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HIGHLIGHTS OF TWO ADMINISTRATIVE MEETINGS

The Coordinating Committee (consisting of the Board and the Chairs of Commissions and Scientific Committee) met in Brussels on 27 and 28 April 1992. The main part of the agenda was devoted to the elaboration of the scientific programme of the General Assembly in Kyoto. Out of the meeting came the list of Sessions, General Lectures and Tutorials reproduced on page 4 to 12 of this Bulletin, together with the names of the conveners. Professor Jørgen Bach Andersen and Professor Hiroshi Matsumoto, respectively coordinator and associate coordinator of the scientific programme, led that part of the discussion. The participation of Young Scientists (less than 35 years of age on 1 September 1993) was discussed. Young Scientists who submit a paper will be identified by means of a suitable question inserted in the Calls for Papers. No special oral sessions are planned for those who are not part of the regular programme, but the possibility of organizing poster sessions has been left open.

The Board of Officers met in Brussels from 29 April to 1 May 1992, right after the meeting of the Coordinating Committee. Part of the meeting was devoted to routine matters, but quite a few items were of general interest to the URSI community, and deserve a brief mention :

- (1) the Board decided to allot an additional \$2000 to each Commission. These additional funds are earmarked for support of attendance at our meetings (and in particular at our General Assembly) of scientists from countries in difficult financial circumstances (e.g. those which suffer from non-convertibility of currencies). Colleagues from the former USSR are obvious beneficiaries.
- (2) the Board noted with satisfaction that the organizers of the Kyoto General Assembly strongly support the Young Scientist

programme, and will provide room and board to some 100 young participants. The Board thanked our Japanese colleagues for their efforts.

- (3) the Board noted also that extensive funds (up to \$30000) will be needed to bring Young Scientists from Developing Countries to Kyoto, and that the prospects for gathering such support were meagre. The Board therefore urges the URSI community, and in particular the Member Committees, to help find suitable sources of support for this worthwhile endeavour.
- (4) the Board reaffirmed its support for the (medium-scale) Scientific Exhibition which will be organized in Kyoto from Monday 30 August to Wednesday 1 September. The URSI community is urged to encourage potential exhibitors to contact the main organizer, Dr. Y. Furuhashi (Advanced Telecommunications Research Optical & Radio Comms. Res. Labs., Seika-Cho, Soraku-Gun, Kyoto 619-02, Japan).
- (5) the Board welcomed the announced creation of a Member Committee in South Korea. It also noted that fourteen Academies had now been activated in the former territory of the USSR and, following ICSU policy, decided to invite these Academies to become Member of our Union.
- (6) the Board discussed the Publications programme in detail, and particularly the future of "Bulletin" and "Radioscientist". It approved the idea of combining both publications into a single quarterly, starting with the issues of March 1994, but wishes to consult the Publications Committee before reaching any decision.
- (7) the Council decided, at the 1990 General Assembly, to create a network of "correspondents". At the present moment, there are some 700 of these (URSI officials, subscribers to the "Radioscientist", colleagues whose names have been given to the Secretariat by the Member Committees ...). These correspondents receive individually-mailed copies of the

Bulletin. The Board decided that regular participants to the Kyoto General Assembly would automatically become "correspondent" for the triennium 1994-6. The concepts of "correspondent" and "individual URSI member" are linked, and fundamental decisions will have to be made in Kyoto to arrive at a satisfactory structure. A number of URSI Committees (Membership, Publications, Long Range Planning, Finances, ...) are involved in this most important decision process, for which inputs from the URSI community at large are particularly desirable.

- (8) the Board, after a lengthy discussion, decided that the choice of the venues of the General Assembly for both 1996 and 1999 should be made in Kyoto. The motivation for this decision is that 3 years has become too short a preparation time for an event of the size and importance of the General Assembly.

THE SCIENTIFIC PROGRAMME OF THE 24TH GENERAL ASSEMBLY IN KYOTO

The first announcement of the General Assembly came out in July, and has been widely distributed by the Japanese organizers. It is not practical to reproduce this document in full. We give, instead, an outline of the (almost complete) programme, mentioning titles of Symposia and names of convener(s). The letters I, C, P, which appear repeatedly in the text, have the following meaning :

I : there are invited papers in the session

C : the session is open for contributed oral papers

P : contributions may also be presented in poster form.

The announcement contains detailed instructions for submission of contributions. We note that authors of invited, contributed and poster papers should submit a one page abstract before 15 January 1993 to :

Professor I. KIMURA
Secretariat, URSI-GA Kyoto
c/o Center for Academic Societies, Osaka
14th Floor, Senri Lift Science Center Bldg.
1-4-2 Shinsenri Higashi-machi
Toyonaka
OSAKA 565
JAPAN
Tel. (81) 6-873-2301
Fax (81) 6-873-2300

Copies of the announcement may be obtained from Professor Kimura's office.

Programme of Commission A (Electromagnetic Metrology)

- A1 Communication systems and optical fibres (I)
K. Morita, H. Ishio (Japan)
- A2 Microwave/millimetre wave standards (I)
S. Kashyap (Canada), T. Iwasaki (Japan)
- A3 New developments in atomic frequency standards (I)
K. Nakagiri (Japan), R.J. Douglas (Canada)
- A4 Navigation systems : from the sextant to GPS (I)
W.J. Klepezynski (USA), F. Takahashi (Japan)
- A5 Quantum metrology and fundamental constants (I)
T. Endo (Japan), B. Taylor (USA)

Programme of Commission B (Fields and Waves)

- B1 Guides waves (I+C)
A.H. Sihvola (Finland), R.E. Collin (USA)
- B2 Planar antennas (I+C)
A. Papiernik (France), T. Teshirogi (Japan)
- B3 Small antennas (I+C)
H. Nakano (Japan), L. Shafar (Canada)
- B4 PC's for electromagnetics (I+C)
M. Iskander (USA), B.A. Austin (U.K.)
- B5 Time domain techniques (I+C)
A. Tjihuis (Netherlands), R. Luebbers (USA)
- B6 Numerical techniques (I+C)
D. Wilton (USA), E. Yamashota (Japan)
- B7 Inverse problems (I+C)
R. Stone (USA), D. Lessellier (France)
- B8 High frequency techniques (I+C)
O. Bucci (Italy), A. Nosich (Ukraine)
- B9 Wave propagation and enhanced backscattering in random media (I+C)
A. Ishimaru, V.I. Tatarskii (USA)
- BP Poster session (P)
F. Gardiol (Switzerland), A.D. Olver (U.K.)

Programme of Commission C (Signals and Systems)

- C1 Synthesis and analysis of systems (I+C+P)
B. Shishkov (Bulgaria)
- C2 Computer aided telecommunications network design (I)
K. Geher (Hungary)
- C3 Picture coding (I+P)
P. Delogne (Belgium)
- C4 Optical space communications (I)
Y. Furuhamo (Japan)
- C5 Millimetre wave premises communications systems (I+C+P)
J.P. McGeehan (U.K.)
- C6 Synchronization in telecommunications (I+C+P)
M. Moeneclaey (Belgium)
- C7 Digital techniques in broadcasting, DAP (I+C+P)
P. Shelswell (U.K.)
- C8 Signal processing for magnetic recording (I+C+P)
J. Wolf (USA)
- C9 Mobile satellite communication systems (I+P)
S. Kato (Japan)
- C10 Modelling of signals and systems (I+C+P)
W. Schwarz (Germany)

Programme of Commission D (Electronics and Photonics)

- D1 Active integrated antennas (I+C+P)
T. Itoh (USA)
- D2 Numerical modelling of microwave and millimetre wave circuits (I+C+P)
R. Sorrentino (Italy)
- D3 Physical size limitations in semiconductor devices (I+C+P)
A. Jelenski (Poland)
- D4 New techniques for mobile radio communications (I+C+P)
M. Nilsson (Sweden)
- D5 Progress in semiconductor lasers (I+C+P)
A.J. Seeds (U.K.)

