

U.R.S.I.

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JOHN ALAN GLEDHILL

1920 - 1988

John Alan Gledhill was born on 1 January 1920 in Littleborough, Lancashire, United Kingdom. He died in Grahams-town on 19 June 1988.

Jack, as he was known to all his colleagues and friends, came to South Africa with his family in 1934. He went to the Rhodes University College and obtained his B.Sc. degree with distinction in Chemistry and Physics in 1938, his M.Sc. degree in Chemistry with distinction in 1942 and his Ph.D. in Physics at the same University in 1947. In 1949, after a period of study, he completed his Ph.D. in Chemistry at Yale University before he returned to Rhodes University in Grahamstown to take up an appointment in the Department of Chemistry. In 1954 he was appointed Head of the Department of Physics, a post he held for 30 years. On his retirement in 1984 he was appointed Director of the Hermann Olthaver Institute for Aeronomy at Rhodes University.

Jack was a true scholar of wide interest, physicist, chemist, geophysicist, radio astronomer, ionospheric physicist, space researcher, educator and historian (with his wife he is author of an important South African historical book *In the Steps of Piet Retief*).

As a Ph.D. student, Jack and a co-worker suggested and confirmed the presence of a 2000k layer 200-300 kilometers above the surface of the Earth. In 1967 he predicted that the magnetosphere of the planet Jupiter is spun out into a discus shape due to the planet's rotation; this was confirmed in 1974 by the Pioneer 10 spacecraft and is now referred to as the *Gledhill disc*.

Jack had a long association with URSI.

- |           |  |
|-----------|--|
| 1969-1988 | Member of Commission G on Ionospheric Radio and Propagation                                |
| 1975-1984 | Co-Chairman of Commission G Working Group on Southern Hemisphere Atmospheric Studies Group |
| 1978-1984 | Chairman of Commission G Panel on Southern Hemisphere Incoherent Scatter Facility          |

1984-1988 Chairman of Commission G Ionosonde Network  
Advisory Group.

Internationally Jack also had a long association with the ICSU Scientific Committee on Antarctic Research (SCAR) and its Upper Atmosphere Working Group.

He was the South African delegate to many URSI and SCAR Assemblies from 1978 onwards.

Jack had a 54-year association with Rhodes University, Grahamstown (first Rhodes University College and later Rhodes University) serving as Dean of Science as well as two terms as a member of the University Council and on a number of occasions Acting Vice-Principal of the University.

In 1953 Prof. Gledhill married a well known botanist, Dr. (Eily) E.A. Archibald; their only child was born in 1957 and Dr. Irvy Gledhill is a physicist following in her father's footsteps.

## FREDERICK L. SCARF

1930 - 1988

It is with deep regret that we announce the death on 17 July 1988 of Dr. Frederick L. Scarf, past Chairman of URSI Commission IV on the Magnetosphere and, at the time of his death, Chief Scientist for Space Research and Technology in the Applied Technology Division of the TRW Space and Technology Group and the Principal Investigator of many of the spaceflight investigations of plasma waves throughout the solar system.

Frederick Scarf was born in Philadelphia, Pennsylvania, on 25 July 1930. He obtained a B.S. degree in Physics from Temple University in 1951 and the Ph.D. degree in Physics from MIT. After graduation from MIT, Fred Scarf joined the faculty of the University of Washington where he pursued studies of theoretical quantum electrodynamics. As the space age dawned and after spending several summers at the Space

Technology Laboratory, now TRW, he gave up his faculty position and began to work full-time on the physics of space plasmas at STL. It was his firm conviction of the importance of plasma waves in the physical processes occurring in these plasmas that led him to be a persistent advocate of including such investigations on space missions throughout the heliospheric plasmas.

Fred Scarf's first association with a spaceflight plasma wave instrument, that on OGO-5, quickly led to his transition from theorist to experimentalist and the leadership of a series of investigations: in interplanetary space, the Earth's magnetotail and comet Giacobini-Zinner with ISEE-3; the outer planets with Voyager and Venus with the Pioneer Venus Orbiter. These studies led to many discoveries such as electrostatic waves at half-harmonics of the electron cyclotron frequency in both the terrestrial and outer planet magnetospheres and lightning-generated signals in both the magnetosphere of Jupiter and the ionosphere of Venus.

One of his most important contributions to observational space science was the generosity and openness with which he shared his observational data with other scientists. Another was his role as mentor to a number of young scientists. He was always eager to help them establish their careers. He was a strong advocate of international cooperation in space and participated strongly in the planning and execution of such cooperative ventures. In the United States he was an important participant in the planning of the solar and space plasma physics program and the planetary program.

The space plasma physics community will deeply miss his contributions to the field because Fred Scarf was very much an active participant. However, he leaves a large legacy in his many publications and in the extensive data sets his instruments have collected. His closest colleagues will miss his openness, advice, perseverance, amiability, sound judgement, humor and enthusiasm. Fred Scarf was a true romantic of the space age who loved space science with a rare passion.

C.T. Russell

## MEETING OF THE BOARD OF OFFICERS

The URSI Board of Officers met in Brussels on 11, 12 and 13 July 1988. It discussed a series of items of importance to the life of the Union. The main decisions and topics of discussion are summarized below.

### 1. Finances

The Treasurer reviewed the financial situation, in particular with respect to the problem associated with the fluctuations in the value of the US dollar. The Board decided that the present situation did not warrant a change in the unit contribution for 1989, which was set at \$740 at the 1987 General Assembly.

### 2. Publications

The increased publishing activity of URSI was the object of long discussions. The Board decided to continue the publication of the *URSI Newsletter* in its present form, for the time being at least. The Editor is Prof. R.L. Dowden. The Board took note of plans to prepare Vol. 2 of the *Handbook on Radio Propagation* (Vol.1 has just been printed in India), the *Register of National Standards Laboratories* (to be published by Adam Hilger) and the *Directory of Radio Scientists in Developing Countries* (prepared by Dr. Mitra). Further collaboration with ICSU Press and Oxford University Press to produce a 1990 version of *Modern Radio Science* was approved. The Board also took note of steps being taken to publish an experimental issue of an *URSI Journal on Signals, Systems and Electronics* in 1989. It also approved a policy to allow periodicals, under certain conditions still to be defined, to use the URSI logo on their cover. Finally, the establishment of an URSI Press - New Zealand was approved in principle.

### 3. Sponsorship of Meetings

The Board devoted a first discussion to the desirability, for the Union, to sponsor scientific meetings incorporating a technical exhibition.

### 4. Prague General Assembly, 1990

The Board discussed in detail the plans for the 1990

General Assembly in Prague, both from the "logistics" and the "scientific programme" points of view. Of particular interest were the important Symposium on Bioeffects, which will be organized in cooperation with the Bioelectromagnetics Society, and the participation of Young Scientists in the General Assembly.

