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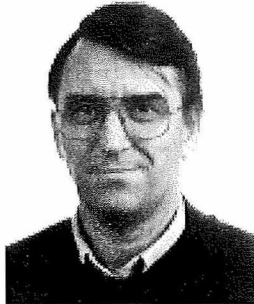
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Editorial



Dear URSI Correspondent,

I welcome you to this issue of your Radio Science Bulletin. This time you will have the opportunity to learn more about one of our members. In this March issue, the committee of our Irish colleagues is presented. Besides this you will find some preliminary information concerning our next General Assembly, even



if the event is still far ahead.

Regular conference reports and announcements are hosted also along with our book's corner.

I wish you a pleasant reading.

Piotr Sobieski
Editor

Errata



In the last December issue of the Radio Science Bulletin (No 295), we published a report on EMC WROCLAW 2000. Unfortunately, there were two errors in it:

- on page 27, just below title (EMC Wroclaw 2000): "Turkey" should be replaced by "Poland"

- on page 28, right column, lines 15-16: "ISEA 2000, Antalya, Turkey, 17-24 May 2000" should be deleted. In the list of the URSI officials, we forgot to mention that Prof. R.G. Struzak is a member of the Scientific Committee on Telecommunications. We apologise for this omission.

UTC Time Step



On n'introduira pas de seconde intercalaire à la fin de juin 2001.

La différence entre UTI et le Temps Atomique International TAI est :

du 1er janvier 1999, 0h UTC, jusqu'à nouvel avis : UTC - TAI = -32 s

Des secondes intercalaires peuvent être introduites à la fin des mois de décembre ou de juin, selon l'évolution de UT1-TAI. Le Bulletin C est diffusé deux fois par an, soit pour annoncer un saut de seconde, soit pour confirmer qu'il n'y aura pas de saut de seconde à la prochaine date possible.

No positive leap second will be introduced at the end of June 2001.

The difference between UTC and the International Atomic Time TAI is :

from 1999 January 1, 0 h UTC, until further notice : UTC - TAI = -32 s

Leap seconds can be introduced in UTC at the end of the months of December and June, depending on the evolution of UT1-TAI. Bulletin C is mailed every six months, either to announce a time step in UTC, or to confirm that there is no time step at the next possible date.

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Maastricht General Assembly

18 - 24 August 2002



The year 2002 will bring the General Assembly of URSI after more than half a century to the Netherlands. After a breathtaking close vote Council decided to accept the invitation of the Dutch National URSI Committee to gather in the year 2002 in the beautiful and most southern city of the Netherlands: Maastricht.

The city has a Roman origin and was once a kind of biprincipality under the Duke of Brabant and the Prince-Bishop of Liege. It was for some time French after the French Revolution destroyed the old regime, until it became in 1815 part of the newly founded Kingdom of the Netherlands.

In 1830, after the splitting off of the southern Netherlands as a separate state Belgium - by the way the colloquial Latin name for the Netherlands - Maastricht only barely remained with the north. Since that time the relations between Belgium and the Netherlands have become friendlier than ever and it is quite natural that the organisation, although the responsibility of the Dutch National Committee, will be in close collaboration with the Belgium National Committee.

The local organising committee has been founded under the chairmanship of Prof. Frans W. Sluijter, a long-time President of the National Committee. The secretary is Dr. Leon P. Kamp, at present also the Secretary of the National Committee. As Scientific Co-ordinator Council appointed Dr. Martin Hall. As Associate Scientific Co-ordinator the member of the local organising committee Prof. Gert Brussaard will serve. As overall theme of the Assembly the local organising committee proposes to the Commission Chairs: "*Radio Science in the Wireless Age*". This theme is widely represented in the "Low Countries". With some justification the work of the late Professors Hendrik van der Hulst and Jan Oort can be seen as the starting point of radio astronomy!

Through the leadership of the inspired Commission Chairs Maastricht will become the point of inspiration for the further development of Radio Science in the triennium after 2002. Maastricht with its many terraces and cosy restaurants will offer the kind of intimate atmosphere

needed for fruitful exchange of ideas and form the cradle for many new cooperations. Details of the conference and its environment will be made available on the website www.ursi-ga2002.nl.

In line with the good tradition of URSI a Young Scientist Program will be developed. As yet the local organising committee secured simple but reasonable housing for approximately 100 laureates of the program. We hope the competition to get these awards will be fierce. Maastricht is worth the trouble.

The Assembly itself will be held in the Maastricht Exhibition & Congress Centre (MECC; see www.mecc.nl). The MECC is the second largest conference facility in the Netherlands. It is compact enough to ensure minimal distances between session locations and yet large enough to provide ample space to host the 2002 General Assembly. Moreover the MECC is within a stone's throw of the centre of Maastricht. We also mention that Maastricht can be reached by rail and road. It has direct connections with Amsterdam and Liege. The city shares a local airport with Aachen, the Maastricht-Aachen Airport.

An important part of the General Assembly in Maastricht will be an exhibition of and by national and regional companies that in some way are affiliated to radio science. We may say that the Netherlands have a long-standing tradition in this field. As mentioned above not only radio astronomy has roots in our country but also other areas of radio science received important contributions from the Netherlands. We mention our Honorary President, Prof. F.L.H.M. Stumpers and the late Professors Hendrik Bremmer and Balthasar van der Pol in this connection.

We sincerely hope the many members of the URSI community will get together in the Summer of 2002 in Maastricht and will depart after the Assembly with a good and kind recollection of scientific value and an inspiring setting of URSI GA 2002.

Everything you want to know is for the asking. Just email to: ursi2002@tue.nl

Frans W. Sluijter, Local Chairman
Leon P. Kamp, Local Secretary



URSI AWARDS FOR YOUNG SCIENTISTS

A limited number of awards are available to assist young scientists from both developed and developing countries to attend the General Assembly of URSI.

To qualify for an award the applicant :

1. must be less than 35 years old on September 1 of the year of the URSI General Assembly;
2. should have a paper, of which he or she is the principal author, submitted and accepted for oral or poster presentation at a regular session of the General Assembly;
3. should hold a Ph.D. if older than 28 years, or have equivalent research experience as evidenced by a list of publications or contributions to conferences. This condition may be waived in the case of applicants from developing countries.

Applicants should also be interested in promoting contacts between developed and developing countries.

All successful applicants are expected to participate fully in the scientific activities of the General Assembly. They will receive free registration, and financial support for board and lodging at the General Assembly. Supported accommodation will be only in places arranged by the organisers. Limited funds will also be available as a contribution to the travel costs of young scientists from developing countries.

Apply before 15 November 2001 to the URSI Secretariat (address below).

*Please submit **THREE COPIES** of each of the following: (1) a completed application form. (2) a CV and list of publications. (3) an abstract of proposed paper.*

Applications will be assessed by the URSI Young Scientist Committee taking account of the national ranking of the application and the technical evaluation of the abstract by the relevant URSI Commission. Awards will be announced on the URSI web-site in April 2002.

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For more information about URSI, the General Assembly and the activities of URSI Commissions, please look at the URSI web site at: www.intec.rug.be/ursi/

APPLICATION FOR A YOUNG SCIENTIST AWARD

I wish to apply for an award to attend the XXVIIth General Assembly of the International Union of Radio Science in Maastricht, the Netherlands, 18th – 24th August 2002, under conditions of financing and lodging fixed by the organising committee.

Name : Prof./Dr./Mr./Mrs./Ms.

Sex : male / female Family Name First Name Middle Initials

Date of birth (day / month / year) : ... / ... / ...

Studying/Employed at :

Institution

Department

Mailing address : Please send all correspondence to my business / home address, i.e.

Street

City and postal code

Province/State Country

Fax E-mail

Academic qualifications, with date(s) obtained :

.....

Title of abstract submitted :

.....

Type of session preferred: in an oral session in a poster session

The subject of the paper is relevant to URSI Commissionsession (leave blank if uncertain).

Date : Signed

Send this form before 15 November 2001 to the URSI Secretariat (address overleaf). Please send THREE COPIES of

For applicants from developing countries only :

I estimate the cheapest return fare to the URSI meeting is US\$

For graduate students only - Supervisor's endorsement :

I support the application for an award to enable this young scientist to attend the forthcoming General Assembly of URSI for the following reasons :

.....

.....

.....

Supervisor's Name and Title :

Address :

Date : Signed :

Some recent activities in the ITU-R Study Groups and their subordinate groups which may be of particular interest to the URSI community are summarized below.

Study Group 1 (Spectrum management)

A number of draft Recommendations on spectrum management and monitoring were adopted at a meeting of Study Group 1 in October 2000.

As a result of decisions made at WRC-2000, and in preparation for WRC-2003, Task Group 1/5 has been considering new terminology related to unwanted emissions from a transmitter, in particular the manner by which the frequency boundary can be defined between out-of-band (OOB) and spurious emissions. At present, the boundary is generally taken as 250% of the necessary bandwidth removed from the centre frequency of the transmission. In recognising the inadequacies of the present emission definitions, which are based more on the source of the emission rather than on any frequency consideration, new ideas are emerging whereby emissions are defined according to frequency domains – the latter expressed in terms of percentage of necessary bandwidth relative to the central frequency. In such a scheme, the “OOB domain” would refer to the frequency range in which OOB emissions generally dominate immediately outside the necessary bandwidth, whilst the “spurious domain” refers to the range outside of the OOB domain in which spurious emissions generally dominate.

Study Group 3 (Radiowave propagation)

Task Group 3/2 was established to prepare an important new Recommendation for point-to-area propagation prediction applicable for the broadcasting, land mobile, maritime mobile and certain fixed services (e.g. those using point-to-multipoint systems). Predictions can be made for the following parameter ranges: frequency 30 – 3 000 MHz; path distance 1 – 1 000 km; percentage time 1 – 50; and for transmitting heights commensurate with the radiocommunication services concerned. The method makes due allowance for location variability for land area-coverage predictions and takes account of local clutter surrounding the receiving location. A procedure is included for treating mixed paths (i.e. those with a combination of land and sea). The method can be used with or without a terrain height database, although increased prediction accuracy would be expected when such data are available.

Study Group 7 (Science services)

Working Party 7A has developed a draft new ITU-R Question concerning the definition and use of Coordinated Universal Time (UTC). Determination and maintenance of

the UTC time-scale is performed by the Bureau International des Poids et Mesures (BIPM) with the International Earth Rotation Service (IERS). The use of the UTC Time Scale and associated frequency is the subject of several ITU-R Recommendations. The implication of changes to the UTC time-scale or identification of an alternative time-scale in these Recommendations could have a significant impact on scientific, governmental, commercial and regulatory interests.

In addition, Study Group 7 has adopted an important draft new Recommendation in the RA series (Radio Astronomy). This recommends that, for evaluation of interference, a criterion of 5% be used for the aggregate data loss to the radio astronomy service due to interference from all networks, and a criterion of 2% be used for data loss to the radio astronomy service due to interference from any one network, in any frequency band which is allocated to the radio astronomy service on a primary basis.

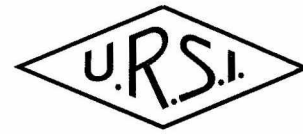
The percentage of time lost resulting from interference is an important parameter for all radiocommunication services, and quantitative criteria relative to radio astronomy operations are needed by Administrations with active services operating in the same, adjacent, nearby, or harmonically related bands.

Study Group 8 (Mobile services)

ITU-R has set up a new structure for carrying out studies related to IMT-2000 by replacing Task Group 8/1 by Working Party 8F. The new group has been tasked not only to pursue developments on radio standards and frequency spectrum issues but to consider vision statements for systems beyond IMT-2000. It may be recalled that the first release of standards was approved by the Radiocommunication Assembly in 2000, providing the necessary technical framework for boosting the licensing activities of IMT-2000 systems worldwide. Shortly afterwards, WRC-2000 also provided an unequivocal sign to the mobile industry of the important role IMT-2000 should play in the deployment of advanced mobile communication systems and identified new spectrum, in addition to the initial 2 GHz bands, in frequency ranges below and above 1 GHz.

Most of the work of WP 8F so far has been devoted to updating the standards for the radio interfaces and to developing harmonization schemes for the worldwide use of IMT-2000 spectrum. Work has also substantially progressed in the area of global circulation of IMT-2000 terminals with the preparation of technical limits and measurement procedures, as well as guidelines to facilitate terminal circulation on a worldwide basis.

Kevin A. Hughes



Introduction

The International Space Environment Service is a permanent service of the Federation of Astronomical and Geophysical Data Analysis Services (FAGS) under the auspices of the International Union of Radio Science (URSI) in association with the International Astronomical Union (IAU) and the International Union of Geodesy and Geophysics (IUGG). The ISES was called IUWDS (International URSIgram and World Days Service) until 1996. The IUWDS was formed in 1962 as a combination of the former International World Days Service, initiated in 1959 as a part of the IGY, and the former URSI Central Committee of URSIgrams which initiated rapid international data interchange services in 1928.

The mission of the ISES is to encourage and facilitate near-real-time international monitoring and prediction of the space environment by: the rapid exchange of space environment information; the standardization of the methodology for space environment observations and data reduction; the uniform publication of observations and statistics; and the application of standardized space environment products and services to assist users reduce the impact of space weather on activities of human interest.

Three basic functions accomplish the task of the ISES. Firstly, the International URSIgram Service provides standardized rapid free exchange of space weather information and forecasts. Secondly, the ISES prepares the International Geophysical Calendar each year. This calendar gives a list of 'World Days' during which scientists are encouraged to carry out their experiments. And thirdly, on behalf of COSPAR, the monthly Spacewarn Bulletins summarize the status of satellites in earth orbit and in interplanetary space.

The ISES also sponsors meetings and establishes working groups to improve space weather services and to promote the understanding of space weather and its effects for users, researchers, the media, and the general public. Solar-Terrestrial Prediction Workshops were held thus far, in Boulder (1979), Meudon near Paris (1984), Leura near Sydney (1989), Ottawa (1992), and Hitachi near Tokyo (1996). ISES members play an active role in the transition of scientific results into operational space weather services.

