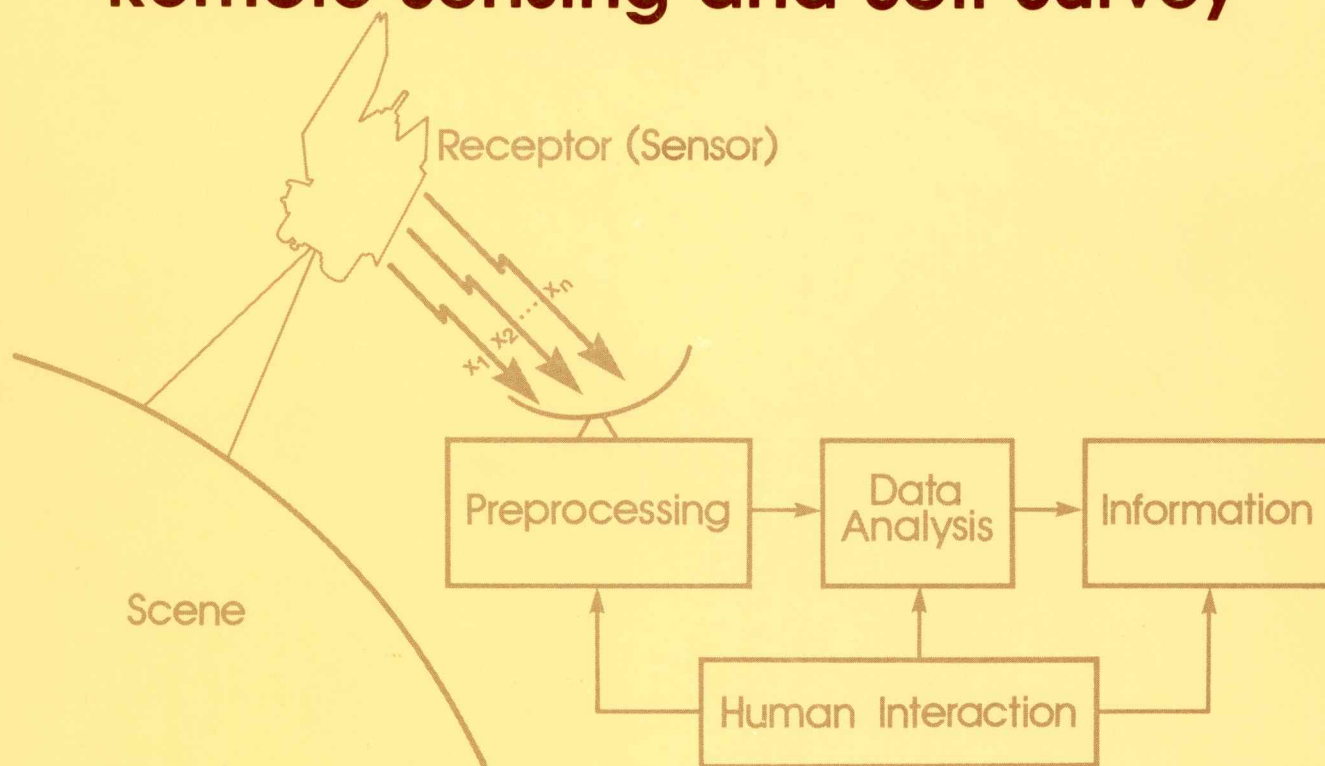


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International Symposia

Machine Processing of Remotely Sensed Data and Soil Information Systems and Remote Sensing and Soil Survey



June 3-6, 1980

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Purdue University
Laboratory for Applications of Remote Sensing
West Lafayette, Indiana 47907 USA

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**Machine Processing of
Remotely Sensed Data**
and
Soil Information Systems
and
**Remote Sensing
and Soil Survey**

Purdue University

Laboratory for Applications of Remote Sensing
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IN MEMORIAM

This volume is dedicated to the memory of Ival D. Persinger (1935-1978), innovative and dedicated soil scientist.



