

U. R. S. I.

TABLE DES MATIERES - CONTENTS

News from Member Committees.....	1
From the Committee in the United Kingdom.....	1
From The Committee in New Zealand.....	2
Profile of Member Committees.....	3
Finland, Forty years of activity.....	3
Reports on Scientific Sessions at the Prague General Assembly.....	9
Report of Commission E.....	9
Report of Commission H.....	30
Reports on URSI Sponsored Meetings.....	34
The 4-th International School For Space Simulation.....	34
Meeting Announcements.....	36
International Symposium on Middle Atmosphere Science.....	36
URSI Radio Science Meeting, IEEE-APS International Symposium and Nuclear EMP Meeting.....	37
International Meeting for Wave Propagation.....	40
URSI International Symposium.....	42
The 18th European Conference.....	43
Seventh International Symposium on Antennas.....	44
Other Meetings which have been brought to our Attention.....	46
URSI Publications.....	48
Publications Received at the URSI Secretariat.....	48
Books Published by Members of the URSI Community.....	49
Electromagnetic Wave Propagation, Radiation and Scattering.....	49
From the archives of URSI.....	50
Personalia.....	54

NEWS FROM MEMBER COMMITTEES

FROM THE COMMITTEE IN THE UNITED KINGDOM (THE UK URSI-PANEL) :

The 8th UK URSI National meeting was held at Leicester University on 10 and 11 July. Fifty papers were presented covering the subject areas of all the URSI commissions. A specific objective of these meetings is to provide an opportunity to learn of recent developments in commissions other than one's own. The programme was very successful in achieving this, since parallel sessions were avoided and three keynote papers on widely different topics were presented. These reviewed recent work in the areas of ionospheric modification by high power radio waves, microwave opto-electronics and biological effects of E-M fields and radiation. The last topic falls within the area of the new Commission K and was included to provide an overview of recent developments in this field for members of the other commissions present. A new development introduced during the meeting was the provision of "hands on" demonstrations of PC software packages which were available outside the lecture theatre on the second day of the meeting. The packages, for example those developed for microwave channel modelling and link simulation studies, generated considerable interest.

A very encouraging feature of the UK URSI meetings is the number of young people attending. This year again, many of the papers were presented by young graduate and postgraduate research workers. The quality of the content and the presentation of these papers were uniformly high. It is evident that the National URSI meeting has developed an important role in providing a forum for these young scientists and engineers.

The friendly and informal nature of the meeting contributed greatly to the exchange of ideas both inside and outside the lecture theatre. The conference was housed in one of the University's halls of residence and discussion continued late into the evening. Discussions between members of the different commissions contributed greatly to this very successful meeting.

PROFESSOR T.B. JONES

FROM THE COMMITTEE IN NEW ZEALAND

The committee has a new President, namely :

Professor J.E. Titheridge

Department of Physics, The University of Auckland

Private Bag, Auckland, New Zealand

Fax : 64 9 737034

Phone : 64 9 737999 Ext. 8866

E-mail : J.TITHERIDGE@AUKUNI.AC.NZ

PROFILE OF MEMBER COMMITTEES

FINLAND, FORTY YEARS OF ACTIVITY

by Ari Sihvola, Secretary of the Member Committee in Finland

The Finnish Committee of URSI, moving ahead towards its fortieth birthday, has experienced a change in its command structure, Professor Ismo V. Lindell having replaced Professor Martti Tiuri as Chairman. This short presentation reviews the undertakings of the Finnish URSI during its existence. A mysterious loss of archives, however, prevents a thorough exploration of the early times of the Committee.

The Finnish Committee of URSI was founded in 1952, 33 years after the International Union itself came into being. In those times the research in Finland on radio short-wave propagation, radar principles, and high-frequency electronic active and passive components had matured enough to give sufficient basis for establishing a formal body to coordinate scientific work in the field of radio science.

It hence appears now that we radio scientists in Finland are celebrating the forty-year birthday of our national union next year. This milestone also marks a change in the office of the Chairman of the Committee. After a quarter of a century, Professor Martti Tiuri vacated the chair for Professor Ismo V. Lindell of the Electromagnetics Laboratory of the Helsinki University of Technology. This does not mean, however, any wane in Tiuri's activities; on the contrary, in March 1991, Tiuri was elected for the third consecutive four-year term as a Member of the Finnish Parliament.

There have also been two other earlier Chairmen of the Finnish Committee. To give a complete list, the Chairman pedigree looks at present like the following :

- Professor Jouko Pohjanpalo (Chairman, 1952 - 1963)
- Professor Jaakko Tuominen (1963 - 1966)
- Professor Martti Tiuri (1966 - 1991)
- Professor Ismo Lindell (1991 -)

Progress in radio science in Finland during these forty years can be traced with the help of the proceedings and abstract collections of national radio science meetings, folders that have fortunately survived and found their way to the office of the Secretary of the National Committee.

Early Work

The first "Radio Days" were held 24-25 April, 1953. In this first scientific meeting organized by the URSI Finnish Committee, 25 presentations were held (of which some document has survived). The topics examined in the presentations were : radioastronomy, wave propagation, possibilities of the radar, and various industrial applications of high frequency radiation. Particular papers focused on devices and components like magnetic attenuators, phase comparators, moving target indicators, electron tubes, and even linear accelerators.

After two years, in 1955, the next Radio Days were held with discussions of topics similar to those in 1953. From the programme it can be seen that during the coffee break, the Philips Company of Finland exhibited TV and measuring devices. The presentation time allowed was 15 minutes with additional 5 minutes for discussion, which is similar to the conference practices of today.

The volume of research discussed in these national radio science meetings increased slowly. Measured by the number of presentations, it started to grow from a minimum of 25 at the first meeting, through 26 (1955), 33 (1957 and 1960), 34 (1964), 42 (1967), 61 (1970), and 84 in the eighth meeting, in 1973.

New applications of radioelectronics made their appearance in the Radio Days very early : the first transistor was introduced to the Finnish URSI audience in 1955, computers in 1957, parametric amplifiers and colour television in 1960, and lasers in 1964. In terms of the ever-ramifying web of sciences and engineering disciplines coming into touch with URSI, the Radio Days gave a forum for presentations about ionospheric disturbances caused by satellites, the nuclear electromagnetic pulse, apparatus for receiving weather satellite images, sensors for determining the amount of magnesite in crushed ore aggregate, and bioelectromagnetic applications. Even as early in 1967, one paper described how the computer could help in the design of reflector antennas.

Establishment as a scientific organization

Starting from the VIII National Radio Days in 1973, it becomes easier to follow the yield of research made public through the URSI in Finland, because the abstracts and summaries of the presentations have since then been bound into a Book of Proceedings. The increase of volume was substantial : 84 presentations in 1973, 114 in 1976, 83 in 1980 (the first time the Radio Days were held outside Helsinki), and 125 in 1983. After this meeting (the XI national convention), the Committee decided to organize a meeting each year, starting with the next Days in 1986, and at the same time to restrict the scope of each meeting to four distinct topics within URSI. This reduced the number of presentations to levels below one hundred : 54 (1986), 48 (1987), 82 (1988), 79 (1989), and 76 (1990).

There is one longer break separating the successive national radio science meetings. This is the four-year interval between 1976 and 1980. This does not mean that the Finnish Member Committee was inactive : on the contrary, in the year 1978 we had the honour and responsibility of organizing the XIX URSI General Assembly in Otaniemi for the Radio Science community of the whole world. This undertaking implied an ample amount of work for the Finnish Member Committee.

Starting from the 1973 meeting, there was enough research in Finland in all of the URSI fields to organize separate sessions for every commission. The Proceedings of the IX meeting (1976) already comprise nearly 500 pages consisting of four-page summaries of the presentations. This meeting also hosted the Nordic Antenna Seminar with participation from research institutions and universities from Sweden, Norway and Denmark.

The X National Convention of Radio Science was held in Oulu, and the profile of the meeting inclined towards the special expertise of the radio scientists of northern Finland : geophysics, ionosphere, and the incoherent radar system of atmospheric research EISCAT. In 1983 we returned back to Espoo, where the Helsinki University of Technology is located, and organized the last "big" national radio science meeting, i.e. one covering all URSI fields.

The XI meeting in 1986 was a one-day conference with a limited scope ; in the Call for Papers, presentations were solicited in the areas of URSI Commissions C, E, and J only, and especially on topics of microwave techniques, telecommunications, and radio astronomy. In addition, one session was planned on pattern recognition. This broadened the scope of the meeting towards electrical engineering; in fact, starting from the XI meeting, the Finland Section of IEEE (the Institute of Electrical and Electronics Engineers) has been a joint organizer of the National Convention of Radio Science.

The Oulu meeting in 1987 focused on radar and remote sensing, communication systems and antennas, and on digital signal processing theory and systems. In 1988 (Otaniemi), sessions were organized on electromagnetics, metrology, space engineering, and integrated circuits. Tampere University of Technology accepted the burden of coordinating the XV meeting in 1989 ; their sessions emphasized optoelectronics, digital signal processing, magnetic signals and fields, medical engineering, and integrated circuits.

In 1990, the University of Kuopio hosted the meeting, co-organized, in addition to URSI and IEEE, by the Biophysics Section of the Finnish Physics Society. New session topics were the biological effects of electromagnetic fields and electromagnetic interference.