The International Ursigram Service

The International Ursigram Service operates through a number of Regional Warning Centers (RWC) scattered all around the world. At the meeting held in 2000, the Directing Board decided to accept applications for membership from the Royal Observatory of Belgium and

the Swedish Institute of Space Physics for RWC, and another application for Associate Regional Warning Center (ARWC) from the Collecte Localisation Satellite, France. At present, there are 11 RWCs located in: Beijing (China), Boulder (USA), Brussels (Belgium), Lund (Sweden), Moscow (Russia), New Delhi (India), Ottawa (Canada), Prague (Czech Republic), Sydney (Australia), Tokyo (Japan) and Warsaw (Poland); and one ARWC in Meudon (France). The RWC in Boulder plays a special role as 'World Warning Agency (WWA)', acting as a hub for data exchange and forecasts.

Each RWC collects data available in its own geographic area, concerning the state of the sun-earth environment. In some cases, these come from observatories operated directly by the Regional Warning Center. In many cases, they are gathered from regional scientific institutes and universities. These data and reports are coded according to the ISES code book and distributed daily, on request to users and to other RWCs. Data exchange is generally via a daily, or more frequent, message sent either by electronic mail or by facsimile transmission. Electronic transfer of data is also used to relay larger image files.

Information transmitted through the ISES network is analyzed by Regional Warning Centers which produce a number of "summary" reports and forecasts. The "Geoalert", a forecast of solar-geophysical conditions for the next few days, is a particularly important one of these reports. Each RWC prepares its own forecast ("Geoalert") and sends it to the WWA in Boulder each day. The WWA then issues a Geoalert which is distributed worldwide each day at 0300 UT through the ISES network.

Publications

The International Geophysical Calendar is distributed free of charge throughout the world. The present distribution is approximately 2000 copies produced at a nominal cost. The Spacewarn Bulletin is also distributed free of charge throughout the world and the information is now available through an electronic bulletin board system.

The Geoalerts and the abbreviated Calendar records are published monthly in "Solar and Geophysical Data" produced and distributed by World Data Center-A for Solar Terrestrial Physics in Boulder, USA.

The daily Geoalerts and Ursigram messages are "real-time" information and only a summary is printed as the "ISES Alert Periods" in the Solar-Geophysical Data Books published by World Data Center-A. However, the production and distribution of Ursigrams is a very important part of the current expenses of the RWCs. This expense is borne by the host institutions.

Recent ISES Activities

1. ISES 2000 Meeting

ISES 2000 Meeting was held in Boulder, CO. USA, from 30 April to 6 May, 2000. There were three plenary meetings attended by all delegates from ISES members and delegates from new applicants for ISES membership, and several small working group meetings scattered throughout the period. Results from the meetings are:

- (1) Ratification of newly-developed ISES constitution, which clearly defines its organization and roles, and declare its mission as outlined in the Introduction of this report.
- (2) Decision to accept new ISES members after reviewing the applications based on the ISES standards for a warning center clearly defined in the ISES constitution and its bylaws.
- (3) Recommendations from the working groups were discussed, and it was decided to continue working group activities after the meeting.

2. Working Group Activities

Working groups and leaders organized for the ISES 2000 Meeting are:

- (1) Solar Cycle (Thomson, Smithtro)
- (2) Alerts, Warnings, Watches (Thompson, Nelson)
- (3) Models (Obara, Ogino, Onsager, Ort, Kihn)
- (4) Data format and exchange (Lakshmi, Erwin, Nelson)
- (5) Ionosphere (Patterson, Stanislawski, Fuller-Rowell, Cohen)
- (6) Geomagnetic (Coles, Balch)
- (7) Virtual forecaster work station (Akioka, Combs, Murtagh)

(8) Verification (Burov)

(9) Future observing requirements (Akioka, Heckman)

Working groups continue their activities with occasional small meetings at times of international scientific conferences, such as AGU meeting and S-RAMP Conference, and through correspondences.

3. The Next ISES Meeting

The next ISES meeting is planned to be held in Boulder in the period 29 April - 5 May.

Personnel

Mr. Joseph Hirman retired the position of Secretary for Space Weather at the end of January 2001. The election was done through e-mail for this position, and Mr. Joe Kunches was elected new Secretary for Space Weather from WWA.

ISES Home Page on the Web

ISES has a home page on the Web and this contains information about ISES and its Warning Centers, copies of the ISES code book, and references to the home pages of ISES centers. The page is a good way to navigate the Web to obtain space environment services. The home page addresses related to three ISES tasks are given below.

ISES Home page:

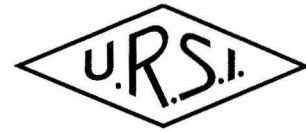
<http://www.sec.noaa.gov/ises/ises.html>

Spacewarn bulletins:

<http://nssdc.gsfc.nasa.gov/spacewarn>

International Days Calendar:

<http://www.sec.noaa.gov/ises/calendar/calendar.html>



Introduction

The Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science, IUCAF, has been formed in 1960 by URSI, IAU, and COSPAR. Its brief is to study the requirements of radio frequency allocations for radio astronomy, space science, and remote sensing in order to make these requirements known to the national and international bodies that allocate frequencies. IUCAF operates as a standing committee under the auspices of ICSU, the International Council for Science and is strongly supported by URSI, IAU, and COSPAR. ICSU works under the umbrella of the United Nations organization UNESCO.

Membership

At the end of 2000 the composition of membership for IUCAF was:

URSI	W.A. Baan	The Netherlands	
	M. Davis	USA	
	W. van Driel	France	
	A. van Eyken	Norway	
	P. Poiares Baptista	The Netherlands	
	K. Ruf	Germany	
	A. Tzioumis	Australia	
	IAU	S. Ananthkrishnan	India
		R.J. Cohen	United Kingdom
D.T. Emerson		USA	
M. Ohishi		Japan	
COSPAR	K.F. Tapping	Canada	
	D. Breton	France	
	A. Gasiewski	USA	

Ex Officio Advisers:

Director ITU Radio Bureau: Robert Jones, Canada

Chairman ITU Radio Board: M. Miura, Japan

IUCAF continues to maintain its network of Correspondents in 35 countries in order to interact with national authorities responsible for radio frequency management.

International Meetings

During the period of January to December 2000, IUCAF Members and Correspondents took part in the following meetings:

January:	ITU-R Task Group 1-5 on Unwanted Emissions in Bangalore, India
January:	IUCAF Pre-Meeting in Orlando, Florida, USA
January:	ITU-R Working Parties 7C and 7D (Space Science and Radio Astronomy) in Orlando, USA

March:	CEPT Project Team for the Preparation of WRC-2000 in Geneva, Switzerland
April:	Meeting of CRAF, the Committee on Radio Astronomy Frequencies of the ESF in Granada, Spain
May/June:	World Radiocommunication Conference, WRC-2000, in Istanbul, Turkey
July:	ITU-R WP7E on Inter-Service Sharing, in Vancouver, Canada
August:	IUCAF Pre-Meeting in Penticton, Canada
August:	ITU-R WPs 7C and 7D in Vancouver, Canada
August:	General Assembly of the International Astronomical Union, IAU, in Manchester, UK
October:	Meeting of CRAF, the Committee on Radio Astronomy Frequencies of the ESF in Budapest, Hungary
October:	ITU-R Task Group 1-5 on Unwanted Emissions in Geneva, Switzerland
November:	Space Frequency Coordination Group, SFCG, in Cairns, Australia

Additionally, a number of IUCAF members and correspondents participated in national or regional preparatory meetings for WRC-2000

IUCAF Meetings

During the year 2000 IUCAF had two meetings as a committee. These pre-WP7D meetings took place in Orlando, Florida (USA), and at the Dominion Radio Astronomy Observatory near Penticton, BC (Canada). They were held with the purpose of discussing and focussing on important issues without the interference of other (non-science) interest groups.

During the WRC-2000 in Istanbul, Turkey, a number of ad-hoc meetings of IUCAF were held to discuss the IUCAF strategy during this important conference.

Contact with the Unions

IUCAF keeps regular contact with the secretariats of the supporting unions and with the ICSU secretariat. The Unions plays a strong supporting role for IUCAF and the membership is greatly encouraged by their support.

1. The IAU General Assembly

IUCAF members and correspondents assisted in the preparations of and actively participated in the General Assembly of the International Astronomical Union, IAU, in Manchester, UK, in August 2000. A topic of main interest to the astronomy community has been, of course, the results of the World Radiocommunications Conference, WRC-2000, where radio astronomy and space science have been exceptionally successful in getting a large fraction

of the radio spectrum reserved for scientific use. Other frequency bands of interest to radio astronomy, which fall into the region of highest radio frequencies not yet assigned by the International Telecommunication Union to any radio service, are now subject to studies, following a recommendation of WRC-2000 and the General Assembly of IAU set up a working group to discuss and define the astronomical requirements. This working group is led by the Japanese IUCAF member, Dr. Masatoshi Ohishi.

The GA of IAU set up another working group, also, to deal with ways to mitigate the effects of radio frequency interference to radio astronomy. Also this group is chaired by an IUCAF member, Dr. Anastasios Tzioumis from Australia.

The committee membership was reviewed by the IAU GA. IAU had sent four representatives to IUCAF, and two of these asked to be replaced after having reached retirement age. Following the IUCAF chairman's proposal, IAU nominated three new IUCAF members, increasing the number of IAU representatives to five. The two leaving members are Dr. Boris A. Dubinski from Russia and Dr. A. Richard Thompson from the US. Both Boris and Dick have been IUCAF members with an enormous experience gained in numerous meetings and conferences. Boris Dubinski is with the Space Science Institute of the Russian Academy of Science at Moscow and his activity centered around radio astronomy from space. Dick Thompson is senior scientist at the National Radio Astronomy Observatory in Charlottesville. His superb technical expertise in all fields of radio astronomical measurements was of greatest value in Working Party 7D of ITU-R.

As new members of IUCAF, IAU nominated Drs. R. James Cohen from National Radio Astronomy Laboratory, Jodrell Bank, UK; Darrel T. Emerson from NRAO, Tucson, USA, and Kenneth F. Tapping from Dominion Radio Astronomy Observatory, Penticton, Canada.

2. Relations with URSI

IUCAF members actively participated in a number of national URSI meetings.

Affairs of the International Telecommunication Union

1. The ITU-R World Radiocommunication Conference 2000

The World Radiocommunication Conference, WRC2000, held in Istanbul, Turkey, during the period of 8 May – 2 June 2000, was by far the most important conference for IUCAF since a number of years. The Agenda Items that relate to Passive Scientific use of the spectrum were:

(The following acronyms are used: RAS: Radio Astronomy Service; EESS: Earth Exploration Satellite Service; MSS: Mobile Satellite Service; FSS: Fixed Satellite Service; SR: Space Research)

- 1.2 Finalize the remaining issues on spurious emission in Appendix S3 for space services,
- 1.4 Consider issues relating to allocations and regulatory aspects related to RESOLUTIONS 126 (WRC-97),

128 (WRC-97), 129 (WRC-97), 133 (WRC-97), 134 (WRC-97) AND 726 (WRC-97);

- 1.5 Consider regulatory provisions and possible additional frequency allocations for services using High Altitude Platforms taking into account the results of RESOLUTION 122 (WRC-97);
- 1.6.1 Review the spectrum requirements for the operation of terrestrial IMT-2000 with the view to identify future expansion bands and adjustments to the Table of Allocations,
- 1.9 Take into account the results of ITU-R studies in evaluating the feasibility of an allocation in the space-to-Earth direction to the MSS in a portion of the 1559 - 1567 MHz frequency range, in response to Resolutions 213 (WRC-97) AND 220 (WRC-97);
- 1.10 To consider the results of ITU-R studies in accordance with Resolution 218 (WRC-97) (Use of the bands 1525 - 1559 MHz and 1626.5 - 1660.5 MHz by the MSS),
- 1.11 Consider constraints on existing allocations and to consider additional allocations on a worldwide basis for the non-GSO/MSS below 1 GHz, taking into account Resolutions 214 (Rev WRC-97) and 219 (WRC-97);
- 1.13 On the basis of the results of the studies in accordance with Resolutions 130 (WRC-97), 131 (WRC-97) and 538 (WRC-97): on the "Use of NGSO (non-geo-stationary-orbit) systems in the FSS in certain frequency bands",
- 1.14 Review the results of the studies on the feasibility of implementing NGSO MSS feeder links in the 15.43 - 15.63 GHz range in accordance with Resolution 123 (WRC-97);,
- 1.15.1 To consider new allocations to the radio-navigation-satellite service required to support developments in the range from 1 to 6 GHz,
- 1.16 To consider allocation of frequency bands above 71 GHz to the EES (passive) and RAS, taking into account Resolution 723 (WRC-97);
- 1.17 To consider possible worldwide allocations for the EES (passive) and SR (passive) services in the band 18.6 - 1.8 GHz taking into account the results of the ITU-R studies.

2. Agenda Item 1.16 of WRC-2000

The complete reallocation of the radio spectrum between 71 and 275 GHz has been considered the single most important issue of WRC-2000 for the science services and preparations by IUCAF have been intense. Proposals had been prepared for this agenda item and submitted to the ITU by a number of countries from all three ITU Regions, which were mostly based on the results of the IUCAF mm Wave Working Group. The guiding principles for re-allocation of the RAS bands have been the following: 1) the RAS can share some spectrum with terrestrial services by means of protection zones around the few mm wave observatories, 2) satellite down-links and aeronautical operations need to be located adjacent to each other at the edges of atmospheric spectral windows, 3) any potentially

damaging active operations need to be located in places where they do least damage to passive spectrum use, and 4) all services need to have continued access to the spectrum. The proposals for Agenda Item 1.16 from the different regions were very similar and could be aligned easily. The conference adopted the proposal quite early in its deliberations and without major resistance. IUCAF noted with satisfaction that the intense preparation has paid and the result was welcomed as a great victory for science in general and for mm wave astronomy and passive remote sensing in particular. Two thirds of the whole radio spectrum, which is administered by the ITU, has been redistributed to satisfy our needs! This has been made possible, of course, by the sense of compromise and good citizenship in spectrum land, by which the proposals worked out by scientific radio services respect the needs of the commercial radio services as well and envisage intensive sharing of frequency band, wherever this appears feasible. This feasibility of sharing between active and passive services will become the subject of studies within the ITU-R study groups, as soon as active service technical and operational parameters become available.

