



IEEE

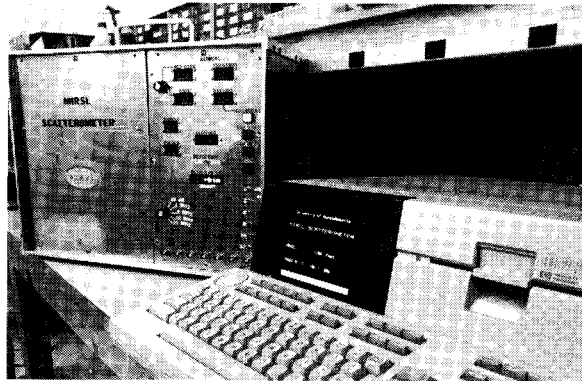
Geoscience and remote sensing society

NEWSLETTER

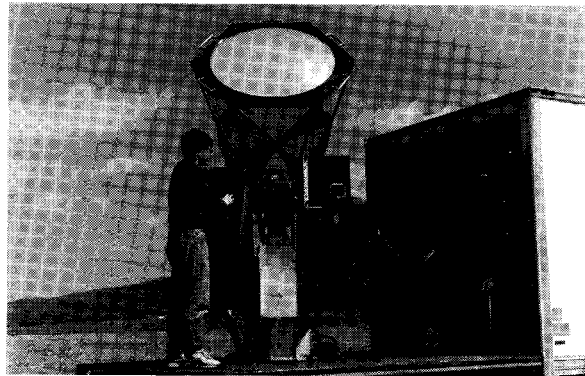


Editor: Christopher S. Ruf
Cumulative Issue #107

September 1998
ISSN 0161-7869



1



2



3

See page 3 for a description of image.

Table of Contents

IEEE GRSS AdCom, Officers and Committee Chairs	2
Editor's Comments	3
President's Message	3
Editorial Board Members	4
1998 AdCom Members' Names and Addresses	5
New Newsletter Associate Editor for University Profiles	6
Committee on Radio Frequencies Request.	6
Robert E. McIntosh	7
Introduction to the Special Section on the Electromagnetic Properties of Sea Ice	8
Message from the Bylaws and Constitution Chairman	10
Call for Nominations	10
Upcoming Conferences	back cover

Notice To Potential Advertisers

The IEEE GRSS Newsletter publishes paid advertisements for job openings, short courses, products, and services which are of interest to the GRSS membership. The rates for advertisements published in the Newsletter are:

Size	Dimensions	Per Insertion
Full page	7" x 10"	\$400.00
Half page		\$300.00
Vertical	3.375" x 10"	
Horizontal	7" x 4.875"	
Quarter page	3.375" x 4.875"	\$205.00

Only black-and-white ads will be published. The Editor reserves the right to reject advertisements. Please address all enquiries to:

Ms. Susan Schneiderman
Advertising Sales Manager
IEEE Magazines/Newsletters
445 Hoes Lane
Piscataway, NJ 08855-1331
Tel: (732) 562-3946
Fax: (732) 981-1855
s.schneiderman@ieee.org

Newsletter Input and Deadlines

The following is the schedule for the GRSS Newsletter. If you would like to contribute an article, please submit your input according to this schedule. Input is preferred in WordPerfect or ASCII for IBM format (please send disk and hard copy) as IEEE now uses electronic publishing. Other word processing softwares, including those for Macintosh, are also acceptable, however, please be sure to identify the format on the disk and include the hardcopy.

GRSS Newsletter Schedule

Month	March	June	Sept	Dec
Input	Jan 15	April 15	July 15	Oct 15
Issue Mailed	March 8	June 2	Sept 1	Dec 7

IEEE GRSS AdCom, Officers and Committee Chairs - 1998 GRS-29 (Division IX)

<i>President</i> Nahid Khazenie	<i>Fellow Search</i> Kiyoo Tomiyasu	<i>1998 AdCom Members</i> Andrew Blanchard Albin J. Gasiewski Thomas J. Jackson Nahid Khazenie Charles Luther Kiyoo Tomiyasu
<i>Vice President of Meetings and Symposia</i> Karen M. St. Germain	<i>Membership Development</i> Albin Gasiewski	<i>1999 AdCom Members</i> Melba M. Crawford Karen M. St. Germain David Goodenough James A. Gatlin Eni G. Njoku
<i>Vice President of Operations and Finance</i> James A. Gatlin	<i>Nominations</i> David Goodenough	<i>2000 AdCom Members</i> M. Halikainen R. Narayanan K. Sarabandi H. Shimoda V. Singhroy W. Wiesbeck
<i>Vice President of Professional Activities</i> Eni G. Njoku	<i>Transactions Editor</i> Leung Tsang	<i>Honorary Life Members</i> Keith Carver Fawwaz Ulaby
<i>Vice President of Technical Committees</i> Charles Luther	<i>Newsletter Editor</i> Christopher S. Ruf	<i>Ex Officio</i> <i>With Vote:</i> Andrew J. Blanchard (Past-President) David Goodenough (Past-President) Martti Hallikainen (Senior Past-President)
<i>Secretary</i> Thomas J. Jackson	<i>IGARSS '98</i> Leung Tsang	<i>Without Vote:</i> Chapter Chairs Standing Committee Chairs Honorary Life Members Irving Engelson Eric Herz
<i>Executive Vice President</i> Werner Wiesbeck	<i>IGARSS '99</i> Werner Alpers	
<i>Awards</i> Werner Wiesbeck	<i>IGARSS 2000</i> Andrew J. Blanchard and David Goodenough	
<i>Chapter and Speakers Committee</i> Eni G. Njoku	<i>IGARSS 2001</i> Anthony K. Milne	
<i>Constitution and Bylaws</i> Ram Narayanan	<i>IGARSS 2002</i> Ellsworth LeDrew	
<i>Education</i> Melba Crawford	<i>PACE</i> John A. Reagan	
<i>Fellows</i> Andrew Blanchard	<i>Society on Social Implications of Technology</i> Keith Raney	

Postal Information and Copyright Notice

IEEE Geoscience and Remote Sensing Newsletter is published quarterly by the Geoscience and Remote Sensing Society of the Institute of Electrical and Electronics Engineers, Inc., Headquarters: 3 Park Avenue, 17th floor, New York, NY 10016-5997. \$1.00 per member per year (included in Society fee) for each member of the Geoscience and Remote Sensing Society. Printed in U.S.A. Periodicals postage paid at New York, NY and at additional mailing offices. **Postmaster:** Send address changes to IEEE Geoscience and Remote Sensing Society Newsletter, IEEE, 445 Hoes Lane, Piscataway, NJ 08854.

© 1998 IEEE. Permission to copy without fee all or part of any material without a copyright notice is granted provided that the copies are not made or distributed for direct commercial advantage, and the title of the publication and its date appear on each copy. To copy material with a copyright notice requires special permission. Please direct all inquiries or requests to the IEEE Copyrights Manager.

IEEE Customer Service Phone: (732) 981-1393, Fax: (732) 981-9667.



Editor's Comments



Christopher S. Ruf
Department of Electrical
Engineering
121 Electrical Engineering East
The Pennsylvania State
University
University Park, PA
16802-2705
TEL: 814.865.2363
FAX: 814.865.7065
EMail: ruf@ktb.ee.psu.edu

Our cover figure and the enclosed obituary mark the passing of Robert E. McIntosh. Prof. McIntosh made many significant contributions to the remote sensing community, as an educator, a researcher, and through voluntary service to the IEEE GRS-S. He was certainly an important part of my education as a graduate student at the University of Massachusetts. We will miss him.