The Future

This year is supposed to witness the XVII National Radio Science meeting. The latter will be held at the Åbo Akademi, in the medieval city of Turku in western Finland. This one-day meeting, on 11 November, 1991, is seeking contributions on four themes :

- The life and work of Karl Ferdinand Lindman
- Electromagnetic theory and chiral materials
- Radio astronomy and space research
- Multiprocessor technology and applications

The focus on the first, narrow topic, of purely historical interest, may seem strange. However, Professor Karl Lindman (1874 - 1952) of the Åbo Akademi was one of the pioneers in studying *chiral* materials in the microwave frequency region, at the beginning of this century. These materials, characterized by their lack of spatial mirror symmetry, have become targets of extremely intensive research during the latest years, owing to their potential applications in,

for example, antenna design, microwave components (such as couplers) and shielding, anti-interference, and low-observable coatings for radio waves.

Those interested in this meeting may wish to contact the Chairman of the Organizing Committee, Professor Juhani Kurkijärvi at Abo Akademi (fax 358-21-654 776). We anticipate a successful meeting that will not remain limited to national boundaries.

REPORTS ON SCIENTIFIC SESSIONS OF COMMISSIONS AT THE PRAGUE GENERAL ASSEMBLY

REPORT OF COMMISSION E

by H. Kikuchi, Chairman

It seems to the Chairman that Commission E had the most active participation in years, in terms of both quality and quantity. Specifically, Commission E has a total of twenty scientific sessions, eleven of their own and nine joint with other Commissions, but with the Convener and main responsibility belonging to Commission E.

Session E1 : EMC in Electrical Circuits

The session was organized and chaired by Professor J. Perini. Topics covered by several speakers were : printed circuit board EMC ; unintentional crosstalk in cable bundles and lands on printed circuit board and countermeasures for its reduction as well as modelling for evaluation which may permit an insight into the coupling mechanism ; time and frequency domain notions as well as the effectiveness of twisting and shielding. Estimated number of participants lied between twenty and thirty.

Session E2 : Lightning : Predischarge Processes, Associated Radiation and Modelling

This session was organized by Professor E.P. Krider and chaired by Dr. D.E. Proctor. N.I. Petrov and I.N. Sissakian presented a paper on radiation generated by positive streamers in laboratory sparks and in lightning. I.

Gallimberti reported on predischARGE phenomena in laboratory sparks and on new models of positive leaders. V. Mazur presented a very interesting paper on lightning strokes to aircraft and on positive streamers in natural lightning. D.E. Proctor presented a paper describing where 773 lightning flashes began in 13 thunderstorms. Future trends will continue work in these fields, particularly in connection with lightning strikes to aircraft, a topic which was also discussed extensively in Session E5. It was suggested that laboratory studies of sparks will have to concern large gaps, say 20 m in distance. The present session is closely related to Sessions E3, 4, 5, and 9.

Session E3 : High Power Electromagnetics (HPE)

The session was convened and chaired by Dr. R.L. Gardner. The goal of the session was to bring together personnel doing research in the elements of electromagnetic pulse (EMP), high power microwaves (HPM) and lightning with emphasis on general HPE methods ; experimental and theoretical. As the session programme evolved, it became clear that many more researchers were interested in the HPM, with emphasis on sources and antennas. The seven papers of the session broke down evenly with emphasis on general EM methods (4 papers) and HPM (2 sources and 1 antenna). The technical quality of the papers was excellent. The contribution from the USSR helped the geographic balance of this normally western-dominated session.

The final session was made up of the following papers :

1. R.L. Gardner : Introduction to HPE;
2. R.L. Gardner, J.L. Gilbert and L. Baker : Analytic Treatment of Cable Bundles with Large Numbers of Component Wires;
3. W.R. Zimmerman : Numerical Methods in HPE;
4. Y. Rahmat-Samii : Reflector Antennas in Microwave Engineering;
5. C.E. Baum : Maximization of Electromagnetic Response at a Distance;

6. A.W. Biggs : An Overview of Microwave Sources-Vircators, Magnetrons and Backward Wave Oscillators, Milos, and modulated Intense Relativistic Beams;
7. Wainstein, Kleev and Solntzev : Radiation from the Relativistic Electron Interacting with the Whispering-Gallery-Mode.

Session E4 : Satellite Observation of Lightning

A workshop-style session was announced and conducted by Professor V. Scuka. The more than 60 participants were encouraged to freely enter the discussion whenever they felt it necessary. The session started with an overview of scientific evolution of lightning flash data from geostationary satellites. The concepts for the ESA Lightning Flash Detector (LFD) and the NASA Lightning Mapper were displayed and commented, along with the basic importance for geophysical research. A review of recent studies in atmospheric electricity was given, with emphasis on the studies which may be favoured by the data from the LFD and the Mapper. The scientific outcome from NASA's U2 flights over the thunderclouds was stressed, together with the efforts invested in the design of both detectors. The use of lightning data for weather forecasting was considered. It was indicated that a lightning model as applied by Gardner and coworkers may become a satisfactory tool in the evolution of detected optical pulses (see R.L. Gardner : "Lightning Electromagnetics"). The scientific value of the projects was recognized. The general opinion was that the new data would considerably accelerate a number of scientific geophysical research and projects.

Session E5 : Lightning Interaction with Aircraft

The session was convened by Dr. J.T. Nanevicz and chaired by Dr. E.F. Vance, who read Nanevicz's introductory paper, reviewing the history of aircraft lightning concerns over the past 70 years. V. Mazur discussed aircraft-triggered lightning, based upon airborne data from NASA F-106B, FAA CV-

580, French C-160. It was proved that triggering of lightning by the aircraft occurs as a bi-directional leader process that consists of a positive leader with increasing continuous current and a negative stepped leader with current pulses of a few kiloamperes. J.P. Moreau described observations of lightning flashes on the C-160 Transall aircraft as viewed with a video camera and electromagnetic measurements. The video images were correlated with the magnetic measurements to infer the nature of leader formation ; they clearly show a positive discharge at the nose boom of the aircraft and a negative one at the tail boom. B.J.C. Burrows discussed some practical aspects of aircraft protection against lightning.

Particularly important for the new generation of transport aircraft is the "fly-by-wire" method of controlling engines and other functions electronically instead of by cable or other mechanical means. The protection of these flight-critical functions is exacerbated by the loss of the metal shield as aluminum is replaced by composite materials such as fiberglass, Kevlar, and graphite-epoxy materials. Attendance was good, and discussion of the papers was enthusiastic. This will be a subject of continuing interest during the coming decade as the new generation of transport aircraft is developed and generates further operating experience in the lightning environment.

Session E6 : Scientific Basis of Noise and Interference Control

The session was convened and chaired by Dr. C.E. Baum who gave an introductory talk on "Norms for Penetrations of Subshields". J.P. Parmantier and the ONERA (French) group reported on some experimental implementation on the quantitative aspects of EM topology. This indicates that the topological concepts are being picked up and beginning to be implemented in experimental procedures and standards. Further progress should be made in this direction. Other papers presented are as follows :

- E.F. Vance : "Delayed Responses to Transient Interference";
- T. Karlsson : "Application of EM Topology to Practical Grounding";
- L.H. Clark and C.E. Baum : "Reparation of Relative Shielding Order in EM Topology".

Session E7 : Spacecraft Charging and Electromagnetic Environment

The session was convened and chaired by Dr. J. Hamelin. After an overview of plasma effects on spacecraft charging over a wide range of altitude by D. Cooke, E. Daly and J.P. Marque summarized the state of the art in geosynchronous orbit, in particular the present development of the prediction codes and their sensitivity to a previous material characterization. L. Levy described a particular aspect of charging in geosynchronous orbit, i.e. bulk charging of some dielectrics. New was the presentation of the electrical effects expected for large structures in low orbits, equatorial and polar. E. Daly and H. Matsumoto showed how Europe and Japan intend to solve low earth interaction, respectively, such as ram/wake effects, charging, $\underline{V} \times \underline{B}$ effects, solar panel current leakage, etc. While Japan is planning an experimental approach using a retrievable polar platform, Europe is developing a large tree of numerical codes which are being validated by terrestrial experiments. These two approaches seem to be complementary to each other and a cooperation will be profitable for both. Finally, C.K. Purvis from NASA insisted on two specific and important problems for future Space Stations : solar panel current leakage and arcing and the grounding reference with respect to the plasma for large structure in low earth orbits.

Session E8 : EMC Modelling

The session was organized and chaired by Dr. M. Ianoz who gave an introductory overview of the state of the art in EMC modelling for lightning current propagation, field-to-transmission line and to antenna coupling, cross-

talk and galvanic coupling. R.L. Gardner described analytical techniques in lightning on the basis of combined transmission line and field models. R. Sato and Y. Kami reported on coupling and radiation problems for a transmission line on the basis of circuit theory and reciprocity concepts. B. Demoulin et al. presented a paper on determination of the currents and voltages induced on bundles of conductors or on shielded lines, using the concept of an equivalent conductor. F.M. Tesche reviewed the state of the art in transmission line modelling with several examples of practical interest. E.F. Vance analyzed the diffusion of transients into a cylindrical ferromagnetic cable shield using the two-state model and using continuously variable relative permeability. G. Labaune et al. presented a paper on experimental and numerical results obtained in laboratory concerning the shielding effectiveness of finite conductivity materials that can be described by using the surface impedance. Finally, the following proposals have been made for future developments : time-domain versus frequency domain approach ; different approaches to the field-to-transmission line problem (use of different excitation sources ; the importance of the horizontal electric field component for lightning electromagnetic effects) ; the importance of soil conductivity on the field-to-transmission line coupling ; the modelling of electric discharge (lightning return strokes models ; spark gap breakdown discharge models) ; braided cables transfer impedance modelling.