- D6 Computer modelling and design of electronic and optical devices (I+C+P)
P. Lagasse (Belgium)
- D7 Coherent optical communications (I+C+P)
A. Leboutet (France)
- D8 Optical information processing (I+C+P)
E. Voges (Germany)
- D9 Engineering and applications of optical fiber sensors (I+C+P)
A.M. Scheggi (Italy)
- D10 Ultra-high speed A/D converters (I+C+P)
D. Skellern (Australia)
- D11 Towards development of a human-like computer
G. Matsumoto (Japan)

Programme of Commission E (Electromagnetic Noise and Interference)

- E1 Extraterrestrial and terrestrial meteorologico-electric environment (I)
H. Kikuchi (Japan)
- E2 Terrestrial electromagnetic environment (I)
M. Hayakawa (Japan)
- E3 Planetary lightning and related phenomena (I)
W.J. Borucki (USA)
- E4 Spectrum management and utilization
R.D. Parlow (USA)
- E5 High power electromagnetics (I)
R.L. Gardner (USA)
- E6 Electromagnetic topology for electromagnetic interference analysis and control (I)
C. Baum (USA)
- E7 Coupling to multiwire cables (I)
F.G. Canavero (Italy)

Programme of Commission F (Wave Propagation and Remote Sensing)

- F1 Ground-based and spaceborne probing of the atmosphere (I+P)
M. Chandra (Germany)
- F2 Remote sensing of ice (I+P)
- F3 Attenuation due to gases, clouds and fog (I+P)
C.J. Gibbins (U.K.)
- F4 Refractive effects on terrestrial radio paths, prediction and countermeasures (I+P)
L. Martin (France)
- F5 Remote sensing of land, especially vegetation (I+P)
- F6 Depolarization due to rain, ice and surface scattering (I+P)
Y. Karasawa (Japan)
- F7 Remote sensing of the sea surface (I+P)
W. Alpers (Germany)
- F8 Regional factors and climatology in propagation predictions (I+P)
M.P.M. Hall (U.K.)
- F9 Probing of the solid earth (I+P)

Programme of Commission G (Ionospheric Radio and Propagation)

- G1 Recent results of coordinated campaigns (I+P)
S. Basu (USA)
- G2 Ionosphere middle- and lower atmosphere interactions (I+C+P)
J. Roettger (EISCAT)
- G3 New results from coherent and incoherent scatter experiments (I+P)
S. Fukao (Japan)
- G4 Ionosphere prediction and modelling (I+C+P)
B.W. Reinisch (USA)
- G5 (a+b) Open session and latest results (C+P)
A.P. Mitra (India), K. Schlegel (Germany)

- G6 Ionosonde networks and stations (C+P)
P.J. Wilkinson (Australia)
- G7 Progress in understanding ionospheric irregularities : techniques, observations and theory (I+P)
C. Hanuise (France)
- G8 Observations and modelling of solar-terrestrial relationships (I+P)
E.P. Szuszczewicz (USA)

Programme of Commission H (Waves in Plasmas)

- H1 Observations and interpretations of interplanetary and planetary wave emissions (I+C+P)
R.G. Stone (USA)
- H2 Electromagnetic and electrostatic cyclotron waves in magnetospheric and laboratory plasmas : theory, simulations and experiments (I+C+P)
D. Nunn (U.K.), Y. Omura (Japan)
- H3 Parallel electric fields in laboratory and space plasmas (I+C+P)
E. Whipple (USA), J. Lemaire (Belgium)
- H4 Nonlinear resonance effects produced in the F region by high-power radio waves (I+P)
F. Djuth (USA), A. Gurevich (Russia)
- H5 Computer simulation of MHD processes in space plasmas (I+C+P)
S.T. Wu (USA), G. Chanteur (France)
- H6 Whistlers and particle precipitation (I+C+P)
H. Strangeways (U.K.), G. Chanteur (France)
- H7 Open session on waves in plasmas (C+P)
R.F. Benson (USA)

Programme of Commission J (Radioastronomy)

- J1 Digital techniques in radioastronomy (I+C+P)
Y. Chikada (Japan)

- J2 Radio-telescope for the third millenium (I+C+P)
R. Frater (Australia)
- J3 Global VLBI (I+C+P)
R. Booth (Sweden)
- J4 Astrometric and geodetic VLBI (I+C+P)
A. Whitney (USA)
- J5 Solar radioastronomy (I+C+P)
S. Enome (Japan)
- J6 Radar/radio studies in the solar system (I+C+P)
D. Campbell (USA)
- J7 Millimetre and sub-millimetre astronomy : instrumentation,
techniques and observations (I+C+P)
J. Moron (USA)
- J8 Search for extraterrestrial intelligence (I+C+P)
K. Kellermann (USA)
- J9 Highlights from poster sessions (C+P)

Programme of Commission K (Electromagnetics in Biology and Medicine)

- K1 Interaction mechanisms (I+C+P)
T. Tenforde (USA)
- K2 Health effects (I+C+P)
R. Saunders (U.K.), D.L. Szabo (Hungary)
- K3 Electromagnetic fields in medical diagnosis (I+C+P)
M. Saito (Japan)
- K4 Therapeutic applications of electromagnetic fields (I+C+P)
B. Veyret (France)

Joint Symposia of Commissions

The first letter designates the lead Commission

- AB1 Time domain metrology (I)
S. Riad (USA), K. Itoh (Japan)
- AB2 Antenna measurements (I)
S. Adachi (Japan), M. Kanda (USA)

- AD Lasers : stabilization and applications (I)
J. Helmcke (Germany), A.J. Seeds (U.K.)
- CA Recent advances in communications satellites in-orbit testing
(I)
G. Hyde, V. Rignies (USA), B. Kastau ()
- CBEF Propagation and modulation in personal radio communication
(I+C+P)
P.A. Watson, L. Lopes (U.K.), J. Shapira (Israel), J.C. Bic
(France), T. Manabe (Japan)
- CD1 Optical-microwave interaction devices and systems (I)
M. Akaike (Japan), T. Berceci (Hungary)
- CE Communication in the presence of non-gaussian noise and
interference (I+C+P)
W. Schwarg (Germany), A.D. Spaulding (USA)
- CFG Propagation effects of ionized and non-ionized media on
broadband signals (I)
K. Craig (U.K.), C. Rush (USA)
- DA Superconductor circuits and devices (I+C+P)
O. Vendik (Russia), H.A. Buckmaster (Canada)
- EA Electromagnetic metrology applied to EMC
P. Degauque (France), M. Kanda (USA), K. Astani (Japan)
- EB Field propagation and coupling to structures (I)
M. Ianoz (Switzerland), F.M. Tesche (USA)
- ED Susceptibility of electronic devices to electrical transients and
their response under extreme operation conditions (I)
V. Scuka (Sweden), B. Demoulin (France), T. Itoh (USA)
- EF Radio noise above 50 MHz (I)
E.K. Smith, E.R. Westwater (USA)
- FC1 Dynamic propagation effects and adaptive counter measures
(I+P)
A. Dissanayake (USA)
- FC2 Propagation statistics, low availability and system reliability
(I+P)

- J.P.V. Poiares Baptista (Netherlands)
- HEG Electromagnetic effects associated with earth quakes and volcanic eruptions (I+C+P)
M. Parrot (France), O.A. Molchanov (Russia), T. Yoshino (Japan), A.C. Fraser-Smith (USA)
- HG1 Active experiments in space (I+C+P)
R. Anderson (USA), P. Stubbe (Germany)
- HG2 Computer experiments of nonlinear kinetic processes in space plasmas (I+P)
H. Matsumoto (Japan), H. Thieman (Germany)
- HG3 Nonlinear wave theories and observations in space (I+C+P)
F. Lefeuvre (France), B. Thide (Sweden)
- JA Pulsar timing (I+C+P)
D. Backer, D.W. Allan (USA)
- JB Imaging with adaptive antennas and spatial signal processing (I+C+P)
T. Cornwell, B. Steinberg (USA)
- JF1 Radio interference to passive systems (I+C+P)
T. Gergely, A. Gaszewski (USA)
- JF2 Refractive effects on transatmospheric paths (I+C+P)
T. Spoelstra (Netherlands), J. Baars (USA/Germany)
- KA Exposure assessment and measurements in complex environments (I+C+P)
L.E. Paulsson (Sweden), M. Kanda (USA)
- KB Computational electromagnetics in biology and medicine (I+C+P)
J.C. Lin (USA), S.N. Hornslett (Denmark)

The Scientific Programme also features three General Lectures and ten Tutorials, already mentioned on page 10 of the June 1992 Bulletin. Final details on these will be published in the Second Announcement, due to be circulated in April/May 1993.

NEWS FROM THE MEMBER COMMITTEES

From the Committee in the United Kingdom (The U.K. National Panel for URSI)

An annual National Radio Science Colloquium, held under the auspices of the U.K. National Panel for URSI (Chairman, Professor P.J.B. Clarricoats), has become an established feature of the national radio science and engineering calendar. The 9th such colloquium was held in Bradford on July 7th and 8th in the centenary year of the birth of Sir Edward Appleton in that city. Exemplary local organisation was provided by Dr. Peter S. Excell. About 80 established workers, young graduates and postgraduates, participated in the meeting.

