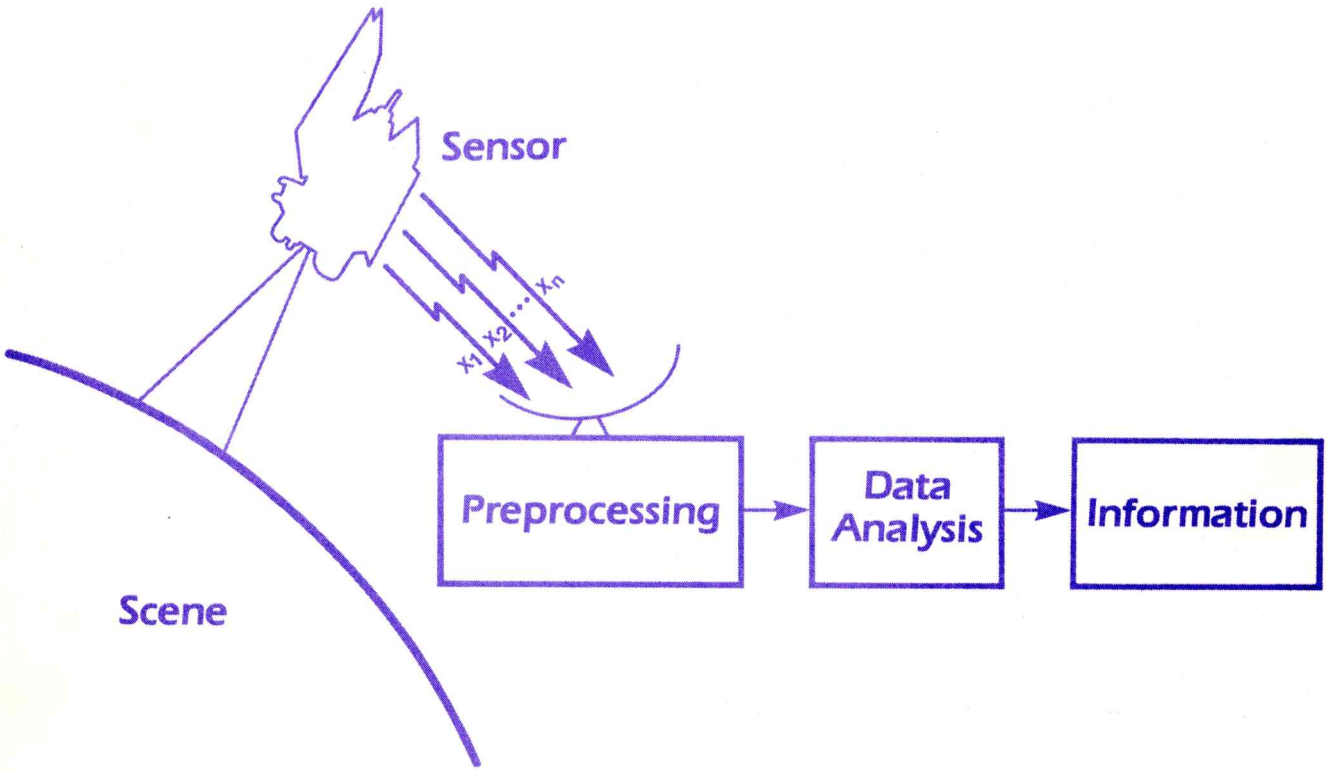
Ninth International Symposium

Machine Processing of Remotely Sensed Data

with special emphasis on

Natural Resources Evaluation



June 21-23, 1983

Proceedings

Purdue University

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

Symposium at a Glance

	TUESDAY JUNE 21	WEDNESDAY JUNE 22	THURSDAY JUNE 23
7:45	REGISTRATION - Fowler Hall		
8:30	OPENING PLENARY - CURRENT RESOURCES: INFORMATION REQUIREMENTS FOR THEIR EVALUATION AND MANAGEMENT Fowler Hall	4. FEATURE ANALYSIS AND TRANSFORMATION Room 202 5. INTERNATIONAL AND DOMESTIC TECHNOLOGY TRANSFER Room 212 6. SCENE SIMULATION AND MODELING Room 214	9. SUPERVISED AND UNSUPERVISED CLASSIFICATION Room 202 10. THEMATIC MAPPER DATA PROCESSING Room 212 11. GEOGRAPHIC INFORMATION SYSTEMS Room 214
	Morning Breaks: 10:00-10:30 in Room 206. Visit the Exhibits.		
12:00			
1:30	1. IMAGE SCIENCE Room 202 2. AGRICULTURAL APPLICATIONS OR REMOTE SENSING Room 212	7. POSTER PAPER PRESENTATIONS Room 206	CLOSING PLENARY - REMOTE SENSING TECHNOLOGY'S ROLE IN PROVIDING RESOURCE INFORMATION IN THE FUTURE Room 202
3:30	3. NATURAL RESOURCE EVALUATION Room 214	8. IMAGE ENHANCEMENT Room 202	
	Afternoon Breaks: 3:00-3:30 in Room 206. Visit the Exhibits.		
5:00			
5:30	CHICKEN BARBEQUE AND ENTERTAINMENT Fort Ouiatenon		
7:30			

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West Lafayette, Indiana 47907 USA

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Preface

The number of international papers in this symposium tends to underscore the world-wide awareness of the importance of natural resources. The emphasis on natural resources in this symposium is timely as evidenced by the plethora of other conferences and meetings devoted primarily, if not exclusively, to this major topic of global concern. The literature may dichotomize resources into renewable and non-renewable categories; however, this division is not always appropriate and is often difficult to define.

The spectres of desertification, salinization, pollution, and erosion -- to name but a few examples of environmental degredation -- must be inventoried, assessed, and quantified if control measures are to be successfully implemented. The magnitude of the serious problem of resources depletion and environmental deterioration posed to the peoples of the world suggests that the role of remote sensing technology continues to be increasingly important.

The research, thought, and concern of the authors of these papers is an encouraging sign that future generations will not have lost these vital assets through default on the part of present day managers and stewards of these resources. It is incumbent on all symposium participants as well as other readers of these proceedings to press decision makers for continued efforts regarding assessment and preservation of natural resources. This symposium is dedicated to that end.