Session E9 : Planetary Lightning and Noise Environment

This session was convened by Prof. H. Kikuchi and Dr. E.K. Smith, chaired by Profs. J.W. Warwick and H. Kikuchi, and was devoted exclusively to novel results of observations, theories, basic ideas and concepts in topics covered. The Hall was full of participants (as many as 80). Due to the unavailability of Dr. S. Gulkis as originally scheduled, Prof. J.W. Warwick gave an introductory overview of the state of the art in "Planetary Radio Emissions from Jupiter, Saturn, Uranus, and Neptune", based upon the results obtained with the Planetary Radio Astronomy (PRA) experiment on the Voyager

spacecraft. This experiment, a stepped frequency receiver that covers the frequency range from 1.2 kHz to 40 MHz, yielded observations of these planets at close proximity. A wide range of emission types was observed, ranging from nearly continuous signals to ultra-short (millisecond) bursts and possibly lightning events. Prof. P. Bliokh presented a new model of "Spokes as Solitons in the Dusty Plasma of Saturn's Rings". A nonlinear theory allows to explain the observed aggregation of spokes as soliton-like groups. The analysis shows that spokes move almost synchronously with the rotation of Saturn's magnetosphere. Namely, it seems that they are frozen on the planetary magnetic field. Thus, the solution found explains the properties of spokes observed by Voyagers.

M. Morimoto presented a paper on millimetre-wave radiation in the galaxy and outside. While 2.7°K background radiation contains most of the energy of the general radiation field in space following the blackbody spectrum. there are discrete sources of millimetre-wave emissions. These molecular line emissions come from dense cold gas clouds in galaxies. This is a unique probe for physics and chemistry of interstellar gas clouds particularly on star forming regions and is one of new areas of radio astronomy in rapid development.

Prof. J.W. Warwick described a new model of lightning, based upon emissions in a broad range of frequency spectra covering ELF and VLF bands, plus wideband total electric and magnetic field variations, and VHF emissions in particular. VHF emissions are diagnostic of accelerated charges flowing throughout the flash, including ground or cloud-to-cloud strokes. The pictures of VHF sources made during lightning present details of flashes that are not shown by records made with other lightning emissions. These provide an essentially complete picture of the flash.

S. Alfás presented a paper on lightning and the origin of electric charge on a basic concept that the electromagnetic field (EMF) is part of matter according to Einstein's view.

H. Kikuchi introduced three novel concepts : (1) electric (field-line) reconnection ; (2) critical ionization velocity ; (3) ponderomotive force, that are thought to play an essential role in obtaining an overall picture for atmospheric phenomena involving electric discharge and ionization in a rather simple unifying way and in establishing new electrohydrodynamics (EHD) or electromagneto hydrodynamics (EMHD). On the basis of these concepts, planetary lightning or electrostatic discharge observed for Venus, Jupiter, Saturn and Neptune was discussed and classified, particularly in terms of the critical velocity concept for collision-dominant gases analogous to Alfvén's critical velocity, and for some electric discharge in terms of electric reconnection in the region of an electric cusp or neutral point (line).

Prof. N.S. Erokhin et al. reported on numerical simulation results on nonlinear dynamics of plasma bubbles in the F-region of equatorial ionosphere. The basic process is Rayleigh-Taylor instability of plasma below F-peak, taking into account multicomponents of ion composition, the ion inertia, disturbances of plasma density by the internal gravity wave and so on. It was shown that joule heating of plasma in bubbles leads to high ion temperature ($T_i > 10,000^\circ\text{K}$).

Session E10 : Atmospherics (Sferics)

The session was organized by Prof. H. Volland and chaired by Dr. B. Schäning. M. Hayakawa reported on satellite observations of VLF radio noise at low latitudes, based upon VLF data from the Ariel 4 satellite. It was found that the noise is impulsive at the frequency of 3.2 kHz, being localized to the longitudes of thunderstorm centers. Thus, low-latitude VLF emissions observed in the southern hemisphere have been found to be well explained by the propagation of sferics to the low-altitude satellite as short-fractional-hop whistlers. Those observed in the northern hemisphere have been attributed to the interhemisphere propagation of those sferics in the whistler mode. Finally, the

satellite VLF data as presented here are suggested as being useful for the study of the global distribution of lightning activity.

B. Schäning presented a paper on long-term variation of the atmospheric radio noise at 27 kHz in South America during the southern summer. The long-term variation correlates with the known climate trends of a downward (1952-74) and a stronger upward (1974-89) period. The time evolution of the mean change of the noise level shows a decrease during the last 12 years which may be a first indication for changes of the noise generating thunderstorm activity as response of the tropical meteorology to the deforestation in the Amazonian region.

A.C. Fraser-Smith et al. reported on some of the recent results being obtained by Stanford University's global survey of ELF/VLF radio noise (frequencies in the range 10 Hz to 32 kHz), with particular emphasis on the noise measurements being made at high (polar) latitudes, where noise measurements have been particularly lacking, with those at lower latitudes. Their three high latitude stations are Thule (76.5°N, 68.8°W) and Søndrestrømfjord (67.0°N, 50.1°W) in Greenland, and Arrival Heights (77.8°S, 166.7°E) in the Antarctic, thus ensuring that their data include representative samples of ELF/VLF radio noise of magnetospheric origin (e.g., chorus and hiss), in addition to the lightning-generated noises (sferics, tweaks, and whistlers) that typically dominate at their five lower latitude stations. As expected, magnetospheric noise produces major differences in the noise statistics at the high latitude stations, which makes its presence easy to identify. Polar Cap Absorption events (PCA's) also typically entail distinctive changes in the high latitude data.

T. Bulat et al. presented a paper on 27 kHz atmospheric EM noise measurements at Kandilli Observatory (41°N, 29°E) in Turkey. There is a strong correlation between noise level and the rapid changes of the wind directions from south to north or vice versa. The recorded activity at 27 kHz EM noise is smaller than expected. This region seems to be quiet for the atmospheric noise. It is

inferred that the two seas, Black Sea (North) and Marmara Sea (South) may play an absorbing role for atmospheric EM noise.

D.D. Sentman described the effect of the day-night height asymmetry in the D-region on the amplitude of the Schumann resonances. Recent simultaneous observations of Schumann resonances in California and Western Australia show a distinct difference in the diurnal intensity modulation patterns observed at the two locations. This difference suggests that factors other than lightning source intensities alone determine the amplitude of the resonances. It is shown that if the amplitudes are corrected using an approximately fifteen percent day-night difference in the local height of the D-region, with the minimum height near local noon, then the diurnal modulations may be brought into reasonable agreement between the two widely separated stations. With this correction, three distinct relative maxima, corresponding to late afternoon activity in the three principal thunderstorm regions, Southeast Asia, Africa and the Americas, are visible in the respective diurnal modulation curves.

A.I. Sukhorukov reported on the excitation of an earth-ionosphere waveguide by pulsed ELF sources. Numerical results based on two kinds of models of the square law and the logarithmic law of the TEM mode dispersion were compared for the law of decay of the ELF pulse amplitude, its broadening and slow-tail separation.

S.G. Dolgoplov presented a paper on spectral characteristics of ELF radio noise in a range of frequencies from 1,5 to 500 Hz registered at three different latitudes (44°N, 60°N, 70°N) in the East of the USSR. Diurnal variations of radio noise spectral density were compared with calculations based on his model. Alfvén wave resonance modes were also evident for a range of frequencies 1.5 to 10 Hz.

Session E11 : The Composite Noise and Interference Environment

The session was convened by Dr. E.F. Vance and was composed of six contributed papers whose abstracts were received from China, but only one author came to the General Assembly.

An alternate presented one paper and the author, Gao You-Gang, presented two of which he was author or co-author. Their titles are :

1. Magnetic Coupling Effects on Underground Pipelines and Telecommunication Cables from Power Lines ;
2. The problems about the Relations between the Pole Distance and the Depth Measuring.

For future research, the past trends of studying coupling and propagation in narrow bands should probably yield to a greater level of activity in transient interference. Digital circuits are affected by transient interference, and electronics today are largely digital circuits. Therefore, it seems logical to supply the composite environment resources to the definition and evaluation of transient interference.

Session JS10 (E, F) : Attenuation and Noise due to Clouds

The session was organized and chaired by Drs. E.K. Smith and E.R. Westwater and went well, with active participants as many as 70. From a technical standpoint the session demonstrated that there is a crude method for estimating cloud attenuation, making use of available parameters, i.e. the surface water vapour concentration, but it remains untested over a wide area, and there is no physical basis for it. A need for cloud attenuation and emission determinations is bound to increase due to spectrum congestion below Ka-band and due to remote sensing needs.