During the colloquium some 40 contributed papers and 10 posters were presented. The interests of Commission B (8 papers); D (6 papers); F (9 papers); G (7 papers) and H (7 papers) featured strongly. Increasingly, papers are presented by young researchers whose attendance at these meetings is encouraged by keeping the costs of the meeting as low as possible.

The centenary was marked in the opening talk of Peter Excell who gave an interesting, if brief, presentation of the life and times of Sir Edward Appleton and Joseph Priestly, "Two Local Giants of Electrical Science". In the Commission G session, Henry Rishbeth put Appleton's work into context in his discussion "What Became of Appleton's Ionosphere". Additionally, participants were privileged to hear an entertaining after-dinner speech by W.R. Piggott (a close friend and colleague of Sir Edward) in which he regaled the audience with numerous reminiscences relating to Appleton and radio science in the UK dating from the 1920's.

To facilitate the cross fertilization of ideas and techniques, there were no parallel sessions. Speakers were allowed 15 minutes for their

presentations. Ample time for discussion of the individual contributions was afforded by the successful innovation (for these colloquia) of arranging a 15 minute period for questions and general discussion at the end of each session. Two well-attended business meetings of the National Panel were held during the colloquium.

DR. D. LLANWYN JONES

PROFILE OF MEMBER COMMITTEES - CORRECTION

Correction to "Profile of Member Committees - Canada" (URSI Bulletin No 261)

Professor S. Silver (U.S.A.) was Chairman (1953-60) of URSI Commission VI on radio waves and circuits. Professor G. Sinclair (Canada) became Chairman of the Commission VI subcommittee on electromagnetic theory in 1957. Other Canadians prominent in URSI affairs who should have been included were Professor C.O. Hines, Chairman (1966-69) of Commission III on the ionosphere and Dr. J.L. Locke, Chairman (1972-73) of Commission V on radio astronomy.

I am grateful to Yela Stevanovitch, who retired as Executive Secretary of URSI in 1990 after more than 30 years with the URSI Secretariat, for the above.

E.V. JULL

NEWS FROM THE COMMISSIONS AND SCIENTIFIC COMMITTEE

COMMISSION B

Professor F. Gardiol, Chair of the Commission, has mailed his forth Newsletter, dated June 1992. It contains data on the registration for the Sydney Symposium on Electromagnetic Theory, and details on the programme which the Commission has developed for the forthcoming General Assembly in Kyoto.

SCIENTIFIC COMMITTEE ON TELECOMMUNICATIONS (SCT)

The SCT recently formed a Task Group on "Propagation and Channel Modelling for Mobile and Personal Communications". The Chair of the Group, Dr. J. Shapira, presents the rationale of the Group in the following terms :

The mobile cellular radio communication is known to be a demanding one. The service has to be maintained everywhere, in urban and other populated areas that are rich in screening, shadowing, or otherwise scattering objects. The transmitted signal suffers excess loss and bounces off objects and structures. The aggregate of its constituents arriving at the receiver antenna forms a channel that changes fast with the receiver location.

This environment stresses the performance of the cellular radio systems, which strive to achieve both a high grade of service - by minimizing the bit error rate, and a high capacity - by isolating the receivers from interference from other transmitters that use the same frequency. These two trends contradict in that the first seeks a high

SNR, continuous over the service area, while the second requires minimization of the transmitted power and isolation of cells from one another. The conflict between these is bridged by multiple diversities, whereby the signal is received through independent states of the channel, and then combined to form a stable and less dispersive reception, which requires a lower transmitted power to maintain the same rate of errors. The amount of independent diversities that a system may use depends on the channel, and may be a direct measure of the channel usefulness.

The impulse response, or its companion - the transfer function, are acknowledged representations of linear channels. The multiple impulse representation of the scattering contributions has also been agreed to properly represent these contributions in the mobile radio environment. This description of such a location-dependent channel is much too detailed and does not lend itself to straightforward reduction to a measurable model, generalized enough to typify certain neighborhoods, and meaningful in comparative evaluations of different systems.

Realizing the staggering demand for mobile and personal communication services, and recognizing the difficulties in addressing optimum solutions and evaluating the performance of many candidate systems and architectures, the Scientific Committee of URSI for Telecommunications has formed a Task Group to investigate, with cooperation of the CCIR, the characterization of mobile and personal communication channel. The Task Group's objective is to seek a characterization that is:

- Physical-model-related, enabling channel predictions in different typical environments,
- Parametrized by system-related parameters that are pertinent to comparative evaluation of systems' performance,
- Measurable by realizable equipment and procedures.

The Task Group consists of an executive body and a correspondence body. The first one takes the lead in formulating challenges, communicating and corresponding with other bodies, organizing meetings, sessions and symposia, and compiling reports to the Scientific Committee for Telecommunications.

The corresponding participants will include experts interested and willing to share the effort by actively participating in the deliberations, studies and exchange of knowledge and scientific views. The group is in the process of forming the correspondence body, and invites experts , actively engaged in relevant research, to show interest.

J. SHAPIRA

REPORTS ON URSI-SPONSORED MEETINGS

URSI WORKSHOP ON DUSTY PLASMAS AND METEOROLOGICO-ELECTRIC ENVIRONMENT WITH NOISE AND CHAOS

25-26 March, 1992, Tokyo, Japan

At the XXIII URSI General Assembly in Prague in 1990, the Working Group on "Extraterrestrial and Terrestrial Meteorologico-Electric Environment with Noise and Chaos" was newly established in Commission E. The Workshop was its first scientific meeting as an open forum to those who are interested in this subject, incorporating related areas in an interdisciplinary and multidisciplinary manner.

The Workshop consisted of thirteen scientific sessions besides opening and evening sessions, covering a large number of quite new, novel or unconventional topics in radio science and related areas as well as more traditional or conventional ones as follows :

1. dusty plasmas in space and the laboratory
2. waves and shocks in cosmic dusty plasmas
3. meteorologico-electric environment and EHD
4. self-organization in turbulence
5. lightning discharges
6. magnetospheric noise and chaos
7. atmospheric electricity and terrestrial noise
8. planetary noise and plasmas
9. extraterrestrial noise and plasmas
10. physical and mathematical basis for EM and statistical theory
11. fluctuations, chaos, and reconnection
12. plasma waves and acceleration
13. ball lightning and related phenomena

The contents discussed in these sessions and the results obtained from them are summarized below :

1. Cosmic, atmospheric, meteorological, and laboratory phenomena involving or accompanying electric discharge, ionization, and/or electrification should be described in terms of dusty or dirty plasmas containing charged dust grains or aerosols on the basis of a new gravito-electrodynamics, self-gravitational plasma dynamics, electrohydrodynamics (EHD), and/or electromagnetohydrodynamics (EMHD) whose construction has just started and has been encouraged by the Workshop.
2. Interactions of large and small scales of spatio-temporal structure associated with noise, fluctuations, and chaos in turbulent dusty or dirty plasmas should be understood on the basis of new concepts of self-organization and chaos, and be described in terms of new statistical approaches to non-linear and turbulent processes.
3. A number of new observations and theories of dusty or dirty plasmas in extraterrestrial and terrestrial environments and in the laboratory have been reported, including some basic common problems in mathematics and physics.

Presentations for each session were as follows :

1. cosmic dusty plasmas (Mendis et al.); electron-free plasmas (Anemiya); multi-charged ion beams (Tamba and Amemiya); cometary dusty-plasma tail (Saito et al.);
2. waves and shocks in cosmic dusty plasmas (Hartquist); dusty solar corona (Saito and Kozuka); laboratory simulation of heliosphere (Minami); waves in dusty plasmas (Rosenberg); LF parametric excitation in planetary rings (Bliokh); electrostatic waves in dusty plasmas (Yaroshenko);
3. charged particle induced electromagnetic hydrodynamic flow (Watson and Chang); jet stream electrodynamics (Ogawa); atmospheric ions near ground (Nagato and Ogawa);

4. self-organization in turbulent atmosphere (Moiseev), self-organization of helical turbulence (Erokhin); self-organization in edge plasmas (Bekki); plasma maser in turbulent media (Nambu);
5. new lightning model (Warwick); laser triggered lightning (Kawasaki et al.); winter thunderstorms (Takeuci et al.); rocket-triggered lightning (Nakamura et al.);
6. DE-observations of VLF emissions (Ondoh); stripped pattern of VLF sonagrams (Yano and Ogawa); VLF-ELF emissions and electron concentration in ionospheric through (Larkina et al.), EM noise associated with seismic activity (Larkina);
7. triggered chorus (Hattori et al.); non-linear interactions between VLF signals and ELF emissions (Ohnami and Hayakawa), new direction finding method (Yamaguchi et al.); atmospheric electric conductivity (Ogawa et al.);
8. Jupiter's dark-side, non-auroral lights (Warwick); Jovian decametric Io-related radiation (Maeda); Venus plasma noise (Taylor); charm and crisis of radio astronomy (Morimoto);
9. bizarre plasma instabilities in accreting neutron stars and black hole (Lewin); GINGA observations and galactic noise (Makino); dense molecular clouds and star formation (Mizuno and Fukui); YOHKOH observations from solar flares (Bentley);
10. state of matter field (Alfas); interaction of matter and mind (Ipavec), two-time Fourier convolution theorem (Akama); Lagrangian turbulence (Kaneda);
11. intermittent and fluctuational chaos (Moiseev); magnetic chaos (Hatori); electric reconnection and chaos in dusty plasmas (Kikuchi); magnetospheric plasma stochasticity and chaos (Likhter); stochastic plasma parameters and ELF/VLF emissions (Larkina and Likhter);
12. CRRES observations with chemical releases (Anderson), plasma-based particle acceleration (Nishida); SURFATRON acceleration (Erokhin);

13. atmospheric microwave discharge (Kando); possible ball lightning event (Nagai); laboratory fireballs produced by microwave interference (Ohtsuki).