5. URSI Membership

The first report of the Membership Committee was considered. The next task of the Committee will be to submit recommendations concerning the possibility of creating "individual" and "affiliate" categories of membership. If approved by the Council, the affiliate level would be reserved for organizations such as government laboratories and industrial firms.

6. URSI Awards

The Board approved a time-table for the nominations to the various URSI Awards. The rules will be published in the December 1988 issue of the *URSI Information Bulletin*, and nominations will have to be in by 1 August 1989.

7. Free Circulation of Scientists

The Board reaffirmed its policy of supporting and applying the rules for the Free Circulation of Scientists approved by ICSU. These Rules are reprinted in the present issue of the Bulletin.(see p.6)

J. Van Bladel  
Secretary General.

## FREE CIRCULATION OF SCIENTISTS

Article 5 of the Statutes of the International Council of Scientific Unions (ICSU) reads as follows:

"5. In pursuing these objectives ICSU shall observe the basic policy of non-discrimination and affirm the rights of scientists throughout the world to adhere to or to associate with international scientific activity without regard to race, religion, political philosophy, ethnic origin, citizenship, language or sex. ICSU shall recognize and respect the independence of the internal scientific planning of its national Members."

This provision concerning the non-discriminatory philosophy of ICSU was reconfirmed by the 21 General Assembly (Berne, Switzerland, September 1986) which adopted the following resolution:

- "13. *Recognizing* the importance to the development of science of the free association of scientists as a means of communicating the results of scientific investigations; *recognizing* further that this is the primary purpose of conferences of ICSU and of the International Scientific Unions and that it is a responsibility of the organizers of such conferences and of participants to ensure that there is free communication and information; *reaffirming* the ICSU principle of non-discrimination and the resolution on the non-political nature of ICSU-sponsored meetings of the Executive Board at its meeting in 1966 in Monaco; *urges* the organizers of ICSU conferences, if they are unable to ensure the attendance of all *bona fide* scientists, to report the problems encountered simultaneously to the adhering body, to ICSU and to their parent Union or Committee in sufficient time (a minimum of 3 months before the meeting is recommended) to allow these bodies to take corrective measures; and *resolves* that all applications for membership and

associate status of ICSU shall include a signed statement that the applicant supports ICSU's Statutes, especially Statute 5, which outlines ICSU's policy of non-discrimination."

A Standing Committee on the Free Circulation of Scientists was created by ICSU in 1963 in order to assist to find solutions of various specific problems concerning the free passage of scientists and free collaboration among scientists. The Executive Secretary of the Committee is

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Tel. ( 46 8) 150430  
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The paragraphs reproduced below are extracted from the ICSU brochure entitled *Advice to Organizers of International Scientific Meetings*. They provide advice to the organizers of meetings on a number of measures which will help to avoid difficulties, and the action to take when confronted by visa refusals.

#### ORGANIZATION OF MEETINGS

1. The organizers of meetings should always keep in mind that bona fide scientists should not be excluded from participating in international scientific meetings because of "...race, religion, political philosophy, ethnic origin, citizenship, language or sex".

Prior to the acceptance of an invitation to hold a meeting in a country the local organizers should produce in writing, preferably at the parliamentary level, an indication that no obstacles will be put to the granting of visas to BONA FIDE scientists who wish to participate. The local organizers should also supply information concerning the mechanisms for applications for visas and an indication of the period normally required between application for and receipt of a visa. Even with written assurances from the local organizers in hand, prior to accepting the invitation the international sponsoring organization should seek information

from either the ICSU Secretariat or the Standing Committee on Free Circulation concerning the past record with regard to delivery of visas of the country concerned.

2. The general information announcement of the meeting should include a statement as to the procedures to be followed to obtain issuance of a visa.

3. If visas are not available four weeks before the commencement of the meeting and the proper authorities are unable to indicate when the visa will be available, the appropriate national body or - failing this - the participant should write to the designated Union Officers who, in turn, should notify the host committee chairman and the Executive Secretary of the ICSU Committee on Free Circulation of Scientists, with copies to the ICSU Secretariat in Paris. It is particularly important that the participant should provide sufficient information concerning the steps taken to illustrate that he has followed the correct procedure.

4. In the first instance action will be taken by the designated Union Officer. If necessary action will then be taken by the Chairman of the Standing Committee on Free Circulation and, where necessary, by the Officers of ICSU in an attempt to resolve problems.

5. If the actions taken under (4) are unsuccessful the international sponsoring organization will be informed.

6. The international sponsoring organization should provide the Chairman of the Standing Committee on Free Circulation of Scientists with the following information concerning visa refusals:

- a) date of invitation, including any statements concerning delivery of visas;
- b) date of first indications that visas would not be available;
- c) Bona fides of scientists concerned;
- d) action taken;
- e) effect of actions, including dates of refusal and authorities;
- f) reactions of local organization responsible for invitation;
- g) follow-up action to local authorities.

7. It must be stressed that time is needed for effective discussions concerning visa problems.

7. As a consequence of refusals most of the following means of registering disapproval have been used:

- a) publicizing information concerning the refusal to grant visas;
- b) issuance of a formal protest statement at the commencement of the meeting;
- c) withdrawal of international sponsorship;
- d) possible cancellation of the meeting or removal to another site;
- e) issuance of a statement that decisions of the meeting cannot be considered valid until all voting delegations, including those not allowed to be present, have the opportunity to exercise their voting right;
- f) independent decision on the part of some scientists to absent themselves voluntarily;
- g) recommendation to all ICSU bodies not to accept invitations to hold meetings in the country until the situation is remedied.

## NEWS FROM MEMBER COMMITTEES

### FRANCE: 40th ANNIVERSARY OF THE FIRST REGULAR IONO- SPHERIC SOUNDINGS AT POITIERS

A meeting was held on 23 June 1988 at the Laboratoire de Physique de la Haute Atmosphère of the University of Poitiers to commemorate the 40th anniversary of the first regular ionospheric soundings initiated by Prof. R. Rivault at the station in Poitiers. The meeting was organised by Prof. Yvonne Corcuff, a collaborator of Prof. Rivault and presently Head of the Laboratory.

During a small ceremony, Miss Corcuff gave a historical account of the work performed at the Poitiers station. She recalled the career of Prof. Rivault and described his pioneering activities and scientific achievements. Prof. R. Rivault had been associated with URSI since 1948, and was Chairman of Commission VIII on Radio Noise of Terrestrial Origin from 1969 to 1972. The ceremony was followed by a visit of the Laboratory and a friendly dinner in the outskirts of Poitiers.

It is worth noting that, since the beginning of the ionospheric work in 1948, the reduction of ionograms at the Poitiers station has been performed by the same person, Mr. R. Dajean, who was warmly congratulated on his perseverance and the quality of his work by the participants in the meeting.

