliminary Report on the Reduction of Reciprocity Failure in Astronomical Plates by Controlled Baking, Photographic Laboratory, Mount Wilson and Palomar Observatories, 1956: Appendix, 1966.
- N. Richter and W. Hogner, Eine neue Plattensorte für Astroaufnahmen im roten Spektralbereich, *Monatsberichte der Deutschen Akademie der Wissenschaften*, **6**, 809, 1964.
- R. Shaw, The Equivalent Quantum Efficiency of Aerial Films, *J. fotogr. Sci.*, **13**, 308, 1965.
- W. F. Swann, Summary of AAS, IAU, Kodak meeting at Naples, N.Y., 1966.
- Report of Meeting on Photographic Plate Testing, Mount Wilson and Palomar Observatories, 1966.
- Kodak Plates and Films for Science and Industry.

R. H. STÖY

*President of the Working Group*

*Individual Contributions on Solar-Terrestrial Relations*

Meeting held at 9.30 a.m. 26 August 1966.

It was an open meeting attended by about 45 persons. The papers submitted were reported very briefly since it may be expected that many of them will be published elsewhere.

*T. Obayashi* dealt with the identification of *M*-regions from their influence on the diurnal variations of cosmic rays. The phasing of the various disturbances was illustrated on a 'floral' diagram.

*S. Matsushita* gave an analysis showing the detailed effects on the geomagnetic  $S_q$  and  $L$  variations that could be associated with solar activity.

*M. Pick* described a study of the slowly varying component of solar radio emission in relation to the structure of associated centres of solar activity. The distribution in the radio spectrum is found to be related to a factor measuring certain geometric properties of sunspots and their magnetic fields.

*E. Tandberg-Hanssen* gave results on the magnetic fields of prominences obtained from the High Altitude Observatory magnetograph at Climax.

*B. Valmíček* illustrated the features of an active flare prominence event observed with high spectroscopic resolution in  $H\alpha$ .

*G. Piccardi* questioned the causality of correlating phenomena. Previously his F-test had been related to flares and he now finds a good relation between the P-tests and proton flares.

*P. Bernard* discussed a 2-year period in geomagnetic variations but could not ascribe it to a solar activity effect; he finds the magnetic field of ionospheric winds quantitatively sufficient to account for it.

*Constance Sawyer* described the preference for certain heliographic longitudes of 45 proton-flare regions of cycle 19. With 15 famous flares of the last century they define a rotation period of 27.2135 days. The rigid rotation and long lifetime of this pattern suggest a deep-seated magnetic field of large scale.

*T. E. van Zandt* had studied the variations in the upper atmospheric ratios  $O^+/He^+/H^+$  throughout the minimum of the solar cycle. The interpretation of these variations led to the suggestion that the coronal variations lagged a year behind those of the chromosphere. Support for this suggestion was found in the E and F layer critical frequency variations.

*C. Popovici, A. Parepeanu and V. Dinulescu* considered the major flares during 1958-61 which did not give rise to geomagnetic storms. Certain aspects and morphology regularities were detected.

*K. Davies* studied the sudden ionosphere frequency deviations resulting from flares and showed that the characteristic electron increase occurred mostly above 100 km. Time variation studies suggest that the D and E-F effects originate from separate parts of the solar ionizing spectrum. The relaxation time of the E region is found to be about one minute.

*M. L. White* described how the mechanism of rotation and drift in the solar photosphere should give rise to a 3-leaf Rossby wave pattern such as occurs in 'dishpan' experiments. Many solar phenomena, including the equatorial drift, can be explained on this basis.

*D. H. Menzel* submitted (in his absence) a paper on the nature of sunspots and solar activity.

*Invited Address*

An invited address by Dr E. G. Bowen, Chief of Division of Radiophysics, CSIRO, Sydney, entitled 'Solar and Planetary Interactions' had been planned for the afternoon of 26 August.



Unfortunately this address had to be cancelled as Dr Bowen was unable to make the trip from Australia.

*Closure of IUCSTR Meetings*

The Belgrade final Meetings of the IUCSTR closed at the end of the Individual Contributions meeting on the morning of 26 August 1966.

- (f) That archive material relating to the IUCSTR (and previous JCSTP) be retained for the present by C. W. Allen at the University of London Observatory. The following spares of the Reports on STR still exist 8 of 2, 55 of 4, 15 of 5, 14 of 6, 34 of 7, 29 of 8, 10 of 9, and 13 of 10.