3. ITU-R Task Group 1-5 on Unwanted Emissions

With two meetings in January and November 2000, Task Group 1-5 of ITU-R completed its term. IUCAF members have been playing a leading role in the ongoing work of Task Group 1-5, providing many input papers and the chairman of the most critical drafting group.

Task Group 1-5 was very successful and produced a number of recommendations on several aspects of Unwanted Emissions, including a general recommendation on the protection of passive services. These recommendations were approved by Study Group 1 of the ITU-R and are at present in the process of circulation, seeking approval by the member states of ITU. Protection procedures for the safety and passive services, however, are the remaining issues to be solved.

As a result of an Space Services effort the protection of the passive services and of the safety services have been relegated to a consideration on a "band-by-band" basis. Rather than having general limits that would benefit all spectrum users by reducing unwanted emissions as intended by Rec. 66, this proposal will only protect the radio science bands to a level that is practical for the interfering service. This "band-by-band study" will be continued in a new Task Group, TG1-7 of ITU-R Study Group 1. IUCAF has been very active in achieving another Task Group to deal with this issue, which has been very high up on the priority list of science service' frequency managers for more than 20 years now. And the new Task Group was set up against strong opposition by some satellite operators and their favorite national administrations. In fact, it could be achieved that Dr. Willem Baan, IUCAF member and former IUCAF chairman, was nominated to be co-chairman of the new Task Group. This is certainly a well merited tribute to his excellently fair guidance of the TG1-5 Drafting Group on passive services, which he had chaired.

4. ITU-R Working Parties 7D and 7C

Working Parties 7C and 7D met twice year. WP7C addresses the issues of the remote sensing community. WP7C met at the same time as WP7D on Radio Astronomy. The January meeting was to a large fraction devoted to finalizing the Working Parties view on the WRC-2000 agenda items, and the August meeting considered the results of the conference and started to organize the work towards the next conference, which will take place in summer 2003.

The Conference Preparatory Meeting for WRC-2000 had produced its report to WRC-2000 already in fall 1999, so no production work for the preparation of the conference was required. WP7D had time to consider TG1-5 issues, and could finally get agreement on a new recommendation on the permissible data loss to interference. This recommendation had been through a long and controversial creation process. It was triggered by the advent of modern mobile services, which did not want to respect large exclusion zones around radio observatories, explaining that the equipment is used only sporadically, and coordination calculations involving radio astronomy stations have in the past only considered the static case of fixed or broadcasting service stations. This has to be seen in the context of spectrum management tools, making use of Monte Carlo simulations of complex sharing scenarios, which cannot work with the data loss being exactly equal to zero.

Initially, the proponents of this Monte Carlo methodology had hoped they could get radio astronomers agree to a number as high as 10 % for the data loss, because in the static calculations of coordination distances radio astronomy had agreed to the use of a propagation model, which gives the required attenuation with a probability of 90 %. It took us long to convince the other side that radio astronomy is a serious undertaking and that our funding agencies would not understand our acceptance of a loss rate so far in excess of corresponding numbers for other, particularly for commercial services. (Or could the reader imagine to accept television with interference throughout 10 % of the program?) The numbers finally agree are 2% for individual systems or services, and 5 % for the aggregate of all possibly interfering transmitters. Additionally, during the long time of improving this draft recommendation, it was made much more generally applicable and now covers interference due to unwanted emissions from services in nearby frequency bands as well as satellite services, which generally cannot share frequency bands with radio astronomy.

The August meeting of the Study Group 7 Working Parties spent much time and effort to complete a document dealing with the band-by-band study of Task Group 1-5. From the WRC-2000 results, which require studies in WP7C and WP7D, the coordination with a new type of service seems to be most remarkable: the high-altitude platforms. This new application to provide broadband access to interactive services is considered to be a terrestrial fixed service by ITU. Accordingly, WRC-2000 started to dedicate fixed service bands to the use by HAPS. Terrestrial

fixed used to be the service which can share frequency band with radio astronomy most easily. We will have to revise this picture, if HAPS are becoming the wide-spread application that its inventors hope. Coordination between HAPS and radio observatories will be a bit more difficult.

Publications and Reports

IUCAF has contributed a number of documents to the proceedings of WRC-2000, Task Group 1-5 and Study Group 7. These documents have all appeared on the ITU-R Home Page and have not all been distributed by email.

Conclusion

It is of extreme importance that the band allocations above 71 GHz have been considered so favorably at WRC-2000. IUCAF has been able to take up a central role in the preparations for this Agenda Item at WRC-2000. Sharing at lower frequencies and limitations to unwanted emissions of active services in passive service bands, as well as the

satellite down-link issues will continue to draw attention.

IUCAF is thankful for the moral and financial support that has been given for these continuing efforts by ICSU, URSI, IAU, and COSPAR during the recent years. IUCAF also recognizes the clear support that has been given by radio astronomy observatories and universities to individual members in order to participate in the work of IUCAF.

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CONFERENCE REPORTS

EUSAR 2000

Munich, Germany, 23-25 May 2000

The EUSAR conference (European Synthetic Aperture Radar Conference) was held for the third time (previous events: Königswinter 1996, Friedrichshafen 1998). EUSAR 2000 has been technically organised by DLR (Chairman: Dr. W. Keydel), with support by ASTRIUM GmbH and FGAN and co-sponsorship by URSI, EUREL, IEEE and DGON. Organiser is by tradition VDE, the German Association of Electrical Engineers.

Theme

Main subject of EUSAR is the observation of the earth by use SAR techniques (synthetic aperture radar). SAR imaging is based on the motion of the radar sensor platform, which may be an airplane or a satellite. SAR images have photo-like quality independently of the actual weather conditions and range. SAR applications can typically be found in environmental monitoring, e. g., observation of natural hazards, generation of 3D terrain maps, detection of oil slicks on the ocean surface, monitoring of polar ice, ship and road traffic, agriculture, soil humidity, ocean salinity etc. Military applications such as reconnaissance and target identification are possible as well. The scope of EUSAR is mainly devoted to the radar sensor and the imaging process. Other conferences such as IEEE IGARSS deal with applications of SAR and other remote sensing techniques.

Highlights of EUSAR 2000

EUSAR 2000 was dominated by the multi-national SRTM experiment (Shuttle Radar Topography Mission). Special sessions have been dedicated to this topic. SRTM was carried out successfully in February 2000. Within 11 days data for 3-dimensional imaging of more than 90 % of the earth surface were gathered. The primary radar sensor was installed in the fuselage of the space shuttle *Endavour*. A second antenna for interferometric measurement was mounted on a 64 m long mast in across-track geometry.

Two operating frequencies (X- and C-band) were used. The development of the X-band radar was in part designed by DLR. Moreover, DLR takes a significant part in the evaluation of the data. Besides SRTM many other papers given at EUSAR 2000 were dedicated to interferometric image generation. SAR systems, spaceborne SAR and SAR at low frequencies (with the capability of ground penetration) and SAR processing. Other important topics were: polarimetric interferometry, real-time data processing, image processing, future SAR concepts, phased array technology, UWB SAR, geocoding, simulation and calibration, moving target detection, feature extraction, classification, data fusion, ScanSAR and SpotSAR.

Attendance

About 250 abstracts were submitted, 220 papers were accepted. Three parallel oral sessions and a poster session were held. 357 registered attendees came from about 28 countries from all over the world (previous events: 275). Some attendees were financially supported by DFG, the German Science Foundation.

Conclusion

The SAR theme receives currently world-wide attention as can be noticed from the growth of the world-wide participation in EUSAR. The high scientific and technological standard of this conference has produced a world-wide reputation. The organisers believe that the two-years turn is optimum.

EUSAR 2002 will be held in the Hyatt Regency Hotel in Cologne, Germany, on 4-6 June 2002. Organiser is FGAN, the Chairman will be Dr. K. Krücker, the Director of FGAN-FHR. For details, please contact www.fgan.de/fhr/eusar2002.

R. Klemm
EUSAR Vice Chairman

ELECTROMAGNETIC ASPECTS OF SELFORGANISATION IN BIOLOGY

Prague, Czech Republic, 9-12 July 2000

The Symposium on "Electromagnetic Aspects of Selforganisation in Biology" was organised by the Institute of Physiology, First Medical Faculty (under the aegis of the dean of the Faculty, Professor Štípan Svačina), by the Institute of Radio Engineering and Electronics of the Academy of Sciences of the Czech Republic, by the Faculty of Electrical Engineering of the Czech Technical University in Prague, and by the National Institute of Public Health of the Ministry of Health Care. The Symposium was sponsored by the International Commission K of URSI and was organised under the auspices of the URSI Committee of the Czech Republic and was linked with the Czech participation in the European COST 244bis project. The Symposium was the fifth meeting of this type organised in Prague since 1987.

Symposium took place at the deanery of the First medical Faculty, Charles University. Altogether 56 scientists from 14 countries (Belgium, Canada, England, Germany, Hungary, Italy, Poland, Romania, Russia, Slovenia, Sweden, Ukraine, Yugoslavia, and the Czech Republic) participated at the Symposium. 42 papers were presented. 8 young scientists and 3 students participated at the Symposium and registration fee was waived for all of them.

Selforganisation is generally accepted as a fundamental concept in biology but its principles and mechanisms are still unclear. Research in this area is still in the beginning. Mechanisms of interaction of electromagnetic fields with living matter are not satisfactorily explained either. The Symposium was mainly focused on these two areas. We will overview the main contributions presented at the Symposium.

Hypothesis concerning long-range order and Selforganisation in biological systems depending on an electromagnetic field was presented by I. Jerman. Selforganisation as a non-linear phenomenon based on quantum processes within biomolecules that are not governed by the second law of thermodynamics ("syntropic phenomena") was described by A. Detela. J. R. Zon and M. Wnuk gave a report on physical plasma in biostructures and its role in selforganisation. Chemical processes in a cell are selforganised into an interconnected network which is similar to a parallel-processing computer (V.L. Vvedensky).

Concrete mechanisms of selforganisation were discussed too. Endogenous electromagnetic fields in living cells can exert forces for reliable transport of molecules and particles to the area of their destination (J. Pokorný). Collective behaviour of proteins in a membrane depends on their dipole-dipole interactions and on the transmembrane potential (A. Zrímc). Periodic endogenous potential has a basic role in rotary molecular motor with high efficiency (V.N. Ermakov et al.). The efficiency of thermal and isothermal conversion of electromagnetic energy used for selforganisation processes was reported by Yu. P. Chukova. Special features of Froehlich system with non uniform energy supply were analysed by F. Šrobár.

Solitons are one of possible mechanisms of selforganisation in biology. Electromagnetic radiation generated by electrosolitons propagating in periodic lattices of polypeptide chains was analysed by A.A. Eremko and L.S. Brizhik. Soliton states may cause delayed luminescence in biological systems (L.S. Brizhik et al.). Soliton in the α -helix chain of a protein under the influence of random lattice fluctuations and of the electric field behaves like a classical particle affected by the Brownian motion and by a constant driving force (S.V. Zekovic, Z.M. Ivic). Theory of the breather dynamics in DNA chains was presented by M.V. Sataric.

Microtubules form essential structures for function of living cells. Tubulin's dipole moment is important for ordering of microtubules as well as for generation of electric field oriented along the microtubule axis as was disclosed by J.A. Tuszyński and J.A. Brown. Electric conduction in microtubules was also studied by them using Hubbard model. Microtubules are hollow tubes whose circular cylindrical cavity has resonant frequency in the region of soft X rays (F. Jelínek, J. Pokorný). Microtubules suspended on kinesin-coated glass surface without applied electric field showed only a Brownian motion with random orientations of microtubule axes. After application of an electric field the microtubules moved from the negative pole to the positive one (E. Unger et al.).

Measurement methods and experimental results on electromagnetic activity of yeast cells *Saccharomyces cerevisiae* and *Schizosaccharomyces pombe* were presented by R. Hoelzel. Properties and behaviour of cold sensitive tubuline mutants of *Saccharomyces cerevisiae* were described by J. Hašek and K. Malínská with the conclusion that these mutants are convenient for synchronised model systems for measurement of electromagnetic activity. The mutant cells in the M phase of the cell cycle display high electromagnetic activity if microtubule structures are present and low (or zero) activity if the microtubule structures are not polymerised (J. Pokorný et al.). Measurement methods of the electromagnetic activity of living cells may be improved using hybrid integrated detection system containing microelectronic sensor and preamplifier (P. Tesař, M. Husák). Low frequency magnetic fields can be detected by bioluminescence of unicellular algae autotrophic dinoflagellates (M. Berden et al.).

Papers on interaction mechanisms of external electromagnetic fields with biological systems brought new contributions. Effects of microwave radiation on biological systems can be explained by nonlinear resonant tunneling of electrons as follows from theoretical analysis presented by V.N. Ermakov and E.A. Ponezha. Exposure to mm waves has strong effect on chromatin conformation in *E. coli* and rat thymocytes at non-thermal power densities; the effects depend on frequency and polarisation of the mm waves (I.Y. Belyaev). Extremely low frequency (ELF) magnetic field (100 mT) strongly enhances the stress

effects of elevated temperature, i.e. expression of hsp16 and hsp70 in transgenic nematodes (*C. elegans*) as was reported by H.O. Gutzzeit. Orientation of the vertebrate rod photoreceptors with a voltage gradient along the cell depends on the frequency of the external electromagnetic field; the external field can change membrane fluidity too (E.A. Kovacs et al.). Exposure of human lymphocytes to 50 Hz magnetic field causes damage of the cell membranes, morphology changes of cells, and of their nuclei (M. Milani et al.). Effects of sinusoidal magnetic field 50 Hz (1 and 10 mT) were investigated using Leukocyte Adherence Inhibition (LAI) assay (LAI assay based on adherence to solid state substrates is used to monitor leukocyte mediated immunity). Magnetic field decreases adherence of T lymphocytes taken from healthy humans to solid state substrates (e.g. to glass) and increases adherence of T lymphocytes taken from cancer patients (A. Jandová et al.).