In one of the rooms of the Laboratoire de Physique de la Haute Atmosphère, a small exhibition of documents and photographs relating to the past and present activities of the Laboratory was presented. One of those documents was a photocopy of a press article, written on 19 January 1935, describing the first "radiovision" experiment performed by the laboratories of the Faculty of Sciences of the Poitiers University. It may be interesting for the readers of this Bulletin to know the state of affairs fifty-three years ago; hence that article is reproduced below.

Samedi, 19 janvier 1935

### LA RADIOVISION A POITIERS

Depuis deux ans des études de radiovision sont poursuivies dans les Laboratoires de notre Faculté des Sciences.

Les résultats obtenus, de plus en plus intéressants, malgré la délicatesse et la complexité des dispositifs à réaliser, tous construits au Laboratoire, ont déjà justifié la communication de deux notes insérées aux comptes rendus de l'Académie des Sciences en juillet 1933 et juillet 1934, notes résumant les principaux points acquis.

M. le Préfet de la Vienne, M. le Président du Conseil Général, M. le Maire de Poitiers, M. le Premier Président de la Cour d'Appel, M. le Recteur, Président du Conseil de l'Université, MM. les Doyens des Facultés de Droit, des Sciences, des Lettres, M. le Directeur de l'Ecole de Médecine et MM. les Professeurs de la Faculté des Sciences furent conviés par M. Turpain à se rendre, rue Renaudot, où se trouvaient provisoirement installés, des appareils récepteurs de radiovision. Les dispositifs d'émission, à poste fixe, au Laboratoire de Physique de la Faculté des Sciences, rue de l'Université (distance à vol d'oiseau: 500 mètres) furent mis en oeuvre dans la soirée du mercredi 16 janvier, devant les personnalités qui avaient répondu à l'invitation.

De 21h30 à 22h15, diverses émissions furent effectuées:

La transmission d'un dessin à contrastes, noir sur blanc, destiné au réglage, fût obtenue avec une parfaite netteté. Puis les physionomies de plusieurs personnes qui étaient à la Faculté des Sciences se projetèrent sur l'écran (dimensions: 18 cm x 8 cm) de la rue Renaudot. Elles y furent vues et entendues, les expressions de leur visage suivant exactement leur diction. En particulier, un amateur, fort spirituel et très musicien se présenta, fit fonctionner un métronome dont on vit et entendit les battements et qu'il régla à diverses vitesses. Il présenta ensuite plusieurs instruments: une grande et une petite flûte, une flûte de Pan, un flageolet desquels il tira des airs entendus rue Renaudot en même temps qu'on apercevait sur l'écran le jeu et le mouvement des lèvres du musicien.

M. Turpain se rendit à la Faculté. Simultanément son image se projeta sur l'écran, rue Renaudot, sa voix énonça: "Je viens de vous quitter, Messieurs, pour vous remercier, sous cette forme originale, d'avoir bien voulu, répondant à mon invitation, consacrer par votre présence les quelques résultats de ces essais. Mes remerciements vont aussi à mes jeunes et dévoués collaborateurs: M. Daniel Bodroux, Chef des travaux de chimie; M. Rivault, assistant de physique, dont l'ingéniosité et l'adresse aidée par une patience et une ténacité remarquables ont eu raison des nombreuses difficultés rencontrées. Tous ces dispositifs ont été construits par eux. Je n'ai fait que les aider de quelques conseils et que mettre à leur disposition - aidé en cela par mon collègue M. le Professeur Bodroux - à qui j'exprime aussi mes remerciements, les ressources de nos laboratoires. Je ne veux oublier ni M. Thomassin, Préparateur à la Faculté qui nous fût un aide précieux, ni M. de Belleville dont le talent et l'humour, que vous avez pu apprécier, a permis de rendre moins terne cette présentation par les variantes musicales qu'il vient de nous transmettre. Et maintenant, nous allons nous rendre parmi vous et nous espérons achever cette soirée en projetant sur l'écran que vous regardez les émissions provenant d'un studio de Londres sur la scène duquel se montrent des artistes de music's-halls. En terminant je tiens à remarquer que les essais de ce genre ne sont pas seulement pleins d'avenir en ce qu'ils sont l'espoir d'une vulgarisation assez prochaine de la radiovision accompagnant la forme actuelle de la radio-diffusion. Ils nous intéressent surtout parce qu'ils fournissent un outil que nous croyons très précieux comme le plus apte à l'étude d'ondes particulières: ces ondes courtes dont je préconisai l'emploi, dès 1894, qu'alors, il y a déjà 30 à 40 ans, j'étudiai. Ces ondes courtes furent au début très négligées; grâce aux amateurs, elles ont enfin mérité droit de cité et sont de plus en plus et de mieux en mieux utilisées parce que, mieux que toutes autres, elles font plus aisément le tour du monde. C'est leur emploi qui, j'ai ai la conviction, permettra de pénétrer le mystère de ces propagations, si souvent capricieuses. Par là s'accroîtra, dans des proportions insoupçonnées, la facilité des relations entre les humains et, espérons-le, s'établira une compréhension plus harmonieuse de la vie permettant, sinon aux hommes de ma génération, du moins à nos successeurs immédiats une plus heureuse et plus complète solution des problèmes constants qui opposent si souvent les nations."

Effectivement, de 21h15 à 21h45, l'écran montra des danseurs, des danseuses, chanteurs et chanteuses de Londres dont on entendait les chansons et dont on vit, parfois, les danses (anciennes, de genre viennois) et les jeux de physiologie avec quelque détail.

## INTER-UNION COMMISSION ON FREQUENCY ALLOCATIONS FOR RADIO ASTRONOMY AND SPACE SCIENCE

At the start of the XX General Assembly of the International Astronomical Union (IAU) in Baltimore, USA, August 1988, Dr. J.W. Findlay handed over the chairmanship of the Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science (IUCAF) to Dr. Brian Robinson. Dr. J.W. Findlay has been Chairman of IUCAF for many years, and the results obtained by the Commission are due, in no small measure, to his continuing efforts and excellent leadership. It is hoped that his advice and experience will still be available to the Commission in the future.

To Dr. B. Robinson, whose address appears below, we wish every success in his new and important task.

Dr. Brian Robinson  
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Australia.

### IUCAF AND FREQUENCIES FOR RADIO ASTRONOMY

by John W. Findlay

*Note: The paper reproduced below was given by Dr. Findlay at the IAU Colloquium N° 112 on Light Pollution, Radio Interference and Space Debris (Washington D.C., USA, August 1988), which was co-sponsored by URSI. It will appear in the Proceedings of the Colloquium.*

#### 1. Introduction

There are a number of papers in the Colloquium which describe the difficulties which now exist when radio astronomers try to make highly sensitive observations in various regions of the spectrum. The author has been involved for

about 30 years in attempts to get parts of the radio spectrum "protected" so that radio observations could be made in these regions free from damaging interference. Thus it may be interesting in this paper to look backward to the work done by many people before and during the International Telecommunications Union (ITU) World Administrative Radio Conference (WARC) of 1959, and to describe briefly the outcome of that WARC.