A very important topic is raised in the article "Committee on Radio Frequencies Request" included in this issue. It concerns frequency allocation and protection for use in Earth remote sensing. I urge you all to read the article and to consider helping the author, Ram Narayanan, by identifying and justifying spe-

cific millimeter wave bands that should be allocated for our use. As commercial technology and applications move up above the 60 GHz oxygen lines, we should all be concerned about the potential for increased interference.

I would like to welcome a new member to the Editorial Board of this Newsletter. Prof. Steven Reising of the University of Massachusetts at Amherst joins us as Associate Editor for University Profiles. He replaces outgoing Associate Editor Michael Collins. A brief biography and contact information for Steve are included in this issue, and parties interested in preparing a feature article on their University-related remote sensing activities are invited to contact him directly.

Cover Figure Information

1) The C-band Scatterometer (C-Scatt) radar system was the first remote sensing instrument developed by Bob McIntosh at MIRSL (picture was taken in around 1984 at MIRSL). It was initially used to measure the radar cross section of foliage and terrain. In 1988 it was rebuilt for airborne radar cross-section measurements of the ocean surface.

2) Constructed in 1993, the dual frequency (Ka and W-band), polarimetric CPRS (Cloud Profiling Radar System) is one of the most advanced ground radars developed at MIRSL (picture was taken in 1996 at an experiment near Penn State University).

3) One of the latest radars built at MIRSL was the UMass-

President's Message



Nahid Khazenie
NASA Earth Sciences Program
Office
NASA Goddard Space Flight
Center
Mail Code 170
Greenbelt, MD 20771
USA
TEL: 703.917.8655
nkhazeni@pop100.gsfc.nasa.gov

The 1998 IEEE International Geoscience and Remote Sensing Symposium (IGARSS'98) was a great success. Over 1,100 attendees representing 40 countries participated in this meeting. IGARSS participation has almost doubled in the past decade. Representation from 40 nations is a clear illustration of our society's success at being a truly global and transnational organization. On behalf of our society, I commend

Leung Tsang, General Chair, Yasuo Kuga and Dale Winebrenner, Technical Co-Chairs, and the entire organizing committee for planning and executing an outstanding international meeting.

I am happy to report that GRSS is taking several key steps towards broadening its sponsorship and co-sponsorship of workshops and meetings focusing on the education community. These efforts are in response to the increased need and interest by the education community in the latest developments and resources for teaching comprehensive, interdisciplinary Earth science and remote sensing technologies and applications. IGARSS'98 held three full sessions titled "Earth System Science EDUCATIONAL INITIATIVES." These sessions covered topics such as Innovations in Remote Sensing Education Programs and Information Systems, Remote Sensing for Management Decisions, and Software and Data Sets for Education and Public Information.

GRSS plans to sponsor several educationally oriented workshops and meetings on the current resources available and the emerging trends for remote sensing technology. They will focus on the K-12 and College-level community. The objective of these activities is to provide the educators with an overview of Earth science and its applications and the status of sensor



President's Message

continued from page 3

technology and platform characteristics related to these applications. Detailed specifics about our planned activities for 1999 will be published in the December issue of this Newsletter as well as posted on the GRSS web site.

One other item of interest is the Millennium Bug, the Century Date Change Problem. The IEEE Technical Activities Board approved the formation of the TAB Year 2000 Technical Information Committee (Y2K Committee) at its June 1998 meeting. The Y2K Committee is composed of Year 2000 experts from industry, government, and academia. It has been working intensely for the past year to produce a Technical Information Statement on the Year 2000 situation. They have produced important results leading to a decision by IEEE to take on a Year 2000 clearinghouse project. This project will seek to provide tools, knowledge, and coordinated

communication such as: key terminology definitions; a framework for communication; quantitative risk assessment tools; quantitative data based on precise, clearly defined measures; and a monitored medium for sharing techniques and experiences. The result will be a primarily web-based global information clearinghouse to provide guidance for technical professionals on the Century-Digits Change Problem. Mark P. Haselkorn of the University of Washington and NSF chairs the Y2K Committee.

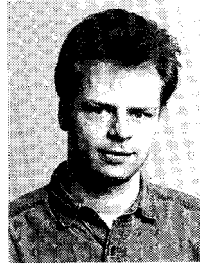
By now you may have received the results of balloting for society elections of three GRSS Administrative Committee (AdCom) positions. I offer my congratulations to those elected.

As always I look forward to receiving your questions, concerns, and thoughts.

Newsletter Editorial Board Members:



Christopher S. Ruf, *Editor*
Department of Electrical Engineering
121 Electrical Engineering East
The Pennsylvania State University
University Park, PA 16802-2705
TEL: 814.865.2363
FAX: 814.865.7065
Email: ruf@ktb.ee.psu.edu



Brian Laursen,
Associate Editor for European Affairs
Department of Electromagnetics Systems
Building 348
Technical University of Denmark
Lyngby, DENMARK
TEL: 45.45.88.14.44
FAX: 45.45.93.16.34
Email: bl@emi.dtu.dk



Steven C. Reising,
Associate Editor for University Profiles
Assistant Professor,
Electrical and Computer Engineering
Department
113B Knowles Engineering Building
University of Massachusetts
Amherst, MA 01003-4410
TEL: 413.577.0697
FAX: 413.545.4652
Email: reising@ecs.umass.edu



David McLaughlin, Associate Editor for
Experimenter's Notebook
Electrical and Computer Engineering
Department
Radar Systems Laboratory
Northeastern University
Boston MA 02115
TEL: 617.373.2032
FAX: 617.373.8970
Email: d.mclaughlin@nUNET.neu.edu



Timothy Kane
Associate Editor for Review Articles
Communications and Space Sciences
Laboratory
318 Electrical Engineering East
The Pennsylvania State University
University Park, PA 16802-2705
TEL: 814.863.9727
FAX: 814.863.8457
Email: tj7@psu.edu



Mark Sletten, Associate Editor for
Organizational Profiles
Code 7255
Naval Research Laboratory
4555 Overlook Ave. SW
Washington, DC 20375
TEL: 202.404.7971
FAX: 202.767.3303
Email: msletten@ccf.nrl.navy.mil

1998 AdCom Members' Names and Addresses

Dr. Nahid Khazenie (AdCom 1996-1998)
President, IEEE-GRSS
 NASA Goddard Space Flight Center
 NASA's Earth Sciences Program
 Mail Code 170
 Greenbelt, MD 20771 USA
 Phone: 703-917-8655
 FAX: 703-917-8656
 E-Mail: nkazeni@pop100.gsfc.nasa.gov

Dr. Werner Wiesbeck (AdCom 1998-2000)
GRSS Executive Vice President
 University of Karlsruhe
 Institute for High Frequency and Electronics
 Kaiserstrasse 12
 76128 Karlsruhe GERMANY
 Phone: 49-721-608-2522 (or 2523)
 FAX: 49-721-691-865
 E-Mail: werner.wiesbeck@etec.uni-karlsruhe.de

Dr. Thomas J. Jackson (AdCom 1996-1998)
GRSS Secretary
 USDA-ARS Hydrology Lab
 104 Bldg 007 BARC-West
 Beltsville, MD 20705 USA
 Phone: 301-504-8511
 FAX: 301-504-8931
 E-Mail: tjackson@hydrolab.arsusda.gov