Generally speaking, the first four presentations (by Smith, Altshuler, Brussaard and Westwater) addressed the communications problem, while the last five (by Fedor, Gasiewski, Bolin, Gossard and Troitsky) were more remote-sensing oriented.

Commission E's interest in clouds stems from the fact that for low noise receiving systems the emission from clouds is more important to the signal-to-noise ratio than is attenuation (Commission F). Liquid water content in clouds is needed for both communications and remote sensing (for meteorological prediction and climatology). There are presently few data from which to construct a worldwide picture. This is a joint E/F problem area.

The papers presented in this session were :

1. E.K. Smith and W.L. Flock : CCIR Interest in Cloud Emission and Attenuation;
2. E.E. Altshuler and R.A. Marr : An Algorithm for estimating Atmospheric Attenuation at Millimeter Wavelengths during cloudy Conditions;
3. G. Brussaard : Radiometry and Concurrent Satellite Beacon Measurements;
4. E.R. Westwater, J.B. Snider and M.J. Falls : Radiometric Observations of Emission and Absorption due to Clouds at 20.6, 31.65, and 90.0 GHz;
5. L.S. Fedor and V.E. Derr ; Radiometric Observations at 20 and 30 GHz in Support of Climate and Cloud Research;
6. A.J. Gasiewski : Aircraft- and Satellite-Based Passive Microwave Observations of the Earth's Troposphere;
7. Z. Bolin : Microwave Remote Sensing of Atmospheric Cloud and Rain;

8. E.E. Gossard, R.G. Strauch and R.R. Rogers : A Ground-Based, Doppler Radar Technique for Monitoring the Dropsize Structure in Clouds - Implications for Improving Communication Path Models;
9. A.V. Troitsky : Remote Investigation of Spatial and Time Characteristics of Clouds.

Session JS11 (E. C) : Communication in the Presence of Noise

The session was convened and chaired by Dr. A.D. Spaulding and was very well attended by participants (more than 70). The topics of signal detection and estimation in non-Gaussian interface, robust (non-parametric) detection, etc. are becoming hot for numerous reasons and are very appropriate subjects for Commissions E and C, involving noise modelling and statistical detection theory.

Papers presented in this session were :

1. J.H. Roberts : Communication in the Presence of Noise;
2. A.M. Maras : Locally Optimum Detection of Stochastic Signals in Non-Gaussian Noise;
3. D. Middleton and A.D. Spaulding : Threshold Signal Detection in Correlated Non-Gaussian Interference;
4. P. Papantoni-Kazakos : Distributed and Consensus Signal Detection in the Presence of Extreme-Data Outliers-Interferences;
5. D. Kazakos : New Error Bounds and Optimum Quantization for Multisensor Distributed Signal Detection;
6. R. von Sachs : Peak-Insensitive Non-parametric Spectrum Estimation.

Session JS12 (E, D) : Lasting Effects of Transients on Electronic Equipment

The session was convened by Profs. V. Scuka and T. Itoh and started with introduction to the subject of EM-control of the environment by Scuka. The problems pointed out were : some examples on the physical processes of semiconductor degradation induced by electrical transients ; elucidation of the problems associated with a reliable state of performance control of semiconductor components ; today and tomorrow trends in the development of LSI circuits and their consequences; needs of measurement and test methods to characterize the components performance.

F.M. Tesche and T. Karlsson reported in detail on the EMP protection of unhardened ground-based systems. Low-level CW-current injection and CW-field irradiation into a system have been used to assess the interference levels due to a NEMP irradiation of a telephone exchange facility. The importance of apertures in the structure as sources of EM induction was stressed. Discussions and short contributions from the audience were : the state of test and measurement norms ; the possibility to extend the measurements into the LF domain and to use the method to determine the LEMP response ; the possibility to evaluate non-linear phenomena ; alternative methods using LEMP natural irradiation into the system to evaluate the level of hardening of the system ; IEC introduces zones for low voltage power installations (see ANSI/IEEE Std. C62, 41-1980) and TC-81 introduces lightning protection zones; how one should in the future harmonize all these measures to achieve reliable and economically justified level of hardening of electronic systems, harmonization of transient suppressor in a large system; the vulnerability of PCM-telecommunication systems exposed to EMP irradiation by cloud discharges ; electrical specification of low voltage power installations and their effective antenna height for LEMP.

Session JS13 (E. C. J) : Spectrum Management and Advanced Radio Communication Technology

The session was organized by Drs. R.D. Parlow and G.H. Hagn and chaired by Dr. Parlow. It consisted of seven papers intended to present a cross section of spectrum challenges associated with the introduction of advanced radio communication technology.

R.C. Kirby, Director of the CCIR, presented information regarding the growth of various radio services in the 1990's and the ability to support these services within the available spectrum. Two key challenges were raised : (1) Are there better and more scientifically based methods available for the allocation of frequency bands ? ; (2) Will economic and value-based principles become commonly used by many Administrations for the distribution of frequencies ?

M.D. Kotzin provided information regarding technology trends in computing and processing power as it relates to demand for land mobile communication services. His conclusion was that the limiting factor, taking into account the most promising trends in technology, is the availability of radio spectrum.

W.B. Garner in his talk on global mobile satellite developments drew many of the same conclusions. Because of the basic designs for mobile satellites and the need to save small band held and mobile terminals, the availability of spectrum and the problems of satellite frequency coordination are limiting factors, and growth and economic viability.

Japan has the first commercial HDTV service. S. Yamazaki provided insight into the development and operational efforts involved in starting this service. The number of viewers at present is small and the displays are quite expensive. As the user base expands and full agreements are reached regarding

HDTV standards, these costs will drop considerably and more widespread use on a worldwide basis is expected.

B. Robinson highlighted the need for scientists and radio regulatory organization to protect the passive radio services. They provide important data to the scientific community that has significant commercial value. The passive services have traditionally some difficulties in preserving the spectral purity and interference-free status of their bands. Examples of interference from spread spectrum satellite systems were illustrated. The author called for system designers to apply interference control techniques to limit their unnecessary emissions.

Management of the radio spectrum can be aided significantly by the use of computers. T. Cesky presented details of an automated system that he is developing for Czechoslovakia. A PC based system design was chosen because of the flexibility. A demonstration was given after the session which created considerable interest from the attendees.

Prof. F. Stumpers sent his paper regarding radio communications in Europe. The paper was distributed and is a valuable reference regarding ongoing research and development activities.

In summary, the session provided valuable information regarding radio communications development and the tie to the subject of spectrum management and the availability of spectrum to support new and innovative radio services.

Session JS14 (E. B. F) : Electromagnetic Coupling to Systems in the Presence of Ground

The session was convened and chaired by Prof. P. Degauque.

J. Fontaine presented a new method of calculation to determine magnitude and phase of a EM field propagating over inhomogeneous and irregular surfaces. This method uses a covariant approach of Maxwell's equations. The first results show that exact solutions are obtained in the case of irregular structures but assuming a certain periodicity. Degradation frequently arises when the propagation is at grazing incidence. Work should be continued on this original method which seems very attractive for applications.

J. Fontaine and Z. Wu have also computed a three dimensional simulation of the influence of relief using integral equations. They obtained results in the low and middle frequency ranges (for the case when dimensions are less than the wavelength).

E. Bahar presented a synthesis of "full-wave solutions" for propagation over ground surfaces, which he has been investigating for the past several years. Significantly, his proposed solutions can take into account the totality of physical processes. In particular, he finds, as a limiting case, the known solutions for very low or very high frequencies.

In regard to the coupling between EM waves and telecommunication cables (e.g. lightning), A. Zeddani and P. Degauque presented interesting results concerning the peak values of the current derivatives induced on the telecommunication lines.

Session JS15 (E. A) : Measurement of Man-Made Noise and of Immunity to It

The session was organized by Prof. F. Stumpers and chaired by Prof. P. Degauque. Reviewing trends in the interference potential due to the proliferation of electronic devices, characteristics and effects of noise, particularly immunity to it were discussed for a variety of man-made sources

such as for automotive ignition, electric discharges, power lines, LEMP, NEMP etc.

Papers presented in this session were :

1. F.L.H.M. Stumpers : Vector Field Measurement and Its Application. Immunity Classes. Oats vs Shielded Absorber-Lined Chambers;
2. M. Kanda and J. Randa : Estimation of Electromagnetic Fields in Complex Environments;
3. A.K. Peurala : Measurement of Immunity to Radiated Electromagnetic Field;
4. J.-P. Catani : Susceptibilité des circuits électroniques au bruit radio-électrique d'origine artificielle;
5. B. Demoulin, L. Koné, M. Rochdi and P. Degauque : State of the Art in the Measurements Techniques of the Cable Shielding Effectiveness;
6. T. Takagi : Measurement and Simulation of Man-Made Noise;
7. T.A.Th. Spoelstra : Reduction of Interference in Observations with Synthesis Radiotelescopes;
8. G.H. Hagn : Toward a Global Model of HF Other-User Interference;
9. T. Maeda : High Speed and High Accuracy Radiation Characteristics Measurement Equipment for Small Built-in Antennas.