Fifty-two papers were presented, twenty-two from overseas and thirty domestic, and participants were seventy-five from ten countries. Session-Chairmen were Professors and Drs. D.A. Mendis, A. Watson, S.S. Moiseev, J.W. Warwick, W.H.G. Lewin, S. Alfas, N.S. Erokhin, R.R. Anderson, and R. Bentley, each assisted by a Japanese Co-Chairman. An opening address was delivered by Professor A. Kimpara, Past President of the URSI Committee in Japan, and was followed by an Introduction (Prospectus of the Workshop and the URSI New Working Group) by H. Kikuchi before opening the regular sessions. Three keynote addresses were given by Profs. A. Kimpara, J.W. Warwick, and M. Morimoto at a reception on the Wednesday evening. Concurrently, the party celebrated Professor Kimpara's 90th birthday and his contributions to URSI over half a century.

The Workshop aimed to highlight a common nature in basic concepts or views of science and to link a wide range of radio science and related areas through timely topics. It is believed, from the statements made by many participants, that this has been attained successfully.

H. KIKUCHI
CHAIRMAN, WORKSHOP AND WORKING GROUP

FOURTH SOLAR-TERRESTRIAL PREDICTION WORKSHOP

The Fourth Solar-Terrestrial Prediction Workshop was held in Ottawa, Canada from May 18 to 22, 1992. More than 150 scientists from 17 countries participated. This meeting was the fourth in the series organized by the International Ursigram and World Service (IUWDS) which is a joint service of URSI, IAU and IUGG. The local organizer of the workshop was the Ottawa Regional Warning Center, part of IUWDS, which is a component of the Geomagnetism Programme of the Geological Survey of Canada.

The STPW was preceded by the "Forecasters" Meeting" where representatives from ten Regional Warning Centres (Australia, Canada, China, France, Germany, India, Japan, Russia, South Africa and USA) of IUWDS discussed the operation of the RWCs and the forecaster's requirements.

The support and contributions for the STPW were received from the following organizations :

CANADA : Geological Survey of Canada, EMR
Earth Sciences Department, Carleton University
Telesat Canada
Ontario Hydro
Manitoba Hydro
Hydro Quebec
Ottawa - Carleton Regional Municipality
The corporation of the City of Gloucester

USA : Space Environment Laboratory, NOAA
Philips Laboratory, AFGL

International Union of Radio Science (URSI)

International Union of Geodesy and Geophysics (IUGG)

The financial support received from the International Agencies helped to finance the participation of ten scientists from Russia, Poland, Czechoslovakia, China and India.

The meeting created the environment in which scientists from solar, magnetospheric, ionospheric physics and geomagnetism as well as forecasters of solar-terrestrial conditions and users affected by the solar-terrestrial environment were brought together to communicate and exchange their knowledge and expertise related to the forecasting of the solar-terrestrial conditions.

The programme of the STP Workshop was divided into two parts. During plenary sessions invited speakers covered all aspects of solar-terrestrial physics relevant to forecasting.

Four Working Groups : Solar, Magnetospheric, Ionospheric and Geomagnetic held individual and joint sessions, which covered topics such as flare predictions, solar cycles, solar wind, nowcasting state of the magnetosphere, interplanetary structures and geomagnetic activity, ionospheric models, magnetosphere-ionosphere coupling and others.

Since advanced technologies are increasingly suffering the effects of solar-terrestrial phenomena, such as geomagnetic storms, a "Users' Day" was organized at the Ottawa STPW. Here invited representatives from power companies (K. Thompson, P. Metsa, P. Czech, J.G. Kapepenman), pipeline operations (R.E. Shapka), communications (L. Lanzerotti, R. Miller); Global Position System's users (A. Kleusberg) and satellite operators (A. Vampola) explained their problems with solar-terrestrial effects and their requirements to the scientific community.

The discussions and communications between users, scientists and forecasters were found very stimulating from scientific and engineering perspective. Much of the discussion of the STPW highlighted the necessity of having real-time solar wind data available for forecasting purposes. The Ottawa STPW expressed support for all

efforts to provide a simple, reliable spacecraft to monitor r-the upstream solar wind.

The Solar-Terrestrial Predictions Workshop Proceedings will contain all the invited lectures and most of the contributed papers ; they will be published in 1993.

J. HRUSKA, GEOPHYSICS DIVISION, GSC

COLLOQUE SUR LA COMPATIBILITÉ ELECTROMAGNÉTIQUE

CEM'92

Le 6ème colloque international et exposition sur la Compatibilité Electromagnétique, CEM'92, a eu lieu les 2, 3 et 4 juin 1992, à l'Ecole Centrale de Lyon à Ecully. Présidé par le Professeur AURIOL, et organisé par le Département d'Electrotechnique de l'ECL, ce colloque a réuni plus de 450 participants ainsi qu'une cinquantaine de stands d'exposition; plus de dix pays étaient représentés à cette manifestation, conduite exclusivement en langue française.

Le but de ce colloque, qui a lieu traditionnellement tous les deux ans, était de regrouper pendant trois jours plusieurs centaines de spécialistes de la CEM, aussi bien universitaires qu'industriels. Ce but a été largement atteint, et le remarquable succès de CEM'92 s'est concrétisé par un très nombreux public dans les amphithéâtres pendant les deux groupes de sessions orales parallèles, au cours desquelles 82 communications sélectionnées par le Comité Scientifique parmi plus d'une centaine, ont été présentées et discutées.

Les sessions principales ont été les suivantes :

- A. Sources de bruit : analyse, effets
On y a étudié les réseaux d'énergie à haute tension, la problématique de la foudre, et un peu l'électronique de puissance.
- B. Couplage avec les structures et les systèmes :
étude des structures filaires, méthodes de calcul.
- C. Technique et systèmes de mesure :
les équipements, les câbles, et une session spéciale traitant de la normalisation.

- D. Modélisation numérique en CEM :
session assez vaste, consacrée aux méthodes numériques spécifiques, aux réseaux et liaisons, aux interfaces.
- E. Protection des équipements et des systèmes :
études et méthodologies, moyens de protection, sensibilité de l'électronique.

Enfin, chaque journée a débuté par une conférence invitée de 45 minutes

- a) Effets biologiques des champs électromagnétiques (Prof. MIRO)
- b) La normalisation européenne en CEM (MM. KUPIEC, DE VRE)
- c) Gestion actuelle du spectre des fréquences (M. POPOT)

Les débats animés qui ont chaque fois suivi les exposés, tous d'un excellent niveau et d'un intérêt certain dans des domaines très variés de la CEM, ont confirmé que ce Colloque, qui est la référence française dans le domaine de la CEM, est indispensable pour favoriser de nombreux échanges fructueux entre chercheurs, formateurs, et industriels de nombreux secteurs, tant civils que militaires.

De même, l'exposition a présenté les plus actuels moyens d'essai, de mesure, d'étude, de protection français et étrangers. CEM'92 a mis en évidence l'apport des outils logiciels dans deux domaines : - celui de la mesure, où grâce à des équipements numériques pilotés par micro-ordinateurs les mesures s'effectuent de plus en plus simplement et avec des précisions bien meilleures; - celui de la simulation numérique, où grâce à des ordinateurs plus performants des modèles et méthodes numériques plus fiables peuvent maintenant être appliqués à des systèmes assez complexes.