Negative result of the effect of ELF magnetic field was reported by M. Vácha and D. Klimeš. The length of the pupae stage of insect (*Tenebrio pupae*) was not influenced by exposure to 50 Hz magnetic field (1, 0.5, 0.1, and 0.05 mT).

Effects of the near zone field of mobile phones on brain is a special question. Now we cannot assess whether the new models of brain organisation and function would contribute to better understanding of the problem, e.g. to what extent the dynamical organisation of the memory in space (analysed by G. Vitiello and E. Alfinito on the basis of the quantum model of brain) or of the control function of brain can be altered by the external field. At present immediate effects of the electromagnetic field on brain activity are measured and evaluated. L von Klitzing found out that about 5 min exposure to the field of the cordless telephones (DETC-system) reduces alpha-activity of EEG to zero level, but without increasing the delta-activity; the microcirculation of blood flow has a strong periodic oscillating characteristic - 0.15 Hz. Effects of exposure to the electromagnetic field of mobile telephones on the brain activity of narcolepsy patients was described by R. Jech et al. During the exposure to the field the evoked potentials and reaction times are changed, and - very likely - different rate of processing of information exists in the irradiated and in the non-irradiated hemisphere of the brain. Power absorbed in the brain from the mobile electromagnetic field depends on the antenna of the mobile. 38% of the radiated power absorbed in the head with a monopole antenna can be decreased to 7% with a microstrip antenna (R. Dlouhý).

It is evident that electromagnetic fields of mobiles interact with the brain activity and can influence brain control function. Contemporary theoretical understanding as well as experimental material do not allow us definite conclusions concerning the long term effect.

Knowledge of the biophysical mechanisms of interaction of electromagnetic fields with biological objects, of the chain of successive events, and the biological consequences is important for beneficial application of the fields in medicine and for assessment of the effects of the new emerging technologies (L.D. Szabó). Cancer treatment is one of the important applications of the electromagnetic fields in medicine. Remarkable achievements in the photodynamic therapy of malignant dermatological tumors (basalioma, melanoma) using TPPS4 (meso-tetra-para-sulfonato-phenyl-porphin) and incoherent light was reported by M. Jirásková et al. Nevertheless, further improvement is possible. Pulsed electric field can produce pores in membranes of cells (90% of cells may become electroporated) and increase uptake of photodynamic agents by cells and strongly enhance effectiveness of the photodynamic therapy of malignancies (H. Berg et al.). New technical facilities for application of electromagnetic hyperthermia were described by J. Vrba et al.

The Round Table Discussion emphasised the role of the nonlinear mechanisms of biophysical and biochemical nature in selforganisation of living matter.

The organisers paid tribute to the distinguished scientist Professor Petr Beckmann. The "Beckmann memorial lecture" was included in the program of the Symposium. Beckmann's theory of superposition of elementary waves as a sum of elementary time-space vectors from different sources may be used in evaluation of endogenous electromagnetic fields in biological systems.

The Opening Session was in the Small Ceremonial Hall in Carolinum (the ancient building of Charles University from the fourteenth century). The representatives of the First Medical faculty of Charles University, of the Czech Technical University in Prague, and of the Academy of Sciences of the Czech Republic emphasised that knowledge of principles of selforganisation is essential for the understanding of life.

J. Pokorný
F. Šrobár
F. Jelínek

INTERNATIONAL SCHOOL OF PHYSICS “ENRICO FERMI”

Varenna, Italy, 25 July - 4 August 2000

The Course on *Recent Advances in Metrology and Fundamental Constants* was organized by the Italian Physical Society, the Istituto Elettrotecnico Nazionale of Italy, and the Bureau International des Poids et Mesures also as a contribution to the celebration of the 125 years of the Metre Convention.

This course was supported by the direct presence of the BIPM and of many National Metrological Institutions and it was attended by 71 well-qualified students from 18 different countries and who contributed with simulating and interacting discussions.

In the field of *Metrology and Fundamental Constants* many improvements took place over the past decade and these were discussed at the School; from one side the old caesium SI second definition has found a new realisation, with the “fountain” approach, replacing the classical thermal atomic beam. The use of “cold” atom techniques, in which bunches of inert atoms are collected, slowed down, and cooled, has opened a number of new and unexpected avenues for metrology and fundamental constants; one of these possibilities being the atom interferometry. Another important “quantum jump” was the demonstration of the possibility of performing a direct frequency division in the visible, using ultra short femtosecond pulses. In addition, the possibility of “counting” electrons or photons gave a fundamental support to the development of single-electron capacitance standards and to new scenarios in the absolute calibration of photo-detectors.

The success of this third Course was made possible by the close co-operation and strict dedication of many Institutions, lecturers, students and persons that are here all acknowledged.

In particular, the Italian Physical Society, the Bureau International des Poids et Mesures, the “Istituto Elettrotecnico Nazionale”, the “Istituto di Metrologia G. Colonnetti” of CNR, the European Community, the Italian Ministry of Foreign Affairs, the International Union of Radio Science, and the UNESCO provided financial support for the attendance of several students.

Topics

The topics presented and discussed at the school were:

- Evolution on the last decade of the International System; n and l metrology: laser confinement, cooling, atomic clocks, and optical frequency standards;
- Radio/photometry: new ideas on radiometry, quantum optical metrology;
- Quantum based electrical standards: quantum Hall devices, new applications of Josephson junctions, single electron devices;
- Fundamental constants: impact in physics and metrology, gravitation measurement, measurements of G, α , R, Avogadro, Planck constants;
- New horizons: Bose-Einstein condensation, atomic interferometry, chaos;
- Mass metrology, relativity and statistics in metrology.

Participation

The participating Students and Observers were 71 from 18 Countries, subdivided as follows: 1 Australia, 1 Brazil, 1 Czech Rep., 1 Denmark, 1 Estonia, 3 BIPM, 4 France, 7 Germany, 3 Mexico, 1 Nepal, 1 Netherlands, 2 Romania, 4 Russia, 1 South Africa, 4 Switzerland, 1 Taiwan, 2 UK, 4 USA, 29 Italy

Lectures

The 20 lecturers giving on the whole 51 hours of lessons were: Wolf (BIPM), Davis (BIPM), Esteve (CEA, France), Vanier (Canada), Phillips (NIST), Sergienko (Boston, USA), Jeckelmann (Ofmet, CH), Mills (UK), Fox (NPL), Petley (NPL), Wilkening (PTB), Helmcke (PTB), Haensch (MPI), Andreone (IEN), Bich (IMG), Mana (IMG), Bittanti (Poli MI), Inguscio (LENS), Arecchi (INO), Nobili (Uni PI).

Additional seminars were given by: Gavioso (IEN), Martinis and Keller (NIST). The school directors were T.J.Quinn (BIPM) and S.Leschiutta (IEN), while Patrizia Tavella (IEN) was scientific secretary.

MMET’ 2000

Kharkov, Ukraine, 12-15 September 2000

MMET’2000, the Mathematical Methods in Electromagnetic Theory meeting, was held at the Kharkov State University in Kharkov, Ukraine, on 12-15 September 2000. Working days of the conference were September 12 to 15; September 11 was the day of registration, September 16 was for the barbecue party. Every day the conference started with a plenary session of three 40-min invited lectures in a large auditorium. After this, half-day or full-day sessions filled with 15-min contributed papers worked,

with three parallel sessions before and after the lunch. All the papers were presented in English. The number of registered participants was 153; it is estimated that up to 70 more participants, mainly from Kharkov, did not register. Totally 175 papers out of a total of 199 in the Program were presented. In all, 47 presenters from Ukraine, Russia, Georgia, Bulgaria and Turkey were supported. 27 participants from out of the Former Soviet Union (FSU) attended the conference, 21 papers of joint authorship were

presented. Two-volume MMET*2000 Proceedings counting totally over 700 pages were published before the conference. The holding of the conference became possible thanks to the support of sponsors. The next MMET*2002 is planned to be held in Kharkov in 2002.

12 September

MMET*2000 started at 8:00 on September 12, 2000 by the opening ceremony at the New Physical auditorium of the Kharkov State University. First to address the participants was MMET*2000 Chairman, Prof. Eldar Veliev of the Institute of Radiophysics and Electronics of the National Academy of Sciences of Ukraine (IRENASU). He reminded that MMET conferences had already a 12 year history and had gained high reputation and recognition in FSU and world-wide. This was followed by the welcome words from academician Vladimir Yakovenko, director of IRE NASU. He emphasised strong academic traditions of IRE and Kharkov in electromagnetic theory. The next to make a welcoming speech was Prof. Ilya Zalyubovskiy, vice-rector of the Kharkov National University (KNU). Eventually, Prof. Alexander Nosich of IRE NASU addressed the participants on behalf of the IEEE East Ukraine Joint Chapter of the Antennas & Propagation, Microwave Theory & Techniques, Electron Devices, and Aerospace & Electronic Systems Societies. This chapter, founded in 1995, was the primary sponsor and organiser of MMET*2000.

On the same morning the first plenary session was held consisting of three invited talks:

- A. Kirilenko, et al. (IRE NASU, Ukraine), Decomposition Approach to the Multi-Layer Circuit Electromagnetic Modeling,
- V. Chumachenko, et al., (Gebze Institute of Technology, Gebze, Turkey and Zaporozhye Technical University, Ukraine), DPT Analysis of Electromagnetic Scattering and Radiation from Multiangular Cylindrical Structures Incorporating Dielectric,
- N. Engheta (University of Pennsylvania, Philadelphia, USA), Fractionalisation Methods and Their Applications to Radiation and Scattering Problems.

Further, after a coffee break, the conference continued working with three simultaneous sessions:

- Time-Domain Methods - I (8 papers),
- Computational Techniques (7 papers),
- Analytical Regularisation (7 papers),
- Time-Domain Methods – II (9 papers),
- Signal Processing (6 papers),
- Propagation and Remote Sensing (8 papers).

The same evening, at 6:00 p.m., a Welcome Party was organised at the university cafeteria. At the welcome party, Ukrainian champagne was served. This event created a perfect atmosphere to relax and shake off the troubles of long and sometimes tiring journeys that participants had to undertake to reach MMET*2000.

September 13

At the conference morning plenary session, the following invited papers were presented:

- M. Idemen (Isik University, Istanbul, Turkey), The Concept of Confluence and the Edge Conditions for a Wedge Bounded by Material Sheets,
- K. Tanaka, et al. (Gifu University, Yanagido, Japan), Numerical Simulations of Near Field Optics by Boundary and Volume Integral Equation Methods,
- G.W. Hanson, et al. (University of Wisconsin-Milwaukee, USA), Applications of Singular and Critical Point Theory to the Analysis and Interpretation of Transform and Time-Domain Guided-Wave Electromagnetics.

This day regular sessions of contributed papers consisted of: Antenna Theory – I (7 papers), Antenna Theory – II (4 papers), Complex Media, Beams and Plasmas – I (5 papers), Complex Media, Beams and Plasmas – II (9 papers), Optical Networks (7 papers), Scattering and Radar Cross Section - I (6 papers).

A number of no-shows (24 papers) were reported by the session chairpersons, mainly of the authors from distant regions of Russia, and also from Poland. However, some of the papers were presented by the colleagues of the absent authors, including the paper of V. Daniele from Politecnico di Torino, Italy, presented by R. Zich.

On this day, a bus city tour was organised, enabling participants to get acquainted with the history of Kharkov, the second-largest city in Ukraine. Remarkable historical buildings and monuments, such as Assumption Cathedral, WW II Memorial, Gosprom complex built, in the 20's as an example of 'constructivism' style in the architecture of the early Soviet period, were visited. Before the city tour, MMET*2000 participants were invited for a short visit to the rooftop observation space of the 14-level main tower of the university building. The September weather was good and allowed enjoying views of the 2-million city, full of green trees and busy streets. Later in the evening participants were offered an organ music concert at the City Hall for Organ Music in the bell-tower of Uspensky (Assumption) Church.

September 14

On the third day of the conference the morning plenary session looked as follows:

- S. Gavrilov, et al. (TUBITAK-MRC, Turkish-Ukrainian Joint Research Laboratory, Turkey), Diffraction Tomography Method Development in Wide Frequency Range,
- E. Romanova, et al. (Saratov State University, Saratov, Russia), Fiber Mode Behavior Near the Cutoff Frequency: Dispersion Characteristics, Modelling and Applications,
- M. Marciniak (National Institute of Telecommunications, Warsaw, Poland), Photonic Crystal Theory, Modelling and Technology.

Parallel sessions of regular papers that day went along the following topics:

- Guided Waves-I (7 papers),
- Guided Waves-II (8 papers),
- Eigenvalue Problems - I (8 papers),
- Scattering and Radar Cross Section – II (7 papers),

- Gratings and Frequency-Selective Surfaces (7 papers),
- Inverse and Synthesis Problems (5 papers).

That evening, the conference banquet was held at the restaurant of the hotel "Poliot". This was a lovely event accompanied with music, dancing and speeches. The dominant tone, however, was the joy of meeting some old friends and colleagues and making new ones.

September 15

On the last working day of the conference, the morning plenary session consisted of three invited papers:

- D. Vavriv (IRA NASU, Kharkov, Ukraine), Millimetre-Wave Radar for Environmental Studies: Image Processing and Interpretation,
- T. Shiozawa, et al. (Osaka University, Osaka, Japan), Growth Characteristics of a Cherenkov Laser Filled with Inhomogeneous and Collisional Plasma,
- K. van 't Klooster, et al. (ESA/ESTEC, Noordwijk, The Netherlands), The Antenna Sub System for the Meteosat: Modelling Tools and Needs.

Parallel sessions of that day covered the topical areas as: Ionospheric Electromagnetics – I (7 papers), Ionospheric Electromagnetics – II (3 papers), Function-Theoretic Methods – I (8 papers), Function-Theoretic Methods – II (6 papers), Inverse and Synthesis Problems – II (7 papers), Scattering and Radar Cross Section - III (6 papers).

The closing ceremony of MMET*2000 took place in the New Physical auditorium of KNU at 4:40 p.m. At first, several awards of the conference were announced and handed to the awardees.