Session JS16 (E. H) : Radio Noise Associated with Earthquakes

The session was convened by Profs. T. Yoskino and M.A. Gokhberg and chaired by T. Yoshino. The enhancement of ELF, VLF and LF background noise level a day or several hours before earthquakes has been observed by

Yoshino's group in 1980 during the USSR and Japan cooperation programme. In the last decade, many scientists in several countries have been involved in the study of this problem obtaining new observations. A.C. Fraser-Smith et al. reported on low-frequency electromagnetic field observations close to the epicenters of several recent California earthquakes, including the Ms 7.1 Loma Prieta earthquake of October 17, 1989. T. Yoshino et al. observed several clear emission signals associated with volcanic eruptions of Mt. Mihara, Japan, in 1986, and also at the city of Itoh very close to it in 1989.

Other papers were :

M. Cutolo, S.P. Kingsley and J.A. Reeve : Low False Alarm Methods of Earthquake Detection; M. Parrot : VLF Emissions form Earthquakes.

Session JS17 (E. H) : Characterization of Terrestrial and Power Line Sources

The session was convened by Drs. M. Hayakawa and K. Bullough and chaired by the former.

The session was composed of six papers. The first two papers (C. Grandt; S. Shimakura et al.) have dealt with sferics, the 3rd (J. Boskova et al.) and 4th (M. Parrot), ionospheric and magnetospheric VLF/ELF emissions and the last two (T. Yoskino et al. ; K. Bullough), power line harmonic radiation.

The 1st paper (unfortunately the speaker was unable to come) intended to provide us with the way of estimating the global distribution of lightning by using the group delay difference of VLF/ELF sferics. This direction finding technique would be of great importance in the studies of lightnings and sferics. The 2nd paper proposed a new and sophisticated signal analysis of estimating the propagation distance of ELF/VLF sferics and the ionospheric height with extremely high accuracy. This new direction finding method would be of great

potential in the study of locating sferics, detailed study of the propagation mechanism of whistlers, etc.

The 3rd and 4th papers have dealt with the magnetospheric and ionospheric ELF/VLF radio emissions, some of which originate in the above-mentioned sferics. New information has been supplied by the 3rd paper on the VLF/ELF emissions with structures. A lot of latest satellite results on discrete plasmaspheric emissions which are not well understood have been presented, and the generation mechanism in terms of electrostatic instability has been suggested. The 4th paper has dealt with the global distribution of ELF/VLF emissions on the basis of satellite measurements, and indicates the importance of the South Atlantic Anomaly in VLF/ELF radio emissions, the importance of VLF transmitter signals, etc.

The last two papers were concerned with power line harmonic (PLH) radiation. The 5th paper has also indicated the importance of the South Atlantic Anomaly in VLF emissions and a new knowledge on the distribution of power line fundamental frequency radiation has been presented on the basis of Japanese satellite data. The last paper has indicated the importance of PLH radiation in the precipitation of energetic electrons into the lower ionosphere, which modifies the electric parameters of the atmosphere, leading to triggering lightning. This is a new idea.

In conclusion, all of these invited papers were found to be of very high quality and to have provided new knowledge and fresh contribution to the study of terrestrial and power line sources.

Session JS18 (E, A, B) : Nonlinear Electromagnetics in Radio Science

The session was convened by Drs. A. Hasegawa and H. Kikuchi and chaired by H. Kikuchi. Among a variety of growing interests in nonlinear dynamics and electromagnetics during the last two or three decades, two kinds of

problems are particularly intriguing, namely "self-organization" and "dynamic chaos". Due to the absence of Prof. K. Spatschek who should have reviewed a topic on vortices in plasmas and the atmosphere, H. Kikuchi presented a short overview of the generation of large-scale vortex structures in helical turbulence due to self-organizational processes. It has been shown that helical hydrodynamic or electrohydrodynamic turbulence and/or some additional symmetry-breaking factors, such as space charges, an external electric or magnetic field, can lead to the generation of coherent large-scale structures. Another topic of dynamic chaos was reviewed by Prof. S.S. Moiseev and in particular, models of an active media with processes of heat production, absorption, and conduction were considered under the title of "Instabilities in Fluctuating Media". The heat is assumed to be produced in bursts induced by the action of random pointlike pulses. By analytical investigations and computer simulations, the threshold frequency of pulses was found ; it allows to keep the medium in the self-supported heated regime. Also, the problem of heating of fully ionized plasmas by random electromagnetic pulses was considered. Heating by sufficiently strong pulses of the pumping field was found to be more effective than the application of nonfluctuating deterministic pumping fields.

Another paper by Prof. N.S. Erokhin was concerned with inhomogeneous plasmas as nonlinear electromagnetics for radio waves. A number of effects accompanied by radio-wave propagation in an inhomogeneous plasma were reviewed. They are : the harmonic generation; wave beam filamentation and self-focusing, charge acceleration; wave barrier transillumination; soliton structures. The weak plasma inhomogeneity, the external magnetic field, wave-particle resonance interaction, particle trapping by strong waves and wave amplitude amplification in plasma resonance layers were taken into account.

Finally, R.L. Schlicher et al. described nonlinear electromagnetic propulsion systems where propulsion is achieved with unsymmetrical magnetic

forces. The systems are modelled by short circuited coaxial lines with single inner conductors and outer conductors of three equally spaced conductors.

Tutorial Session TE: What is the Scientific Approach to EMC Control and Vulnerability?

This tutorial Session of Commission E was chaired by the chairman of Commission E, H. Kikuchi. The topics were prepared by Drs. C. Baum and D. Hansen and the talk delivered by Dr. Baum. The lecture consisted of two parts; Part 1 concerned real problems or examples of EMC control and vulnerability, and Part 2 concerned how to approach those problems on a scientific basis. Part 1 should have been delivered by D. Hansen. Because of his unavailability, Dr. Baum displayed numerous TV video pictures provided by D. Hansen, and then proceeded to Part 2, which was the main issue of his talk. The text can be found in the volume "Review of Modern Science", published by URSI.

Commission E meetings had usually some 50 to 70 participants, and sometimes more for the joint sessions. In my opinion, it was a wide ranging and successful meeting for our Commission. I should like to express my sincere thanks to all those who contributed to this success.

H. KIKUCHI

REPORT OF COMMISSION H

by H. Matsumoto, Chairman

In the 1987-90 triennium Commission H has sponsored four symposia under Modes A and B, according to the Resolution adopted at the Tel Aviv General Assembly. The remainder of the budget for the URSI sponsorship was used to support the participation of key speakers at the Prague General

Assembly. All of the URSI sponsored symposia were successful and contributed to the Commission H activities during the past triennium.

The Working Groups C/H1 (Wave Analysis), G/H1 (Incoherent Scatter) and H/G1 (Computer Experiments, Simulation and Analyses of Wave Plasma Process) have been active and functioned properly during the triennium. Unfortunately, however, the joint Working Groups IAGA/H/G (Wave Instabilities in Plasmas) and IAGA/H (Passive Electromagnetic Probing of the Magnetosphere had made no report on their progress. V. Wickwar reported on the activity of the G/H1 (Incoherent Scatter) of scheduling joint operations of all incoherent scatter radars (CEDAR, WITS, STEP). He has been trying to work out a decision and alert mechanism for operations during periods of special geomagnetic activity. Effort has been directed toward establishing a bulletin board and finding a site for a southern hemisphere station. H. Matsumoto reported the H/G1 activity which includes national schooling, coordinating simulation studies jointly with other international bodies like SCOSTEP, and helping conveners of sessions at the Prague General Assembly. F. Lefeuvre suggested that the Wave and Turbulence Analysis Working Group be expanded to include Commission G. I must thank all of the Chairmen and C0-Chairmen of these Working Groups for their efforts in keeping the Working Groups active.

Very hard and massive work of editing the Review of Radio Science of URSI has been carried out by the team of M. Rycroft, R.L. Dowden and G. Hyde. It must have been a headache to squeeze a vast number of reference lists in the fields of the G and H Commissions into a limited number of pages, and respect the allotted total. I would like to express our deep appreciation for their tremendous efforts. I also thank H. Rishbeth, Chairman of Commission G with whom I worked together for most of the time of my Chairmanship of Commission H for his efforts for the compilation of the Review of Radio Science for the G/H part. H. Rishbeth has been warm and friendly to me in our

cooperative running of some projects of common interest. I thank him for his kind and helpful partnership.

We have lost our Vice Chairman, the late Dyfrig Jones, during the triennium. It was a great loss for the Commission to lose such an active and talented person. To commemorate his achievements in plasma wave science, we had a commemorative special invited talk at the Prague General Assembly. Everybody missed Dyfrig, and so did I. Because of this loss, we had to elect both an incoming Chairman and a Vice-Chairman. R.F. Benson from the USA was elected as Chairman, and F. Lefevre from France as Vice-Chairman. I congratulate them on becoming Commission H Officers. Both of them are well acquainted with URSI business.

I appreciate all of the help and cooperation provided by the members of Commission H and conveners of scientific sessions. My special thank should go to the URSI Secretariat, i.e. to Prof. Van Bladel and Mrs. Stevanovitch, for their warm help in handling Commission Business. If the Prague General Assembly was successful for Commission H, it is also because of the unselfish devotion of P. Bauer, in his capacity of Program Coordinator, and of Prof. Zima and his Czechoslovak Organizing Committee, who did so much for the success of the General Assembly. I hereby would like to express our thanks to them on behalf of Commission H. I have enjoyed my six-year long association with the Commission, first as Vice-Chairman with the former Chairman, R.L. Dowden, who advised me when I needed it, and afterwards as Chairman.