The need to have bands of frequencies preserved for radio astronomy was first discussed at URSI in Zurich in 1950, and between then and 1957 the subject was studied by the IAU and URSI. When URSI met in 1957, Sub-Commission V(e) was formed to prepare, with IAU, for the WARC to be held in late 1959. The author became Chairman of V(e) in the Spring of 1958.

## 2. Work within the CCIR

The first need was clearly for radio astronomers to state which bands of the spectrum were of the greatest scientific importance to them. This statement should have international support. Since the International Radio Consultative Committee (CCIR) is the body charged with giving agreed scientific and technical advice to the ITU, it was clearly the correct body to present the views of the scientists. Action to bring this about had been started in URSI in 1950, when a Resolution was passed to the CCIR asking for channels to be kept clear for RA. The CCIR responded in Geneva (1951) with Resolution 56. This spelled out the request for clear bands from 40 MHz to 3 GHz. Unfortunately, when URSI met in Australia in 1952, Commission V said that it was "impracticable to use the frequencies specified for solar observations..." The CCIR then (London 1953) withdrew Res.56 in favour of a more general statement. Only after URSI met in the Hague (1954) was CCIR asked to return to the protection of the H-line and the continuum bands; then the CCIR accepted a new Resolution 173 in Warsaw in 1956. This now referred to the deuterium, hydrogen and OH lines, though only hydrogen had been observed. When Sub-Commission V(e) was set up by URSI in 1957, CCIR Resolution 173 was still the relevant document.

This story has been re-told, because, as will be seen later, it was important in the formation of at least one national position prior to the 1959 WARC. As V(e) started, a better CCIR document was needed, and there was soon to be a

CCIR Plenary in Los Angeles in April 1959, the last one before the 1959 WARC. In preparing to state the agreed international position on the frequency bands to be included in this new paper, I was able to rely on opinions gathered from the Netherlands, the UK, France and Belgium during a tour of Europe in October 1958. I had believed that the IAU at the Moscow Assembly (August 1958) had passed a detailed Resolution which was in line with the opinions I had collected. This was not so; the formal wording was only general, but IAU Commission 40 had produced an excellent paper during the IAU Symposium in Paris (August 1958). This was the basis of the paper offered to the CCIR in Los Angeles, and it was agreed and published as Recommendation 314. Thus the first step was successfully taken. The countries who responded and helped in this process were the Netherlands, the UK, Belgium, France, and the USA. The Chairman of CCIR Study Group IV, which dealt with 314, was Dana K. Bailey of the USA.

### 3. Preparing for the WARC

The 1959 WARC was essentially the first full Conference since WWII, although there had been a WARC in Atlantic City in 1947. But since then, the science of RA and the space age had started, COSPAR was in existence, and the first requests for both RA and Space Science were to be considered at the WARC. Professor Jan Oort (IAU President and a major actor in the work being described), Professor H.C. van de Hulst (President of COSPAR) and Lloyd Berkner (President of URSI and also a major actor in the work) were all agreed that there should be at least one representative of the three Unions throughout the WARC. This was a major commitment, since the schedule called for a conference lasting four months and, as Oort wrote to the IAU General Secretary, "per diem in Geneva is \$15.00". Nevertheless, it was agreed and Oort named himself, Van de Hulst, Balth. van der Pol and Charles Seeger to serve. W.J.G. Beynon from the UK, R. Coutrez from Belgium and I completed the list.

By the end of the CCIR Plenary it was clear that there would be positive positions taken at the WARC in support of the need to clear the H-line and also to set clear bands throughout the spectrum from 40 MHz to above 10 GHz. Although differing in detail, at least the Netherlands and UK proposals were good, and there would be support from other Administrations. However, it was also known that the USA would support

only 1400 - 1427 MHz as a world-wide (WW) exclusive band; the rest would be left to "local arrangements".

This US position had been arrived at after lengthy study organised by the State Department. Radio astronomers had been included in the discussions, which of course also involved most of the civil and military users of the spectrum. It is not possible to assign any one reason now for the weakness of the RA position. But, as has been indicated in paragraph 2, the apparent inability of the international astronomers to state their views to the CCIR was certainly a contributing factor.

After the CCIR Plenary, an attempt was made by me and Otto Struve, the recently appointed first Director of NRAO, to request a change in the US position for the WARC. Dr. Struve knew Dr. Kistiakowski, who had just been chosen as Science Advisor by President Eisenhower. Accordingly, Otto and I met with Dr. Kistiakowski on July 15th 1959. The meeting is recorded in Dr. Kistiakowski's memoirs (1) - which are correct except that I am listed as John W. Finney of the New York Times. I was asked to visit Dr. Wallace Brode, the Science Advisor to the Secretary of State, to tell him of the international situation and of my actions. This I did; but, in a not very satisfactory meeting, I do not believe my message got across. At any rate, when the WARC convened on August 17th 1959 we soon found the US position unchanged.

#### 4. The 1959 WARC

The first phase (from the viewpoint of RA) lasted about 5 weeks, and was taken up with the assignment of the tasks to working groups of various sizes. Professors Oort and van de Hulst visited and both gave lectures on RA. Most unfortunately, Dr. van der Pol, who was already in bad health, died in October. The main burden fell on Charles Seeger, who was our observer during most of this period. The "observer" status means that there is access to all papers and to all working group and Plenary sessions. But an observer cannot speak on any subject unless so requested. His task, therefore, involves a great deal of speaking and writing outside the formal work of the WARC.

By mid September it was clear that the RA discussions had reached an impasse. The Netherlands, the UK and some others

were coming together along the lines of CCIR 314. The United States was adhering to its original position. At about this time both Otto Struve and Leo Goldberg spoke to the Press, and Walter Sullivan wrote an article in the New York Times(2) with the headline "US STAND SCORED ON RADIO AND SPACE". There was also an article by John Lear in the Saturday Review (3).

This publicity caused trouble. At least one member of the US Delegation flew back from Geneva to attend a day and a half of meetings at the National Academy of Sciences on October 16 and 17 at which many officials and radio astronomers were present. The outcome of this meeting was a major change of the policy of the United States. John W. Finney reported this meeting (4).

When I arrived in Geneva on October 22, the US Delegation had already presented a WARC paper which became Recommendation 32 of the Conference, and work began to help RA as much as was still possible.