- The V.G. Sologub Award "*For remarkable contribution to the development of analytical regularisation techniques in electromagnetics*" went to Yevgeny Trifonov and Yevgeny Karchevskii (Kazan, Russia) for the paper entitled, "Computing Complex Propagation Constants of Dielectric Waveguides".
- The V.P. Shestopalov Memorial Award "*For the contribution to the Riemann-Hilbert problem technique*" went to Sergey Panin and Anatoly Poyedinchuk (Kharkov, Ukraine) for the paper entitled, "The Diffraction of the Normally Incident Plane Wave by a Grating over a Chiral Medium".

Six traditional MMET awards "*In recognition of remarkable presentation at the student paper competition*" went to the following young scientists:

- Vladimir Kisel (Moscow, Russia), "Electromagnetic scattering from Cavities with Complex Objects Inside" (1-st grade),
- Alexander Bijamov (Tbilisi State University, Georgia), "3D-Analysis of the Compact Cellular Phone Antennas" (2-nd grade),
- Stanislav Derevyanko (IRE NASU, Kharkov, Ukraine), "Peculiarities in the Non-Linear Electromagnetic Response of a Thin Metal Film Carrying a Strong DC Current" (2-nd grade),
- Ildar Urazgildiev (NTU - Kiev Polytechnic Institute, Kiev, Ukraine) "Maximum Likelihood Technique for Direction of Arrival Estimation in Adaptive Arrays",
- Bahattin Tueretken (TUBITAK-UEKAE, Gebze, Turkey) "Comparison of Symbolic Computation Techniques for the Problems of Electromagnetics" (3-rd grade),

"Electromagnetic Wave Scattering by a Doubly-Periodic Magnetodielectric Layer" (3-rd grade).

Besides of this, three original honorary certificates were handed "*For the most distant travel to MMET*2000 and remarkable paper presentation*", to:

- Sergey Kolesnik of the Irkutsk State University, Irkutsk, Russia,
- Maxim Tolstikov of Irkutsk Military Aviation Engineering Institute, Russia,
- George Hanson of the University of Wisconsin-Milwaukee, Milwaukee, USA.

The prize "*For the earliest submission of a successful conference paper*" was given to Svetlana Volkova from Dnepropetrovsk University of Chemical Technology, Ukraine. The prize "*For the earliest conference registration*" was given to Georgy Koshevoy of the Kharkov Aerospace University.

Each MMET award consisted of a colourful certificate signed by the chairman and a bottle of Crimean champagne.

Final closing address was done by Prof. Eldar Veliev. He informed the audience that, in all, the number of registered participants was 153. Unidentified number of non-registered participants was estimated as around 50, mainly from Kharkov universities and research establishments. Of registered participants, 27 came from the non-FSU countries, and 45 others from the cities of FSU other than Kharkov. Of 199 papers included into the Program of MMET*98, 175 had been presented according to the preliminary information. Relatively high fraction of no-shows is understandable as travel budgets of universities and laboratories are today zero in FSU. In fact, a great number, 51 in all, of non-Kharkov speakers were able to attend the conference due to a partial or complete support of the train-travel or registration expenses from the organisers. This was especially important for the students and young scientists who obtained their first experience of taking part in a major international conference and presenting their research results in English. One should note that such a support, as well as publishing the Program and the 700-page Proceedings, and holding such a conference in general would not be possible without a generous support of MMET*2000 sponsors: IEEE, URSI, EOARD, ERO and TICRA. After that, Prof. N. Engheta thanked the organisers for creating an unprecedented forum for scientific discussions and expressed a hope that MMET series will continue. He confirmed his intention to write a report of the MMET*2000 for the IEEE Antennas & Propagation Magazine and URSI Radio Scientist. Eldar Veliev announced that the next conference, MMET*2002, will be held most probably again in Kharkov in 2002.

September 16

After the conference, the participants were proposed a social program in order to get relaxed after four days of intensive work and strengthen the links originated at the conference. On Saturday, September 16, an outdoor barbecue party was organised in a park zone at the northern rim of the city. Besides of shish-kebab roasted on the field fire and drinks, participants enjoyed playing badminton, riding a horse, and competing in a football game 'Europe versus Asia' on an improvised field. Bus transportation to the place of barbecue and back was provided.

Oleg A. Tretyakov, URSI representative
Alexander I. Nosich, TPC co-chairman

BIANISOTROPICS' 2000

Lisbon, Portugal, 27-29 September 2000

Bianisotropics 2000 – 8th International Conference on Electromagnetics of Complex Media, was held at Instituto Superior Técnico, Lisbon, Portugal, from 27 to 29 September 2000, organized by Instituto Superior Técnico and Instituto de Telecomunicações. This conference follows a series of international conferences and workshops concerned with electromagnetics of complex media and materials, the first one held in Helsinki, in 1993, and received organizational support from the IBCC – International Bianisotropics Conference Committee (<http://www.maths.gla.ac.uk/~wsw/ibcc/>).

From the very beginning a web page (<http://www.lx.it.pt/Bian2000/>) was available with all the relevant information concerning the conference. Moreover a call for papers was issued in December 1999, following a few preliminary announcements, using an e-mail address list initially supported in the Chiral-L list server (<http://www.listserv.gmd.de/archives/chiral-l.html>), which now includes some 250 addresses.

77 participants coming from 21 countries attended the conference. These participants had very different backgrounds (Applied Mathematics, Electrical and Mechanical Engineering, Physics, Chemistry and Materials Science), a very unique characteristic of this research field.

The Conference program was organized in 12 oral sessions, 2 poster sessions and a round table discussion. The oral sessions topics were: Complex Media I; Composite Materials: Theory; Composite Materials: Numerical Studies and Experiments; Bianisotropic Media I; Nanostructures and Related Topics; Bianisotropic Media II; Complex Media: Random and Nonlinear; Complex Media II; Chiral Materials and Structures: Theory and Experiments; Propagation and Scattering; Unconventional Media: Wire, Turbid and Chiroferrite; Complex Media III, with a total of 41 oral papers including 9 invited presentations: On the Problem of Constitutive Parameters of Composite Materials, by A. P. Vinogradov and I. I. Skidanov; A Pedigree of Bianisotropic Media, by F. Olyslager and I. V. Lindell; Filamentary, My Dear Watson! by A. Lakhtakia; Effective Boundary Conditions in Electrodynamics of Nanostructures, by G. Ya. Slepyan and S. A. Maksimenko; Ubi Materia, Ibi Geometria, by A. Sihvola; Electromagnetic Waves in Chiral Media with Compensated Anisotropy, by I. V. Semchenko, S. A. Khakhomov, S. A. Tretyakov, and A. H. Sihvola; Scattering and Absorption by Thin Metal Wires in Rectangular Waveguide: Chiral Cranks versus Non-chiral Staple; by J. Cloete, M. Bingle, and D. Davidson; An Overview of the Theory of Wire Media, by C. A. Moses and N. Engheta; Depolarization Dyadics, by W. S. Weiglhofer. The two poster sessions included 52 posters in specific time slots with no oral presentations given during these sessions.

The round table discussion was an open discussion session with participation from all interested delegates. These sessions have become a cherished tradition at Bianisotropics conferences. Usually held towards the end of the conference when most papers have been presented, the discussion session provides a forum for a detailed exchange

of new ideas, for the enforcement and critical review of novel approaches in basic research and of avenues of applicational development. As at predecessor conferences, the discussion event at Bianisotropics 2000 provided a stimulating hour of exchanges between participants on a number of important issues in complex media research.

To begin with, the focus was on various important issues of basic theoretical research. In particular, a lively discussion ensued about the reputed (by some participants) requirement to supplement the standard boundary conditions of the Maxwell equations with additional ones when certain types of materials (spatially nonlocal, for example) are investigated. This topic lead on to a discussion of correct approaches to the homogenization of composite materials and also issues concerned with characterization of materials through constitutive relations.

Next, it was suggested a material must be characterized necessarily by homogeneous constitutive relations. This was quickly refuted by several participants, the form of constitutive relations being dependent on the length and time scales being considered. Finally, it was pointed out that the development of complex materials is not enough for them to be adopted for technological purposes. More than scientific and technological acumen is needed to convert laboratory research into useful products.

The program included also a competition for the best oral paper and the best poster presentation; a jury with the session chairmen selected the following papers: Magneto-Electric Jones Birefringence: A Bianisotropic Effect (best oral paper), by T. Roth and G. L. J. A. Rikken; Fabrication Effects on the Resonance Bandwidth of Chiral Materials (best poster paper), by J. Psilopoulos, J. Reinert, and A. F. Jacob.

The Conference papers are published in the Conference Proceedings (A. M. Barbosa, A. L. Topa (Eds.) – BIANISOTROPICS 2000 Proceedings. ISBN 972-98115-1-2) and are now available in the conference web page.

A special issue of AËU – International Journal for Electronics and Communications (guest editors: W. S. Weiglhofer, A. M. Barbosa, A. L. Topa), Vol. 55, Issue 4, to appear in July/August 2001, will include, after an independent review cycle, a set of full papers selected from the presentations at the conference.

A very strong financial support from several institutions allowed the conference organizers to support, at least partially, 36 conference participants, including several PhD. students and young scientists. Support was obtained from:

- The European Union, DG Information Technology (Brussels);
- The US Office of Naval Research (London);
- Foundation for Science and Technology (Lisbon);
- Technical University of Lisbon;
- Calouste Gulbenkian Foundation (Lisbon);
- Luso-American Development Foundation (Lisbon);
- PT Inovação, S. A. (Aveiro);
- IEEE MTT Region 8

A. M. Barbosa
Conference Chairman

2001 REMOTE SENSING FOR MONITORING BALTIC SEA AND OTHER INTERIOR BASINS

Kaliningrad, Russia, 14-17 May 2001

2001 International symposium "Remote Sensing for Monitoring Baltic Sea and Other Interior Basins" will be held on May 14 – May 17 2001 in Kaliningrad, Russia.

This symposium is organised by Institute of Radio Engineering and Electronics RAS (IRE RAS), Atlantic Branch Shirshov Institute of Oceanology RAS (AB SIO RAS), Space Research Institute RAS (SRI RAS), and URSI and sponsored by the Russian Basic Researches Foundation (RBRF).

The Symposium will review research results to the modern technique of remote measurement as well as more traditional use of towed and moored instruments. The Symposium will be devoted to enclosed basins with emphasis on the Baltic Sea. Of special emphasis will be mechanisms of scattering and thermal irradiation of electromagnetic waves by the sea surface and their links with hydrophysical perturbations, as well as problems of remote data interpretation and validation.

New approach in monitoring of the interior basins takes account their specific properties – peculiarities of the water balance, predominance of mesoscale and submesoscale processes, urbanisation of coastal areas and presence of high-toxic substances remained after the World War II. The main purpose of the symposium is to consolidate efforts of the experts both in remote sensing and in oceanography for studying the processes in conditions of real bottom relief, real stratification, and real atmospheric impacts.

Topics

- Airspace radar, microwave radiometer, scatterometer, altimeter, optical and infrared methods in monitoring the interior basins.
- Surface manifestations of currents, fronts, internal waves and circulation in enclosed basins.

- Comparison of microwave, infrared, optical and in-situ data. Problems of interpretation and validation of remote sensing measurements.
- Remote sea level measurements.
- Remote sensing for operational oceanography and coastal and estuarine management.
- Manifestations of winds, waves and other processes in surface layer.
- Remote sensing of temperature and salinity.
- Remote sensing for monitoring of the ecological state of the interior basins
- Specific problems of the Baltic Sea.

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<http://www.ire.rssi.ru/RSBS01>

Steering Committee

Chair: N.A.Armand, IRE RAS, Russia
Vice-chairs: V.T.Paka, AB SIORAS and Yu.A.Kravtsov

Local Organising Committee

Chair: V.T.Paka, AB SIO RAS, Russia
Vice-chair: B.V.Chubarenko, Russia
Secretary: I.P.Chubarenko, Russia

URSI/COSPAR IRI WORKSHOP MODELING THE LOW LATITUDE IONOSPHERE

Sao Jose dos Campos, Brazil, Russia, 25-29 June 2001

These annual meetings are the primary venue for improvements and refinements of this international standard representation of ionospheric electron density, electron temperature, ion composition, ion temperatures and ion drift. The special emphasis of the 2001 Workshop will be on (1) the specification of the low latitude ionosphere, and (2) the inclusion of Spread F occurrence statistics in IRI. Empirical and theoretical studies related to all aspects

of the IRI effort are welcome. Of special interest are papers that indicate potential improvements of IRI in the low latitude and equator anomaly region, e.g., statistical studies of the variation and variability of equator anomaly parameters, regional models, or updating with measurements. Proposals for inclusion of additional parameters and features in IRI are solicited. As usual there will be one session on applications of the IRI model in

science, engineering and education. It is expected that selected papers from the meeting will be published in *Advances in Space Research*.

Organising Committee

M. Abdu (INPE), D. Bilitza (RITSS), I. Batista (INPE), J.H.A. Sobral (INPE; Chair of Local Organizing Committee)

Program Committee

B. Reinisch (USA), D. Bilitza (USA), K. Oyama (Japan), K. Rawer (Germany), M. Abdu (Brazil), S. Radicella

(Italy/Argentina), P. Bradley (U.K.), S. Pulnits (Russia), I. Batista (Brazil), H. Chandra (India)

Abstract deadline:

31 January 2001. Please include title, author(s), address with Fax and Email.

Information

More information about the IRI project and past IRI workshops can be found at <http://nssdc.gsfc.nasa.gov/space/model/ionos/iri.html>.

SPECIALIST MEETING ON MICROWAVE REMOTE SENSING

Boulder, Colorado, USA, 6 - 8 November 2001

mWRS '01 is being hosted by the National Center for Atmospheric Research (NCAR) and the National Oceanic and Atmospheric Administration (NOAA). This meeting aims to provide an international forum for reporting programs and recent advances in microwave radiometry and radar. The meeting incorporates the 7th Specialist Meeting on Microwave Radiometry and Remote Sensing of the Environment, and the 8th URSI Commission F Microwave Specialist Symposium on Microwave Remote Sensing of the Earth, Oceans, Ice and Atmosphere.