Dr. James A. Gatlin (AdCom 1997-1999)
GRSS VP of Operations and Finance
 NASA Goddard Space Flight Center
 Mail Code 730
 Greenbelt, MD 20771 USA
 Phone: 301-286-6680
 FAX: 301-286-0235
 E-Mail: j.gatlin@ieec.edu

Mr. Charles A. Luther (AdCom 1996-1998)
GRSS VP of Technical Committees
 Office of Naval Research
 800 N. Quincy Street
 Arlington, VA 22217 USA
 Phone: 703-696-4123
 FAX: 703-696-3390
 E-Mail: lutherca@onr.navy.mil

Dr. Eni G. Njoku (AdCom 1997-1999)
GRSS VP of Professional Activities
 M/S 300-233
 Jet Propulsion Laboratory
 4800 Oak Grove Drive
 Pasadena, CA 91109 USA
 Phone: 818-354-3693
 FAX: 818-354-9476
 E-Mail: eni.g.njoku@jpl.nasa.gov

Dr. Karen M. St. Germain (AdCom 1997-1999)
GRSS VP of Meetings and Symposia
 NRL Remote Sensing Division, Code 7223
 4555 Overlook Avenue, SW
 Washington, DC 20375-5351 USA
 Phone: 202-767-3443
 FAX: 202-767-9194
 E-Mail: ksaint@ultraimg.nrl.navy.mil

Dr. Andrew J. Blanchard
GRSS Past President and IGARSS 00 General Co-Chairman
 College of Engineering
 University of Missouri-Columbia
 W1024 Engineering Building East
 Columbia, Missouri 65211 USA
 Phone: 573-882-4403
 FAX: 573-882-2490
 E-Mail: ajb@ecn.missouri.edu

Dr. Melba M. Crawford (AdCom 1998-1999)
 Director of Educational Initiatives
 Center for Space Research
 3925 W. Braker La., Suite 2000
 The University of Texas at Austin
 Austin, TX 78712-5321 USA
 Phone: 512-471-5573
 FAX: 512-471-3570
 E-Mail: crawford@csr.utexas.edu

Dr. Albin J. Gasiewski (AdCom 1996-1998)
 NOAA Environmental Technology Lab
 325 Broadway R/E/ET1
 Boulder, CO 80303 USA
 Phone: 303-497-7275
 FAX: 303-497-3577
 E-Mail: agasiewski@etl.noaa.gov

Dr. David G. Goodenough (AdCom 1997-1999)
IGARSS 00 General Co-Chairman
 Pacific Forestry Centre
 Natural Resources Canada
 506 West Burnside Road
 Victoria, BC V8Z 1M5 CANADA
 Phone: 250-363-0776
 FAX: 250-363-0775
 E-Mail: dgoodeno@pfc.forestry.ca

Dr. Martti T. Hallikainen
 GRSS Past President
 Helsinki University of Technology
 Laboratory of Space Technology
 P. O. Box 3000
 FIN-02015 HUT FINLAND
 Phone: 358-9-451-2371
 FAX: 358-9-451-2898
 E-Mail: Martti.Hallikainen@hut.fi

Dr. Ram M. Narayanan (AdCom 1998-2000)
 University of Nebraska-Lincoln
 Dept. of Electrical Engineering
 209N Walter Scott Engineering Center
 P. O. Box 880511
 Lincoln, NE 68588-0511 USA
 Phone: 402-472-5141
 FAX: 402-472-4732
 E-Mail: rnarayanan@unl.edu

Dr. Kamal Sarabandi (AdCom 1998-2000)
 Dept. of Electrical Ent. & Computer Science
 Ann Arbor, MI 48109-2122 USA
 Phone: 313-936-1575
 FAX: 313-647-2106
 E-Mail: saraband@eecs.umich.edu

Dr. Haruhisa Shimoda (AdCom 1998-2000)
 National Space Development Agency of Japan
 Earth Observation Research Center
 Roppongi First Bldg. 14F
 1-9-9 Roppongi Minato-ku Tokyo 106 JAPAN
 Phone: 81-3-3224-7054
 FAX: 81-3-3224-7051
 E-Mail: shimoda@eorc.nasda.go.jp

Dr. Vernon Singhroy (AdCom 1998-2000)
 Canada Centre for Remote Sensing
 588 Booth Street
 Ottawa, K1A 0Y7 CANADA
 Phone: 613-947-1215
 FAX: 613-947-1387
 E-Mail: singhroy@ccrs.nrcan.gc.ca

Dr. Kiyo Tomiyasu (AdCom 1996-1998)
 Lockheed Martin Corp.
 366 Hilltop Road
 Paoli, PA 19301-1211 USA
 Phone: 610-531-5740
 FAX: 610-644-8521
 E-Mail: kiyo.tomiyasu@lmco.com

Dr. Keith R. Carver
 Honorary Life Member
 University of Massachusetts
 Dept. of Electrical & Computer Engineering
 Amherst, MA 01003 USA
 Phone: 413-545-1665
 FAX: 413-545-4611
 E-Mail: kcarver@zonker.ecs.umass.edu

Dr. Fawwaz T. Ulaby
 Honorary Life Member
 The University of Michigan
 Dept. of Electrical Ent. & Computer Science
 Radiation Laboratory/3328 EECS Bldg
 Ann Arbor, MI 48109-2122
 USA
 Phone: 313-764-0501
 FAX: 313-747-2106
 E-Mail: ulaby@eecs.umich.edu

Tammy Stein
 Director of Conferences & Information Services
 IEEE Geoscience and Remote Sensing Society
 17906 St Emillion Court
 Spring, Texas 77379 USA
 Phone: 281-251-6067
 FAX: 281-251-6068
 E-Mail: tstein@phoenix.net

Dr. Leung Tsang
IGARSS 98 General Chairman and Transactions Editor
 University of Washington
 Electromagnetics and Remote Sensing Laboratory
 Department of Electrical Engineering, FT-10
 Seattle, WA 98195 USA
 Phone: 206-685-7537
 FAX: 206-543-3842
 E-Mail: tsang@ee.washington.edu

Dr. Christopher S. Ruf
Newsletter Editor
 The Pennsylvania State University
 121 Electrical Engineering East
 University Park, PA 16802-1705 USA
 Phone: 814-865-2363
 FAX: 814-865-7065
 E-Mail: ruf@ktb.ee.psu.edu

R. Keith Raney
GRSS Rep. to Soc. on Social Implications of Technology
 Johns Hopkins Univ. Applied Physics Lab
 Space Dept.
 Johns Hopkins Rd.
 Laurel, MD 20723-6099 USA
 Phone: 301-953-5384
 FAX: 301-953-5548
 E-Mail: Keith.Raney@jhuapl.edu

John A. Reagan
 PACE Rep.
 University of Arizona
 ECE Dept., Bldg. 104, Rm. 230
 Tucson, AZ 85721-0104 USA
 Phone: 520-621-6193
 FAX: 520-621-8076
 E-Mail: reagan@ece.arizona.edu

Dr. Werner Alpers
IGARSS 99 General Chairman
 University of Hamburg
 Institute of Oceanography
 Troplowitzstr 7
 Hamburg D-22529 GERMANY
 Phone: +49-40-4123-5432
 FAX: +49-40-4123-5713
 E-Mail: alpers@ifm.uni-hamburg.de

Dr. Anthony K. Milne
 IGARSS 01 General Chairman
 University of New South Wales
 Office of Postgraduate Study
 Sydney, NSW 2052 AUSTRALIA
 Phone: 61-2-9385-2731
 FAX: 61-2-9385-3733
 E-Mail: t.milne@unsw.edu.au