#### 5. After the WARC

The final outcome of the WARC fell considerably below the hopes of radio astronomers, but the following main points were gained:

- (a) Radio Astronomy was recognized as a "Service" in the ITU.
- (b) The H-line was protected WW in the Radio Regulations.
- (c) Some minimal protection, usually in footnote form, was given to many spectral bands from about 70 MHz to 31.5 GHz.
- (d) It was agreed that the needs of RA and Space would be included in the "Space" WARC expected to be held in 1963.

#### 6. The formation of IUCAF

URSI Commission V(e) reported the outcome of its work at the General Assembly held in London in 1960. In that Report was a recommendation that URSI, the IAU and COSPAR should form an international body to continue to work to obtain and protect radio frequencies for the three sciences. This was started in London, where Lloyd Berkner set up a working group under J.A. Ratcliffe to plan an Inter-Union Commission under the International Council of Scientific Unions (ICSU). With

Ratcliffe in this task were V. Ilyin and V. Vitkevich (USSR), H. Sterky (Sweden), L.G.H. Huxley (Australia), J. van der Mark and E. Metzler (CCIR), and J.W. Findlay (USA), who acted as Secretary.

After three meetings, the group recommended that an Inter-Union Commission on frequency allocation should be set up to be ready for the proposed Space WARC for 1963 and that WARC should deal with the allocation of frequencies for both Space Science and Radio Astronomy.

This resulted in the formation of IUCAF, with Professor J.F. Denisse as the first Chairman and Dr. R.L. Smith-Rose as the first Secretary General.

References:

- (1) "A scientist at the White House", page 10.
- (2) The New York Times, Sunday, September 20th, 1959, page 27.
- (3) John Lear, Saturday Review, September 1959.
- (4) New York Times, Saturday, October 17th, 1959, page 17.

11 August 1988.

## MEASUREMENT OF 10.7 CM SOLAR FLUX

At the General Assembly in Tel Aviv, the URSI Council passed a Resolution (U.24), the text of which reads as follows:

"The URSI Council,

*noting* the recommendation of Commission G on Ionospheric Radio and Propagation;

*considering* that the termination of the long-standing 10.7 cm solar flux measurement by the Canadian National Research Council is a major setback to ionospheric modelling and prediction work;

*urges* the Canadian Administration to renew its support of the routine measurement of the 10.7 cm solar flux".

In a letter dated 17 May 1988, addressed to Dr. H. Rishbeth, Chairman of Commission G; Dr. H.G. James, Official Member of Commission G in Canada, wrote as follows:

"At the XXII General Assembly of URSI last year, the URSI Council approved asking the Canadian administration to renew support of the routine measurement of the 10.7 cm solar flux. I wish to inform you that the rumoured termination of this measurement by the National Research Council of Canada was never carried out. NRCC will continue with the measurement as before. This will be for the foreseeable future, inasmuch as NRCC is updating the program.

Further information about the program is available from Dr. Ken Tapping, NRCC/HIA, Ottawa. He is currently responsible for the program, and informs me that a letter stating NRCC's assurances about maintaining the 10.7 cm service will be sent from the President of the NRCC to the URSI Secretary General".

Dr. L. Kerwin wrote to the Secretariat on 17 May:

"...It is very apparent that there must be a great misunderstanding. The National Research Council of Canada fully appreciates the value of the 10.7 cm Solar Flux as an internationally recognized index of solar activity and has no current plans for discontinuing its measurement. Indeed, the

programme is in the process of being upgraded, which includes making improvements of measurement accuracy and availability of data. We are also endeavouring to maintain a level of in-house scientific research sufficient to ensure the continuing relevance of the programme.

The sentiments expressed in your letter are a gratifying indication of continuing international support for the programme. Please be assured that we will not terminate it without fully considering the consequences. We hope that the current upgrade will further increase the usefulness of the 10.7 cm solar flux data...".

## WORLD-WIDE IONOSONDE NETWORK

During the XXII General Assembly in Tel Aviv, the URSI Council adopted a resolution (U.20) which is reproduced partially below:

"The URSI Council,

*noting*

- (a) the recommendation of Commission G on Ionospheric Radio and Propagation regarding the importance of an operating world-wide ionosonde network;
- (b) the important contributions made for many years by the ionosonde stations of the New Zealand network in both the scientific and communications fields;
- (c) the important contributions made for many years by the ionosonde station at De Bilt, Netherlands;
- (d) the need to achieve world-wide coverage by the ionosonde network;

*expresses* its great concern at the proposed closing of the ionosonde stations of the New Zealand network and at the proposed closing of the ionosonde station at De Bilt;

*urges*

1. the responsible authorities in New Zealand to reconsider

this decision and to continue the operation of the stations;  
.....".

The following letter, dated 27 May 1988, was received from Dr. R.J. Tizard, Minister of Science and Technology of New Zealand:

"...Thank you for your letter of 6 April 1988 expressing concern at the proposed closing of the New Zealand ionosonde stations. Like you, I am extremely sorry to see these stations go. As you say, they have made outstanding contributions to the world ionosonde network over a long period.

Unfortunately, as you will be aware, New Zealand is currently experiencing a balance of payments problem due, in no small part, to restrictive trading practices by some of our major trading partners.

It has therefore been necessary to curtail scientific activities which do not contribute directly to the scientific or technological development of this country, unless alternative funding sources are available.

Unfortunately, in the case of ionosonde stations, no alternative funding could be found and it has thus been necessary to close them down.

Please accept my sincerest regrets".

## INTERNATIONAL BEACON SATELLITE SYMPOSIUM 1988 (IBSS '88)

The Beacon Satellite Symposia are held at roughly two-year intervals since 1972. The 1988 Symposium on "the investigation of the ionosphere by means of beacon satellite measurements" was held in Beijing, China from 18 to 21 April 1988, on the invitation of the Chinese Research Institute of Radio Wave Propagation and the Chinese Institute of Electronics (CIE). The Chairman of the Local Organizing Committee was Prof. Feng Shizhang, Dr. Cao Chong and Mr. Li Kaichun acted as secretaries of the Committee.

The Symposium took place at the Fragrant Hill Hotel, and was held in parallel with the International Symposium on Radio Propagation.

There were 22 registered participants from 12 countries and 11 participants from the People's Republic of China. About 15 scientists (five from abroad, 10 from China) who had registered for the Radio Propagation Symposium attended some of the sessions of the Beacon Satellite Symposium.

A total of 37 papers were presented in 5 scientific sessions. The number of accepted contributions was 56 but some of the authors who had submitted an abstract could unfortunately not attend the meeting. The contributions were of high standard, and gave a good general idea of the status of research in most areas connected with Satellite Radio Beacon Observations. The Proceedings of the Symposium will be issued in the host country. Dr. Cao Chong may be contacted at the following address for information about spare copies:

Dr. Cao Chong  
Chinese Research Institute of Radio Wave  
Propagation  
P.O.Box 138/88  
Xinxiang, Henan  
People's Republic of China.