Born and reared on a farm in Iowa, Ival Persinger came to appreciate early in life the importance of good management of our land resources. Immediately after completing his Bachelor of Science degree in Agronomy from Iowa State University in 1957, Ival was employed by the Soil Conservation Service (SCS) as a soil scientist. This employment was interrupted by two years of service in the U.S. Army, 1957-59. From 1959 until his untimely death on April 14, 1978, Ival Persinger had an outstanding career as a professional soil scientist with the SCS, including seven years in Iowa, seven years in Indiana and five years in Missouri.

As Assistant State Soil Scientist in Missouri (1972-1977), Ival played a pioneering role in the analysis and application of remote sensing data for preparation of land resource and soil maps. He became one of the few distinguished soil scientists familiar with the application of remote sensing data to soil survey and mapping.

His professional and personal commitment and his sense of adventure prompted him in 1977 to accept a professional assignment in the Kingdom of Saudi Arabia. There, as the Remote Sensing Specialist in the Ministry of Agriculture and Water, Persinger was charged with the introduction of a new and challenging technology, which was then essentially untried if not unknown in that country. Using an enhanced Landsat image mosaic of the country, he produced the first schematic soils map of an entire country that was based on Soil Taxonomy and which used Landsat image interpretation.

Although Ival Persinger did not live to see the completion of the Saudi Project, his work was completed according to his exacting standards. Even today, soil survey activities, based on the principles that Persinger established, continue in Saudi Arabia.

The Kingdom of Saudi Arabia presented the Exceptional Service Award posthumously to Ival D. Persinger, the first American to be so honored.

The dedication, energy and creative spirit of Ival Persinger, who had close professional and personal ties with Purdue University and the Laboratory for Applications of Remote Sensing, will continue to inspire those who were privileged to know and work with him.

Symposium at a Glance

TUESDAY JUNE 3		WEDNESDAY JUNE 4		THURSDAY JUNE 5		FRIDAY JUNE 6	
Time	Event and Location	Time	Event and Location	Time	Event and Location	Time	Event and Location
7:45-8:45am	Registration East Foyer (All events in the Stewart Center unless otherwise noted.)	8:25-11:55am	3.1 Data Processing Systems Room 202 3.2 Soil Survey I Room 214 3.3 Crop Inventory I Room 218 3.4 Soil Information I Room 322	8:25-11:55am	4.1 Data Processing and Analysis I Room 322 4.2 Soil Survey II Room 214 4.3 Land Use I Room 218 4.4 Soil Information II Room 320	9:00-12:00pm	Closing Plenary Session Fowler Hall
8:55-11:55am	First Opening Plenary Session Fowler Hall						
12:00-1:25pm	Lunch	12:00-1:25pm	Lunch	12:00-1:25pm	Lunch		
1:30-4:30pm	Second Opening Plenary Session Fowler Hall	1:30-5:00pm	Field Trips	1:30-5:00pm	5.1 Data Processing and Analysis II Room 322 5.2 Applications for Forestry Room 214 5.3 Land Use II Room 218 5.4 Soil Information III Room 320 5.5 Crop Inventory II Room 218	2:00-4:00pm	LARS Open House Flex Lab 2 Conference Room
5:30-8:30pm	Barbeque and Program at Fort Quiatenon	7:30-9:30pm	Informal Discussion Groups Room 214 and 218	3:30-5:00pm	Informal Discussion Groups Room 214 and 218		

PREFACE

In the early stages of planning the Sixth Symposium on Machine Processing of Remotely Sensed Data, an invitation was extended to the International Society of Soil Science (ISSS) to be a cosponsor. In accepting the invitation ISSS assigned two specific Working Groups to participate --the Working Group on Soil Information Systems and the Working Group on Remote Sensing and Soil Survey.

Although these Proceedings reflect the special emphasis on the applications of remote sensing to soils, the total range of papers is broad, covering the general areas of data processing analysis, data processing systems, crop inventory, forestry, land use, soil survey and soil information. The Plenary Sessions on the first day focus on the current and future need for land resource information, future Earth resource data acquisition systems, current soil information systems, remote sensing and soil survey, and the future challenge of resource data storage, retrieval, analysis and utilization. The Closing Plenary Session highlights plans for the U.S. operational land satellite program, soil information needs, non-federal information requirements and research priorities for the 1980's.