We all enjoyed the Tutorial lecture by Jim Eastwood on Simulation Technology for Plasma Wave Research. Jim gave a clear and yet deep background of simulation research, a discipline which is indispensable for the modern study of nonlinear wave plasma process. Commission H had only one Session of its own, traditionally named after the Commission i.e., Waves in Plasmas. This covered a wide research area that cannot be covered by joint

session with other Commissions. The session included Poster and Oral talks. For poster papers, we had poster preview talks, each of which was allotted three minutes before the poster session. This worked out well and provided useful information for the participants to the poster session. The oral session included a commemorative talk for Vice-Chairman Dyfrig Jones by D.A. Gurnett. The title of the talk was "Planetary Radio Emission : A review of the Work of Dyfrig Jones". It was followed by 11 invited talks. All other sessions of Commission H were jointly held with other Commissions, mostly with Commission G. Some were led by Commission G, such as JS5, JS6 and JS9; their contents have already been reported by H. Rishbeth in URSI Bulletin No. 257. Some were led by Commission H. JS1 was co-convened by F. Lefeuvre, JS2 by I. Kimura, JS3 by B. Lembege, JS4 by Y. Omura and D. Nunn, JS7 by M. Kaiser, and JS8 by U.S. Inan. All of these joint sessions were attended by several tens of Commission H members (sometime close to one hundred). Most sessions met the URSI scheduling of 20 minutes allocation for oral talks. Each joint session attracted many poster contributed papers in addition to oral invited papers. The poster sessions gathered fairly many attendants, who enjoyed direct discussions with the authors.

H. MATSUMOTO

REPORTS ON URSI SPONSORED MEETINGS

THE 4-TH INTERNATIONAL SCHOOL FOR SPACE SIMULATION

KYOTO AND NARA, JAPAN, 25 MARCH - 6 APRIL 1991

The International School of Space Simulation (ISSS) was founded in 1981 at the General Assembly of URSI in Washington in order to emphasize the importance of educating newcomers in the space simulation world, and the significance of the exchange of the latest informations in simulations and related theory and observations. The past three ISSS's received excellent marks from the attendants.

The 4-th ISSS (ISSS-4) inherited, and respected, this tradition. It was held from March 25 through April 6, for two weeks, under the co-sponsorship of URSI. Two different types of schooling were held in each consecutive week. The organizing committee was chaired by H. Matsumoto of Kyoto University.

The first week was dedicated to a tutorial course, given in the vein of the previous ISSS-3 (held in France). The lectures were given at the lecture room of Kyoto Software Application Inc. in the Kyoto Research Park. Forty-eight UNIX workstations were prepared and connected as terminals to three mini-super-computers. Eighty-four students and scientists from various countries participated in the Tutorial Course. The following ten lecturers gave a series of lectures, supported by the local assistant staff. In alphabetical order : O. Buneman, H. Matsumoto, M. Okada, N. Omid, Y. Omura, A. Sawada, M. Tanaka, H. Usui, Watanabe and H. Yamaguchi. The local supporting staff members were M. Tsutsui, H. Kojima, Miwa and K. Satofuka.

The simulation codes used in the lectures had been distributed to the participants as the ISSS-4 Software Library. The participants were also allowed

to use the simulation codes for their own study and research. Such free distribution of useful and powerful simulation codes is unprecedented, and forms a unique feature of the ISSS-4 Tutorial Course. The participants were very positive and active, asking many questions during and after the lectures. Many of them showed great interest in learning the usage and mechanism of the simulation codes which had been distributed on their request. They were very much impressed by the well designed simulation codes and their graphic outputs.

The second week was held at the Nara Prefectural Hall in Nara, from April 2nd to 6th. It was a Symposium type of School where the latest results of simulation research as well as those of related theories and satellite observation were presented. The program committee of the symposium was chaired by Dr. C.T. Dum. The number of participants was 148, from 10 countries. Thirty-nine invited papers and sixty-nine contributed poster papers were presented. Six topics were chosen as Sessions; New Code and Technical Points of Simulation, MHD Global Simulation, Particle Simulation on Micro-physics in Plasma, Particle Simulation on Large-scale Phenomena, Panel on MHD Simulations, and Recent Space Vehicle Observations. Participants from China and the USSR, as well as from Europe and the USA, exchanged professional and personal information with Japanese young scientists.

H. MATSUMOTO
URSI Representative
Chairman of ISSS-4

MEETING ANNOUNCEMENTS

INTERNATIONAL SYMPOSIUM ON MIDDLE ATMOSPHERE SCIENCE (MAS SYMPOSIUM)

MARCH 23 - 27, 1992, KYOTO, JAPAN

This conference, co-sponsored by URSI, will be held at the New Miyako Hotel, Kyoto, Japan during March 23-27, 1992, under the chairmanship of Prof. S. Kato. It is organized by the Radio Atmospheric Science Center of Kyoto University, supported by the Ministry of Education, Science and Culture of Japan.

The MAS Symposium is planned to discuss recent progress and future perspectives on a wide range of issues concerning the middle atmosphere-dynamics and chemistry, transport, environmental systems, and couplings between hemispheres and with the upper and lower atmosphere.

Authors are encouraged to submit papers on all topics of interest to the MAS Symposium. The topics listed below are intended as suggestions, but full consideration will be given to papers on other relevant subjects,

- Climate change in the middle atmosphere
- Natural and external sources of the decadal variability
- Ozone and minor constituents
- Aerosol chemistry effects : Volcano and others
- UARS : Dynamics, energetics and chemistry
- ATLAS
- QBO : Tropical and extra-tropical
- Waves and turbulence
- Equatorial middle atmosphere

- The Arctic and Antarctic : Similarity and differences
- Downward control of the middle atmosphere from above
- Strato/troposphere exchange
- DYANA
- Tides and dynamo effects
- Electrodynamics

Deadline : abstracts must be received by 30 Nov. 1991.

**URSI RADIO SCIENCE MEETING, IEEE-APS INTERNATIONAL
SYMPOSIUM AND NUCLEAR EMP MEETING
JULY 18-25, 1992, CHICAGO, IL, U.S.A.**

Suggested Topics for URSI

Commission A (Electromagnetic Metrology)

- | | |
|---|--|
| A1. Microwave to submillimeter measurements and standards | A7. Metrology for optical communication components |
| A2. Quantum metrology and fundamental constants | A8. Noise |
| A3. Time and frequency | A9. Materials |
| A4. High- T_c superconductors at high frequency | A10. Impulse radar |
| A5. Time domain metrology | A11. Bioeffects and medical applications |
| A6. Metrological problems with EMC and EM pollution | |

Commission B (Fields and Waves)

- | | |
|-------------------------------------|-----------------------------------|
| B1. Asymptotic Methods | B7. Nonlinear phenomena |
| B2. Canonical problems | B8. Radar cross sections |
| B3. Complex and random media | B9. Radiation |
| B4. Gratings | B10. Rough surfaces |
| B5. Innovative numerical techniques | B11. Theoretical electromagnetics |
| B6. Inverse scattering | B12. Waveguides |

Commission D (Electronics and Photonics)

- | | |
|--|---|
| D1. Opto-electronic techniques,
sensors and materials | D4. Laser measurements |
| D2. Superconductivity | D5. High-frequency and high-speed
devices and circuits |
| D3. Optical fibers | D6. Advanced materials and
processing |

Commission E (Electromagnetic Noise and Interference)

- | | |
|---|--|
| E1. Lightning, EMP/HEMP | E4. Effects of man-made noise on
communication |
| E2. Damage to systems | E5. Scientific basis for noise and
interference |
| E3. Intentional noise and
interference | E6. ULF/ELF/VLF natural and man-
induced geomagnetic signatures |

Suggested Topics for APS

- | | |
|---|--|
| 1. Adaptive and signal processing antennas | 14. Millimeter-wave antennas |
| 2. Antenna measurement and metrology | 15. Monolithic active array techniques |
| 3. Antenna theory | 16. Multiple beam antennas |
| 4. Biomedical applications | 17. Near-field measurement and theory |
| 5. Broadband and multifrequency antennas | 18. Numerical methods |
| 6. Computer aided antenna design | 19. Phased arrays |
| 7. Electromagnetic theory | 20. Polarimetrics |
| 8. Frequency-selective surfaces | 21. Propagation |
| 9. Imaging radars | 22. Reflector antennas |
| 10. Inverse methods | 23. Remote sensing |
| 11. Microstrip antennas | 24. Scattering and diffraction |
| 12. Microwave materials in antenna applications | 25. Time domain methods |
| 13. Millimeter and submillimeter waves | 26. Other |

Suggested Topics for NEM

- | | |
|---|---|
| N1. EM environment and coupling phenomenology | N4. EM hardness assessment and maintenance |
| N2. Simulation and measurement techniques | N5. EM protection, standards and specifications |
| N3. Numerical and statistical analysis techniques | N6. High-power microwaves |
| | N7. Lightning |
| | N8. Transient radar |

All Abstracts and Summaries must be received by January 6, 1992.