The last session was followed by an open business meeting of URSI Working Group G.2 on Studies of the Ionosphere Using Beacon Satellites. After a thorough discussion the following

plan for future Symposia of the Group was adopted unanimously.

The next Symposium will be held in Tucuman, Argentina, in March 1990 probably in conjunction with the Symposium on Equatorial Aeronomy. Prof. S. Radicella will host the meeting.

The following meeting will be held at The Massachusetts Institute of Technology (MIT) in Cambridge, Massachusetts, USA, in June or July of 1992, and will be hosted by Dr. Min Chang Lee.

R. Leitinger  
Chairman,  
URSI Working Group G.2.

## CONFERENCE ON PRECISION ELECTROMAGNETIC MEASUREMENTS (CPEM '88)

CPEM '88 was held at Tsukuba Research Centre, Tsukuba Science City, Japan from 7 to 10 June 1988. The Conference was sponsored by many international and Japanese organizations including URSI, and the Organizing Committee was chaired by Professor S. Okamura.

The programme covered the precision measurements and standards of electromagnetic quantities and advanced applied measurements. It contained (1) a Keynote Address on Atoms in Precision Electromagnetic Measurements, by Prof. K. Shimoda; Special Lectures on High-Tc Superconductors, by Prof. K. Kitazawa; on Advanced Technology in Precision Measurements, by Dr. T. Quinn; on Aharonov-Bohm Effect, by Dr. A. Tonomura; (3) 194 papers in both verbal and poster sessions; (4) panel discussions on Basic Standards and Fundamental Constants; on the Fifth Force Experiment; on National Measurement Systems; (5) a Workshop on Microwave and Optical Frequency Standards.

CPEM '88 was attended by 423 scientists from 26 countries. Technical tours to the Electrotechnical Laboratory, to the National Research Laboratory of Metrology, to the National Laboratory of High Energy Physics, to Kashima Space Centre of the Communications Research Laboratory, and the social gatherings provided an excellent opportunity to extend technical and personal contacts among scientists.

The Proceedings of CPEM '88 will be published as a special issue of *IEEE Transactions on Instrumentation and Measurements* early in 1989. The next CPEM will be held from 11 to 14 June 1990 in Ottawa, Canada.

Y. Saburi  
Official Member,  
URSI Commission A.

## 9TH INTERNATIONAL WROCLAW SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY

The Symposium was held from 28 to 30 June 1988 in Wrocław, Poland. During the Opening Session, chaired by Prof. Bem, Mr. Paszkowski, President of the Polish Society of Electrical Engineers, presented several Awards: the Janusz Groszkowski Medal to Prof. Stumpers and to Prof. Betsky (for Prof. Kotelnikov), and the Golden Honour Award of Distinction to Prof. Kikuchi and to Dr. Lorke. Prof. Stumpers said a few words of thanks, on behalf also of his colleagues, and evoked his many years of association with EMC and with Polish scientists (in Polish). Some 280 participants were present.

In the following Plenary Session, Prof. Stumpers reviewed the programme of the Symposium with special attention to the URSI-sponsored sessions chaired by Prof. Kikuchi (ball, bead and anomalous lightning) and by Dr. Hamelin (ESD, lightning, EMP). The session organized by Dr. Bullough on the EM environment of the Earth also fits well into the URSI pattern. The second speaker in the Plenary Session was Prof. Gorgolewski, who discussed radio astronomy and frequency protection. An ebullient speaker on his favourite subject! Radio astronomers can do something against interference if its source is well known, but more primary allocations to radio astronomy are better. An international European frequency protection group has been formed by radio astronomers, which was pointed out by Dr. Kahlmann in another session. Dr. Lorke once more organized a session on EMC in wire communications while Dr. Chang's session was devoted to industrial gas discharges and plasmas. Cichon's subject was EMC and the Amateur Radio Service. With Trzaska, Yoshino and Verholt, he discussed the interference caused by amateurs in home electronic devices, such as wide-band audio, the immunity of which should be standardized. Yoshino organized another session on seismological effects, but this time without surprising results. Antennas always attract a lot of interest in Wrocław. Measurements of vertical radiation patterns by Bem et al., microstrip antennas, horn antennas, helix antennas and slot antennas were discussed, with a good number of Russian contributions. There were also sessions on radiation hazards and on biological risks. EMC education was treated by Lazarov. Coupling paths were discussed

by Canavero et al., Deb, Fang and Vilesov. Eleven speakers treated various aspects of electromagnetic interference measurements. Interference prediction was discussed by Turin, Zagorin and several others. Other sessions covered the following subjects: radio noise and its reduction; filters; grounding and shielding; immunity; power lines; propagation; spectrum management and susceptibility.

Three sessions in parallel were not sufficient, and poster sessions had to be organized as well. There was also an informal meeting of CCIR Study Group I. A cocktail party on Tuesday, a barbecue on Wednesday were welcome after the many hours of mostly interesting talks. For the members of the various committees, the chairmen of sessions and the like, a visit to the ancient city of Brzeg and its restored palace, a soprano concert, and a reception by Mr. Kaminsky, Patron of the Symposium and Minister of Transport, Navigation and Communications, brought the finishing touch to the Symposium.

The Proceedings of the Symposium (two books totalling 940 pages) are available from:

EMC Symposium  
Box 2141  
51 645 Wrocław  
Poland.

F.L.H.M. Stumpers  
Past Chairman,  
URSI Commission E.

## ANNOUNCEMENTS OF MEETINGS AND SYMPOSIA

### MEETINGS OF COMMISSION E AT THE ZURICH SYMPOSIUM ON EMC

Dr. J. Hamelin, Chairman of Commission E on Electro-magnetic Noise and Interference, organizes a meeting of all the Working Groups of Commission E on Monday, 6 March 1989. The draft programme of the meeting is as follows:

10h30-12h30 - Lasting Effects of Transients on Electronic Equipment Performance  
Chairmen: V. Scuka, T. Itoh

"Susceptibility of semi-conductor devices to damage by electrical transients, related lightning parameters and creation of data-basis".

10h30-12h30 - Scientific Basis of Noise and Interference Control  
Chairman: C. Baum

Developing methods for synthesizing (controlling) parts of systems design in order to foresee the macroscopic electromagnetic interaction. Topics are "EM Topology" and "Norms".

13h45-15h45 - Satellite Observation of Lightning  
Chairman: V. Scuka

"Scientific justification of lightning flash data from a geostationary satellite and the implementation of data into the scientific society".

13h45-15h45 - Man-made Noise  
Chairman: A.D. Spaulding

"Trends in the interference potential for the proliferation of electronic "gadgets". Characteristics and interference effects of noise from power transmission lines and automotive ignition systems".