No symposium can be successful without the support of many unselfish interested people and organizations whose time, energy and cooperation is so essential in bringing such a conference to fruition. It is with grateful thanks to the cosponsors, the session chairpersons, the symposium committee and the authors that the chairman expresses his gratitude. A special word of thanks is extended to those who have been intimately involved in the preparation of these proceedings; namely Darlys C. McDonald, Susan L. Ferringer, Patricia A. Morgan, Glenda C. Bauer and the symposium coordinator, Douglas B. Morrison.

Richard A. Weismiller, Chairman
1983 Symposium

Symposium Chairman

Richard A. Weismiller

Richard A. Weismiller is Program Leader for the Earth Sciences Research Program Area at LARS. B.S., Agronomy, with Highest Distinction, Purdue University; M.S., Soil Mineralogy, Purdue University; Ph.D., Soil Chemistry-Clay Mineralogy, Michigan State University. He joined LARS in 1973 after four years in the USAF, serving as a research scientist, Civil Engineering Research Division, Air Force Weapons Laboratory, Kirtland AFB, New Mexico. During May 1974-July 1980 Dr. Weismiller served as Associate Program Leader for Earth Sciences Research at LARS. He is a member of Phi Eta Sigma, Alpha Zeta, and Sigma Xi honoraries, and the Soil Conservation Society of America. He is also listed in American Men and Women in Science. His publications are in the areas of remote sensing as related to soils and land use and infrared spectroscopy studies of clay minerals.

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Opening Plenary

Current Resources: Information Requirements for Their Evaluation and Management

SESSION CHAIRMAN: Marion F. Baumgardner

B.S., Texas Tech University; M.S. and Ph.D., Purdue University; Honorary D.Sc., DePauw University. The author of numerous scientific papers, Professor Baumgardner serves frequently 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, the Soil Science Society of America, and the Indiana Academy of Sciences. Having traveled and lectured in more than 60 countries, Dr. Baumgardner is active in a dozen national and international scientific societies. He has served on numerous national and international committees and working groups to evaluate methods for surveying and monitoring earth resources. Through his three decades of experience in international agricultural development, Prof. Baumgardner has come to recognize the critical need by decision-makers for more accurate, useful, timely information about land, mineral, vegetation and water resources. He was named director of LARS in 1982.