In addition to the formal presentations several optional half-day field trips are scheduled midway in the Symposium. These field trips feature field measurements (instrumentation and techniques), soil survey, soil information systems and data bases, electronics, and local history. Evening discussion sessions are also scheduled to stimulate a more direct interchange of ideas on specific topics of interest.

The success of this Symposium may be largely attributed to the support and cooperation of the cosponsoring organizations and the valuable technical and organizational contributions made by program committee members and session chairpersons.

SYMPOSIUM CHAIRMAN: DR. MARION BAUMGARDNER

Dr. Marion F. Baumgardner, B.S., Texas Technological College; M.S., Ph.D., Purdue University, joined Purdue Agronomy Department staff in 1961. After two years (1964-66) in Argentina with the Ford Foundation, Dr. Baumgardner joined the Laboratory for Applications of Remote Sensing. He often serves as consultant to several international development agencies with assignments in Africa, Asia, Latin America, and Europe. He is a Danforth Associate and a Fellow of the American Society of Agronomy and the Soil Science Society of America. He is vice-chairman of the International Soil Science Society's Working Group on Remote Sensing and Soil Survey and is chairman of the U.S. Agricultural Research Institute's Study Panel on Remote Sensing.

SYMPOSIUM CO-CHAIRMAN: DR. LUIS BARTOLUCCI

Dr. Bartolucci received his B.S., M.S., and Ph.D. in Geophysics from Purdue University. He has been involved in Remote Sensing research since 1969. He has played an active role in the development of remote sensing technology applied to water resources and in the field of thermal infrared radiation. Dr. Bartolucci has served as consultant to the U.S. Information Agency, the U.S. Agency for International Development, the Interamerican Development Bank and to several Latin American development agencies. He has been Principal Investigator and Project Director of several domestic and international research and training programs involving computer-aided processing and analysis of remotely sensed data for earth resources inventories. Dr. Bartolucci is currently Program Leader and Director of Training of the LARS educational and training program.

SPONSORSHIP

With special emphases on soils applications, the INTERNATIONAL SOCIETY OF SOIL SCIENCE joins in the sponsorship of the 1980 symposium. The complete roster of participating organizations is listed below:

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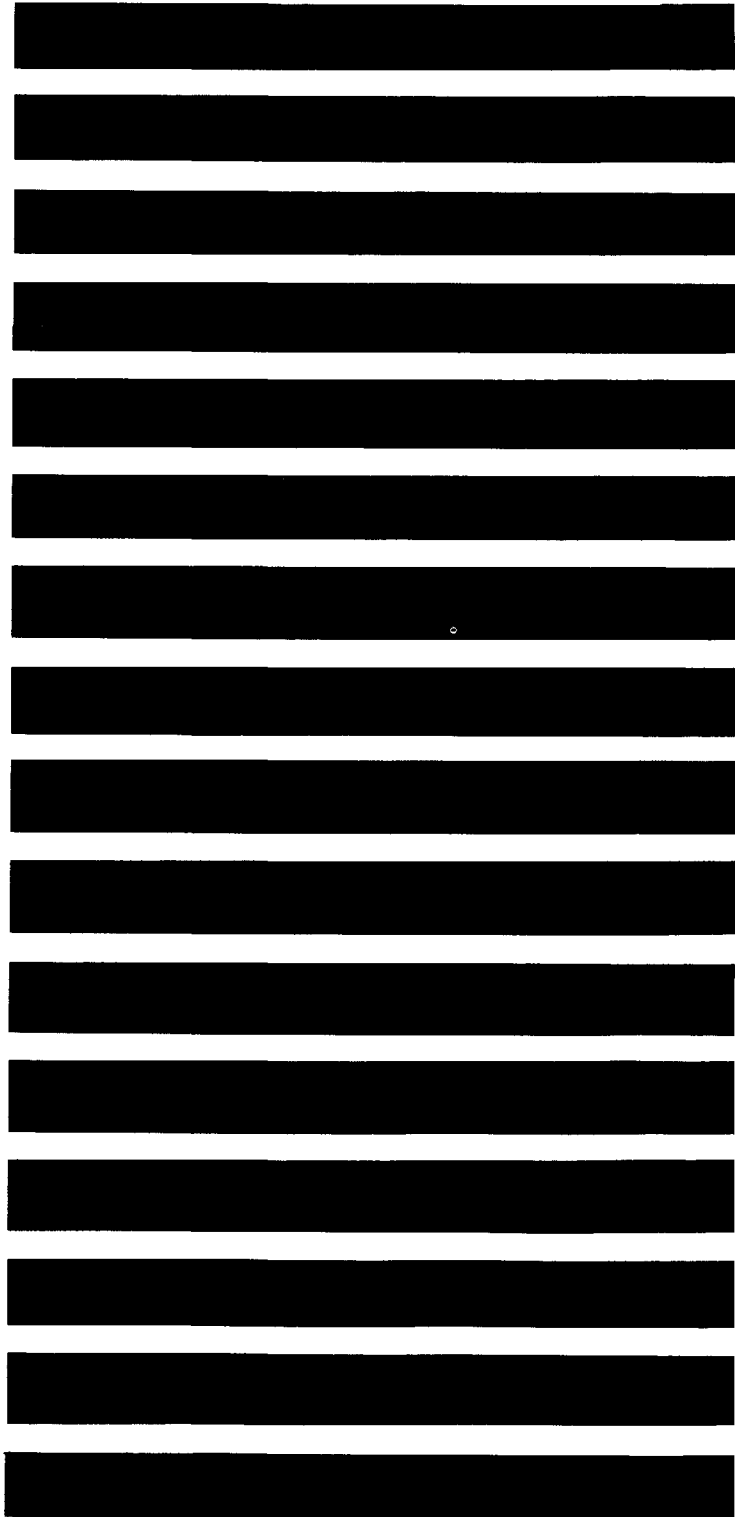
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1.1

First Opening Plenary Session

SESSION CHAIRMAN: DR. KLAUS W. FLACH

B.S.-1950, Munich, Germany, M.S.-1954 Ph.D.-1960, Cornell University. Active member of Soil Science Society of America, has authored 31 technical publications, and served as a United States representative to numerous international meetings. Major thrust of work is to integrate as much soil science and allied disciplines as possible into soil survey. Soil survey is much more than drawing lines on a map. From 1976-present he is the Assistant Administrator for Soil Survey, Soil Conservation Service.

SESSION COORDINATOR: DR. MARION F. BAUMGARDNER

Marion F. Baumgardner, B.S., Texas Technological College; M.S., Ph.D., Purdue University, Joined Purdue Agronomy Department staff in 1961. After two years (1964-66) in Argentina with the Ford Foundation, Dr. Baumgardner joined the Laboratory for Applications of Remote Sensing. He often serves as consultant to several international development agencies with assignments in Africa, Asia, Latin America, and Europe. He is a Danforth Associate and a Fellow of the American Society of Agronomy and the Soil Science Society of America. He is vice chairman of the International Soil Science Society's Working Group on Remote Sensing and Soil Survey and is chairman of the U.S. Agricultural Research Institute's Study Panel on Remote Sensing.

2.1

Second Opening Plenary Session

SESSION CHAIRMAN: MR. JOSEPH VITALE

Mr. Vitale received his undergraduate degree in Mechanical Engineering from NYU then subsequently did graduate work at MIT and the U. of Oklahoma. Following several years work in the radiation laboratory of MIT, during which time he was Division Head of the Lincoln Laboratory, he became President and founder of an Engineering & Manufacturing Co. This was then followed by a few years in the Electronics Research Center at Boston, MA prior to his joining NASA Headquarters in the Office of University Affairs. He received the NASA Exceptional Service Medal in 1975. Currently Mr. Vitale is Manager, University Applications Program.