The microwave community is invited to participate in this meeting and present new research results and instrument designs in the field of remote sensing of land, ocean and atmosphere. Suggested topics are listed below, but consideration will be given to papers on other related subjects. A digest of Accepted Abstracts will be distributed to participants at the meeting. Participants are encouraged to submit extended papers for publication in a special issue of *Radio Science*. The special *Radio Science* issue would serve as a post conference Proceedings.

Topics

- Ground-based Remote Sensing of the Atmosphere and Ocean
- Satellite-and Aircraft-based Remote Sensing of the Atmosphere, Ocean, Land Surface and Vegetation
- Radiometric and Radar Polarimetry, including Imaging
- Radiometric and Radar Calibration
- Advanced Instrument Techniques
- Special Campaigns and Field Experiments (TRMM)
- Radiometric/Radar Modelling of Scattering, Emission and Radiative Transfer

Sponsoring organisations

URSI, GRSS, NOAA, NCAR, NASA, Microwave Remote Sensing Centre, Italy '01

Meeting Co-Chairs

Dr. Ed R. Westwater, CIRES, University of Colorado, NOAA/Environmental Technology Laboratory, and Dr. J. Vivekanandan, National Center for Atmospheric Research (NCAR), Boulder, Colorado

Abstracts

Deadline for abstracts: 15 May 2001.

Notification of acceptance of papers will be available at the conference website by 1 June 2001. Confirmation of submissions will also be available on this site.

Steering Committee

Giovanni D'Auria, Università La Sapienza, Italy, William Emery, University of Colorado, USA, Albin Gasiewski, NOAA/ETL, USA, Prasad Gogineni, University of Kansas, USA, Martti Hallikainen, Technical University of Helsinki, Finland, Jin Au Kong, MIT, USA, Robert Meneghini, NASA/GSFC, USA, Simonetta Paloscia, IROE, Florence, Italy, Paolo Pampaloni, IROE, Florence, Italy, Paul Racette, NASA/GSFC, USA, Eric Smith, NASA/GSFC, USA, Domenico Solimini, Università Tor Vergata, Italy, Calvin T. Swift, University of Massachusetts, USA, David Weissman, Hofstra University, USA

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EUSAR 2002

Cologne, Germany, 4 - 6 June 2002

The 'EUSAR European Conference on Synthetic Aperture Radar' fills the gap between classical radar and remote sensing conferences. It is the unique forum in Europe for the world-wide SAR community to exchange ideas, experience, and information on the latest developments in air- and spaceborne SAR, and to develop perspectives for the future. The program of EUSAR 2002 will encompass aspects of both civilian and military use of SAR, including SAR technology and imaging techniques.

Topics

- Airborne and Spaceborne SAR Systems, Inverse SAR Systems
- SAR Technology (Antennas, T/R Modules, Waveform Generators, ...)
- Innovative SAR Concepts, Bistatic and Multistatic SAR
- SAR/ISAR Algorithms and Signal Processing
- Along-, Across-Track and Differential Interferometry, Polarimetry
- Moving Target Detection, Change Detection
- SAR Calibration, SAR Simulation
- SAR/ISAR Image Evaluation and Data Handling
- New Applications and Other SAR Related Concepts

Conference Highlights

- International Keynote Speakers and Commercial Technical Exhibition
- Permanent Display of Outstanding SAR/ISAR Images
- Invited Papers, Best Paper and Best Poster Awards,

- Recommendation for Special Journal Publication
- Technical Excursion to FGAN
- Social Events: Reception in Famous City Location, Piano Recital, Daily Excursions for Accompanying (Guest) Persons, ...

Deadlines

First Call for Papers to be distributed by March 2001
Deadline for Abstract Submission: 15 September 2001
Deadline for Paper Submission: 15 March 2002

Conference Chairman

Dr. K. Krücker, FGAN, Germany

Contact

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Internet: www.fgan.de/fhr/eusar2002

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Email: vde-conferences@vde.com
Internet: www.vde.com

URSI CONFERENCE CALENDAR

April 2001

International Symposium on Electromagnetics in Biology and Medicine

Tokyo, Japan 2001, 2-4 April 2001

Contact : Prof. Shoogo Ueno, Dept of Biomedical Engineering, Grad. School of Medicine, Univ. of Tokyo, 7-3-1 Hongo, Bunkyo-ku, 113-0033 Tokyo, Japan, Phone : +81 3-5841-3563/3812 2111, Fax : +81 3-5689-7215, E-mail : ueno@medes.m.u-tokyo.ac.jp

ICAP 2001 - Eleventh International Conference on Antennas and Propagation

Manchester, UK, 17-20 April 2001

Contact : ICAP2001 Secretariat, IEE Conference Services, Savoy Place, London WC2R 0BL, UK Tel: +44 (0) 207344 8425 Fax: +44 (0)20 7240 8830, Email : icap@iee.org.uk, <http://www.iee.org.uk/Conf/ICAP/>

May 2001

2001 URSI International Symposium on Electromagnetic Theory

Victoria, BC, Canada, 13-17 May 2001

Contact : Prof. Staffan Ström, Chair, Commission B of URSI, Dept. of Electromagnetic Theory, Royal Institute of Technology, SE-100 44 Stockholm, Sweden, Phone: +46-8-7908195, Fax: +46-8-108327, e-mail: staffan@tet.kth.se, <http://www.nrc.ca/confserv/URSI-B2001/>

Remote Sensing in Monitoring the Baltic Sea and other interior bassins

Kaliningrad, Russia, 14-17 May 2001

Contact: Prof. N.A. Armand, Institute of Radioengineering & Electronics (FIRE), Russian Academy of Sciences, Mokhovaja Street 11, 103907 Moscow, Russia, Phone: +7-095-203-6078, Fax: +7-095-203-8414, Email: armand@ire.rssi.ru

Climpara 2001

Budapest, Hungary, 28-30 May 2001

Contact : Dr. J.P.V. Poyares Baptista, ESA/ESTEC, Keplerlaan 1, NL-2200 AG Noordwijk, The Netherlands, phone: +31-71-565-4319, fax: +31-71-565-5675, Email: climpara@climpara.org

June 2001

MSMW 2001 - Physics and Engineering of mm and submm Electromagnetic Waves

Kharkov, Ukraine, 4-9 June 2001

Contact: Dr. A.A. Kostenko, Institute of Radiophysics and Electronics, Ukrainian Academy of Sciences, 12, ac. Proskura Street, 310085, Kharkov, Ukraine, e-mail: ukr-ursi@guokr.freenet.kiev.ua

URSI/COSPAR IRI Workshop

Modeling the Low Latitude Ionosphere

Sao Jose dos Campos, Brazil, 25-29 June 2001

Contact: Dr. D. Bilitza, Raytheon ITSS/NSSDC, Code 632, 10136 CRESTWOOD Road, MD 20895 Kensington USA, Phone: +1 301 286 0190, Fax: +1 301 286 1771, Email: Bilitza@nssdca.gsfc.nasa.gov

July 2001

ISSSE'01 - Questing More Significant Harmony and Integration: Systems/Devices and Softwares/Hardwares

Tokyo, Japan, 24-27 July 2001

Contact: ISSSE'01 Secretariat, Dept. of Elec. Eng., Science University of Tokyo, 1-3 Kagurazaka, Shinjuku Tokyo 162-8601 Japan, E-mail: issse01@ee.kagu.sut.ac.jp, <http://issse01.ee.kagu.sut.ac.jp/>

August 2001

AP-RASC 2001 - Asia-Pacific Radio Science Conference

Tokyo, Japan, 1-4 August 2001

Contact: AP-RASC Secretariat, c/o The Japanese URSI Committee, c/o Dr. Y. Furuhashi, Executive Director, National Space Development Agency of Japan (NASDA), World Trade Center Bldg., 2-4-1 Hamamatsu-cho, Minato-ku, Tokyo, 105-8060, Japan, Phone: +81-3-3438-6007, Fax: +81-3-5402-7934, E-mail: ap-rasc@kurasc.kyoto-u.ac.jp, <http://www.kurasc.kyoto-u.ac.jp/ap-rasc/>

September 2001

ICEAA'01 - International Conference on Electromagnetics in Advanced Applications

Torino, Italy, 10-14 September 2001

Contact: COREP - ICEAA'01, Politecnico di Torino, Corso Duca degli Abruzzi 24, I-10129 Torino, Italy, Tel. +390 11-564-4056, Fax +390 11-564-4099, E-mail: graglia@polito.it, <http://www.polito.it/~iceaa/>

June 2002

EUSAR 2002

Cologne, Germany, 4-6 June 2002

Contact: Dr. Richard Klemm, FFM-FGAN, Neuenahrer Strasse 20, D-53343 Wachtberg, Germany, Fax: +49 229 9435 618, Email: r.klemm@fgan.de

November 2002

ISAP-i02, 2002 Intermediate International Symposium on Antennas and Propagation

Yokosuka, Japan, 26-28 November 2002

Contact: Prof. Kenichi Kagoshima, Chairperson, ISAP i-02, Ibaraki University, 4-12-1 Nakanarusawa, Hitachi, 316-8511 Japan, Internet: <http://www.ieice.org/cs/ap/ISAP2002/>

URSI Homepage



In order to be kept informed about the activities of URSI, and the preparations of the upcoming URSI General Assembly in Maastricht (the Netherlands), 18-24 August 2002, please make it a habit of frequently visiting our Homepage at <http://www.intec.rug.ac.be/ursi>.

Please go to "Latest News" and you will see links to the latest additions.

Our young colleagues who are interested in obtaining a Young Scientist award to attend the General Assembly

will find an application form in this bulletin, pp. 5-6 (permission to make copies of this form is hereby granted), but more information will be available on our Homepage.

Our "Conference Calendar" is also available there with direct links to the conference sites of the URSI-sponsored meetings.

Please send your comments to improve our Homepage to : ursi@intec.rug.ac.be

News from the URSI Community



PROFILE OF A MEMBER COMMITTEE

IRELAND

Early Studies of Electromagnetic and Associated Topics in Ireland

The discoveries of Galvanic and Volta in the late 18th century, followed by those of oersted and Ampere in the early 19th century effectively culminated in Faraday's Law of Electromagnetic induction in 1831. Strange to relate, there appeared to be a long interval between Faraday's discovery and immediate technical applications.

In Ireland, however, Nicholas J. Callan (1799 - 1864) of the Pontifical University at Maynooth near Dublin had already independently developed the induction coil or step-up transformer (a crucial element in early wireless experiments) as early as 1836 well before Ruhmkoff in 1851. Furthermore, Callan's announcement of the Principle of the Self-Inducted Dynamo in 1838 preceded Werner Siemens to whom it is usually attributed in 1867. It now appears that Callan had no serious contact with Faraday but had studied at length the self inductive work of Joseph Henry at Princeton. Unfortunately, Callan's pioneering achievements tended to fade into obscurity after his death, but a comprehensive review by P.J. McLaughlin in 1964, published in the Proceedings of The Royal Irish Academy has to a significant extent rectified the situation (1).

One of the main problems of astronomy in the early 19th century centred on the status of the sun, additionally, the star system or galaxy in which the sun lies. The problem could not be solved without a far more powerful telescope than was available at that time and led William Parsons, Third Earl Rosse (1800-1867) from Parsonstown (now Birr in central Ireland) to design and build in the 1840's a telescope with a reflector of 72 inches (183ccm) which was, for over 70 years, the largest in the world. With its immense light collecting power it was able to show galaxies in sufficient detail to indicate the spiral shape of many of them (2). It is interesting to note that Parsons and Callan were well acquainted with each other.

Although James Clerk Maxwell will be forever associated with electromagnetic theory as described in his seminal paper in 1865 (3) his interest was almost certainly initially inspired by William Thomson, later Lord Kelvin (1824-1907) and originally from Belfast. As early as 1847, Thomson had made a mathematical investigation into the similarities between electromagnetic phenomena and elasticity (4). Some years later it occurred to Maxwell that the analogies between elastic strain and electrostatic forces

might be extended and applied to the propagation of electromagnetic forces through an appropriate medium. One of the strongest advocates of Maxwell's theory was George F. Fitzgerald (1841-1901) of Dublin who succeeded in extending the theory to non-uniform media involving reflection and refraction in 1879 (5). In 1882 he actually



Nicholas J. Callan (1799 - 1864)

proposed that "sufficiently rapid alternating currents (might be obtained) by discharging condensers through circuits of small resistance". (6) Then, in 1888, Heinrich Hertz published his epoch-making physical confirmation of Maxwell's theoretical predictions (7), leading Fitzgerald to state in a letter to Hertz dated 8 June 1888, that "I consider that no more important experiment had been made this century" (8).

It now seems beyond doubt that it was Fitzgerald who recognised even more vividly than Hertz himself the full import of his discovery. Indeed the almost immediate recognition and appreciation which was accorded to Hertz's experiments was very largely due to the quick and clear

vision generously displayed by Fitzgerald very soon after his discovery. (9). Today Fitzgerald is remembered mainly for the theory that bears his name. The Fitzgerald-Lorentz Contraction, which proved to be a milestone in Special Relativity.

An extraordinary coincidence occurred in 1898 when Fitzgerald was invited by Guglielmo Marconi (1847-1937, whose mother and wife were both Irish born) to participate in Marconi's ship-to-shore experimental transmissions reporting the Kingstown Regatta in Dublin Bay. A Callan induction coil was the key element in the spark-gap transmitter (10) (11). The test attracted international acclaim, including Queen Victoria, who asked Marconi to provide similar wireless equipment so that she could monitor the behaviour of the future King Edward VII on the Royal yacht in the English Channel!