Dr. Ellsworth LeDrew
 IGARSS 02 General Chairman
 University of Waterloo
 Geography Department
 200 University Ave. West
 Waterloo, Ontario M2L 3G1 CANADA
 Phone: (519) 888-4567 x 2783
 FAX: (519) 888-6768
 E-Mail: ells@watle.uwaterloo.ca



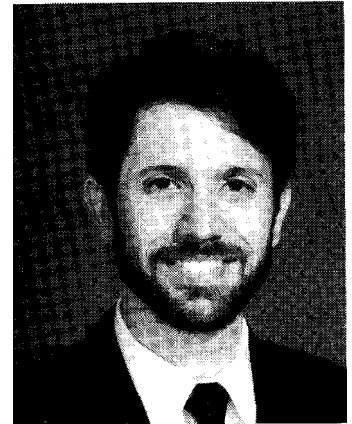
New Newsletter Associate Editor for University Profiles

Steven C. Reising, Assistant Professor
Electrical and Computer Engineering Department
113B Knowles Engineering Building
University of Massachusetts
Amherst, MA 01003 -4410
Ph: (413) 577-0697 E-mail: reising@ecs.umass.edu
Fax: (413) 545-4652
http://www.ecs.umass.edu/ece/gradfac/reising.html

Steven C. Reising (S'88-M'98) received the B.S. degree in electrical engineering in 1989 and the M.S. degree in 1991, both from Washington University, St. Louis, Missouri. He received the Ph.D. degree from Stanford University in June 1998. In July 1998, Dr. Reising joined the Microwave Remote Sensing Laboratory of the University of Massachusetts, Amherst, as Assistant Professor of Electrical and Computer Engineering.

From 1988 until 1991, he was a Research Assistant in the Magnetics and Information Science Center at Washington University, where he performed experimental investigations on the micromagnetic sources of noise in hard disk magnetic recording. From 1991 to 1998, he was a Research Assistant in the VLF Group of the Space, Telecommunications and Radioscience (STAR) Laboratory at Stanford University, under the direction of Prof. Umran S. Inan. At

Stanford, Dr. Reising developed data acquisition software for continuous high-resolution radio wave measurements and gained extensive experience in field deployment of remote sensing hardware at four sites in rural Alaska and at Palmer Station, Antarctica. His Ph.D. dissertation topic was the remote sensing of the electrodynamic coupling



between thunderstorm systems and the mesosphere and lower ionosphere.

Dr. Reising received the first prize in the URSI Student Paper Competition at the 1998 National Radio Science Meeting in Boulder, Colorado. In 1994, he received a NASA Graduate Student Fellowship in Earth Systems Science and completed an internship in the Microwave Sensors Branch of NASA Goddard Space Flight Center.

Dr. Reising is a member of the American Geophysical Union, the American Meteorological Society, Tau Beta Pi, and Eta Kappa Nu.

Committee on Radio Frequencies Request

I serve on the National Research Council's Committee on Radio Frequencies. One of the primary tasks of this committee is to make recommendations on frequency allocations and to protect frequency bands for scientific use, such as radioastronomy and passive remote sensing. The committee is currently in the process of making recommendations for frequencies above 71 GHz, i.e., in the millimeter-wave bands. The higher frequency limit is not specified. Currently, the only frequency band that is protected above 71 GHz is the 94.0-94.1 GHz band for cloud profiling radar applications.

Since this is a matter of relevance and concern to the remote sensing community, I am requesting your input on frequencies that need to be protected. It is also to be noted that some frequencies need to be protected because their harmonics may fall in bands of interest. Please provide the following data on frequencies that are or will be of interest to you in the future.

1. Frequency or frequency range (eg., XX GHz or YY-ZZ GHz),
2. Fairly detailed justification for protection (eg., presence

of absorption band of chemical species, third harmonic falls in absorption band of interest, etc.),

3. Sharing/Non-sharing (Sharing = band can be shared with other protected users, ea., same band can be used for radioastronomy and for passive remote sensing; Non-sharing = band must exclusively be used only for application specified).

These matters will be discussed at the World Radio Conference (WRC'99) in Geneva in the October-November 1999 timeframe, so it is important for your comments to be communicated at the earliest. Please forward your comments to me by November 1, 1998. My coordinates are:

Dr. Ram M. Narayanan
Dept. of Electrical Engineering
209N Walter Scott Engineering Center
University of Nebraska
Lincoln, NE 68588-0511, U.S.A.
Tel: +1 (402) 472-5141, Fax: +1 (402) 472-4732
EMail: rnarayanan@unl.edu



Robert E. McIntosh 1940- 1998

Our colleague and friend, Robert E. McIntosh, Jr., passed away on July 10, 1998 at the age of 58. Bob contracted a rare form of cancer, known as Zollinger-Ellison disease, in 1994. Throughout this ordeal, Bob kept a positive attitude, and a desire to confront the problem as directly as possible.

Bob was prominent in two IEEE Societies, serving as Treasurer, and then President of the Geoscience and Remote Sensing Society (GRS-S), and as Newsletter Editor, Secretary- Treasurer, and President of the Antennas



Bob was a Fellow of the IEEE, and was inducted into the National Academy of Engineering in 1997. He received a number of University awards, including the Senior Faculty Scholarship Alumni Award (1984), the General Electric Teaching Award (1988), and the University Research Fellowship (1995). He also received the *Hobart Newell Award* from Worcester Polytechnic Institute as a distinguished graduate from that institution's Electrical and Computer Engineering Department. Professional awards included the IEEE

and Propagation Society (AP-S). He served as Editor of the *Transactions on Antennas and Propagation* and as a Guest Editor for the *Transactions on Geoscience and Remote Sensing* and *Proceedings of the IEEE*. He was General Chairman of the 1976 AP-S Symposium and the 1985 GRS-S Symposium (IGARSS'85), both of which were held in Amherst, Massachusetts. He was also well known within the IEEE Microwave Theory and Techniques Society (MTT-S), and the International Union of Radio Science (URSI). Bob spent his entire career of 31 years at the University of Massachusetts, Amherst, rising to the rank of Distinguished University Professor in 1996. As a research-oriented Professor, he directed 20 Ph.D. dissertations, and co-authored over 80 journal papers. He spent one year as acting head of the Department of Electrical and Computer Engineering, 17 years as Co-Director of the Microwave Remote Sensing Laboratory, and was known throughout the microwave community for his leadership to establish the Microwave and Electronics Group within the ECE Department. Education of industrial students was a feature of this program, whose success can be measured by the awarding of over 180 M.S. degrees to employees from Raytheon, Lockheed-Sanders, and General Electric. Bob was also co-founder of Quadrant Engineering Inc., which is located in Amherst and specializes in building microwave and millimeter wave systems for remote sensing applications.

Centennial Medal, the GRS-S Distinguished Service Award (1985) and the GRS-S Distinguished Technical Achievement Award (1997).

Bob McIntosh was born in Hartford, Connecticut on January 19, 1940. He received the B.S. degree (1962) from Worcester Polytechnic Institute, the M.S. degree from Harvard University (1964), and the Ph.D. from the University of Iowa (1967). He married Anne Potvin on July 7, 1962, and is survived by Anne and their five sons. Robert III was born in 1963, Edgar in 1965, Michael in 1967, Bill in 1970, and Matt in 1972. Anne and all of the sons except Michael (Ph.D., University of North Carolina) received the B.S. and/or M.S. degrees from the University of Massachusetts. Bob and Anne were dedicated parents, and did well in raising their sons to exhibit the same moral character that they possessed.