SESSION COORDINATOR: MARION F. BAUMGARDNER

Marion F. Baumgardner, B.S., Texas Technological College; M.S., Ph.D., Purdue University, joined Purdue Agronomy Department staff in 1961. After two years (1964-66) in Argentina with the Ford Foundation, Dr. Baumgardner joined the Laboratory for Applications of Remote Sensing. He often serves as consultant to several international development agencies with assignments in Africa, Asia, Latin America, and Europe. He is a Danforth Associate and a Fellow of the American Society of Agronomy and the Soil Science Society of America. He is vice chairman of the International Soil Science Society's Working Group on Remote Sensing and Soil Survey and is chairman of the U.S. Agricultural Research Institute's Study Panel on Remote Sensing.

3.1

Data Processing Systems

SESSION CHAIRMAN: MR. DONALD H. HAY

B.S./University of Florida/Mathematician (1958). Chief, Systems & Facilities Branch, Earth Observations Division (1974 -Current). Chief, Administrative Data Processing Branch, IDSD (1969-1974). Head, Telemetry & Special Projects Section, IDSD (1964-1969). Engineer, Systems Programming RCA Service Co., Cape Kennedy, Fla. (1962-1964). Asst. Research, Mathematician, Rich electronic Computer Center, GA. Tech-Atlanta, GA (1959-1962). Engineer, Propulsion Wind Tunnel & Inc. Tullahoma, Tennessee (1958 -1959)

SESSION COORDINATOR: MR. JAMES L. KAST

James Kast is the Manager of Systems Analysis for the Laboratory for Applications of Remote Sensing at Purdue University. Mr. Kast has been active in Remote Sensing Data Processing since 1972. He has managed the development of a shared data processing facility for researching remote sensing of agriculture which is the primary facility now used by Purdue, Johnson Space Center's Earth Observation Division (JSC/EOD) and a number of EOD's support contractors for remote sensing research computing. Mr. Kast was responsible for the installation of the current computer system at LARS. He served on the peer review panel for the LACIE Symposium and the Office of Space and Terrestrial Applications (OSTA) Data Systems Planning Workshop. Mr. Kast has a B.S. in Mathematics and an M.S. in Management from Purdue University. He is a member of Phi Beta Kappa, Phi Kappa Phi and Beta Gamma Sigma Societies.

3.2

Soil Survey I

SESSION CHAIRMAN: MARTIN RAGG

Formerly of the Soil Survey of Scotland (1951-1978), now Regional Officer in the Soil Survey of England and Wales with special responsibilities for Data Management. Has the principle aim of presenting a soil information system with a friendly face to both internal and outside users. Special interests: computer mapping, systematic field recording techniques, databases integrating soil survey, land use and agricultural needs.

SESSION COORDINATOR: DR. RICHARD A. WEISMILLER

Richard A. Weismiller, B.S., M.S., Purdue University; Ph.D., Michigan State University, joined the Laboratory for Applications of Remote Sensing in 1973. His primary research interests are the relation of the spectral reflectance of soils to their physical and chemical properties and the application of remote sensing technology to soils mapping, land use inventories and change detection as related to land use. He is a member of Phi Eta Sigma, Alpha Zeta, and Sigma Xi honoraries, the Soil Science Society of America, the American Society of Agronomy, the Clay Minerals Society, and the Soil Conservation Society of America.

3.3

Crop Inventory I

SESSION CHAIRMAN: DR. DAVID R. THOMPSON

Dr. David R. Thompson received B.S., M.S. and Ph.D. degrees in agronomy from Texas A & M University. He worked several years for the USDA Soil Conservation Service. Since 1975 he has been an agronomist at the NASA Johnson Space Center where he conducted research on the effect of drought on the spectral response of crops during the Large Area Crop Inventory Experiment. He is now responsible for the research and development of crop development stage and yield models utilizing Landsat MSS data as part of the AgRISTARS program.

SESSION COORDINATOR: DR. MARVIN E. BAUER

Dr. Marvin E. Bauer is a Research Agronomist at Purdue University and holds degrees from Purdue University and the University of Illinois. He is program leader of Crop Inventory Systems Research at the Laboratory for the Applications of Remote Sensing. He has had key roles in the design, implementation and analysis of results of several major remote sensing experiments including the 1971 Corn Blight Watch Experiment and the Large Area Crop Inventory Experiment. His research is on the spectral properties of crops in relation to their agronomic characteristics and the development and application of satellite spectral measurements to crop identification, area estimation and condition assessment.