16h00-18h00 - URSI-CCIR-CCITT Liaison Committee  
Chairman: G. Hagn

Planned activities of the Committee relating to: Atmospheric Noise mainly in the southern hemisphere, Man-made Noise in particular outside the USA and Spectrum Management.

The programme will be followed by a business meeting of the Official Members of Commission E, at which the programme for the 1990 General Assembly in Prague will be discussed.

COMMISSION F OPEN SYMPOSIUM ON

WAVE PROPAGATION: REMOTE SENSING AND COMMUNICATIONS

Commission F Open Symposium on Wave Propagation: Remote Sensing and Communications will be held at La Londe-les-Maures (Var), France from 11 to 15 September 1989.

Papers on any topic of interest to Commission F are welcome. However, papers are particularly encouraged in the following areas:

- Propagation in tropical climates
- 20/30 GHz propagation measurements using the European satellite Olympus
- Wave propagation in, and interaction with, the neutral atmosphere
- Wave propagation through, and scattering by, the subsurface medium
- Wave interaction with the Earth's surface, oceans, land, ice
- Characterization of the environment as it affects wave phenomena
- Applications of wave propagation studies to remote sensing and communications
- Quantitative measurement of precipitation with remote sensing (radar meteorology).

Abstracts should be mailed to:

Prof. J.P. Mon  
CNET/CRPE  
38-40 rue du Général Leclerc  
F-92131 Issy-les-Moulineaux, France.

Phone: (33) 1 45 29 50 19  
Telefax: (33) 1 45 29 60 52  
Electr. Mail: EARN: MON FRCRPE51,BITNET

Abstracts are due by 15 December 1988.

Authors will be notified of acceptance of their papers by the end of February 1989.

Four-page summaries of papers accepted for presentation are due by 30 April 1989 for inclusion in the preprint volume.

Advance registration and accommodation information will be mailed with the Advance Programme.

The General Programme Committee is composed as follows: J.P. Mon (Chairman), R.K. Crane, G. Brussaard, F.Dintelman, F. Fedi, T. Oguchi, P. Sobieski, D. Vidal-Madjar, A. Waldvogel, P.A. Watson.

#### SYMPOSIUM DE LA COMMISSION F

#### PROPAGATION DES ONDES: TELEDETECTION ET COMMUNICATIONS

Le Symposium de la Commission F "Propagation des Ondes: Télédétection et Communications" aura lieu à La Londe-les-Maures (Var), France du 11 au 15 septembre 1989.

Bien que toute communication sur des sujets d'intérêt général pour la Commission F puisse être prise en considération, les contributions relatives aux domaines précisés ci-après seront particulièrement appréciées:

- Propagation en climats tropicaux
- Mesures de propagation dans les bandes 20/30 GHz à l'aide du satellite européen Olympus
- Propagation des ondes dans l'atmosphère neutre et interaction des ondes avec l'atmosphère neutre
- Propagation et diffraction des ondes en milieu souterrain
- Interaction des ondes avec la surface de la Terre: océans, sol et glace
- Caractérisation de l'environnement en ce qu'il affecte les phénomènes ondulatoires
- Applications des études de propagation à la télédétection et aux communications
- Télédétection quantitative des précipitations (radar-météorologie).

Les résumés doivent être adressés à :

Professeur J.P. Mon  
CNET/CRPE  
38-40 rue du Général Leclerc  
F-92131 Issy-les-Moulineaux, France.

Téléphone: (33) 1 45 29 50 19  
Téléfax: (33) 1 45 29 60 52  
Courrier élect.: EARN:MON FRCRPE51.BITNET

Les résumés doivent être reçus avant le 15 décembre 1988.

Les auteurs dont les communications auront été retenues en seront avertis vers la fin du mois de février 1989.

Le texte définitif des communications retenues (quatre pages maximum) devra parvenir au Comité d'Organisation avant le 30 avril 1989 afin d'être inclus dans le fascicule du Colloque.

Des renseignements sur l'inscription et les facilités d'hébergement seront communiqués avec le pré-Programme du Symposium.

Le Comité général du Programme est composé comme suit:  
J.P. Mon (Président), R.K. Crane, G. Brussaard, F. Dintelman, F. Fedi, T. Oguchi, P. Sobieski, D. Vidal-Madjar, A. Waldvogel, P.A. Watson.

#### RADIOASTRONOMICAL SEEING

#### TROPOSPHERIC AND IONOSPHERIC EFFECTS

A meeting entitled "Radioastronomical Seeing - Tropospheric and Ionospheric Effects" will be held in China, probably Beijing, in May 1989, under the joint sponsorship of IAU and URSI.

The membership of the Scientific Organizing Committee is as follows: J.E. Baldwin (UK), Chairman, W.C. Erickson (USA), R.H. Frater (Australia), Y. Ilyasov (USSR), D.L. Jauncey (Australia), N. Kardashev (USSR), V. Radhakrishnan (India), B.J. Robinson (Australia), R. Sramek (USA), T.A. Th. Spoelstra (Netherlands), G. Swarup (India), C. Walker (USA), Wang Shouguan (China), Chairman LOC, J. Welch (USA), R. Wielebinski

(FRG).

The programme will cover those atmospheric properties which affect high resolution radio-astronomical imaging. There are three main areas for discussion:

1. Atmospheric properties and their measurement
2. Their effects on observations and methods for image correction
3. The astronomical programmes which depend on high resolution imaging.

Further information may be obtained from:

Dr. J.E. Baldwin  
Cavendish Laboratory  
Madingley Road  
Cambridge CB3 0HE  
United Kingdom.

Telephone: (44 223) 337299  
Telex:81252 CAVLAB.

2nd INTERNATIONAL SYMPOSIUM ON ANTENNAS

---

AND EM THEORY (ISAE '89)

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Call for Papers

The ISAE '89 will be held in Shanghai, China, from 29 August to 1 September 1989. The Symposium will cover the progress in all areas of antennas and electromagnetic theory. It is organized by The Antenna Society of CIE. Authors are invited to submit a one-page abstract on any of the topics of interest in the domain of antennas and electromagnetics. Contributed papers will be published in the Symposium Digest.

Deadline for submission of abstracts	1 October 1988
Acceptance notification	15 February 1989
Camera-ready manuscript	15 April 1989

Contributions and enquiries should be sent to:

Professor Mao Yukuan  
Xindian University  
2 Taibe Road  
Xi'an, China.  
Telex: 70034 XDUCN.

15th EUROPEAN CONFERENCE ON OPTICAL COMMUNICATION (ECOC'89)

The 15th European Conference on Optical Communication will be held from 10 to 14 September 1989 at the Congress Göteborg, Gothenburg, Sweden. It is being organized by the Chalmers University of Technology, Gothenburg, and sponsored by the Convention of National Societies of Electrical Engineers of Western Europe (EUREL). URSI is one of the co-sponsors.