Memorial contributions may be made to the Robert E. McIntosh Memorial Scholarship Fund, in care of the Department of Electrical and Computer Engineering, 201 Marcus Hall, University of Massachusetts, Amherst, MA 01003, or in care of the Worcester Polytechnic Institute, Department of Electrical and Computer Engineering, Worcester, MA 01609.

Submitted by:
Cal Swift,
Dan Schaubert,
Jim Mead



Introduction to the Special Section on the Electromagnetic Properties of Sea Ice

Approximately 13 % of the world's oceans is covered by sea ice during some portion of the year. This volume of ice has significant effects on the world's climate, ocean currents, and biological ecosystems. Furthermore, the extent of sea ice cover is used as an input parameter in many meteorological forecasting models. It is difficult to obtain ground-based measurements over large regions of the Arctic, where the distances are vast, the climate is hostile, and the operations are expensive. The material composition of sea ice varies with temperature and winds. Thus remote sensing of sea ice may be the preferred method to obtain quantitative information about sea ice.

This Special Section of the IEEE Transactions on Geoscience and Remote Sensing presents results obtained by the Accelerated Research Initiative (ARI) on the Electromagnetic Properties of Sea Ice (EMPOSI) that was sponsored by the Office of Naval Research (ONR). Briefly stated, the ARI had three broad objectives:

- To better understand the mechanisms and processes that link the morphological characteristics with its electromagnetic properties.
- To further develop and verify predictive models for the interactions of visible and microwave radiation with sea ice.
- To develop and verify the techniques in the mathematical

theory of inverse scattering theory that are applicable to problems arising from interactions of electromagnetic waves with sea ice.

Remote sensing is an application of electromagnetic inverse scattering theory—so called because it inverts the traditional direct (or forward) concept of physical phenomena: the cause determines its effects. Inverse theories seek to determine the cause from its effects; in general they are mathematically oriented and computer intensive. The EMPOSI ARI provided a unique opportunity to design sea-ice remote sensing experiments and coordinate them with the sea ice physics and the corresponding mathematical inverse scattering models of the electromagnetic interactions of sea ice. This was a combined effort of several ad hoc groups of theoreticians and experimentalists working together on various aspects of the ARI. The cooperation of the groups and individuals is evident from the contents of the Special Section. The majority of the ARI laboratory experiments were conducted on the indoor and outdoor ice ponds at the U. S. Army CRREL (Cold Regions Research & Engineering Laboratory), Hanover, NH; the ARI field experiments were conducted at Point Barrow, Alaska.

Arthur K Jordan
Guest Editor

IEEE Transactions on Geoscience and Remote Sensing Electromagnetic Properties of Sea Ice (EMPOSI)

Introduction to the Special Section on the Electromagnetic Properties of Sea Ice

A. K Jordan

A Broad Spectral, Interdisciplinary Investigation of the Electromagnetic Properties of Sea Ice

K. C. Jezek, D. K Perovich, K M Golden, C. Luther, D. Barber, S. P. Gogenini, T C. Grenfell, A. K Jordan, C. D. Mobley, S. V Nghiem, and R. G. Onstott

Evolution of Electromagnetic-Signatures of Sea Ice from Initial Formation Through the Establishment of Thick First-Year Ice

T C. Grenfell, D. G. Barber, A. K Fung, A. J Gow, K C. Jezek, E. J Knapp, S. V Nghiem, R. G. Onstott, D. K Perovich, C. S. Roesler, C. T. Swift, and F. Tanis

Forward Electromagnetic Scattering Models for Sea Ice

K M. Golden, M. Cheney, K H. Ding, A. K Fung, T. C. Grenfell, D. Issacson, J. A. Kong, S. V. Nghiem, J. Sylvester, and D. P. Winebrenner

Inverse Electromagnetic Scattering Models for Sea Ice

K M Golden, D. Borup, M Cheney, E. Cherkaeva, M S. Dawson, K H Ding, A. K Fung, D. Isaacson, S. A. Johnson, A. K Jordan, J. A. Kong, R. Kwok, S. V Nghiem, R. G. Onstott, J Sylvester, D. P. Winebrenner, and I H H Zabel

Field Observations of the Electromagnetic Properties of First-Year Sea Ice

D. K Perovich, D. G. Barber, G. F. Cota, A. J. Gow, T. C. Grenfell, M. Landry, J. Longacre, R. Maffione, C. D. Mobley, R. G. Onstott, W. S. Pegau, and C. Roesler



Laboratory Measurements of Sea Ice: Connections to Microwave Remote Sensing

R. Kwok, S. V. Nghiem, S. Martin, D. P. Winebrenner, A. J. Gow, D. K Perovich, C. T. Swift, D. G. Barber, K M. Golden, and E. Knapp

Saline Ice Thickness Retrieval Under Diurnal Thermal Cycling Conditions

S. Shih, K. H. Ding, J. A. Kong, S. V. Nghiem, and A. K Jordan

Modeling Light Propagation in Sea Ice

C. D. Mobley, G. F. Cota, T. C. Grenfell, R. A. Maffione, W. S. Pegau, and D. K Perovich

The Role of Snow on Microwave Emission and Scattering Over First-Year Sea Ice

D. G. Barber, A. K Fung, T. C. Grenfell, S. V. Nghiem, R. G. Onstott, V. Lytle, D. K. Perovich, and A. J Gow

Electromagnetic and Physical Properties of Sea Ice Formed in the Presence of Wave Action

R. G. Onstott, S. P. Gogenini, T. C. Grenfell, K C. Jezek, D. K Perovich, A. J. Gow and C. T. Swift

A Model for Altimeter Returns from Penetrable Geophysical Media

R. J. Adams and G. S. Brown

EMPOSI Data Base

F Tanis and R. G. Onstott



Remote Sensing

THE IMAGE CHAIN APPROACH

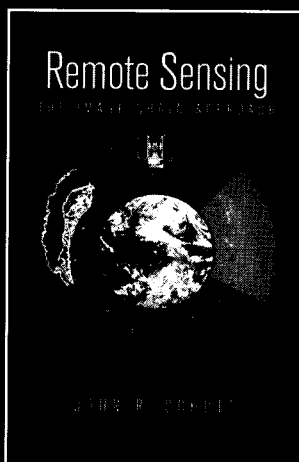
John R. Schott, *Rochester Institute of Technology*



"I know no other remote sensing textbooks which address remote sensing from the overall viewpoint of the basic physics, the sensor design, and information retrieval. When the readability of the text is included as a factor, this book really has no competition."

—Kurtis J. Thome, *Remote Sensing Group, Optical Sciences Center, University of Arizona*

Remote Sensing is a unique advanced text which covers the fundamental science underlying the rapidly growing field of remote sensing. Unlike similar books, which focus on one aspect of remote sensing, this text treats the subject as a continuous process, including energy-matter interaction, radiation propagation, and data dissemination, and emphasizes the tools and procedures required to extract information from remotely sensed data using the image chain approach. Using the image chain analogy, the component processes are linked together using a common quantitative



terminology that can be used to study physical parameters (e.g., reflectance and temperature) that are related to the type and condition of land cover features. This approach has evolved from over a decade of the author's teaching experience with undergraduate and graduate students and two decades of research and consulting experience on remote sensing problems for government and industry. *Remote Sensing* is ideal as a first text in remote sensing for graduate students and advanced undergraduates in the physical or engineering sciences, and also serves as a valuable reference for the many practitioners of remote sensing throughout government and industry who were trained in the traditional technical disciplines and need to know how to better apply them to the remote sensing process.