Par ces deux approches complémentaires, mesures et simulations, que l'on a vu apparaître ensemble dans beaucoup de communications, on constate aujourd'hui une assez bonne maîtrise des problèmes relatifs à l'immunité (câbles, blindages, ouvertures, couplage avec des structures filaires), ainsi que des plates-formes d'essais et des moyens de test aux

IEM. Les méthodes numériques sont de plus en plus temporelles, ce qui semble maintenant indispensable; il n'apparaît pas de méthode universelle et, souvent, il convient d'en associer plusieurs telles que équations intégrales et différences finies.

Esquissés lors du colloque précédent, deux thèmes ont commencé à prendre une certaine ampleur dans le domaine des sources de bruit dans l'environnement quotidien : les réseaux d'énergie électrique haute tension, et le vaste domaine que constitue l'électronique de puissance, qui est encore insuffisamment exploré. Enfin, la CEM dans les véhicules terrestres motive de plus en plus de chercheurs et semble impliquer d'importants moyens d'investigation.

Pour terminer, nous n'oublierons pas de mentionner la soirée de gala, qui s'est déroulée dans le cadre agréable du caveau de Villié-Morgon, au coeur du Beaujolais, et qui a vu les sympathiques intronisations dans la Confrérie des Compagnons du Beaujolais de plusieurs membres du Comité Scientifique de CEM'92, parmi lesquels on notait les membres actifs de l'URSI que sont Joël Hamelin, Pierre Degauque et Ahmed Zeddami.

La 7ème édition de ce colloque aura lieu en 1994 à Toulouse. Elle sera organisée par le Professeur H. BAUDRAND. La première annonce et le premier appel à communications paraîtront début 1993.

Des exemplaires des Actes du Congrès sont encore disponibles, mais en nombre limité. Ils peuvent être obtenus en s'adressant au

Professeur P. Auriol
L.E.L. - E.C.L
B.P. 163
F-69131 Ecully
France
Tel. : (33) 7833-8127
Fax : (33) 7843-3717.

MEETING AND LECTURE-COURSE ANNOUNCEMENTS

INTERNATIONAL SCHOOL ON MAJOR PROBLEMS OF THE ATMOSPHERIC SYSTEM

26 October - 6 November 1992
International Centre for Theoretical Physics, Trieste, Italy

The objective of the School is to train scientists from developing countries in the use of data obtained by means of ground-based and spacecraft techniques for the study of the upper and lower atmosphere and their coupling. The topics selected are related with the research areas where collaborative efforts between developed and developing countries scientists have been identified.

Around 50 participants are expected from Developing and East European countries. The participants will be preferably young scientists actually engaged in research activities.

The programme will contain Tutorial Lectures on measurements techniques and methods of analysis of atmospheric parameters and processes, and Workshops on these methods. Workshops will be organized to study actual data and discuss their interpretation. The computing facilities (Central computer and PC's) that are available at ICTP will be used for training the students in data analysis and modelling through the use of special softwares which will be brought by the teachers.

The Tutorial Lectures will be given by international experts who will also coordinate the workshops related to their fields of expertise with the help of other scientists.

For further information concerning the School, please contact

Prof. S. M. Radicella
ICTP
PO Box 586,
I-34100 Trieste
Italy
Tel. : (39) 40 22 40 331
Fax : (39) 40 22 46 04

**COMPUTER TECHNIQUES FOR MICROWAVE CIRCUITS
AND ANTENNAS**

November 17-20, 1992, Montreux, Switzerland

This intensive 4-day short course will cover the general topics.

Finite Elements (FEM) (Prof. J.B. Davies)

Variational and Asymptotic Techniques (Prof. E.F. Kuester)

Finite Difference in Time Domain (FD-TD) (Prof. R. Mittra)

Integral Equation + Method of Moments (Prof. J.R. Mosig)

Transmission Line Matrix Method (TLM) (Prof. P. Saguet)

For General enquiries and accommodation, contact Mrs H. Krucker :
Tel (41) 21 693 2669, Fax (41) 21 693 2673. For details on the
Technical programme : Prof. Juan R. Mosig : Tel (41) 21 693 4628

MICROWAVES IN MEDICINE 1993

11-14 October, 1993, Rome, Italy

The 1993 International Scientific Meeting "Microwaves in Medicine" is organized jointly by the Microwave Theory and Techniques Society (MTTs) of IEEE and our the Commission K 'Electromagnetics in Biology and Medicine'.

Suggested Topics :

URSI Commission K

Biological effects of
microwaves
Non-invasive diagnostic
methods
Mechanisms of interaction
Bioheat models and
computations
Dielectric properties of tissues
Electromagnetic field
computation in biological
tissues
Radiation and scattering in
lossy bodies
Protection and safety methods

IEEE-MTT Society

Microwave radiometry
Measurement of tissue
permittivity Applicators
Medical applications of
microwaves
Hyperthermia for cancer
Benign tumour treatment
Bone and other tissue repair
Non-invasive diagnostic
systems
Exposure in mobile
communication
Telemetry and EMC in the
hospitals

Receipt of abstracts (2 pages) - 31 January 1993

Notification of acceptance - Mid April 1993

Receipt of final manuscripts - 30 June 1993

Address correspondence to :

Professor Guglielmo D'Inzeo
Dept. of Electronic Engineering
University "La Sapienza" of Rome
Via Eudossiana 18, I-00184 Rome, Italy
Fax (39) 6-474 2647.

Other meetings which have been brought to our attention :

- 56th General Assembly of the International Electrotechnical Commission, 28 September - 10 October 1992, Rotterdam, The Netherlands. General theme : International Standards Serving World Trade.
- 2nd International Conference dedicated to Image Communication. 23 to 25 March, 1993, Bordeaux, France. Secretariat : BP48,33166 St.-Medard-en-Jalles, France. Phone (33) 5670-6856, Fax (33) 5695-9883.
- IEEE International Solid-State Circuits Conference, 24-26 February, 1993, San Francisco, CA, USA.
- 1992 Regional Symposium on Electromagnetic Compatibility, 2-5 November 1992, Tel Aviv Israel, P.O. Box 50432, Tel Aviv 615000, Fax (972) 3-660952.
- Progress in Electromagnetics Symposium (PIERS), 12-16 July 1993, J.P.L., California Institute of Technology, Pasadena, CA91109, USA, Dr. van Zijl, Tel (1-818) 354-9311, Fax (1-818) 393-4468.

THE "URSI JOURNAL" RADIO SCIENCE - A PERSONAL PERSPECTIVE

by J.R. Wait

President Ed Jull had suggested that I submit an historical account of the founding of Radio Science. Vice President Dick Dowden has said on several occasions that I "started" the journal. Let's say I was in at the beginning. I could give a detailed account but I think the URSI community would rather have a summary of the salient events.

In 1958, when I was an aspiring member of CRPL (the Central Radio Propagation Laboratory) in Boulder, it was proposed that the Journal of Research of the National Bureau of Standards be split into four sections. Part D was then subtitled "Radio Propagation" and I became the first editor. The first issue appeared in July 1959 (Vol. 62) and it was issued bimonthly up until 1963 after which it was issued monthly. In 1966 the title was changed to Radio Science (Vol. 1, New Series) and the sub-title was "The Journal of the US National Committee of URSI". Later, for reasons not clear to me, the USNC connection was dropped from the masthead in 1979, but the publisher remained the American Geophysical Union, who had assumed this responsibility since 1966. This very satisfactory arrangement with AGU is currently in effect. And beginning with the January 1991 issue, it is clearly stated on the cover that Radio Science is co-sponsored by the International Union of Radio Science, with no reference to USNC. Since January 1992 the URSI logo has also appeared prominently on the cover. Thus it can now be said that URSI has a journal! But this is not a sudden happening because numerous special issues on URSI sponsored meetings and symposia have appeared over the years. Also

many URSI people (including those from outside the US) have appeared on the editorial board.

Although I was editor for three (three-year) terms in the early days, the real momentum came later when others took the helm. Let me mention a few names : Sidney Bowhill, Thomas Senior, Akira Ishimaru, Alan Waterman, Lawrence Manning, Gordon Little, Kung Yeh, and (currently) David Chang. Others, not cited, served for shorter terms and, of course, many of the associate editors also played important roles.

Unlike other journals, such as those issued by professional societies, Radio Science does not have an automatic base circulation underwritten by membership fees. Thus it is important individuals in the URSI community support the journal by entering a personal subscription. The current personal rate (for 1992) is US\$57 but URSI "members" (i.e. people who receive the URSI Information Bulletin and/or those who subscribe to the Radioscientist) can receive Radio Science for US\$47. (Order from AGU, 2000 Florida Ave., NW, Washington DC 20009, USA.)