It was recommended that the Report of the Belgrade meetings of IUCSTR should be prepared for presentation to the ICSU Executive Committee meeting in Monte Carlo (October 7-8, 1966), and that the points relevant to the IUCSTP should be sent to its President (Dr H. Friedman) as soon as possible in order that the points may be considered in the planning of future activities.

As a conclusion to the Meeting the Commission noted with satisfaction the creation of the new IUCSTP and commended the President (IUCSTR) for his leadership in the Commission's activities and for his participation in the arrangements for specification of terms of reference for the new Commission which should serve as an excellent basis for future international activities not only in the field of solar-terrestrial physics but also for the continuation and extension of activities of the character that have in the past occupied our Commission.

The activities and responsibilities of the IUCSTR *will close* when the various reports and recommendations have been prepared, circulated and submitted. A statement is to be circulated to the Roster of Active Workers. The President is to report to ICSU in October. He will also arrange with the IAU to close the accounts after the ICSU meeting in October.

#### *Open Discussion on Suitability of Solar Data for Terrestrial Correlations*

Meeting held at 2 p.m. 25 August 1966.

Attended by Allen, Bailey, Bernard, Buzchanov, Campbell, Cardús, Davies, Dieminger, Dinulescu, Djurković, Ehmert, Fortini, Friedman, Jacchia, Karabin, Knuth, Kundu, Landstreet, Lauter, Lincoln, Lüst, Matsushita, Milogradov, Minnis, Mustel, Obayashi, Parepeanu, Piccardi, Pick, Popovici, Przeuijervic, Pushkov, Ramanathan, Righini, Roberts, Roederer, Sawyer, Senatre, Shapley, Svestka, Tandberg-Hanssen, Valniček, van Zandt, Waldmeier, White, Zhulin.

The President introduced the discussion by saying that the solar data to be discussed related to the extended routine data intended for use rather than exploration or speculation. The purposes of such data could be summarized: (i) for studying effects on the Earth and surrounding Earth-space, (ii) for coordinating specialized observations and researches, and (iii) for studying the Sun itself. The discussion would take this order of priorities.

Points that might be considered in discussing the data were, (i) the measurement often was no more than an *indication* of the physical quality required, (ii) measurements were frequently subjective and required standardization and comparability, (iii) data were often applied through correlations and secondary correlations may require elimination, (iv) it was often necessary to segregate a total solar effect into individual activity contributions, (v) there is need for numerical indices for descriptively complex phenomena.

The discussion was subdivided into (i) generalities, such as the points mentioned above, (ii) slowly varying phenomena, active areas, (iii) rapidly varying phenomena, flares, and (iv) phenomena not associated with active areas including the quiet Sun.

#### *Discussion points*

*Shapley*: Difficulty of dealing with very extensive and almost continuous data. There may be need for more analysis before publishing.

*Waldmeier*: Filament should be reported in a numerical form suitable for correlation with *M* regions.

*Mustel*: More whole-disk magnetic field measurements should be undertaken (recommendation A made). Early magnetic storm data should be sorted into recurrent and sporadic.

*Lincoln*: The CRPL are preparing to publish the Mount Wilson magnetic data.

*Pushkov*: Introduced the question of solar terrestrial services (recommendation C made).

*Valniček*: Introduced the question of computer processing of data.

*Jacchia*: Suggested that steps be taken to segregate the active and quiet Sun components of 10.7 cm radiation (recommendation B made).

*Friedman*: Referred to the variations in 2 to 10 Å solar emissions and their relations to ionosphere responses. These variations challenge solar observers to detect analogous variations in spectroheliographic material.

*Kundu*: Suggested 3 cm solar-radio recordings might give indication of similar variations.

*Godoli* (Submitted): The peculiarities of long-term correlations can be ascribed to the behaviour of solar indices.

### *IUCSTR Recommendations arising out of Discussion on Solar Data*

#### *A. Solar Disk Magnetic Observations*

In view of the importance of relating the whole picture of the Sun's magnetic field to the magnetic field in the neighbourhood of the Earth and in interplanetary space

It is *recommended*:

That observatories with facilities for high spectroscopic resolution consider the possibility of making magnetic observations of the whole solar disk on a regular basis.

#### *B. Quiet and Active Radio Observations*

In view of the great use made of solar radio observations at various wavelengths for correlation with solar XUV flux measurements at all stages of the sunspot cycle

It is *recommended*:

That radio observatories offering suitable data be asked to endeavour to express the results quantitatively in such a way that the two components, quiet and active, can be segregated.