Oxford Series on Optical and Imaging Sciences 13

1996 424 pp., 234 illus., cloth \$65.00

To request an examination copy, write on school letterhead giving course name, expected enrollment, and your decision date to College Sales Coordinator at the address below.

OXFORD UNIVERSITY PRESS • 198 Madison Avenue • New York, NY 10016

To order any book by credit card, call toll free: 1-800-451-7556. Price and publication date is subject to change.

PLEASE VISIT OUR WORLD WIDE WEB SITE AT: <http://www.oup-usa.org/>



Message from the Bylaws and Constitution Chairman

Amendments to Society Bylaws

The following amendments to IEEE Geoscience and Remote Sensing Society Bylaws were approved by the Administrative Committee. These are hereby being communicated to the society members. If anyone has any objections, please let me know before October 15, 1998. If I do not hear from anyone until that date, it will be assumed that the members are in agreement with the amendments, which will then be forwarded to IEEE Headquarters for their final approval.

1. Paragraph 1.2 relating to Nominations:

REPLACE the last sentence "A nominating petition carrying a minimum of 25 names of Society members, excluding students, shall automatically place that nominee on the slate, although the Nominations Committee may choose to include a name on the slate regardless of the number of names on the nominating petition" WITH "A nominating petition carrying a minimum of 5 names of Society members, excluding students, shall automatically place that nominee on the slate, although the Nominations Committee may choose to include a name on the slate regardless of the number of names on the nominating petition"

2. Paragraph IV.8 relating to Fellows and Senior Member Search Committee:

REPLACE the first sentence "The Search Committee shall identify suitable nominees for membership upgrade and specifically to nominate appropriate Senior Members for Fellow status to the Fellows Committee" WITH "The Search Committee shall identify suitable candidates for upgrade to Senior Member, and nomination to IEEE Fellow."

Members having any objections are requested to contact Dr. Ram Narayanan, Chairman of the Bylaws and Constitution Committee, at the address below:

*Dr. Ram M. Narayanan
Department of Electrical Engineering
209N Walter Scott Engineering Center
University of Nebraska-Lincoln
Lincoln, NE 68588-0511, USA
Tel: + 1 (402) 472-5141
Fax: + 1 (402) 472-4732
EMail: marayanan@unl.edu*

CALL FOR NOMINATIONS

Distinguished Achievement Award

Outstanding Service Award

Deadline November 15, 1998

Please send nominations to:

Professor Kamal Sarabandi

Radiation Laboratory

Dept. of Electrical Engineering & Computer Science

The University of Michigan

Ann Arbor, MI 48109-2122

Voice: 734-936- 1575

FAX: 734-647-2106

E-Mail: saraband@eecs.umich.edu

INTERNATIONAL GEOSCIENCE AND REMOTE SENSING SYMPOSIUM

Proposals for Future Symposia

*Next Available Dates: 2003 and 2004
Summary Due: 15 October 1998*

GRSS will be accepting white paper proposal summaries for IGARSS'03 (non-North American teams) and IGARSS'04 (North American teams) through 15 October 1998. Invitations will be extended to qualifying teams December 1998 for full presentations to be made at the February 1999 AdCom meeting to be held in Hilton Head SC USA. Interested parties should direct inquiries and submit written summaries to:

IEEE GRSS
17906 St. Emilion Court
Spring Texas 77379 • USA
+1.281.251.6067 (f) +1.281.251.6068
tstein@phoenix.net

Summaries should include the following

A. General Information

- Proposed Year & Possible Dates (May to September, 5 days)
- Location (country/state/city)
- Available airport or train facilities

B. Team Data

- Host Institution, Group or Agency
- General & Tech Prgm Chairmen
- Steering Committee Members

C. Potential Conference and Hotel Facilities within region, including current facility rental rates and guest room rates

D. Potential Sponsors

E. Preliminary Budget (in US\$ at the prevailing rate) -- a sample budget is available upon request

Please note that white paper summaries are to be in outline form. Photographs or regional brochures are not requested at this evaluation phase. Eighteen (18) copies are requested.

IGARSS

FUTURE SYMPOSIA SITES AND DATES

IGARSS'99 28 June - 2 July 1999
Congress Centrum Hamburg
Hamburg Germany
Werner Alpers, University of Hamburg
General Chairman

*Abstract submission data now available!
Abstract submission deadline: 05 January 1999*

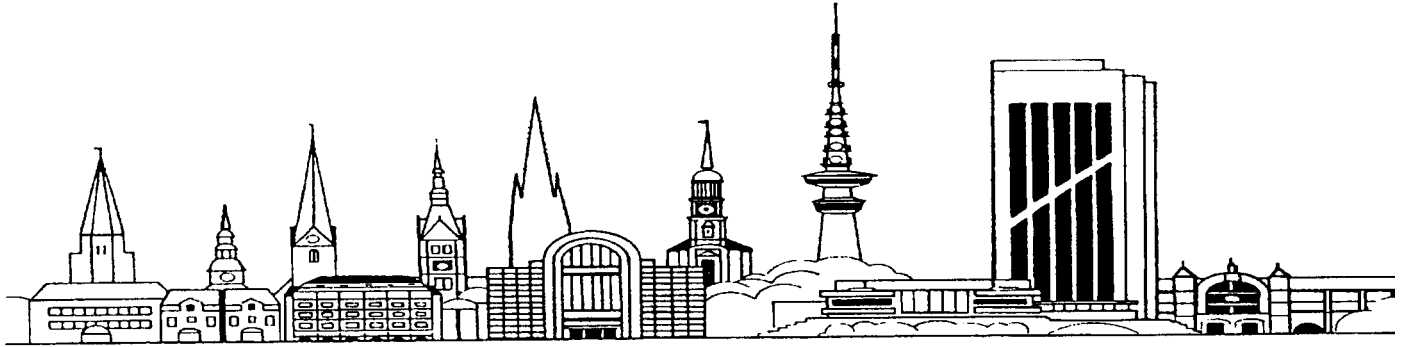
IGARSS 2000 24-28 July 2000
Hilton Hawaiian Village
Honolulu Hawaii USA
Andrew J. Blanchard, University of Missouri at Columbia
and David Goodenough, Pacific Forestry Centre, Victoria Canada
General Co-Chairmen

IGARSS'01 Date TBA
Sydney Australia
Anthony Milne, University of New South Wales
General Chairman

IGARSS'02 June 24-28, 2002
Westin Harbour Castle
Toronto Canada
Ellsworth LeDrew, University of Waterloo
General Chairman

For more information regarding future symposia, contact:

IEEE Geoscience and Remote Sensing Society
17906 St. Emilion Court • Spring Texas 77379 • USA
(t) +1.281.251.6067 (f) +1.281.251.6068 (email) tstein@phoenix.net



IGARSS'99 • Hamburg Germany • 28 June - 02 July 1999

Sponsors

*Institute of Electrical and Electronics
Engineers, Inc. (IEEE)*

*IEEE Geoscience and Remote Sensing
Society (GRSS)*

University of Hamburg

*National Aeronautics and Space
Administration (NASA)*

*National Oceanic and Atmospheric
Administration (NOAA)*

Office of Naval Research (ONR)

European Space Agency (ESA)

German Aerospace Center (DLR)