The postage charge for outside North America is US\$11.

12 APRIL 1992

JAMES WAIT

2210 EAST WAVERLY

TUCSON AZ 85719-3848

BOOKS WRITTEN (OR EDITED) BY MEMBERS OF THE URSI COMMUNITY

ENVIRONMENTAL AND SPACE ELECTROMAGNETICS

by Professor H. Kikuchi (Editor)

600 pages, 304 figures, including 2 in colour

Published by Springer-Verlag in 1991

ISBN 4-431-70082X

This book is based on papers presented at the URSI Symposium on Environmental and Space Electromagnetics, held in Tokyo, 4-6 August 1989.

Chapter headings :

- Introduction
- Spacecraft EM Environment
- Natural and Triggered Lightning
- Atmospherics, Whistlers and Emissions
- Natural VLF/ELF Radio Noise
- Terrestrial and Extraterrestrial Noise Environment
- Planetary Lightning and Cosmic Plasma Noise
- Man-made Noise Environment and EMC
- Noise and Communications Statistics
- Space Communications and Measurement
- High Power Electromagnetics
- Seismoelectric Emissions
- Ball Lightning
- Meteorologico-electric Phenomena and EHD
- Assembled Abstracts.

RECIPROCITY, SPATIAL MAPPING AND TIME REVERSAL IN ELECTROMAGNETICS

by C. Altman

Dept. of Physics, Technion, Israel Institute of Technology, Haifa

and K. Suchy

Institute for Theoretical Physics, University of Düsseldorf, Germany

304 pages, published by Kluwer in 1991 (price : £62)

ISBN 0-7923-1339-9

The authors present a systematic and mathematically well-defined procedure for time reversal which can serve as a tool for solving problems concerning reciprocity and scattering symmetries. They also present many earlier theorems and results in a compact and unified approach. Much of the material is new.

There are two underlying themes to the book. The first concerns the use and application of the formally adjoint and the Lorentz-adjoint Maxwell system of equations. The (formally) adjoint Maxwell system is shown to play an essential role in the derivation of scattering theorems. The second underlying theme concerns the relationship between the time-reversed and the Lorentz-adjoint Maxwell systems.

Table of contents :

Preface

Introduction : Scope and Aims

1. Wave Propagation in a Cold Magnetoplasma
2. Eigenmode Reciprocity in k-Space
3. Generalization of the Scattering Theorem
4. Reciprocity in Media with Sources
5. From Scattering Theorem to Lorentz Reciprocity
6. Orthogonal Mapping of Fields and Sources

7. Time Reversal and Reciprocity

Appendix

Bibliography

Notation and Symbols

Index

MICROWAVE AND OPTICAL TRANSMISSION

by A.D. Olver, Queen Mary and Westfield College, U.K.

400 pages, published by J. Wiley and Sons in 1992

The difficult topic of electromagnetic theory is brought sharply into focus in this comprehensive book, which describes two key areas of application : microwaves and optoelectronics.

While electromagnetic theory forms the basis of the book, the author breaks away from traditional treatment of the subject by showing the reader that the applications of the theory are both considerable and interesting, with significant future potential.

Physical examination and worked examples have been included in the author's survey of Maxwell equations, plane waves, guided waves, dielectric and optical waveguides, transmission lines and antennas and radio wave propagation. The book is written for Senior students of electrical and electronic engineering and physics, as well as researchers and practising electronic engineers.

Contents : Preface, Microwave and Optical Systems, Electric and Magnetic Fields, Maxwell's Equations and Electromagnetic Waves, Boundary Conditions and Quasi-Static Fields, Plane Waves, Reflection and Refraction of Plane Waves, Microwave Systems in Free Space, Microwaves in Lossy Media, Ray Optical Systems, Guided Waves, Transmission Lines, Microwave Waveguides, Optical Waveguides, Antennas, Bibliography and References, Appendices.

**PROCEEDINGS OF THE INTERNATIONAL WORKSHOP
"HOLOGRAPHY TESTING OF LARGE RADIO TELESCOPES"**

This Workshop, sponsored by URSI, was held in Nizhnij Arkhyz, USSR, on 10-13 September 1990.

The Proceedings may be interesting, not only for those who work in the field of holography antenna measurements, but for all antenna specialists concerned with the improvement of radio telescope surface accuracy.

For a copy, contact

V. Khaikin
The Special Astrophysical Observatory
Nozhnij Arkhyz
Stavropol Ter. 357147
RUSSIA
Telex 123244 zenit SU
E-mail : VKH@SAO.STAVROPOL.SU.

**PROCEEDINGS OF THE URSI WORKSHOP ON DUSTY
PLASMAS AND METEOROLOGICO-ELECTRIC
ENVIRONMENT WITH NOISE AND CHAOS.**

This workshop was held in Tokyo on 25-26 March 1992. The editor of the Proceedings is Professor Kikuchi, from whom copies may be obtained at the address :

Professor H. KIKUCHI
Nihon University
College of Science and Technology
8, Kanda Surugadai, 1-chome
Chiyoda-ku, TOKYO 101
JAPAN

KLEINHEUBACHER BERICHTE, BAND 35.

These are the Proceedings of the Annual Meeting of the URSI Committee in Germany, held in Kleinheubach on 7 to 11 October 1992. They are published by the Deutsche Bundespost Telekom Forschungsinstitut, Postfach 100003, Am Kavalleriesand 3, 6100 Darmstadt, Germany.

**PROCEEDINGS OF THE 1992 INTERNATIONAL
SYMPOSIUM ON ANTENNAS AND PROPAGATION.**

This meeting, held in Sapporo, Japan on 22-25 September 1991, under sponsorship by URSI, featured 317 papers from 33 countries. The Proceedings (4 volumes of approximately 1290 pages) may be ordered at a price of US\$480.00 or 57,000 Japanese yen (yen price definitive) per copy, including surface mail postage and handling charges.

Orders should be sent to :

MYU
2-23-3 Sendagi
Bunkyo-ku
Tokyo 113
Japan
Tel. (81) 3-3821-2930
Fax (81) 3-3827-8547.

ICSU STATEMENT ON GENE PATENTING

The attached statement has been prepared by ICSU in collaboration with COGENE and CODATA and approved by the Executive Board, following discussions on this subject at its April 1992 meeting. The Board has requested that this statement be given urgent and broad dissemination. Although the material is not "Radio Science", it seems appropriate to publish it in these pages, since it is of general human interest.

"The International Council of Scientific Unions (ICSU) is an international non-governmental organization whose mandate includes the promotion of cooperation in the basic sciences, and the safeguarding of the principle of the universality of science and of the free flow of scientific knowledge.

The Council is aware of the tremendous potential benefit of genetic research for humanity and realizes that new ethical and social dimensions arise from this. Accordingly, ICSU strongly believes that efforts to patent genetic information should not jeopardize either progress in the basic sciences or access to the information which is necessary for such progress to continue.

ICSU asserts its view that information about nucleic acid sequences cannot be patented per se. Such sequences should be patentable solely within the context of their demonstrated significance and/or application (e.g. regulatory signals, antisense RNAs, probes, etc.) - and not of their potential products (e.g. proteins) - and provided that this can be shown to be "novel", "non-obvious" and "useful".

Under such circumstances, patenting of complementary DNA sequences (cDNAs) would distort the patent process, which is designed to protect applications, methods and products, on the basis of proven

facts and not mere expectations, and normally serves society by stimulating the investments and developments necessary to provide useful products and services. Any deviation from such patenting principles would run counter to the best interests of science and hinder international collaboration in such endeavours. ICSU therefore cautions against decisions which may be irreversible, such as those possibly emerging as a results of the recent patent requests concerning complementary DNA (cDNA) sequences corresponding to portions of unknown messenger RNAs (mRNA).

ICSU urges the relevant authorities, particularly in countries where patent applications in this field have been or are soon to be filed, to consider such applications taking due account of the possible implications and to ensure a strict application of established patenting principles, thereby setting an example for other countries in which similar cases may arise in the future.

ICSU would welcome a formal international agreement on this subject.

NEWS FROM THE CCIR

Dr. R.G. Struzak has contributed an interesting note on the microcomputer software available from ITU, the International Telecommunications Union. We give it in extenso :

Software for Radio Frequency Spectrum Engineering

The future of radio communications depends on the availability of the frequency spectrum. Most of frequency bands are already occupied, and to find place for new applications, automated spectrum engineering tools are needed. Below is a brief overview¹ of such tools available in the ITU².