Address correspondence and all papers to :

1992 Joint Symposia
Technical Program Committee
P.O. Box 6805
Chicago, Illinois 60680-6805, USA

- General information about the 1992 Joint Symposia may be obtained from P.L.E. Uslenghi, Symposia Chair (phone 312-996-5487, FAX 312-413-0024).
- Technical program inquiries may be directed to Allen Taflove, Technical Committee Chair (phone 708-491-4127, FAX 708-491-4455), or to one of the Co-Chairs : K.R. Umashanhar (phone 312-996-3192, FAX 312-413-0024) or P.L.E. Uslenghi.

**INTERNATIONAL MEETING FOR WAVE PROPAGATION
IN RANDOM MEDIA (SCINTILLATION)
AUGUST 3-7, 1992, SEATTLE U.S.A.**

A meeting on wave propagation in random media, co-chaired by Professors Tatarskii and Ishimaru, will be held August 3-7, 1992, at the University of Washington, Seattle, U.S.A. This meeting of the optical, radio, and acoustical communities will result in an exchange of ideas and new insights for all participants. Only problems of wave propagation in continuous random media will be addressed. Relevant topics include :

- statistical description of scintillation (PDF, second moment, fourth moment)
- measurements of scintillation statistics
- measurements of turbulence spectra using scintillation
- measurement of velocity using scintillation
- remote sensing using scintillation
- scintillation of waves propagating in random media upon reflection (mirror, phase conjugate mirrors, retro reflector, diffuse target)
- image and focal plane statistics with scintillation
- simulation of scintillation problems
- effects of turbulence profiles on scintillation statistics
- scintillation of beams, incoherent and partially coherent sources
- multifrequency scintillation
- pulse propagation in random media
- adaptive optics and scintillation
- speckle interferometry

The meeting is co-sponsored by URSI. Papers are solicited for presentation in a poster format to foster conversations between scientists from the different communities. Invited papers will be presented by internationally recognized experts. If you plan to attend this meeting (or would like to receive the advance program), please write to : "Scintillation Meeting", Engineering Continuing Education, University of Washington, 4725 30th NE, GG-13, Seattle, Washington 98195.

**URSI INTERNATIONAL SYMPOSIUM
ON ELECTROMAGNETIC THEORY
17-20 AUGUST, 1992, SYDNEY, AUSTRALIA**

Dr. James gave us the following additional information on this most important meeting, already mentioned in the June 1991 issue of the Bulletin :

- For delegates planning to attend the 4th biennial Asia-Pacific Microwave Conference (APMC'92) as well as the URSI EM Theory Symposium, please note the **change of dates for APMC'92**. This is now to be held the week prior to the URSI EM Theory Symposium from 11-13 August 1992 at the Adelaide Convention Centre, Adelaide, Australia.

- The programme is to begin each day at 0900 with a plenary session consisting of two invited talks giving an overview on selected subjects. This will be followed by three 90' periods (except for minor variations on the first and last day) at 1030-1200, 1330-1500, and 1530-1700 consisting of up to three (or possibly four) parallel sessions. Each session of 90' in duration will consist of one 30' and three 20' presentations (including question time). Each subject of the invited talks will be the basis of one or more sessions on that day. These special sessions will be chaired by the invited speakers who will also be responsible for selecting, in the first instance, the papers sent by the Technical Program Committee (TPC) to them in early November. There is provision for up to seven invited talks and the Symposium is to end with a keynote address. To date at least four of these invited talk slots have been filled, covering the topics Chiral Media, Phase Retrieval, Bioelectromagnetic Effects and Non-linear Guided Waves.

**THE 18TH EUROPEAN CONFERENCE
ON OPTICAL COMMUNICATION
27 SEPT - 1 OCT. 1992, BERLIN, GERMANY**

This conference is organized by the

- Informationstechnische Gesellschaft im VDE (ITG) Frankfurt/Main
 - Heinrich-Hertz Institut für Nachrichtentechnik Berlin GmbH (HHI), Berlin
- and is co-sponsored by URSI. Contributions will address topics related to the theory, design, fabrication and characterization of the following :

1. Materials for active and passive components
 - III-V materials, LiNbO₃, polymers,...
2. Passive and active components
 - fibres, couplers, multiplexers, filters, mode converters, isolators,...
 - sources, detectors, amplifiers, modulators, switches, nonlinear devices,...
 - device modelling,...
 - component packaging, pigtailling,...
3. Integrated optics and optoelectronic integrated circuits
 - hybrid and monolithic integrated circuits,
 - fibre-chip coupling, packaging,...
 - device modelling,...
 - optics for micro systems,...
4. Systems and applications
 - trunk networks,...
 - customer access systems, customer premises networks,...
 - evolution strategies,...
 - local, metropolitan and wide area networks,...
 - local and mobile control systems,...
 - optical free space communications,...
5. Photonics
 - optical interconnects,...
 - photonic switching, signal processing and computing,...
 - optical neural networks,...

- ultrafast optics,...
- tunable devices, frequency converters, optical memories, logic devices,...
- optical standard frequencies,...

The paper deadline is 14 April, 1992.

The Organizing Committee consists of
Prof. Dr. C. Baack, chairman, HHI
Dr. R. Evers, secretary, HHI
Dr. G. Tröller, secretary, HHI
P. Stilke, secretary, VDE

and the Technical Programme Committee of
Prof. Dr. C. Baack, chairman, HHI
Dr. R. Evers, secretary, HHI
Dr. G. Tröller, secretary, HHI
Telephone : (+49) 30 31002 399/325
Telex : 185 995 hhi d
Telefax : (+49) 30 31002 559

The URSI representative is Prof. W. Klein.

SEVENTH INTERNATIONAL SYMPOSIUM ON ANTENNAS
(JINA : JOURNÉES INTERNATIONALES DE NICE
SUR LES ANTENNES)
12-14 NOV. 1992, NICE, FRANCE

The organizers of this meeting, which is co-sponsored by URSI, have just issued their call for papers, of which we give the essential elements :

SUGGESTED TOPICS

- EM theory applied to antennas
- Analytic and numerical techniques
- High frequency techniques
- Scattering and diffraction
- Computer-aided antenna design
- Antenna synthesis
- Feeds and radiating elements
- Reflector antennas
- Multibeam antennas
- Satellite antennas
- Earth station antennas
- Frequency selective surfaces
- Wideband antennas
- MM wave antennas
- Microstrip antennas
- Array antennas
- Active arrays and monolithic integrated antennas
- Adaptive and signal processing antennas
- Near-field measurement and theory
- Industrial and medical applications

SPECIAL TOPICS

- Mobile antennas
- Active antennas

DEADLINES

- Submission of summaries : March 92
- Notification of accepted paper : May 31/92
- Submission of completed papers : July 15/92

WORKING LANGUAGES

- French and English.
- Simultaneous translation will be provided.

SUMMARIES

Typed summaries of original papers related to one of the suggested topics must be sent in three copies by March 1, 1992 to :

Dr. J.L. GUIRAUD - Secretariat JINA'92
CNET-PAB
Centre de la Turbie
06320 LA TURBIE, FRANCE

Summaries (1 to 3 pages) may be written in French or English. The title must appear at the top of the page in capital letters. Authors' names and complete addresses must appear directly below the title. If several names are mentioned, please underline the name of the main author, to whom all correspondence will be addressed. Authors whose summaries are accepted will be notified by the end of May 1992. At this time, they will receive author's kits with full instructions for the final typescript. Completed papers must be received by the Secretariat before July 15, 1992.

Secretariat JINA'92
Fax : 33.93.41.02.29 - Telex : 470159F

OTHER MEETINGS WHICH HAVE BEEN BROUGHT TO OUR ATTENTION

- 42^e Congrès de la Fédération Internationale d'Astronautique (le prochain siècle : perspectives spatiales), 7-11 oct. 1991, Montréal, PQ, Canada.
- Colloque International sur l'Exploration de l'Univers, facteur de développement pour des technologies nouvelles, 24-25 oct. 1991, Toulouse, France.

- Premier Colloque Européen : Fluides dans l'Espace, organisé par le Centre National d'Etudes Spatiales (CNES), en collaboration avec l'Agence Spatiale Européenne (ESA), 18-22 nov. 1991, Ajaccio, France.
- IEEE Conference on Global Communications, 2-5 Dec. 1991, Phoenix, Arizona, USA.
- IEEE International Electron Devices meeting, 8-11 Dec. 1991, Washington, D.C. , USA.
- SPIE Conference on Emerging Optoelectronic Technologies, 16-20 Dec. 1991, Bangalore, India.
- First Congress of the European Bioelectromagnetics Association, 23-25 Jan. 1992, Brussels, Belgium.
- IEEE International Symposium on Circuits and Systems, 10-13 May 1992, San Diego, CA, USA.
- IEEE International Microwave Symposium, 1-5 June 1992, Albuquerque, N.M., USA.
- International Symposium on Small Satellites Systems and Services, organized by CMES and ESA, 29 June - 2 July 1992, Arcachon, France.
- IEEE International Symposium on Electromagnetic Compatibility, 18-20 Aug. 1992, Anaheim, CA, USA
- Sixth IEE International Conference on Dielectric Materials, Measurements and Applications, 7-10 Sept 1992, Manchester, UK.
- XI International Conference on Microwave Ferrites, Sept-Oct. 1992, South Coast of Crimea, USSR.