INFORMATION REQUIREMENTS FOR EVALUATION AND MANAGEMENT OF RENEWABLE RESOURCES

R. WOOD

The World Bank
Washington, D.C.

Manuscript not available at time of printing.

INFORMATION REQUIREMENTS FOR EVALUATION AND MANAGEMENT OF MINERAL AND PETROLEUM RESOURCES

R.J.P. LYON

Stanford University/Remote Sensing Laboratory
Stanford, California

Manuscript not available at time of printing.

1
Image Science

SESSION CHAIRMAN: Frederic C. Billingsley

Frederic C. Billingsley has had over 30 years experience in electrical engineering following his receipt of three degrees from Rensselaer Polytechnic Institute, Troy, New York. Joining the Jet Propulsion Laboratory in 1962, Mr. Billingsley has been a Group Supervisor responsible for the development of the Image Processing Laboratory and the VICAR image processing systems. Subsequently, he (along with N. Bryant) defined the Land Use Management System, which has evolved into IBIS. Currently he is a member of the technical staff concerned with the development of future generation sensors using area array detectors. He is a senior member of IEEE and is an Associate Editor for the Computer Graphics and Image Processing Journal.

2
Agricultural Applications of Remote Sensing

SESSION CHAIRMAN: William H. Wigton

Consultant Agricultural Assessments International. Since January 1983 Mr. Wigton has been to Ecuador, Peru, Thailand, and Yemen setting up Agricultural Statistics and Remote Sensing Programs. From 1972 to January 1983 Mr. Wigton worked at U.S. Department of Agriculture, Statistical Reporting Service in the Remote Sensing Branch. The last six years of that time, Mr. Wigton directed research to support all operational methods developed for the Statistical Reporting Service.

REMOTE SENSING TECHNOLOGY TRANSFER FOR LARGE AREA CROP CONDITION ASSESSMENT

G.O. BOATWRIGHT, D.W. GOSS, T.W. TAYLOR

U.S. Department of Agriculture/
Agricultural Research Service
Houston, Texas

Manuscript not available at time of printing.

COMPARING LANDSAT DATA WITH NRI DATA FOR ACCURACY AND ESTIMATING SOIL EROSION POTENTIAL WITH LANDSAT DATA AND DIGITIZED SOIL INFORMATION

B.I. NAUGLE, J.D. MIKULCIK
N.V. WEBER, T.C. KIND

Murray State University
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Soil Conservation Service
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Manuscript not available at time of printing.

3
Natural Resource Evaluation

SESSION CHAIRMAN: Donna K. Scholz

Donna K. Scholz, Senior Scientist, Technique Development, joined Technicolor Government Services Inc., at the EROS Data Center in 1980. Prior to that she worked for five years as a Research Analyst on the Earth Science staff at Purdue University's Laboratory for Applications of Remote Sensing. Donna received her B.S. degree in Geology from Indiana University and her M.S. degree in Geology from Purdue University, where her research involved mineral exploration applications using remote sensing techniques. Her current research activities at EROS are in the area of integration of remotely sensed and other types of digital data as geographic information system tools for effective resource management.

4
Feature Analysis and Transformation

SESSION CHAIRMAN: David G. Goodenough

David George Goodenough is a senior research scientist at the Canada Centre for Remote Sensing of Energy, Mines and Resources Canada. He is Head of the Methodology Section which is concerned with the physics, pattern recognition, systems development, and engineering of systems and spectroscopic laboratories for remote sensing data analysis. He is a member of several national committees concerned with remote sensing and space science and is the author of more than 34 technical publications.

Goodenough is an active member of the IEEE, the Canadian Remote Sensing Society, the American Astronomical Society, and the Pattern Recognition Society. He is a non-resident professor in the Department of Electrical Engineering of the University of Ottawa and an Adjunct Professor in the Centre for Research in Experimental Space Science of York University.

5
International and Domestic Technology Transfer

SESSION CHAIRMAN: Joseph K. Berry

Dr. Berry is an Associate Professor of Forestry at Yale University where he teaches several graduate level courses in the application of computers in natural resource fields. His research involves the application of computer-assisted map analysis to natural resource planning.