Spectrum Engineering

Spectrum engineering problems are characterized by complex interactions, a large number of variables, and huge collections of

1) An extract from the papers "CCIR software for personal computers" (Proc. of the International Commsphere Symposium, Herliya, December 16-19, 1991, p. w521-w525) and "Computer-Aided Spectrum Engineering" (Proc. of the International Zurich Symposium on EMC, 12 - 16 March 1991, pp. 193-198) by R.G. Struzak.

2) The International Telecommunication Union (ITU) is a Specialized Agency of the United Nations. The International Radio Consultative Committee CCIR and International Frequency Registration Board IFRB are the ITU organs dealing with radio communications.

data³. This implies the application of computer techniques⁴. Since the emergence of personal computers, declining prices of hardware and software and increasing computing power have resulted in a phenomenal growth in their use. Easy access to computers and user-friendly software allows more and more people, even with modest budget or programming skills, to use them successfully in daily work. Analyses that, not so long ago, might have required weeks, can now be completed in hours with personal desktop or laptop computers. Spectrum engineering has become *computer-aided*.

Spectrum Engineering Software

Elaboration of spectrum engineering software is a time-consuming and costly process. The market for such a software is too specialized and too limited to generate an interest from large software firms. As a consequence, many organizations have to create themselves the software they need. Without information about the existing software, unavoidable is unintended duplication of the work that already has been done. In order to eliminate such duplications, the participants in the CCIR work decided to exchange the information about the software they can share with others. A wide use of that software leads to better utilization of the common resources of the radio frequency spectrum and geostationary satellite orbit and is beneficial to all. The CCIR Resolution 88-1 invites the participants to make their computer programmes available to all those interested.

3) Spectrum Engineering - the Key to Progress. A JTAC IEEE - EIA Report on Technical Policies and Procedures for Increased Radio Spectrum Utilization, IEEE, 1968.

4) CCIR Handbook on Spectrum Management and Computer-Aided Techniques, ITU, Geneva, 1987.

Types of ITU Software

The spectrum engineering software available in the ITU is of three types. The software of the first type has been developed through the regular CCIR studies. It has been reviewed, verified and approved by international groups of experts and complements the CCIR Recommendations. The software of the second type has been offered under CCIR Resolution 88 by individual participants in the CCIR work. Created independently, it may be unrelated to the CCIR studies and CCIR Recommendations. The software of the third type has been created in the IFRB and CCIR specialized secretariats, in connection with the regular duties, or in response to specific decisions of the Members.

Summary Programme Description

The ITU has published a catalogue containing information about 130 programmes⁵. The catalogue contains a one-page description of each programme, including the required hardware configuration, references and address of the originator. A summary description of some microcomputer software is given below. As the software for large computers rarely is portable or transportable, it has not been included here.

Frequency assignment

The programme package MSAM from the USA contains the following twelve programmes :

1. Bearing-Distance Programme which calculates the distance and bearings between two points on the Earth surface.

5) Catalogue of software for radio spectrum management, ITU, Geneva 1992 (This catalogue is available from the ITU Sales Service, Place des Nations, CH-1211 Geneva 20, Switzerland, Fax (41) 22-733-7256).

2. Satellite Azimuth Programme to calculate the bearing and distance to a satellite relative to an earth station.
3. Intermodulation Programme which analyzes transmitter frequencies and receiver frequencies to identify potential interference due to intermodulation products or harmonics. Intermodulation products up to the seventh order can be identified when two or three signals are mixed.
4. Integrated Propagation System which is a collection of four smooth-earth propagation algorithms. The most appropriate algorithm is automatically selected.
5. Frequency Dependent Rejection Programme which calculates the minimum distance separation required between a victim receiver and an unwanted transmitter to satisfy given compatibility criteria (it is also available separately).
6. Programme "Annex 1" which implements procedures contained in Annex 1 of the NTIA Manual of Regulations and Procedures for Federal Radio Frequency Management.
7. Antenna Field Intensity Programme to estimate the near-field power density and checks for compliance with the U.S. radiation hazard standard.
8. Personal Computer Plot Programme which plots data on a plotter, monitor, or printer.
9. Profile Programme which produces a terrain elevation profile between two locations, given a topographic data base (not provided with the programme).
10. Horizon Programme which calculates the distance and elevation angle to the radio horizon (requires a topographic data base).
11. Single Emitter Analysis Model. This programme estimates the received signal level at a specified distance from the transmitter.
12. Terrain Integrated Rough-Earth Model. This programme predicts propagation loss between two locations, using the terrain profile. It considers ground-wave and tropospheric-scatter propagation modes, but does not include sky-wave propagation. The terrain

profile can be input manually or derived from the topographic data base.

The programme KANP from Czechoslovakia solves a frequency assignment problem using a Monte Carlo method. The JCAL programme from Japan computes potential adjacent, co-channel, and third order interference, and desensitization effects using a transmitting station data base. The software package TVNET from Poland has been developed to assist in the planning low-power re-broadcasting television transmitters and requires transmitter and topographic data bases. It performs the following five tasks :

1. Terrain profile extraction and analysis. The terrain elevation profile is extracted from the data base. Horizon distances elevation angles, terrain roughness factor "delta h" and the first Fresnel zone ellipse are calculated.
2. Point-to-point propagation prediction using various propagation models and topographic data base.
3. Spectrum occupancy prediction. All signals expected at a given test point are identified and the frequency, level, azimuth of arrival and source is determined for each signal.
4. Line-of-sight coverage prediction.
5. Transmitter file management. Transmitter data may be added, corrected, or deleted. Transmitters may be selected by name, frequency, power, geographic area, or by a combination of these parameters.

Propagation and noise predictions and data. Three programmes from CCIR Study Groups 5 and 6 deal with propagation prediction :

1. The programme GRWAVE calculates the ground-wave field strength and transmission loss in an exponential atmosphere as a function of distance, frequency, antenna height, polarization and electrical characteristics of the Earth. Its approximate frequency range is 10 kHz to 10 GHz.

2. The programme REP8942 provides an estimation of MUF, sky-wave field strength, signal-to-noise ratio, LUF and basic circuit reliability.
3. The MINIFTZ programme estimates the basic MUF and sky-wave field strength.

The programme package MPS11 from the USA contains seven programmes for point-to-point propagation predictions.

1. The programme TIREM11 computes the path loss expected for the particular terrain profile between the transmitter and receiver. It is applicable in the 40 MHz to 20 GHz frequency range. The terrain information required is extracted from a topographic data base or may be input manually.
2. The programme IPS11 is a smooth-earth propagation model, applicable in the frequency range 1 MHz to 20 MHz.
3. The programme NLAMBDA11 is a smooth-earth propagation model applicable in the 0.1 MHz to 20 GHz.
4. The programme MXPATH11 is a smooth-earth model applicable for mixed paths.
5. The programme VLF11 is applicable in the 10 to 100 kHz frequency range. It accounts for both the ground wave and the wave reflected from the ionosphere.
6. The programme SATPROP applies to line-of-sight Earth-space links in the 100 MHz to 100 GHz frequency range. It computes the median path loss and deviations due to ionospheric scintillation and rain attenuation.
7. The MMW11 programme provides predictions to signal attenuation and phase dispersion of radio waves in the 1 to 300 GHz range. It applies to both Earth-space and terrestrial line-of-sight transmission links.

The didactic programme package MLINK from Japan deals with a radio-relay link propagation path analysis. It calculates various propagation path parameters, including propagation loss, diffraction

loss, reflection point, reflection loss and path clearance. The CCIR propagation data banks have been created to verify propagation prediction algorithms. The data bank of Study Group 6 comprises measurement data for about 180 combinations of path lengths (175 to 26000 km) and frequencies (2.5 to 26 MHz). Data banks of Study Group 5 contain measurement data on terrestrial and Earth-space paths, grouped in three categories : terrestrial line-of-sight, Earth-space, and terrestrial over-the-horizon. The NOISEDAT programme from Study Group 6 gives estimates of atmospheric, man-made and galactic noise following CCIR Report 322-3.

Coordination & EMC analysis. The programme APP28 from Sweden determines the coordination area around an earth station, in the frequency bands between 1 to 40 GHz, shared between space and terrestrial services. It follows Appendix 28 of the Radio Regulations. There are three software packages for analysis of potential interference that a VHF sound broadcasting transmitter can cause to an aeronautical radionavigation (ILS/VOR) system. These have been submitted from Germany and Poland. All are interactive and based on the procedures and criteria specified in CCIR Report 929. The RS3 simulation programme package from the CCIR Secretariat is a simulation tool for the analysis of the threat of co-channel man-made interference to radiocommunication systems. The PRODSIR programme from the USA computes the probability distribution of the signal-to-interference ratio from co-channel interferers in a congested radio environment.