3.4

Soil Information I

SESSION CHAIRMAN: DR. STEIN W. BIE

Norwegian, 37 years, graduated University of Oxford and Cambridge, England, D. Phil Oxford 73 on efficiency of alternative soil survey methods. Field research in East Africa, Australia, Cyprus; Five years project leader soil information systems, Netherland Soil Institute and Geological Survey. Now research on natural resource information systems in Norway, especially cartography. Secretary Working Group on Soil Information Systems of ISSS.

SESSION COORDINATOR: DR. JOSEPH E. YAHNER

Dr. Yahner joined the Agronomy Department staff in 1963. He worked on soil fertility problems with the Purdue-Brazil project at the Federal University in Minas Gerais, Brazil until 1967. After returning to Purdue Campus he has worked in the area of soil survey interpretation and education. Major areas of interest include the use of soil maps for land assessment, waste disposal, residential development and general planning. The most recent projects are the use of soil maps for Indiana's reassessment, developing yield ratings for soils, interpreting Indiana's soils for septic system filter fields and investigating innovative systems of home waste disposal.

4.1

Data Processing and Analysis I

SESSION CHAIRMAN: DR. PHILIP H. SWAIN

Philip H. Swain is assistant professor of electrical engineering, Purdue University, and program leader for Data Processing and Analysis Research at the University's Laboratory for Applications of Remote Sensing (LARS); B.S.E.E., Lehigh University; M.S.E.E. and Ph.D., Purdue University. Prof. Swain has been affiliated with LARS since 1966 and has contributed extensively to the development of data processing methods for the management and analysis of remote sensing data. His areas of specialization include theoretical and applied pattern recognition and methods of artificial intelligence. He is co-editor and contributing author for the textbook Remote Sensing: The Quantitative Approach (McGraw-Hill, 1978).

SESSION COORDINATOR: MR. TERRY L. PHILLIPS

Terry L. Phillips, Deputy Director of LARS, received his B.S. and M.S. degrees in Electrical Engineering from Purdue University in 1964 and 1966 respectively. He has held positions in Purdue's EE Dept., National Cash Register Co., and U.S. Navy. He has consulted for the Computer Sciences Corp., the U.S. and Iowa Geological Survey, TRANARG-CA Venezuela and U.S.AID. He has been engaged in the applications of computer to remote sensing since 1966. Mr. Phillips is the author of several publications in the area of remote sensing, data systems, information systems, and earth resources, and is responsible for the design and implementation of LARSYS. He was recognized by NASA for the creative development of technology. Mr. Phillips is a senior member of IEEE and a member of the ACM, Tau Beta Pi, and Eta Kappa Nu.

4.2

Soil Survey II

SESSION CHAIRMAN: IR. FREDERIK HILWIG

Frederik Hilwig, Soil Scientist at the International Institute for Aerial Survey and Earth Sciences (ITC), Enschede, The Netherlands. Training research and consultancy using remote sensing techniques for developing countries are major ITC objectives. Ir. Hilwig worked five years for the Indian Photo-Interpretation Institute Dehra Dun. His special interests involve selection and interpretation of Landsat data for natural resources surveys. At present he is Secretary of the Working Group on Soil Sciences and Remote Sensing of the ISSS.

SESSION COORDINATOR: DR. RICHARD A. WEISMILLER

Richard A. Weismiller, B.S., M.S., Purdue University; Ph.D., Michigan State University, joined the Laboratory for Applications of Remote Sensing in 1973. His Primary research interests are the relation of the spectral reflectance of soils to their physical and chemical properties and the application of remote sensing technology to soils mapping, land use inventories and change detection as related to land use. He is a member of Phi Eta Sigma, Alpha Zeta, and Sigma Xi honoraries, the Soil Science Society of America, the American Society of Agronomy, the Clay Minerals Society, and the Soil Conservation Society of America.