*International Union of Radio Science
(URSI) — Technical Sponsor*

**Access complete data on-line
via the IGARSS website ...**

www.igarss.org

Call for Papers

Deadline: 05 January 1999

ABSTRACT SUBMISSION GUIDELINES

Abstracts will be used by the Technical Program Committee for selection of papers and composition of the final program; hence, each abstract should clearly and concisely state the problem addressed, the methodology used and the central conclusions. **A maximum of three (3) papers, inclusive of general and invited submissions, may be authored (first author) and submitted by each individual.**

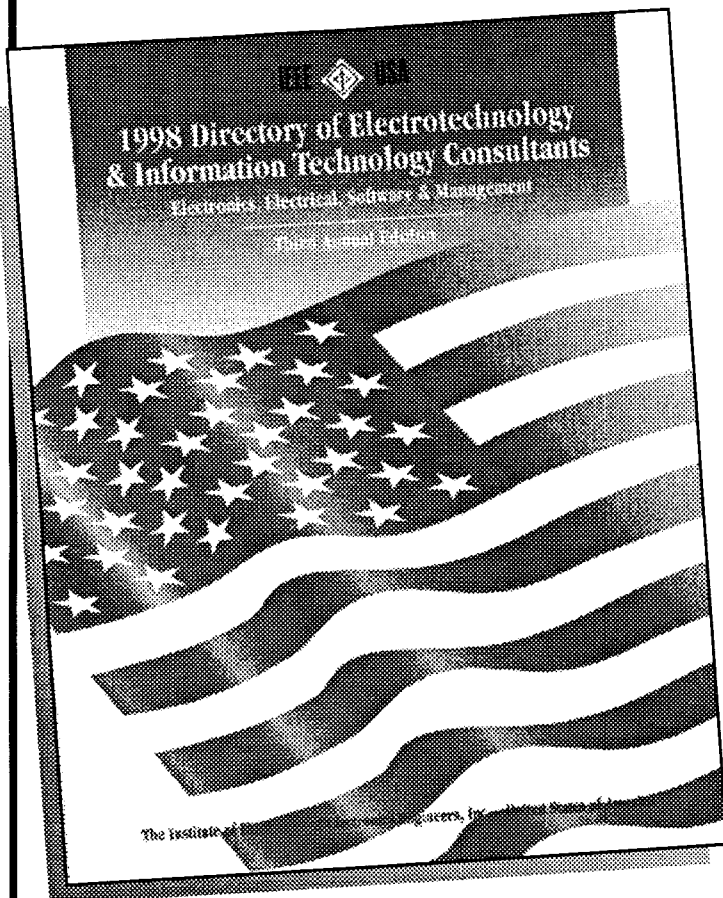
- √ Submit in English
- √ Limit to **one** 8.5 x 11 or A4 page, one side only (including author information)
- √ Indicate preferred topic area, using *Suggested Topic List* (a complete topic list is available from IEEE GRSS or may be accessed via the IGARSS website at www.igarss.org)
- √ Introductory header should include the following data: title, followed by name(s) of author(s) [please indicate last name or surname in all caps], affiliation, **complete** mailing address including mail stop or building and room number, telephone and facsimile numbers, and email address
- √ Indicate corresponding author (first author assumed unless otherwise noted)
- √ If applicable, indicate Interactive preference — papers/presentations containing numerous images are recommended for interactive presentation.

Abstracts must be received by 05 January 1999. All abstract submissions arriving after the deadline will only be considered for program placement if space permits. On-time arrival does not guarantee placement, but it does guarantee review and program consideration.

GRSS will accept abstracts via the following means:

- √ Email to tstein@phoenix.net — must be submitted in plain ASCII text or Word 6 attachments (for immediate acknowledgment, please indicate “99abstract” in email subject line)
- √ Facsimile: +1.281.251.6068
- √ Post to:
IEEE IGARSS'99 • IEEE GRSS
17906 St Emilion Court • Spring TX 77379 USA

An acknowledgment will be posted to each corresponding author regarding submissions received. Author receipt of acknowledgment depends upon date abstract received and post time; allow me time for abstracts submitted just prior to or on the deadline date.



Looking for Consultants?

**CONSULT WITH OVER
350 OF THE BEST!**

**IEEE-USA has released the
3rd Annual *Directory of
Electrotechnology Consultants.***

Our publication lists over 350 independent consultants and profiles engineering professionals who are operating as sole practitioners or in small businesses. It includes a description of each listed consultant, cross-references by category and state, and contacts for local IEEE consultants' network referral systems. It gives detailed information regarding specific areas of expertise.

If your organization uses technical or management consultants, then stop using the phone book. Contact us today for your **FREE *Directory!***

Prepared by the Coordinating Committee of the Alliance of IEEE Consultants' Networks, the Directory is also available as a searchable database on the Web at www.ieee.org/consultants. Or, for a hard-copy version, contact Bill Anderson at:

IEEE-USA
1828 L Street, N.W., Suite 1202,
Washington, D.C. 20036,
202-785-0017 ext. 330,
202-785-0835 (fax),
w.anderson@ieee.org



The Institute of Electrical and
Electronics Engineers, Inc.
United States of America

IEEE-USA

1828 L Street, N.W., Suite 1202,
Washington, DC 20036-5104

Networking For You.

Phone: 202-785-0017
E-mail: ieeusa@ieee.org
www.ieeeusa.org/usab



Upcoming Conferences

(continued from back cover)

Name: **OCEANS '98**

Dates: 28 September - 1 October 1998

Location: Acropolis Conference Center, Nice, FRANCE

Contact: Georges Bienvenu

Thomson Marconi Sonar

525, Route des Dolines, BP 157

06903 Sophia-Antipolis

FRANCE

tel. +33 492 96 44 69, FAX +33 492 96 39 25

email bienvenu@tmr.thomson.fr

Email: j-jin1@uiuc.edu

Name: **IEEE International Conference on Systems, Man, and Cybernetics**

Dates: October 11-14, 1998

Location: Hyatt Regency La Jolla, San Diego, CA

Contact: SMC'98 Secretariat

Dept. of Industrial Engineering

Rutgers University

96 Frelinghuysen Road

Piscataway, NJ 08854-8018

voice: 732-445-3671, FAX: 732-445-5467

Email: smc98@coewww.rutgers.edu

URL: <http://www.engr.rutgers.edu/~smc98>

Name: **32nd ESLAB Symposium - Remote Sensing Methodology for Earth Observation and Planetary Exploration**

Dates: Sept. 15-18, 1998

Location: ESTEC, Noordwijk, The Netherlands

Abstracts: April 15, 1998

Manuscripts: Sept. 18, 1998

Contact: ESTEC Conference Bureau

Postbus 299, 2200 AG

Noordwijk, The Netherlands

Voice: +31-71-5655005, FAX: +31-71-5655658

Email: eslab32@estec.esa.nl

URL:

<http://www.estec.esa.nl/CONFANNOUN/98a01>

Name: **Workshop on Emerging Scatterometer Applications - From Research to Operation**

Dates: Oct. 5-7, 1998

Location: ESTEC, Noordwijk, The Netherlands

Abstracts: April 15, 1998

Manuscripts: Oct. 7, 1998

Contact: Mrs. M. Brons

ESTEC Conference Bureau

Postbus 299,

2200 AG

Noordwijk,

The Netherlands

Voice: +31-71-5655005

FAX: +31-71-5655658

Email: confburo@estec.esa.nl

URL: <http://www.estec.esa.nl/CONFANNOUN/>

Name: **Workshop on Retrieval of Bio- and Geo-Physical Parameters from SAR Data for Land Applications**