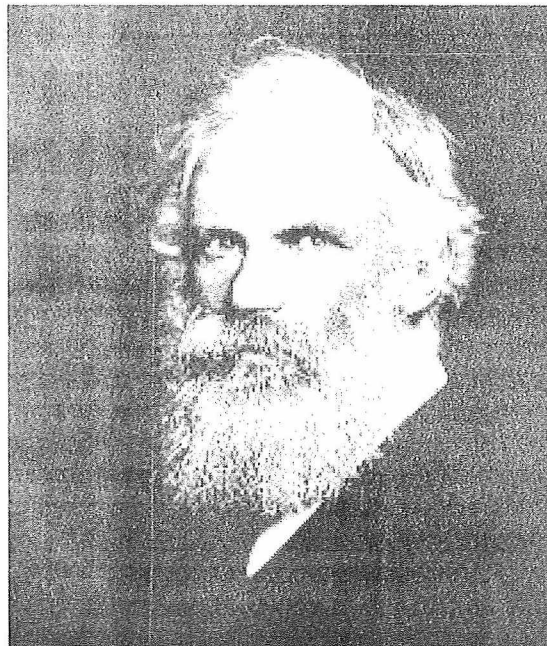
George J. Stoney (1826-1911) of Galway and, subsequently, Dublin is probably best remembered for coining the word 'electron' as the then discrete unit quantity of electricity. Furthermore in 1874 he actually succeeded from electrolysis experiments in measuring the elementary unit of charge as 10⁻²⁰ amperes (now coulombs) which - amazingly - is 1/16 of the correct value (12).

Following on the electromagnetic nature of light postulated by Maxwell, Stoney also stated in 1891 that orbital electrons were generators of electromagnetic waves as shown by atomic spectra. The significance of this in the context of modern optical and radio waves need hardly be exaggerated. This was pioneering work in what was then an obscure and difficult line of research. Stoney's studies, which also included the physics of the solar atmosphere and the earth's magnetism, are admirably assessed in an obituary by his colleague John Joly (of Calorimeter fame) in 1912 (13). It is worthwhile noting that Stoney also worked at the Rosse telescope for four years during the 1880's.

In 1891 Joseph Larmor (1857-1942), born in Antrim and subsequently working in Galway and Cambridge, attracted considerable attention, especially from newly emerging ionospheric scientists. He made the profound suggestion that the generation and maintenance of the earth's magnetic field might be explained by self-excited dynamo action in fluids undergoing relative motion within the core (14). Today Larmor is probably better known for his theorem relating to the precession of electron orbits in the atom under the influence of an external magnetic field. He was also the first to give the formula for the radiation of energy from an accelerating electron.

In the latter context mention must be made of the considerable (and largely underrated) achievements during the 1930's and 1940's of Eric Megaw (1908-1956). Megaw, born in Dublin and educated in Belfast played a major role in the development of the cavity magnetron during the early stages of radar (15).

Alexander Anderson (1958-1936), born in Derry, succeeded Larmor in the Chair of Physics in Galway in 1885 and is probably best recalled today for the Anderson AC Bridge method of measuring self-inductance (16). In fact he was very prolific indeed and was actually operating medical X-ray apparatus as early as 1900.



George F. Fitzgerald (1841 - 1901)

Finally, mention must also be made of the two great mathematicians in Ireland who were virtually contemporaries. They are of course, William R. Hamilton (1805-1865) from Dublin and George Boole (1815-1864) who, although English by birth, spent all his working life in Cork. Boole's efforts to express the "Law of Thought" (17) led him to develop Boolean algebra which today's engineers have found to be ideal both in the hardware design and software operation of computers and, by extension, to digital communications. He became known as the "Father of Symbolic Logic".

Hamilton is well known for his pioneering studies in the development of quaternions for vector fields and for the Hamiltonian formalism which became the foundation stone of quantum mechanics. In his position of Astronomer Royal in Ireland, however, he had already in 1832 at the age of 27 predicted conical refraction which takes place when light passes through biaxial crystals, i.e. crystals with two axes in which double refraction does not occur. This significant optical effect was elegantly verified by experiment in the same year by Humphrey Lloyd also of Dublin (18). The above summery whilst not being exhaustive is indicative of the main achievements in general electromagnetics and associated topics of Irish scientists during the 19th and early 20th centuries. The achievements have provided a solid foundation for the continuing - and expanding - interest in Radio Science in Ireland at the beginning of the 21st century.

The Royal Irish Academy

The Royal Irish Academy was founded in 1785 as a society for promoting the study of Science, Polite Literature and Antiquities. It is immediately set to work, publishing scholarly papers, amassing a library, taking innovative steps such as the establishment of a countrywide network of meteorological stations and offering open awards to encourage intellectual activity; At present, the encouragement may take a different form but the Academy's aim is unchanged, as is the commitment to serve the interests of the whole island of

Ireland. The membership is at present approximately 250 drawn equally from the Sciences and Humanities.

Much of the strength and vigour of the Academy today derives from its system of national committees. These committees, administered by the Academy and recognised officially by the Government, concern themselves with the organisation and development of their respective disciplines and provide the mechanism by which Ireland adheres to the more important relevant international bodies e.g. the International Council of Scientific Unions (ICSU), European Science Foundation (ESF), etc.

There are now 20 National Committees financed and serviced by the Academy and drawing their membership both from the Academy itself and from designated bodies such as universities, professional organisations, government departments and (where relevant) industry. The National Committee for Engineering Sciences representing engineering as a whole in Ireland was established in 1974 and the URSI subcommittee evolved from this in 1982 and comprises 15 members appointed for a 3-year period.

Activities of the Academy URSI Subcommittee

The URSI Subcommittee has now held 10 symposia over the past years. Invited speakers of international repute have included Professors M. Stuchly, P. Clarricoats, R. Adey, J. Wait (now sadly deceased) and Dr. G. Waters of the European Broadcasting Union. In addition to the invited papers, contributions from industry, government and third level institutions have also been highlighted. Major topics in communications have included digital techniques, propagation, mobile phones, radio astronomy, rf, microwaves, laser devices and systems, bioelectro-magnetics and new possibilities of communications.

Attention is also drawn to the very successful symposium in December 1998 held jointly with the Royal Society of London URSI National Committee in Dublin (19). The invited speakers were Professor D. Olver, Chairman of the UK URSI Panel who spoke on 100 Years of Radio and Mr. A. Kane, Chief Executive of Telecom Eireann (now Eircom) on Information Technology in Ireland.

At the Toronto URSI General Assembly, held in August 1999, three topics were accepted for presentation by Irish young scientists.

A second joint symposium with the UK URSI Panel was held from 3rd/4th July 2000 in Abingdon, Oxfordshire, adjacent to the Rutherford Appleton Laboratory where the UK Panel Secretariat is located.

The 11th Irish Symposium is already scheduled for March 2001 in Dublin and it is envisaged that Professor Lagasse will give the keynote discourse.

Prof. M.C. Sexton

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Ultrasound Imaging - Waves, Signals and Signals Processing

By Bjørn A. J. Angelsen, Professor of Biomedical Engineering
Norwegian University of Science and Technology - NTNU, Trondheim, Norway

General

This book is the first comprehensive text on all aspects of ultrasound propagation, signal modelling, and signal processing in medical ultrasound imaging. The presentation is in three levels, starting with an easy to read overview of methods and instrumentation for ultrasound imaging, introducing fundamental mathematical concepts of wave propagation, beam forming, and signal processing, proceeding to frontier research on wave propagation in heterogeneous, nonlinear tissue, and scattering from ultrasound contrast agents. A 115 page Appendix gives an overview of relevant mathematical methods. A 17 page alphabetical index gives easy reference to all topics.

Each Chapter starts with a content list and a review of basic results and structure of the presentation. A set of problems is attached to each Chapter. The 1416 pages covers in essence the material of five ordinary textbooks:

- Ultrasound bulk wave transducers.
- Ultrasound wave propagation and beam forming in homogenous tissue. An indepth analysis of absorption mechanisms in soft tissue is given.
- Ultrasound scattering in the Born approximation regime. Modelling of amplitude imaging, Doppler measurements, and Doppler imaging.
- Analysis of phase aberrations and multiple scattering (reverberations).
- Nonlinear wave propagation and scattering in heterogeneous tissue and tissue with ultrasound contrast agents.

The text contains much unpublished material.

Content

The text, consisting of two volumes with 12 Chapters, is devoted to mathematical modeling and analysis of ultrasound wave generation, propagation, and scattering in soft tissues and blood, and the use of ultrasound waves for imaging of soft tissue and Doppler measurements of blood and tissue velocities.

The first volume starts with an overview of methods and instrumentation for ultrasound imaging and Doppler measurements, followed by analysis of one-dimensional vibrations in plates and ultrasound transducers. The analysis is then expanded to waves in three-dimensional space, to describe propagation and beamforming in homogeneous, absorbing tissue. An in depth analysis of absorption mechanisms in soft tissue is given. Detailed analysis of beam forming with single element transducers and arrays then follows.

The second volume introduces propagation and scattering in the heterogeneous, absorbing tissue, with modelling of scattered and received signals for both amplitude backscatter imaging and Doppler measurements with Doppler imaging of blood and tissue velocities. Processing of the signals for amplitude and Doppler imaging is analyzed.

The scattered signal is first analyzed within the Born approximation regime in linearly elastic tissue, while in the two final Chapters, Chapter 11 and Chapter 12, 2nd order modifications to this scheme is introduced. Chapter 11 gives an in depth analysis of phase aberrations and multiple scattering (reverberations) in soft tissue, with a detailed analysis of correction algorithms with possibilities and problems. Chapter 12 gives an in depth analysis of nonlinear wave propagation and scattering in soft tissue, ending with an analysis of the nonlinear scattering from ultrasound contrast agents. Both these chapters will be of high interest to researchers in the field.

The text uses advanced mathematical and statistical analysis of the scattered waves, signals, and processing. An 115 page Appendix reviews some of the mathematical fundamentals that is used in the analysis. Each chapter ends with a set of problems and a large list of references as a guide to the research literature in the field.

The text has been developed over a period of 10 years to form a basis for two 40h courses on acoustics and signal processing in medical ultrasound imaging at NTNU - The Norwegian University of Science and Technology, Trondheim, Norway. The first course is taught in the 4th year of a 5 year engineering curriculum, while the second course is taught at the Ph.D. (dr.ing. level). NTNU is the main engineering school in Norway, with an enrollment of 2000 engineering students each year. The material therefore has had good review of many students over many years.

Chapter 11 and 12 includes much new material in the rapidly advancing field of propagation and scattering in the heterogeneous, nonlinear tissue, also containing ultrasound contrast agent. Together with the rest of the Chapters, this makes the text a reference for researchers and industrial development groups in the field of medical ultrasound imaging.

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Next year at the occasion of the XXVII URSI General Assembly in Maastricht, the Netherlands, five URSI Awards will be presented. We thought it appropriate to inform our Correspondents about these awards.

The Presidents of the Member Committees, the Chairs and Vice-Chairs of the scientific Commissions and the former Laureates of URSI Awards have been invited to send in nominations.

The awards are: the Balthasar van der Pol Gold Medal, the John Howard Dellinger Gold Medal, the Appleton Prize, the Booker Gold Medal and the Issac Koga Gold Medal. The rules for these awards are reproduced below.

Rules for the Award of the Balthasar van der Pol and John Howard Dellinger Gold Medals

1. The Balthasar van der Pol and the John Howard Dellinger Gold Medals honour the memory of two scientists who were closely associated with URSI for many years. The awards are made normally at intervals of three years on the occasion of the General Assembly of URSI. If the interval between two General Assemblies is either considerably greater or considerably less than three years, the Board of Officers is authorized to modify the date on which the next Medals will be awarded, the period referred to in Art. 2, and the dates referred to in Arts. 3 and 4.
2. The Medals are awarded to outstanding scientists whose achievements in any of the branches of science covered by the Commissions of URSI have been particularly valuable. No member of the URSI Board of Officers shall be eligible. The award is for career achievements of the candidate with evidence of significant contributions within the most recent six-year period.
3. The names of not more than two candidates may be submitted by any Member Committee of URSI, URSI Commission Chair or Vice-Chair, or former laureate of any URSI award. The names of the candidates must be received by the Secretary General of URSI not later than 15 August of the year preceding that of the General Assembly at which the award is to be made.
4. The name of each candidate must be accompanied by a nomination form (supplied by the URSI Secretary General) providing information on, inter alia :
 - (a) a general summary of the candidate's career and scientific activities;
 - (b) a review of the candidate's recent achievements, including references to the most important papers of which the candidate is the sole or a joint author published during the six-year period referred to in Article 2;
 - (c) an outline of the reasons for the nomination of the candidate.
5. As soon as possible after 15 August, copies of the nomination forms referred to in Article 4 shall be sent to the Awards Advisory Panel by the Secretary General.

The members of the Awards Advisory Panel shall be determined by the President of URSI, in consultation with the Board of Officers. The Panel is authorized, when necessary, to consult non-members regarding the merits of the candidates before submitting its own considered views to the Board of Officers not later than 1 March of the year of the General Assembly.

6. The Board of Officers has full authority to select the candidates to whom the awards will be made. In doing so it will take into account the information provided by the proposers of the candidates and also the views expressed by the Awards Advisory Panel. The Board of Officers will bear in mind that it is desirable to make the awards to candidates working in different branches of radio science, and that the J.H. Dellinger Gold Medal should be awarded preferably for work in the field of radio wave propagation.
7. The Board of Officers has full authority to withhold one or both awards if, in the opinion of the members, there is an insufficient number of qualified candidates.