URSI PUBLICATIONS

The hard cover version of Modern Radio Science 1990, has now become available. This handsome volume, edited by J. Bach Andersen, is published for URSI by Oxford University Press (ISBN 0-19-856350-7). Its 210 pages contain General Lectures and Tutorials presented at the Prague General Assembly, namely :

- Electromagnetic fields and the essence of living systems
W. Ross Adey
- Scientific and technological research from manned space platforms
Owen K. Garriott
- Electromagnetic quantities, units, and standards in a changing SI
B. Kibble
- Solution techniques for electromagnetic field problems
S. Ström
- The theory of electromagnetic interference control
Carl E. Baum
- Satellite measurements of moisture variables and global change
Gerald R. North
- The ionosphere from space
P. Bauer
- Simulation methods for plasma wave research
James W. Eastwood
- New bio-information from ultraweak photon emission in life and biological activities : biophoton
Humio Inaba
- Nonlinear networks and chaos
L.O. Chua
- Polarization
V. Radhakrishnan

PUBLICATIONS RECEIVED AT THE URSI SECRETARIAT

- The Bulletin of the the International Electrotechnical Commission (No. 129, May-June 1991).
- The 1990 Annual Report of the Space Research Organisation in the Netherlands.
- The U.S. STEP Newsletters (vol. 1 no. 1 May 1991 and no. 2 1991).

- The Proceedings of the Seventh IEE International Conference on Antennas and Propagation, held in York on 15-18 April 1991.
- The CCIR Report on Technical and Operational Bases for the World Administrative Radio Conference 1991 (WARC-92)
- The Report of the International Frequency Registration Board to WARC-92.
- L'Union Internationale des Télécommunications de demain : les Défis du Changement (Genève, avril 1991).
- Centre national d'études des télécommunications (CNET) : rapport annual 1990.

**BOOKS PUBLISHED BY MEMBERS
OF THE URSI COMMUNITY**

**ELECTROMAGNETIC WAVE PROPAGATION, RADIATION
AND SCATTERING**

by A. Ishimaru. Published in 1991 by Prentice Hall

(ISBN 0-13-249053-6)

The chapter headings of this book, 637 pages long, are :

1. Introduction
2. Fundamental field equations
3. Waves in inhomogeneous and layered media
4. Waveguides and cavities
5. Green's functions
6. Radiations from apertures and beam waves
7. Periodic structures and coupled-mode theory
8. Dispersion and anisotropic media
9. Antennas, apertures, and arrays
10. Scattering of waves by conduction and dielectric objects
11. Waves in cylindrical structures, spheres and wedges
12. Scattering by complex objects
13. Geometric theory of diffraction and low-frequency techniques
14. Planar layers, strip lines, patches, and apertures
15. Radiation from a dipole on the conduction earth
16. Inverse scattering
17. Radiometry, noise temperature, and interferometry
18. Numerical techniques

FROM THE ARCHIVES OF URSI

In the Bulletin of July-August 1951 the death of Prof. Elias, a well known expert of circuit theory and electromagnetics, was announced. We also read that the Joint Commission on Radio Meteorology met in Brussels in August, under the chairmanship of C.R. Burrows, and with participation of E.G. Bowen, W.E. Gordon, J. Lugen, H. Norinder, A. Perlat, P.A. Sheppard and J. Voge. The issue contains comments on various CCIR questions, some of them concerning extra-terrestrial radio-noise.

In the September-October 1951 issue we note an article on the Transmission of URSIGRAMS, written by the German "Arbeitsgemeinschaft Ionosphäre", and a list of CCIR Study Groups, together with the question they submitted (this in preparation to the CCIR Plenary Assembly in Genève).

In the July-August 1961 issue we find a document of IUCAF concerning the "Tolerable Level of Interference in the Radio Astronomy Frequency Bands", an extensive COSPAR document on the "Investigation of the atmosphere and various atmospheric phenomena by means of artificial satellites", and the "Development and use of meteorological satellites".

The September-October 1961 issue starts with an obituary of K.S. Krishnan, who was Chairman of the Radio Research Committee of India, and director of the National Physical Laboratory. We also find a report of a workshop organized by the C.N.F.R.S. (Comité National Français de Radioélectricité Scientifique), the URSI member Committee in France. The workshop, held on 29, 30 and 31 May 1961, was devoted to Parametric Amplifiers. The largest contribution, however, is from the (now defunct) Inter-Union Committee on Radiometeorology, chaired by J.S. Marshall, which held a meeting in Paris in April 1961. Many well-known URSI personalities

contributed to the meeting, such as B.R. Bean, R. Bolgiano, J.A. Saxton, P. Misme, K. Naito, Y. Ogura, P.A. Sheppard, J. Voge and A.T. Waterman.

Among the topics under discussion :

- Turbulence and atmosphere inhomogenities
- The role of radioclimatology
- Tiros (weather) satellite and propagation
- The pattern of refractive index
- Weather radar
- Radar observations of sferics and lightning
- Microwave radiometers
- Radio refractometers

In the September 1971 issue we find an obituary of Prof. L. Harang, who was a distinguished member of the URSI Committee in Norway. In addition to the usual announcements and meeting reports, we note the report of IUWDS for 1970, and the answer of the URSI Board to a question asked by ICSU, described in the following lines :

"The division of science into separate disciplines with sharply-defined boundaries has become more and more inappropriate over the past 15-20 years. A consequence of this trend is the increasing tendency for some overlap in the interests and responsibilities of the Unions and other ICSU bodies. The Secretary General of ICSU asked the Unions to comment on the difficulties arising from such overlaps".

The answer of the Board (given only partially here) is interesting, because it was the prelude to a discussion of the fundamental goals of URSI, a topic which kept our Union busy during the first years of the seventies, and led to the decision to give more emphasis to the "Telecommunications" aspects of our activities. The main ideas were :

1. Responsibility for Scientific Activities

If a Union has an interest in a certain branch of science, it will be assumed that this implies certain responsibilities for various types of scientific activity relating to the discipline in question. Such interests are not exclusive to any one Union, and it is obviously possible for two or more Unions to regard themselves as responsible for the same activities. Thus the problem to be solved is not how to improve inter-Union cooperation, but rather how to deal with the situation where there is some doubt as to the appropriate distributions of responsibilities between two or more Unions in the same branch of science. Where such a situation exists, at least three possible courses of action may be considered :

1. the allocation of the overlapping responsibilities exclusively to one of the Unions;
2. the creation of a new Union which would be exclusively responsible for activities in the overlap area;
3. the creation, by the interested Unions, of one of more bodies which would be responsible to these Unions for these activities.

The first of these possible solutions is hardly worth consideration because the Unions concerned usually have a comparable level of interest in the overlap area; it would be difficult or impossible for them to agree, or for ICSU to make an arbitrary decision on which one should carry all the responsibility.

The creation of a new independent Union, which would take over the responsibilities, seems at first sight to be an attractive proposal since it avoids the need to making a decision of the kind just mentioned. Unfortunately, the new Union would necessarily have frontier areas with the two Unions concerned with the original situation. It is difficult to believe that these areas would not, in the future, give rise to similar problems of overlapping interests.

The third solution has merits. It should be remembered that interdisciplinarity is not a new problem, and that the first attempt to solve it was made by the International Research Council (later ICSU) in 1925, when it formed the Joint Commission on Solar and Terrestrial Relations.

2. Inter-Union Commissions

The Inter-Union Commissions correspond closely, in fact, to the bodies referred to in the third of the possible courses of action listed above; they have the following characteristics :

- a. they are small bodies consisting of one or two representatives appointed by each of the Unions wishing to cooperate in a given field;
- b. they are supported financially by these Unions, one of which is responsible for the administration of the Commission;
- c. their scientific activities are jointly controlled by the Unions, both directly through the Union representatives, and indirectly through the amount of financial support given by the Unions;
- d. the Unions can dissolve a Commission when, in their opinion, it no longer has a useful function to perform.

The characteristics of an Inter-Union Commission are such that two or more Unions can successfully cooperate in a given field of scientific activity. Moreover, the Unions remain in control of the work of the Commission and hence they can vary their support for it in the light of the changing priorities of their numerous other responsibilities.

3. Creation and Termination of ICSU Bodies

The demand for the creation of interdisciplinary bodies has arisen because of the recognition of the interdependence of scientific studies formerly regarded as having little relating with each other. As science continues to increase in complexity, ICSU and the Unions must keep abreast of the need to initiate new interdisciplinary investigations when the occasion seems appropriate. This implies not only the creation of new bodies to deal with new investigations and programmes, but also the critical assessment, from time to time, of the need for the bodies already in existence.

The September 1981 issue of the Bulletin was entirely devoted to the Resolutions and Recommendations approved at the Washington D.C. General Assembly.

PERSONALIA

Prof. dr. H. Bremmer was granted a doctorate honoris causa on April 26, 1991, on the occasion of the 7th Lustrum of the Eindhoven University of Technology. The doctorate was conferred on the initiative of the Department of Applied Physics, for Bremmer's outstanding work on wave propagation in general, and on the propagation of radiowaves in particular. The promoters were professors F.W. Sluijter and M.P.H. Weenink. The distinction is a rare one indeed as the university has granted in total, up to now, only 10 honorary doctorates, one of them being to the late Prof. dr. A. van der Ziel.

URSI old-timers know that Prof. Bremmer has been an URSI personality for many years, and that he has been a co-worker and colleague of the late Prof. van der Pol.