Antenna analysis/design. The Programme ELLIPSE from Czechoslovakia determines ellipse of the minimum area enclosing a given polygon. It is intended to optimize the satellite antenna beam. The following three programme packages are from the CCIR Secretariat :

1. The programme LFMFANT calculates long-wave and medium-wave vertical antenna arrays.

2. The software package HFANT calculates the HF antennas of various types.
3. The programmes FMTVANT and FMTVSYNT perform an analysis and synthesis, respectively, of VHF-UHF broadcasting antenna systems.

How to get it

The software is available directly from the originators. If the software has been offered under CCIR Resolution 88 and supplied to the CCIR Secretariat, the ITU Headquarters has authority to make copies available for good professional use (on request and with a handling charge of about 100 SFr).

Protection of rights

The distribution of the software within the ITU does not imply any form of endorsement. The software is provided on an "as is" basis, without any warranty, and some modification may be required before it can be utilized with a specific type of computer hardware. The proprietary rights, author's rights and all other titles are reserved by the originators. In no event may the user transfer, assign, rent, lease, sell or otherwise dispose of the software.

Concluding remarks

As the use and demand for the spectrum resource increases, automated spectrum engineering tools are increasingly needed. Improved spectrum engineering is required to coordinate and harmonize competing requirements of the ever increasing number of spectrum users in a cost-effective way. The role of personal computers in such applications continues to increase. The microcomputer tools available in the ITU may facilitate many tasks of radio communications, spectrum engineering and spectrum management.

R.G. STRUZAK

FROM THE ARCHIVES OF URSI

The excerpts from the Bulletins of ten, twenty, thirty and forty years ago, which now appear regularly in the Bulletin, are hopefully of interest to the "elder statesmen" of URSI. Certain readers, however, might feel that URSI should concentrate on the future, and de-emphasize these (nostalgic) excursions into the past. But there are problems, and topics, which have been with us for decades, such as the support of Young Scientists, the emphasis on the telecommunications aspects of our programmes, or the collaboration with the CCIR. We try systematically to select excerpts from past Bulletins in which these problems come to the fore, in order to give those concerned with the development of our Union an added historical perspective.



From the Bulletin of September - December 1952

This Bulletin was published right after the 10th General Assembly in Sydney, during which Father Lejay, S.J., was elected President of URSI, and the Member Committees in Canada, Spain and the Federal Republic of Germany were admitted. Three well-known participants are shown on the photo. From left to right, W.N. Christiansen (President, 1978 - 1981), E.V. Appleton (President, 1934 - 1952), and B. van der Pol (Honorary President, 1952 - 1959).

The Bulletin mentions that the unit contribution was 450 "gold francs", and that a special Commission for the International Geophysical Year had been constituted under the chairmanship of Sir Edward Appleton. Most of the Bulletin, however, is taken up by the Resolutions and Recommendations adopted in Council and Commissions. Many of these are concerned with questions submitted by the CCIR. In the recommendations of Commission VI, the forerunner of the present Commission B, we note

"6. It was recommended to the National Committees that they give serious consideration, prior to the next General Assembly to their position relative to the following proposed resolution : "That the use of rationalized M.K.S. units and of the time periodic factor $e^{i\omega t}$ be recommended."

From the Bulletin of September - October 1962

The Bulletin contains a detailed report of a joint meeting of the Member Committees in the U.S. and Canada, held in Ottawa on 15-17 October 1962, in the presence of Dr. R.L. Smith-Rose, President of URSI. We notice that one of the many sessions was devoted to Synthetic Aperture Antennas. The issue also features a series of documents produced by IUCAF, and entitled :

- Protection of the Deuterium Line Frequency for Radio Astronomy;
- Details of Radio Astronomy Observatories in the U.S.A.;

- COSPAR Resolutions 10, 11 and 12;
- The Protection of Frequencies for Radio Astronomy.

We also find details on the preparations for the International Year of the Quiet Sun (IQSY) (see also the Bulletin of March 1992, p. 55), including a report of the 26 March 1962 First Plenary Session of the IQSY Committee, held in Paris. There, working groups were set up on World Days, Meteorology, Geomagnetism, Aeronomy, Space Research and World Data Centres. We also find details on vertical incidence sounding, absorption observations, drift observations, investigations of atmospheric noise, whistlers and VLF ionospheric noise, radar aurorae, forward scattering, oblique incidence and back-scattering experiments.

From the Bulletin of September 1972

Most of this issue was devoted to resolutions and recommendations approved at the 17th General Assembly, held in Warsaw in August 1972, and where Professor Beynon was elected President of URSI. The unit contribution was set at \$200 for 1973-4, and increased to \$250 in 1975. The most important recommendation of Council concerned the status of URSI, following discussions which were already mentioned in the Bulletins of March 1992 (page 55) and June 1992 (page 73). We quote :

"The URSI Council,

considering

- (a) that fundamental research in radio science has present and future applications in many other branches of science;
- (b) that the relative importance of the contributions made by radio scientists to these other branches will vary from time to time depending on the needs of the moment;
- (c) that, in consequence, an international organization concerned with radio science must be completely free to decide how to

distribute the effort devoted to the different aspects of radio science and its applications;

- (d) that it would be difficult or impossible for this organization to enjoy the necessary full freedom of action within a Union primarily concerned with another branch of science, for example, astronomy, biology, geophysics, etc.;
- (e) that the concern of URSI with certain aspects of other disciplines may imply that the responsibilities of URSI overlap those of other Unions leading to a duplication of effort and to other problems;

resolves

1. that URSI shall retain its status as an independent Union of ICSU;
2. that, in order to stimulate the scientific activities of the Union, the URSI Board of Officers, in consultation with the Chairmen and Vice-Chairmen of Commissions, be authorised to examine the international structure of the Union and to recommend modifications appropriate to this objective;
3. that, where consultation or collaboration between URSI and another Union seems to be desirable, the Board of Officers and the Chairmen of Commissions be encouraged to establish the appropriate direct contacts."

These decisions were clearly of considerable importance, in that URSI was continued as an organization, but with goals which had yet to be re-examined. This re-examination resulted in a new text for the statutes, which was adopted in Lima in 1975.

The Bulletin also mentioned the creation of a Working Group on the Teaching of Radio Science, chaired by G. Barzilai (Italy). This group organized a session at the 1975 General Assembly in Lima, but without great success, and was later dissolved. Teaching aspects have always been a difficult problem within URSI, given the variety of topics discussed in our Commissions, and the graduate level of our

activities. This is probably why URSI is one of the few Unions which have not joined ICSU's Committee on the Teaching of Science. Our efforts in that area concentrate on giving Colleges on Radiopropagation Physics in Trieste every other year (see the Bulletin of June 1991 p. 41).

The recommendations of the Commissions filled 27 pages of the Bulletin. We shall only quote a text, approved by Commission I on Radio Measurements and Standards. It contains the germ of the present Commission K, which came into being in 1990 after a long pregnancy. The text of the recommendation was :

" Commission I,

considering

- (a) that the vastly increased use of radio frequency energy for many purposes has greatly increased the risk of over-exposure to radiation of scientific and industrial workers and of the general public;
- (b) that the acceptable limits of human exposure to radio-frequency fields vary widely from one country to another and that this situation is partly due to the lack of international agreement on :
 - the definitions of the parameters to be measured and the quality of radiation that can be tolerated without harmful effect or injury,
 - the criteria for, and the definition of, effects, injuries and hazards due to radiation,
 - the appropriate biological and radio-frequency measurement techniques and experimental procedures;
- (c) that the US Public Health Service, the Warsaw Medical Academy and the World Health Organization are planning an international symposium, to be held in Warsaw in 1973, on biological effects

of microwaves and related health hazards, with the participation of scientists concerned with biomedical research and with measurements of radio-frequency radiation;

resolves to encourage the plans for this Symposium,; to co-operate with its sponsors in bringing it about, and to provide appropriate support, other than financial, in helping to make it a success."

From the Bulletin of September 1982

The Bulletin mentions the deaths of Professor Issac Koga, Professor F.E. Borgnis and Professor A.H. Waynick. Professor Koga, emeritus of the Tokyo Institute of Technology and the University of Tokyo, was President of URSI from 1963 to 1966, and became Honorary President in 1981.

The September 1982 issue also contains an interesting article by C.M. Minnis on the role of URSI in the International Polar and Geophysical Years. It further mentions the admission of the China Association for Science and Technology as a National Member of ICSU, and quotes the report of the Committee which recommended the creation of an ICSU Press. The Press actually came into being, and published several volumes in the late eighties, one of which was our own Modern Radio Science 1987.