The programme will cover a broad range of topics both those of present interest and those likely to have an impact on future optical fiber systems. Contributions should address themselves to topics related to the theory, fabrication, and characterization of the following:

1. MATERIALS: Materials for fibers, lasers, modulations, detectors, and optical processing including non-linear effects.
2. PASSIVE COMPONENTS: Isolators, couplers, multiplexers, filters, switches, splices, modulators, connectors, fiber sensors.
3. ACTIVE DEVICES: Sources, modulators, detectors, optical memories, devices for coherent transmission, quantum-well and superlattice structures.
4. FIBERS AND CABLES: Linear and non-linear propagation, characteristics, design and fabrication, reliability, coupling, splicing, cable design, fabrication and installation, measurement techniques, and test equipment.
5. OPTICAL AND ELECTRONICS DESIGN: Waveguides, active and passive devices, hybrid and monolithic integration.
6. SYSTEMS AND APPLICATIONS: Intensity-modulated and coherent telecommunication systems, local-area-networks and sensors.

Systems design, performance, implementation and economics.

At ECOC'89 there will be "highlight" sessions on new trends and opportunities in optical communication. The topics of the special sessions include .g.: quantum-well devices, optical interconnects, and photo ic switching and processing.

Original, previously unpublished, contributions are solicited in the topics listed above. The deadline for submission of papers is March 20, 1989.

For further information, apply to:

ECOC'89 Secretariat  
Department of Optoelectronics and  
Electrical Measurements  
Chalmers University of Technology  
S-41296 Gothenburg, Sweden.

Telephone: (46) 31 721601  
Telex: 2369 chalbib s  
Facsimile: (46) 31 721561.

#### SOLAR-TERRESTRIAL PREDICTIONS WORKSHOP

The dates of the third Solar-Terrestrial Predictions Workshop, to be held in Sydney, Australia, have been changed to 16-20 October 1989 in order to avoid overlapping in time with a CCIR meeting.

As already announced in *URSI Information Bulletin* No 244, the Workshop will be based around seven Working Groups and the following topics:

- \* Long-Term Solar Forecasting
- \* Medium-Term Solar Forecasting
- \* Short-Term Solar Forecasting
- \* Geomagnetic Activity Forecasting
- \* Ionospheric Prediction
- \* Day to Day Forecasting - Users Requirements
- \* Other Topics in Solar-Terrestrial Predictions.

These Working Groups will meet to discuss and review scientific progress since the last Workshop (Meudon, 1984) and to formulate research directions for the future.

Further details and the second announcement can be obtained by applying to:

Dr. Richard Thompson  
IUWDS Regional Warning Centre  
IPS Radio and Space Services  
P.O.Box 702  
Darlinghurst NSW 2010  
Australia.

Telephone: (61) 2 269 8555  
Telex: 20663 (IPSO)  
Fax: (61) 2 269 8612.

## THE IMPACT OF VLBI ON ASTROPHYSICS AND GEOPHYSICS: PROCEEDINGS

The Proceedings of Symposium No 129 of the International Astronomical Union: The Impact of VLBI on Astrophysics and Geophysics, edited by Dr. M.J. Reid and Dr. J.M. Moran, have been published by Kluwer Academic Publishers.

On the 20th anniversary of the first coherent Very Long Baseline Interferometric (VLBI) observations and the 100th anniversary of the discovery of radio waves by Hertz and of the Michelson-Morely experiment, an international meeting of experts in the field of VLBI was held in Cambridge, Massachusetts, USA from 10 to 15 May 1987, to discuss recent progress. VLBI images achieve resolution approaching  $10^{-4}$  arcseconds and the relative positions of telescope can be determined with accuracies of about 1 centimeter. These unique capabilities have lead to dramatic results with major impact on the fields of astrophysics and geophysics. For example, interesting results are presented for subjects in astrophysics as diverse as quasars and active galactic nuclei, interstellar and stellar masers, gravitational lenses, radio stars, astrometry, and cosmology. Papers on geophysics included topics in geodesy, precession, nutation and polar motion of the Earth, variations in universal time, regional crustal deformation, and continental drift. Also included in these proceedings are papers discussing the latest technical advances in the field of VLBI both for ground-based observations and future space-based interferometric systems.

Contents: Preface. Extragalactic, Galactic, Astrometry, Geophysics, Instrumentation and Analysis. Author Index, Source Index, Subject Index.

1988, 630 pp.

Hardbound Dfl. 230.00/US\$126.00    ISBN 90-277-2704-X

Paperback Dfl. 110.00/US\$60.00    ISBN 90-277-2705-8

Kluwer Academic Publishers, P.O. Box 989, 3300 AZ Dordrecht,  
The Netherlands.

101 Philip Drive, Norwell, MA 02061  
USA.

LIST OF URSI OFFICERS AND OFFICERS OF MEMBER  
COMMITTEES: AMENDMENTS

Amendments to the List published in the December issue of the "URSI Information Bulletin" are listed below.

1. Member Committees

IRAQ

President: Dr. Ali M. Al-Mashat, Director General, Space Research Centre, P.O.Box 2441 Baghdad, Iraq.

USA

President: Prof. S.A. Bowhill, Head, Department of Electrical Engineering, University of Lowell, 1 University Avenue, Lowell, MA 01854, USA,

Secretary: Dr. D.C. Chang, Chairman, Electrical and Computer Engineering Department, University of Colorado, Boulder, CO 80309, USA.

2. Commissions

Commission E on Electromagnetic Noise and Interference

Switzerland: Dr. G.V. Meyer, Paul-Reinhard Strasse 11, CH-8570 Weinfelden, Switzerland.

Commission J on Radio Astronomy

China (SRS): Prof. Wei-Tou Ni, Department of Physics, National Tsing Hua University, Hsin-Chu, Taiwan.

3. Change of Address

CHEN, Mr. Yu-Kai, c/o Telecommunication Training Institute, MOC, 168 Min-Chu Road, Pan-Chiao, Taipei Hsien, Taiwan.

DEN, Dr. Chi-Fu, Vice-Chairman, National Science Council, 106 Hopping East Road Section II, Taipei, Taiwan.

MATUURA, Prof. N., Research Institute of Atmospherics, Nagoya University, Toyokawa, Aichi 442, Japan.

MIYAUCHI, Prof. K., Department of Electrical and Electronic Engineering, Tokyo College of Science, 1-3 Kagurazaka, Shinjuku-ku, Tokyo 162, Japan.

TENG, Mr. Yuan-Cheng, Chief Research Engineer, Applied Research Laboratory, Telecommunication Laboratories, MOC, P.O.Box 71, Chung-Li, Taiwan.

WU, Prof. Tien-Shou, Department of Electrical Engineering, National Cheng Kung University, Tainan, Taiwan.