Rules for the Award of the Appleton Prize

1. The Appleton Prize is awarded by the Council of the Royal Society of London and honours the memory of Sir Edward Appleton, F.R.S., President of URSI from 1934 to 1952. The Prize of £250 is awarded normally at intervals of three years on the occasion of the General Assembly of URSI. If the interval between two General Assemblies is either considerably greater or considerably less than three years, the Board shall consult the Royal Society before modifying the date on which the next award will be made, and the dates referred to in Articles 3, 5 and 6 below. The Council of the Royal Society reserves the right to discontinue the award.
2. The Appleton Prize is awarded for outstanding contributions to studies in ionospheric physics. The award is for career achievements of the candidate with evidence of significant contributions within the most recent six-year period. No member of the URSI Board of Officers shall be eligible.
3. Candidates may be nominated by any Member Committee of URSI, URSI Commission Chair or Vice-Chair or former laureate of any URSI award including the Appleton Prize, but not more than one candidate may be nominated by any one Committee or individual. The names of the candidates must be received by the Secretary General of URSI not later than 15 August of the year preceding that of the General Assembly at which the award is to be made.
4. The name of each candidate must be accompanied by a nomination form (supplied by the URSI Secretary General) providing information on, inter alia :
 - (a) a general summary of the candidate's career and scientific activities;
 - (b) a review of the candidate's recent achievements,

- including references to the most important papers of which the candidate is the sole or a joint author published during the six-year period referred to in Article 2;
- (c) an outline of the reasons for the nomination of the candidate.
5. As soon as possible after 15 August, copies of the nomination forms referred to in Article 4 shall be sent by the Secretary General to the Awards Advisory Panel, the members of which shall be determined by the President of URSI in consultation with the Board of Officers. The Panel is authorized to seek additional advice from outside its membership, regarding the merits of the candidates, before submitting its own considered views to the Board of Officers not later than 1 March of the year of the General Assembly.
 6. After considering the views submitted by the Awards Advisory Panel, the Board of Officers shall submit a short list of candidates in order of preference, with reasons for the order, to the Royal Society by 1 May of the year of the General Assembly and advise the Royal Society of the total number of candidates.
 7. The Council of the Royal Society has full authority to select the candidate to whom the Prize will be awarded or to withhold it if, in its opinion, there is no sufficiently qualified candidate.

Rules for the Award of the Booker Gold Medal

1. The Booker Gold Medal honours the memory of Professor Henry G. Booker who served as URSI Vice President, 1969-1975, and Honorary President until his death in 1988. The award is made normally at intervals of three years, on the occasion of the General Assembly of URSI. If the interval between two General Assemblies is either considerably greater or considerably less than three years, the Board of Officers is authorized to modify the date on which the next Medal will be awarded, the period referred to in Article 2, and the dates referred to in Articles 3 and 5.
2. The Medal is awarded for outstanding contributions to telecommunications or a related discipline of direct interest to URSI. The award is for career achievements of the candidate with evidence of significant contributions within the most recent six-year period. No member of the URSI Board of Officers shall be eligible.
3. Candidates may be nominated by any Member Committee or URSI, URSI Commission Chair or Vice-Chair or former laureate of any URSI award, but not more than one candidate may be nominated by any one Committee or individual. The names of the candidates must be received by the Secretary General of URSI not later than 15 August of the year preceding that of the General Assembly at which the award is to be made.
4. The name of each candidate must be accompanied by a nomination form (supplied by the URSI Secretary General) providing information on, inter alia:
 - (a) a general summary of the candidate's career and scientific activities;

- (b) a review of the candidate's recent achievements, including references to the most important papers of which the candidate is the sole or a joint author published during the six-year referred to in Article 2;
 - (c) an outline of the reasons for the nomination of the candidate.
5. As soon as possible after 15 August, copies of the nomination forms referred to in Article 4 shall be sent to the Awards Advisory Panel by the Secretary General. The members of the Awards Advisory Panel shall be determined by the President of URSI in consultation with the Board of Officers. The Panel is authorized, when necessary, to consult non-members regarding the merits of the candidates, before submitting its own considered view to the Board of Officers not later than 1 March of the year of the General Assembly.
 6. The Board of Officers has full authority to select the candidate to whom the Award will be made. In doing so it will take into account the information provided by the proposers of the candidate, and also the views expressed by the Awards Advisory Panel.
 7. The Board of Officers has full authority to withhold the award if, in the opinion of the members, there is not a qualified candidate.

Rules for the Award of the Issac Koga Gold Medal

1. The Issac Koga Gold Medal honours the memory of a scientist who was closely associated with URSI for many years. The award is made normally at intervals of three years, on the occasion of the General Assembly of URSI. If the interval between two General Assemblies is either considerably greater or considerably less than three years, the Board of Officers is authorized to modify the date on which the next Medal will be awarded, the period referred to in Article 2, and the dates referred to in Articles 3 and 5.
2. The Medal is awarded to a Young Scientist, of age not more than 35 on 30 September of the year preceding the General Assembly of URSI, who has made an outstanding contribution to any of the branches of science covered by the Commissions of URSI. The award is for career achievements of the candidate with evidence of significant contributions within the most recent six-year period. The Medal will be presented at the General Assembly.
3. The name of not more than one candidate may be submitted by any Member Committee of URSI, URSI Commission Chair or Vice-Chair or former laureate of any URSI Award. The names of the candidates must be received by the Secretary General of URSI not later than 15 August of the year preceding that of the URSI General Assembly.
4. The name of each candidate must be accompanied by a nomination form (supplied by the URSI Secretary General) providing information on, inter alia :
 - (a) a general summary of the candidate's career and scientific activities;
 - (b) a review of the candidate's recent achievements,

including references to the most important papers of which the candidate is the sole or a joint author published during the six-year referred to in Article 2;

(c) an outline of the reasons for the nomination of the candidate.

5. As soon as possible after 15 August, copies of the nomination forms referred to in Article 4 shall be sent to the Awards Advisory Panel by the Secretary General. The members of the Awards Advisory Panel shall be determined by the President of URSI in consultation with the Board of Officers. The Panel is authorized, when necessary, to consult non-members regarding the merits of the candidates, before submitting its own considered views to the Board of Officers not later than 1 March of the year of the General Assembly.
6. The Board of Officers has full authority to select the candidate to whom the Award will be made. In doing so it will take into account the information provided by the proposers of the candidate, and also the views expressed by the Awards Advisory Panel.
7. The Board of Officers has full authority to withhold the award if, in the opinion of the members, there is not a qualified candidate.

FORMER LAUREATES OF THE URSI AWARDS

Balthasar van der Pol Gold Medal

- 1963 : Sir Martyn RYLE (UK) : Application of the phase switching and aperture synthesis techniques to antennas for radio astronomy.
- 1966 : Prof. W.E. GORDON (USA) : Development of the incoherent scatter technique for ionospheric studies.
- 1969 : Dr. J.P. WILD (Australia) : Radio astronomy, including completion of a notable high-resolution radio-heliograph.
- 1972 : Dr. B.D. JOSEPHSON (UK) : Electronic effects in superconductors.
- 1975 : Prof. L.B. FELSEN (USA) : Application of ray-optical methods to studies of the propagation and diffraction of electromagnetic waves.
- 1978 : Dr. J.R. WAIT (USA) : Work on propagation of electromagnetic waves in the Earth's crust, and application of results.
- 1981 : Prof. D.S. JONES (UK) : Work on electromagnetic theory and, in particular, on the development of a number of analytical approaches.
- 1984 : Prof. W.G. FARNELL (Canada) : Work in physical electronics, in particular on microwave lenses, spin phonon interactions in solids, microwave acoustics, and acoustic microscopy.

1987 : Dr. T. HAGFORS (Norway) : Contributions to radar engineering and the theory and experimental development of the incoherent scatter techniques.

1990 : Prof. A.A. OLINER (USA) : Contributions to theory of guided waves, especially leaky waves, and novel radiating structures.

1993 : Prof. T.B.A. SENIOR (USA) : For theoretical contributions to diffraction and scattering of electromagnetic waves, with particular reference to the simulation of material effects in scattering.

1996 : Prof. R. HARRINGTON (USA) : For contributions to electromagnetics and the development of the method of moments

1999 : Prof. S. SHAMAI (Israel) : For contributions to the basic understanding of the potentials for and the limitations to information transfer through various communication channel models.

John Howard Dellinger Medal

1966 : Drs. J.H. CHAPMAN (Canada) : Radio wave propagation and the Alouette I topside ionosphere sounder.

1969 : Prof. H.M. BARLOW (UK) : Development of waveguides ; the characteristics of surface waves.

1972 : Prof. A. HEWISH (UK) : Advances in radio astronomy.

1975 : Prof. N.M. BRICE (USA) : Theory of the Earth's plasmopause and theoretical investigations of the physics of Jupiter's magnetosphere.

1978 : Prof. D.A. GURNETT (USA) : Investigations relating to electromagnetic and electrostatic wave propagation in the Earth's plasma environment.

1981 : Dr. J. FEJER (Germany) : Work on ionospheric modifications, parametric instabilities, ionospheric irregularities and incoherent scatter.

1984 : Mrs. I. DE PATER (the Netherlands) : Work on noise of planetary origin, the magnetosphere of Jupiter, and shock waves in the magnetosphere of the Earth.

1987 : Dr. R. GENDRIN (France) : Study of waves of natural origin propagating in the surroundings of the Earth, and their influence on the behaviour of the magnetosphere.

1990 : Dr. G. SWARUP (India) : Contribution to radioastronomy and cosmology, both in observational research and in conceiving and building radio telescopes.

1993 : Dr. P. STUBBE (Germany) : For the conception, construction, and operation of a high frequency

ionospheric modification facility in the auroral zone and for the theoretical advancement of the understanding of the associated plasma process.

1996 : Prof. T. OGUCHI (Japan) : For theoretical work on the polarization effects of non-spherical raindrops and the multiple scattering effects of hydrometeors.

1999 : Dr. A. ISHIMARU (USA) : For contributions to the theories and applications of wave propagation and scattering in random media an backscattering enhancement.

Appleton Prize

1969 : Prof. W.I. AXFORD (N.Z.) : Ionospheric and magnetospheric physics.

1972 : Prof. R.A. HELLIWELL (USA) : Radio wave propagation in the magnetosphere.

1975 : Dr. J.V. EVANS (USA) : Ionospheric physics, including application of the incoherent scatter technique.

1978 : Prof. P.M. BANKS (USA) : Theoretical and observational studies of the plasma flow between the ionosphere and the magnetosphere.

1981 : Dr. H. RISHBETH (UK) : Contributions to studies of the dynamics and structure of the ionosphere F region.

1984 : Prof. K.D. COLE (Australia) : Contributions to the understanding of the basic processes taking place in the magnetosphere and the ionosphere.

1987 : Dr. S. KATO (Japan) : contributions to the study of the ionosphere and the middle atmosphere, and in particular for the development of a highly sophisticated radar to observe the atmosphere.

1990 : Dr. A.V. GUREVICH (Russia) : contributions to the understanding of the non-linear properties of the ionosphere, particularly with respect to the interaction with high-power radiowaves.

1993 : Prof. T.B. JONES (UK) : For major contributions, individually and in scientific leadership, to the study of ionospheric physics, using radio and radar techniques.

1996 : Dr. D.T. FARLEY (USA) : For contributions to the development of the incoherent scatter radar technique and to radar studies of ionospheric instabilities.

1999 : Dr. R.F. WOODMAN (Peru) : For major contributions and leadership in radar studies of the ionosphere and neutral atmosphere.

Issac Koga Gold Medal

1984 : Dr. M. OHTSU (Japan) : Work on precise optical measurements, gas and semi-conductor lasers, including the frequency stabilization of these components.

1987 : Prof. D.M. POZAR (USA) : Contributions to the analytical, numerical and experimental study of printed antennas and phased arrays, and related problems in applied electromagnetics.

1990 : Dr. M. LOCKWOOD (UK) : Study of non-thermal ionospheric plasma and ionospheric convection.

1993 : Prof. G. REBEIZ (USA) : For contributions to the advancement of sub-millimetre wave antenna science and technology.

1996 : Prof. Z. POPOVIC (USA, but Yugoslavian nationality) : For contributions to the field of active microwave circuits, in particular, the original demonstration of the planar grid oscillator, as well as continuing efforts with quasi optical amplifiers and active antennas.

1999 : Prof. E. MICHIELSEN (USA, but Belgian Nationality) : For contributions to computational electromagnetics, in particular the development of fast frequency and time domain integral equation analysis techniques and nature-driven synthesis methods.

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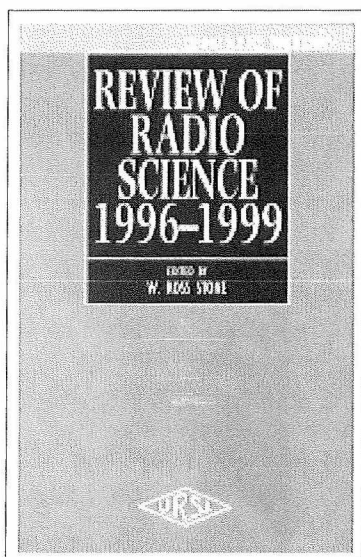
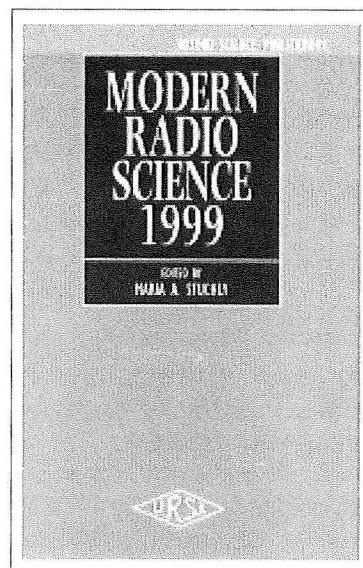
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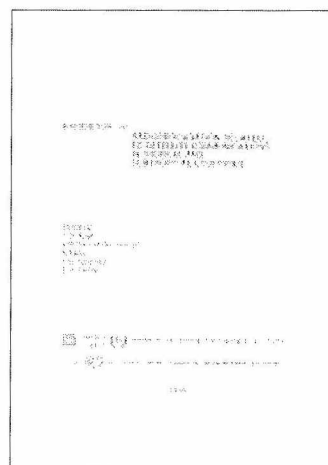
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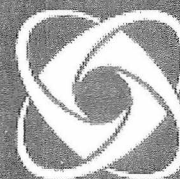


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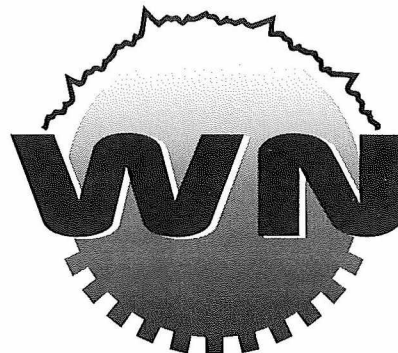
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