#### *C. International Solar-Terrestrial Services*

Considering:

- (1) That the collection and publishing of solar-terrestrial data is prepared by many different organizations in several countries,
- (2) That this work has received some coordination in the past, but that this coordination needs to be maintained and improved with particular reference to such questions as standards and definitions,
- (3) That it is by no means certain that all data thus published are of sufficient use to the scientific and operating communities to justify their publication,
- (4) That it is possible that additional observations could usefully be made,
- (5) That in the field of meteorology the WMO provides services for all user purposes,

The IUCSTR *recommended*:

- (1) That a clear need now exists for a more closely coordinated *international solar-terrestrial services* such that the needs of both the scientific and operational communities requiring solar-terrestrial information will be effectively served.
- (2) That the IUCSTP be asked to consider how the need for such services can be met.

# INTER-UNION COMMISSION ON SOLAR AND TERRESTRIAL RELATIONSHIPS

The Commission held its final meetings in the House of Youth, Belgrade, on 25-26 August 1966, prior to the Inter-Union Symposium on Solar-Terrestrial Physics.

The meetings to be reported are:

- (i) Business meeting of the Commission.
- (ii) Open discussion on 'Suitability of Solar Data for Terrestrial Correlations'.
- (iii) Individual contributions on solar-terrestrial relations.

At the time of the meetings, the membership was as follows:

## *Members*

IAU	IUGG	URSI
C. W. Allen (U.K.), <i>President</i>	Mrs N. P. Benkova (U.S.S.R.)	G. M. Allcock (N.Z.)
R. Giovanelli (Australia)	T. Obayashi (Japan)	D. K. Bailey (U.S.A.),
E. R. Mustel (U.S.S.R.)	W. O. Roberts (U.S.A.)	<i>Secretary</i>
M. Waldmeier (Switzerland)	E. J. Vassy (France)	R. Coutrez (Belgium)
		A. H. Shapley (U.S.A.)

## *Corresponding Members*

E. K. Bigg (Australia)	R. Michard (France)
Mrs. H. Dodson-Prince (U.S.A.)	M. Nicolet (Belgium)
F. Link (Czechoslovakia)	

There were 155 names on the Roster of Active Workers.

## *Business Meeting of the Commission (IUCSTR)*

After some informal discussion the meeting began at 10<sup>h</sup> 20<sup>m</sup>, 25 August 1966. It was attended by the following Members or Corresponding Members:

C. W. Allen, *President* (in the Chair), D. K. Bailey, *Secretary*, E. R. Mustel (represented by N. W. Pushkov), T. Obayashi, W. O. Roberts, A. H. Shapley, M. Waldmeier.

The President of the newly formed Inter-Union Commission on Solar-Terrestrial Physics (IUCSTP), Dr H. Friedman, attended by invitation.

It was accepted that since the IUCSTR is to terminate in 1966 by ICSU resolution the present meetings would be the last held by the present Commission.

The report of the previous meeting at Hamburg, 24 August, 1964 (Trans. IAU, **12B**, 651, 1966) was adopted.

The President reported briefly on the use of available funds for travel and subsistence allowances. The funds are from ICSU sources and accounting is in the hands of the IAU Secretariat.

## *Future organization of solar terrestrial relations*

The main concern of the meeting was to consider the situation occasioned by various efforts to coordinate the science of solar-terrestrial relations (STR) with the wider science now using the title solar-terrestrial physics (STP). These activities were briefly reviewed and will be recorded. The Working Group on Solar-Terrestrial Physics, mentioned in the report on the Hamburg Meeting (p. 652), had met in September 1964 and recommended the formation of a Symposium Committee on STP to coordinate symposia in this field. This was considered by

the IUCSTR through the medium of circulars in November 1964 and February 1965. The IUCSTR approved the Working Groups recommendation but considered it was *not* necessary to form a *new* Symposium Committee. In February 1965 the IUCSTR reported its willingness to modify itself with the view to accepting the responsibility of coordinating STP. This proposal was considered by ICSU at its meeting in Munich, April 1965 and resulted in Resolution 5 (ICSU Executive Committee 3rd Meeting, Summary Record, p. ii, 1965) which stated:

The Executive Committee resolves that the Inter-Union Commission on Solar and Terrestrial Relationships (IUCSTR) be urged to make appropriate additions to its membership, and modify its terms of reference so as to provide representation for all interested Unions, Commissions of ICSU; and that the Unions and Commissions concerned be likewise urged to coordinate the arranging of symposia through this Commission.