4.3

Land Use I

SESSION CHAIRMAN: DR. JULIAN DUMANSKI

Dr. Dumanski received his undergraduate degrees at the University of Saskatchewan and his Ph.D. from the University of Alberta in 1970. He has worked on Soil Survey in Western Canada in both Agriculture and Forestry. He has been involved with agricultural land evaluation in Southeast Asia and has served as a consultant to an Engineering firm working on agricultural land fill. Dr. Dumanski was one of the primary architects of Canada's Soil Information group and activity. His long term interest in this area lead to his present position of Head, Land Use and Evaluation Section of the Land Resource Research Institute of Canada.

SESSION COORDINATOR: DR. GARY C. STEINHARDT

Dr. Steinhardt is an Extension Agronomist in the Agronomy Department, Purdue University. His specialty is soil management and applications of soil survey information. His current research interests include the adverse effects of soil compaction and excessive tillage, the interaction of soil physical properties and herbicides and the extent of prime agricultural land loss.

4.4

Soil Information II

SESSION CHAIRMAN: DR. SALEEM AHMED

Saleem Ahmed, Ph.D. Soil Science, University of Hawaii, 1965 (on East-West Scholarship). Came to the center from position as Senior Technical Services Advisor with a multinational fertilizer manufacturing and marketing firm in Pakistan. Was formerly on faculty of the University of Karashrc.

SESSION COORDINATOR: DR. JOSEPH E. YAHNER

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5.1

Data Processing and Analysis II

SESSION CHAIRMAN: DR. PHILIP H. SWAIN

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5.2

Applications to Forestry

SESSION CHAIRMAN: DR. ROY A. MEAD

A native of Niles, Michigan, Dr. Mead received a B.S. in Botany from Northern Arizona State University, an M.S. in Remote Sensing from Colorado State University, and a Ph.D. in Remote Sensing from the University of Minnesota. Currently, Dr. Mead is an Assistant Professor in the Department of Forestry at VPI & SU. His research interests include Landsat data classification accuracy and interpretation of aerial photographs. Dr. Mead is an active member of ASP and SAF.

SESSION COORDINATOR: DR. ROGER M. HOFFER

Roger Hoffer is Professor of Forestry, and Leader, Ecosystems Research Programs, LARS, Purdue University. He was a co-founder of LARS in 1966; has lectured and participated in remote sensing projects in various countries throughout South America, Asia, and Europe; has served as principal investigator on Landsat, Skylab, and other remote sensing projects; has authored over 100 scientific papers on remote sensing. Dr. Hoffer teaches three courses in Remote Sensing; is a member of the American Society of Photogrammetry (where he has served as Director of the Remote Sensing and Interp. Div., and Assoc. Editor of Photogrammetric Engineering and Remote Sensing), Society of American Foresters, Sigma Xi, Phi Kappa Phi, and other professional and honorary societies. He is a Certified Photogrammetrist and is listed in American Men and Women in Science.

5.3

Land Use II

SESSION CHAIRMAN: MR. PIERRE-MARIE ADRIEN

A native of Haiti educated at VPI and State University where he received his B.S. in Agronomy, Mr. Pierre-Marie Adrien works in the Agriculture Division of the Project Analysis Department of the Inter-American Development Bank in Washington, D.C. He has been a visiting scientist at LARS and is doing graduate work in Remote Sensing at Purdue University. Mr. Adrien is technically responsible for all remote sensing work which the bank is financing in Latin America. He is a lecturer on remote sensing for the Economic Development Institute of the World Bank and has served as a consultant for O.A.S. and I.I.C.A. as well as the Brookhaven Laboratory in N.Y. He has authored or co-authored 10 papers on remote sensing, is a reviewer for the National Science Foundation and is listed in American Men and Women of Science, 14th edition.

SESSION COORDINATOR: DR. GARY C. STEINHARDT

Dr. Steinhardt is an Extension Agronomist in the Agronomy Department, Purdue University. His specialty is soil management and applications of soil survey information. His current research interests include the adverse effects of soil compaction and excessive tillage, the interaction of soil physical properties and herbicides and the extent of prime agricultural land loss.