Dates: October 21-23, 1998

Location: ESTEC, Noordwijk, THE NETHERLANDS

Abstracts: June 1, 1998

Contact: Dr. Maurice Borgeaud

European Space Agency

ESTEC-EEP

Keperlaan 1,

2200 AG Noordwijk

THE NETHERLANDS

tel. +31 71 565 4830

FAX +31 71 565 4999

email maurice@xe.estec.esa.nl

URL

<http://www.estec.esa.nl/CONFANNOUN/98c07>



1998 IEEE GEOSCIENCE AND REMOTE SENSING SOCIETY MEMBERSHIP APPLICATION

(Current and reinstating IEEE members joining GRSS complete areas 1, 2, 9, 10.)
Mail to: IEEE OPERATIONS CENTER, Admission & Advancement Dept., 445 Hoes Lane, P.O. Box 459, Piscataway, New Jersey 08855-0459 USA
or Fax to: (732) 981-0225 (credit card payments only)

IEEE Networking the World™

For info call (732) 981-0060 or 1 (800) 678-IEEE or E-mail: new.membership@ieee.org

1. NAME AS IT SHOULD APPEAR ON IEEE MAILINGS: SEND MAIL TO: Home Address OR Business/School Address
If not indicated, mail will be sent to home address. NOTE: Please enter your name as you wish it to appear on your membership card and all correspondence. Please circle your last/ surname as a key identifier for the IEEE database.

PLEASE PRINT

TITLE	FIRST OR GIVEN NAME	MIDDLE NAME
SURNAME / LAST NAME		
HOME ADDRESS		
CITY		STATE / PROVINCE
POSTAL CODE		COUNTRY

2. Are you now or were you ever a member of IEEE? Yes No
If yes, please provide, if known:

MEMBERSHIP NUMBER									
Grade	Year Membership Expired								

3. BUSINESS / PROFESSIONAL INFORMATION

Company Name _____

Department / Division _____

Title / Position _____ Years in Current Position _____

Years in the Profession Since Graduation _____ PE State / Province _____

Street Address _____

City _____ State / Province _____

Postal Code _____ Country _____

4. EDUCATION A baccalaureate degree from an IEEE recognized educational program assures assignment of "Member" grade. For others, additional references and information may be necessary for grade assignment.

A. Baccalaureate Degree Received _____ Program / Course of Study _____
College/University _____ Campus _____
State / Province _____ Country _____ Mo./Yr. Degree Received _____

B. Highest Technical Degree Received _____ Program / Course of Study _____
College/University _____ Campus _____
State / Province _____ Country _____ Mo./Yr. Degree Received _____

5. IEEE Reference Name _____
Member, Senior Member or Fellow (Print) _____

Member number (if known) or place of residence _____

I hereby make application for IEEE membership and agree to be governed by IEEE's Constitution, Bylaws, Statements of Policies and Procedures and Code of Ethics. I authorize release of any information related to this application to determine my qualifications for membership.

6. Full signature of applicant _____ Date _____

7. DEMOGRAPHIC INFORMATION —ALL APPLICANTS—

Date of Birth _____ Male Female
Day Month Year

8. CONTACT INFORMATION

Office Phone _____ Home Phone _____

Office Fax _____ Home Fax _____

Office E Mail _____ Home E mail _____

9. 1998 IEEE MEMBER RATES

Check (✓) a box	Sept. 1 - Feb. 28	Mar. 1 - Aug. 31
IEEE DUES	Pay Full Year	Pay Half Year**
Residence	Total Amount	Total Amount
United States	\$113.00 <input type="checkbox"/>	\$56.50 <input type="checkbox"/>
Canada (includes GST)*	\$107.00 <input type="checkbox"/>	\$53.50 <input type="checkbox"/>
Canada (includes HST)*	\$114.00 <input type="checkbox"/>	\$57.00 <input type="checkbox"/>
Africa, Europe, Middle East	\$ 97.00 <input type="checkbox"/>	\$48.50 <input type="checkbox"/>
Latin America	\$ 90.00 <input type="checkbox"/>	\$45.00 <input type="checkbox"/>
Asia, Pacific	\$ 91.00 <input type="checkbox"/>	\$45.50 <input type="checkbox"/>

*IEEE Canadian Business No. 125634188
**If application is to be received by IEEE after Aug. 31, pay full year.
Subscription to Spectrum (\$11.50/year) and The Institute are included in dues.

1998 GRSS MEMBER RATES

Geoscience and Remote Sensing Society Membership Fee*	\$ 25.00 <input type="checkbox"/>	\$13.00 <input type="checkbox"/>
(Includes Society Newsletter)		
Transactions on Geoscience and Remote Sensing	(Included in membership fee)	
*IEEE membership required or request Affiliate application to join GRS Society only.	Amount Paid \$	_____

METHODS OF PAYMENT:
You may pay for your 1998 membership by:

- Credit Card—American Express, Visa, MasterCard,
- Check • Bank Drafts • Money Orders— Payable on a bank in the USA
- UNESCO Coupons
- Corporate Purchase Orders

10.

IEEE Membership Dues \$ _____

Geoscience and Remote Sensing Society Membership Fees Total \$ _____

Canadian residents pay 7% GST or 15% HST
Reg. No. 125634188 on Society payment(s) only TAX \$ _____

AMOUNT PAID WITH APPLICATION . . . TOTAL \$ _____

Prices subject to change without notice.

Check or money order enclosed. (Make payable to IEEE.)

American Express VISA MasterCard

Charge Card Number	Cardholder 5 Digit Zip Code
Exp. Date	Billing Statement Address
Mo. / Yr.	USA Only

Full signature of applicant using credit card _____ Date _____

UPCOMING CONFERENCES



Name: **Asia-Pacific Symposium on Remote Sensing: Atmospheric, Environmental, and Space**

Dates: September 13-17, 1998

Location: China International Exhibition Center, Beijing, CHINA

Abstracts: February 16, 1998

Manuscript: June 22, 1998

Contact: SPIE

Voice: 360-676-3290

FAX: 360-647-1445

URL: www.spie.org

Name: **URSI Commission F Triennial Open Symposium "Wave Propagation and Remote Sensing"**

Dates: September 22-25, 1998

Location: Aveiro, PORTUGAL

Contact: Prof. Armando C. D. Rocha

Instituto de Telecomunicacoes

Universidade de Aveiro

3810 Aveiro, PORTUGAL

Voice: +351 34 370324,

FAX: +351 34 381128

Email: arocha@av.it.pt

Name: **European Network for the Development of Advanced Models to Interpret Optical Remote Sensing Data Over Terrestrial Environments (ENAMORS Workshop)**

Dates: September 17-19, 1998

Location: Tuusula, FINLAND

Contact: ENAMORS Finnish Geodetic Institute

Geodeetinrinne 2 (PL 15)

FIN-02431 MASALA

voice: 358-9-295550, FAX: 358-9-29555200

Email: ENAMORS@fgi.fi

URL: <http://hneutrino.pc.helsinki.fi/jouni/>

ENAMORS/ws97.html

Name: **OCEANS '98**

Dates: 28 September - 1 October 1998

Location: Acropolis Conference Center, Nice, FRANCE

Contact: Georges Bienvenu

Thomson Marconi Sonar

525, Route des Dolines, BP 157

06903 Sophia-Antipolis

FRANCE

tel. +33 492 96 44 69

FAX +33 492 96 39 25

email bienvenu@tmr.thomson.fr

Email: j-jin1@uiuc.edu

(Continued on page 14)

The Institute of Electrical and Electronics Engineers, Inc.

445 Hoes Lane

P.O. Box 1331

Piscataway, NJ 08855-1331