In accordance with this resolution the IUCSTR submitted in July 1965 Draft Proposals for its own modification in order to undertake coordination of STP symposia. Several discussions with interested parties were held and in November 1965 the 'Proposals for an International Solar-Terrestrial Commission (ISTC)' was submitted to ICSU in time for consideration at the ICSU Bombay Meeting in January 1966. However, these proposals were not actually used as basis for the discussions in Bombay. The future of STP research and STP symposia was conjoined with the future of IQSY and led to the Resolution VII (ICSU Eleventh General Assembly, Summary Record, p. 37, 1966) which might be stated in a reduced form as follows:

- (1) That the IUCI and IUCSTR be terminated in 1966,
- (2) That an Inter-Union Commission on Solar-Terrestrial Physics (IUCSTP) be set up in 1966:
  - (i) to promote, organize and coordinate international research in solar-controlled disciplines of geophysics,
  - (ii) to coordinate all ICSU symposia in the field of solar-terrestrial physics, and
  - (iii) to provide certain advisory services on operational activities arising out of IQSY.

The ICSU resolution was discussed and was considered to be a satisfactory basis for the future promotion of STR. It was noted that no Parent Union had been proposed and satisfaction was expressed that the IUCSTP would be directly responsible to ICSU.

The Commission then discussed what recommendations, arising out of the work of the IUCSTR, should be sent forward to the IUCSTP. The following recommendations were made:

- (a) That the IUCSTP be asked to accept advisory responsibilities with respect to the *Quarterly Bulletin of Solar Activity* and other relevant Services.
- (b) That the IUCSTP might at times be expected to promote operational planning, associated working group activities, and timely assessments of particular subjects such as problems arising from overlapping areas of interest in various scientific Unions under ICSU.
- (c) That the IUCSTP give attention to maintenance of continuity in STP programmes and data.
- (d) That the Roster of Active Workers maintained by the IUCSTR (containing 155 names) be sent to the IUCSTP Executive. This represents a useful list of scientists actively interested in STR.
- (e) That, although the Reports 1 to 10 on Solar-Terrestrial Relations constitute an important part of the IUCSTR (and previous JCSTR) output, it is *not* recommended that the IUCSTP necessarily continue such reports.

Observatoire de Liège (Professeur Swings): peut accueillir des étudiants à condition que soit résolu le problème financier.

National Radio Observatory (Green Bank, Professeur Heeschen). Un certain nombre de postes de 'Research associate' sont disponibles, pour des étudiants ayant déjà reçu un entraînement. Il est probable que seuls les meilleurs étudiants des Ecoles de l'UAI pourraient bénéficier des bourses du NRAO.

### (3) *Autres réponses*

Les institutions suivantes: Berkeley, Johannesburg, Kitt Peak, Royal Society (au nom des Institutions Britanniques), Saltsjöbaden, Torun, pour des raisons variées, ne peuvent prendre part à l'organisation des Ecoles elles-mêmes.

Les réponses laissent penser que le stage de formation de un an serait possible, mais l'absence de précision à ce sujet rend nécessaire une nouvelle enquête.

L'Académie des Sciences de Paris (au nom des Institutions Françaises) fait une réponse évasive; le Professeur Rienäcker, au nom de l'Académie des Sciences de Berlin, annonce une réponse précise avant le 31 décembre 1965 concernant une Ecole en 1967.

En résumé, on peut faire les prévisions suivantes:

1967: Manchester ou Bucarest

1968: Harvard

1969: JILA

1970: Edinburgh ou Mont Stromlo

Il paraît vraisemblable que dès maintenant des plans peuvent être faits pour six Ecoles consécutives.

Il avait été convenu de chercher un secrétaire pour l'Ecole. Après consultation, le Comité Exécutif de l'UAI a désigné le Dr J. Kleczek.

#### ANNEXE IV. A SUMMER SCHOOL ON SATELLITE TRACKING FOR YOUNG OBSERVERS FROM THE COUNTRIES OF EASTERN EUROPE AND ASIA

(Tashkent, 7-15 September 1965)

In agreement with the plans of multilateral co-operation between the Academies of Sciences of East European and Asian countries on the problem 'Scientific investigations based on satellite tracking data' the Astronomical Council of the U.S.S.R. Academy of Sciences organized in Tashkent jointly with the Tashkent Astronomical Observatory during 7-13 September 1965 a summer school on satellite tracking for young observers. Tashkent was chosen since a good tracking station functions at the Tashkent Astronomical Observatory and because fine weather is typical there for this season, which is very important for training in tracking of satellites. Young astronomers from Bulgaria, Hungary, the DDR, Mongolia, Poland, Romania, the Soviet Union and Czechoslovakia (altogether 40 students) participated at the school.