5.4

Soil Information III

SESSION CHAIRMAN: DR. ALEX R. MACK

Alex Mack is a research scientist with the Land Resource Institute of Agriculture Canada and currently acting head of the Agrometeorology Section of the Institute. He holds a Ph.D. degree in Agronomy. He has more than 20 years experience in soil fertility studies in various climatic regions, yield estimation, crop productivity and remote sensing. Dr. Mack has published more than 50 papers in scientific and technical journals. For the past few years, he has been responsible for advising Agriculture Canada in developing a crop information system for Canada using remotely sensed and weather data. He has been chairman of the Agriculture Working Group of the Canadian Advisory Committee on Remote Sensing since its inception in 1972.

SESSION COORDINATOR: DR. JOSEPH E. YAHNER

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5.5

Crop Inventory II

SESSION CHAIRMAN: DR. DAVID R. THOMPSON

Dr. David R. Thompson received B.S., M.S. and Ph.D. degrees in agronomy from Texas A & M University. He worked several years for the USDA Soil Conservation Service. Since 1975 he has been an agronomist at the NASA Johnson Space Center where he conducted research on the effect of drought on the spectral response of crops during the Large Area Crop Inventory Experiment. He is now responsible for the research and development of crop development stage and yield models utilizing Landsat MSS data as part of the AgRISTARS program.

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6.1

Closing Plenary Session

SESSION CHAIRMAN: DR. LARRY HEACOCK

Mr. E. Laurence (Larry) Heacock received his BSEE and MSEE from the University of Illinois. He joined Illinois Bell upon receipt of his B.S. then (following a two year tour of duty with the U.S. Air Force) entered Federal Service with the ESSA Meteorological Satellite Laboratory in 1962, serving as Chief of Electronics Branch. This was followed by six years service with the European Space Agency where he was project manager for METEOSAT satellite until 1976 at which time he returned to Federal Service as Director of NESS' Office of Systems Integration, which is his present position. A recent responsibility added to his other duties has been as chairman of the Task Force to study the integration of Landsat as a civil operational system.

SESSION COORDINATOR: DR. MARION F. BAUMGARDNER

Marion F. Baumgardner, B.S., Texas Technological College; M.S., Ph.D., Purdue University, joined Purdue Agronomy Department staff in 1961. After two years (1964-66) in Argentina with the Ford Foundation, Dr. Baumgardner joined the Laboratory for Applications of Remote Sensing. He often serves as consultant to several international development agencies with assignments in Africa, Asia, Latin America, and Europe. He is a Danforth Associate and a Fellow of the American Society of Agronomy and the Soil Science Society of America. He is vice chairman of the International Soil Science Society's Working Group on Remote Sensing and Soil Survey and is chairman of the U.S. Agricultural Research Institute's Study Panel on Remote Sensing.

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1.1 FIRST OPENING PLENARY SESSION

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2.1 SECOND OPENING PLENARY SESSION

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3.1 DATA PROCESSING SYSTEMS

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3.2 SOIL SURVEY I

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3.3 CROP INVENTORY I

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3.4 SOIL INFORMATION I

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4.2 SOIL SURVEY II

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5.1 DATA PROCESSING AND ANALYSIS II

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5.4 SOIL INFORMATION III

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5.5 CROP INVENTORY II

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6.1 CLOSING PLENARY SESSION

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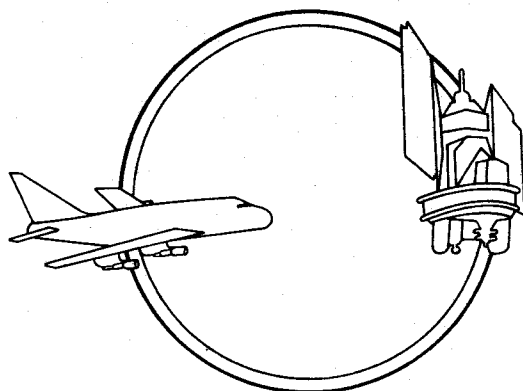
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