The program included 14 lectures on general topics related to: methods of satellite tracking with the aid of photographic cameras; reduction methods of data obtained; and possibilities for using the data for scientific purposes. The detailed program was the following.

On 7 September three lectures were delivered on the utilization of precise photographic satellite tracking data for cosmic geodesy and for the study of the figure of the Earth and the Earth atmosphere.

On 8 September the NAPA camera used in the Soviet Union for precise satellite tracking

was demonstrated and a review of methods for taking photographs of artificial satellites presented. Besides, the students were informed in a special lecture about possibilities to insure precise timing.

The third and the fourth days (9-10 September) were dedicated to two important items: predictions of satellite passages and methods of the reduction of photographic data. These problems were considered also in two lectures delivered on 13 September.

Then separate groups of students (5-6 persons in a group) were trained daily in handling the cameras, plate reduction, reception of precise time signals and calculation of ephemeris. Each student was given the opportunity to take several photographs of the balloon-satellite Echo-2 and to reduce the obtained plates. The lectures were delivered and the training carried out by the scientific staff of the Astronomical Council of the U.S.S.R. Academy of Sciences of the Institute of Theoretical Astronomy and of the Pulkovo and Tashkent Astronomical Observatories.

As a result, young observers, who as a rule had not been enough experienced in photographic tracking had a good training under the guidance of experienced observers and were given theoretical knowledge necessary for the work in this domain.

On 13 September a closing lecture was given by Professor V. P. Shcheglov, the Director of the Tashkent Observatory on the history of the astronomy of middle Asia. The lecture was followed by a two-day tour to the ancient Observatory of Ulughbok near Samarkand. The students had also the opportunity to see the beautiful architectural monuments of Samarkand.

Sight-seeing tour of the city of Tashkent and a visit to the Institute of Ancient Oriental Manuscripts were also arranged for the participants. Several documentary films about Middle Asia and a new picture about Ulughbok—the ancient founder of the Uzbek astronomy—were shown.

On the closing day all the participants were given special diplomes.

N. P. SLOVOKHOTOVA,  
*Scientific collaborator*  
*of the Astronomical Council,*  
*U.S.S.R. Academy of Sciences*

Canada: David Dunlap Obs., Univ. Toronto; Univ. Western Ontario, London.  
Espagne: Inst. Marina San Fernando, Cadiz.  
Etats-Unis: Boston Univ., Boston, Mass.; Calif. Inst. Techn., Pasadena, Calif.; Yerkes Obs., Univ. Chicago, Illinois; Univ. Colorado, Boulder, Col.; Harvard Univ., Cambridge, Mass.; Indiana Univ., Bloomington, Ind.; University Mich., Ann Arbor, Mich.; Pomona College, Claremont, Calif.; Swarthmore College Sproul Obs., Swarthmore, Penna.  
Finland: Astron. Obs., Helsinki.  
France: Univ. Aix-Marseille; Univ. Montpellier; Univ. Paris.  
Grande-Bretagne: Royal Obs., Edinburgh; Royal Greenwich Obs., Herstmonceux; Univ. London Obs.  
Italie: Oss. Astrof. Arcetri, Firenze; Oss. Astron., Trieste.  
Japon: Univ. Tohoku, Sendai; Univ. Tokyo; Univ. Kyoto.  
Mexique: Univ. Mexico.  
Pays-Bas: Kapteyn Astron. Lab., Groningen; Sonnenborgh Obs. Univ., Utrecht.  
Pologne: Astron. Obs. Univ. Copernicus, Torun.  
Portugal: Astron. Obs. Univ. Lisbonne; Astron. Obs. Univ., Porto.  
Suède: Univ. Obs. Stockholm.  
Suisse: Univ. Obs. Basel; Obs. Genève.  
Turquie: Univ. Ankara.

*Received after completion of the report*

U.S.A.: Princeton Univ.; Southern Missionary College, Collegedale, Tennessee; UCLA.  
U.R.S.S.: Conseil astronomique.

ANNEXE II. RÉUNION DE DÉLÉGUÉS DE LA COMMISSION 46 ET D'EXPERTS

(Nice, 8-9 juillet 1965)

*Propositions relatives à la formation des jeunes astronomes*

I. La formation de jeunes astronomes exige un entraînement pratique et théorique de longue durée.

Organisée sur le plan international, notamment à l'intention de pays en voie de développement, cette formation pourrait se faire au moyen d'une Ecole de formation pratique d'Astronomie de l'UAI. Cela comporterait une formation essentiellement pratique 'A', reçue pendant 3 mois. Dans cette période, les étudiants seraient astreints à un contrôle strict de leur travail.

Il serait souhaitable que des étudiants reçoivent une formation 'B', en étant envoyés pour une année dans une institution où ils trouveraient une formation pratique et une formation théorique plus spécialisées.

II. L'organisation de cette Ecole Internationale pourrait se faire de la façon suivante:

(1) Trouver, dans chaque institution astronomique, le nombre et le niveau des jeunes astronomes qui pourraient faire l'objet d'un encadrement scientifique sérieux pendant un an.

(2) Choisir, chaque année, le pays et l'institution qui pourraient donner la formation intense de 3 mois. Si cela est à la fois souhaitable et possible, l'institution pourrait inviter des assistants (instructeurs) d'autres institutions.

(3) Adresser aux différents pays et institutions, en vue du recrutement des étudiants, un programme de l'Ecole, indiquant notamment les exigences du niveau (graduate level en mathématiques ou en physique, et au moins une connaissance de base de l'astronomie), les conditions de travail pendant la période d'entraînement intense, les conditions d'admission dans les institutions pour les deux types d'entraînement, une demande séparée devant être faite pour les 2 stages.



III. Le fonctionnement de cette Ecole Internationale demande les conditions suivantes:

(1) Désignation par le Comité Exécutif d'un secrétaire général pour 3 ans, prenant en charge l'organisation des Ecoles de formation de l'UAI.

(2) Désignation, dans l'Institution qui prend en charge la formation de 3 mois, d'un directeur.

(3) Préparation d'un budget de l'Ecole. Il conviendra de déterminer la contribution de l'institution recevant l'Ecole de 3 mois et la contribution des institutions recevant les stagiaires d'un an.

(4) Préparation d'un contrat UAI-UNESCO, permettant notamment d'aider au recrutement des étudiants pour le stage de formation intense. On rappelle qu'il existe déjà des ressources appréciables pour les stages de longue durée.

#### ANNEXE III. RAPPORT SUR L'ENQUÊTE CONCERNANT LA FORMATION DE JEUNES ASTRONOMES

A la date du 19 novembre 1965, j'avais reçu vingt et une réponses à l'enquête commencée en septembre.

Vingt réponses approuvent en termes souvent chaleureux, l'intention de la Commission 46. Toutes les Institutions qui estiment pouvoir contribuer à l'initiative de la Commission 46 indiquent ce qu'elles peuvent faire.

Le classement suivant résume les propositions reçues:

##### (1) *Ecole de trois mois*

L'Observatoire de Bucarest demande à l'Académie des Sciences de Roumanie d'approuver l'organisation d'une Ecole pratique d'Astrométrie en 1967.

Le Dublin Institute for Advanced Studies (Professeur Wayman) envisage d'accueillir une telle Ecole dans quelques années.

L'Observatoire d'Edinbourg (Professeur Bruck) envisage de participer à l'organisation de ces Ecoles après 1967.

L'Observatoire de Harvard (Professeur Menzel) envisage de tenir une telle Ecole en 1968, moyennant quelques arrangements de durée. La lettre du Professeur Menzel pose clairement le problème du budget de l'Ecole.

Le Joint Institute for Laboratory Astrophysics, Boulder (Professeur Garstang) pourrait tenir une Ecole de Physique solaire après 1966.

Le Department of Astronomy de l'Université de Manchester (Professeur Kopal) pourrait s'engager à tenir une Ecole de trois mois en 1967.

Le Comité National d'Astronomie de Prague (Professeur Sternbeck) envisage de participer à ces Ecoles après 1968.

L'Observatoire du Mont Stromlo (réponse indicative du Professeur Bok) tient chaque année, à plus petite échelle (8 étudiants), une telle Ecole. L'extension paraît possible au cours d'une des prochaines années.

L'Observatoire de Wesleyan (Professeur Page) pourrait prendre une fois cinq étudiants (astrométrie, astrophysique, galaxies).

L'Observatoire de Yerkes (Professeur Morgan) pourrait participer aux Ecoles dans quelques années.

##### (2) *Entraînement d'un an*

Les Institutions suivantes peuvent contribuer à l'entraînement d'un an:

Royal Greenwich Observatory (Professeur Woolley); jusqu'à trois étudiants par an.