SESSION CHAIRMAN: Shirley M. Davis

Shirley M. Davis is Senior Education and Training Specialist at Purdue University's Laboratory for Applications of Remote Sensing and Director of Independent Study, Continuing Education Administration. Mrs. Davis received the A.B. degree with honors in English in 1958 from Sweet Briar College and the M.A. degree in English from Case-Western Reserve University in 1962. Her major contributions to remote sensing education have been as co-author and editor of the LARSYS Educational Package; co-editor and contributing author of the textbook Remote Sensing: The Quantitative Approach; Chairman of the 1981 Conference on Remote Sensing Education; and creator/coordinator of the videotape series Introduction to Quantitative Analysis of Remote Sensing Data. Her recent work has involved the development of educational materials for digital image processing.

RESULTS OF A COURSE ON REMOTE SENSING FOR NATURAL RESOURCE MONITORING

A. FALCONER

Regional Remote Sensing Facility
Nairobi, Kenya

W. WIGTON

Consultant Agricultural Assessments
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Upper Marlboro, Maryland

D. REBEL

EG & G, Inc.
Las Vegas, Nevada

Manuscript not available at time of printing.

6
Scene Simulation and Modeling

SESSION CHAIRMAN: George A. Hanuschak

George A. Hanuschak received his B.A. in Mathematics at Youngstown State University (Ohio), his M.S. in Mathematical Statistics at Ohio State University, and completed the Education for Public Management Program at Cornell University. Mr. Hanuschak is currently the Head of the Applications Section, Remote Sensing Branch, Statistical Reporting Service and has been with the Remote Sensing Branch since 1975. From 1972-1975 he was a Mathematical Statistician for the USDA/SRS, Florida, California and Iowa State Statistical Offices. He has had experience as a Statistics Instructor at Des Moines (Iowa) Area Community College, the U.S. Department of Agriculture Graduate School, and the United Nations and Government of Sweden Remote Sensing Workshop.

Mr. Hanuschak has authored or coauthored numerous papers on the use of Landsat data by USDA/SRS. Topics addressed have been (1) the use of Landsat imagery in area sampling frame construction, (2) the timely use of Landsat data with SRS ground gathered data for crop area estimation, and (3) the impacts of cloud cover when using Landsat data for agricultural inventories.

7
Poster Paper Presentations

SESSION CHAIRMAN: Tina K. Cary

Tina Cary is a Ph.D. candidate in the Geography Department at Columbia University. Her dissertation research incorporates Landsat data in a study of agricultural systems in Western Kenya. she collected field data during her year as a Fulbright-Hayes Fellow, with support also from the National Geographic Society. Computer analysis is being done at the NASA/Goddard Institute for Space Studies, where she has also participated in AgRISTARS research.

Before coming to GISS and Columbia University, she worked at the Laboratory for Applications of Remote Sensing (1971-76), where she was involved in technology transfer activities as well as in research. Her M.A. is in Geography from Columbia University, B.S. in Mathematics from Purdue University.

8
Image Enhancement

SESSION CHAIRMAN: Alan H. Strahler

Alan H. Strahler is the chairman of the Department of Geology and Geography at Hunter College, City University of New York. His emphasis has centered on the remote sensing of biogeographical topics including forest and range applications, canopy modelings, physical geography, image classification and segmentation, and general Geographical Information Systems technology. Dr. Strahler received his B.A. and Ph.D. in Geography from Johns Hopkins University, and taught for six years at the University of California, Santa Barbara. He is the joint author of several physical geography textbooks.

9
Supervised and Unsupervised Classification

SESSION CHAIRMAN: Richard P. Heydorn

Richard P. Heydorn was born in Akron, Ohio, September 4, 1935. He received his B.S. degree in Electrical Engineering and his M.A. in Mathematics from the University of Akron. In 1971, he received his Ph.D. in Statistics from the Ohio State University. Dr. Heydorn has been actively working in Pattern Recognition and related research since 1959. He joined NASA/Johnson Space Center in 1974 where he worked on the Large Area Crop Inventory Experiment (LACIE). Later he became the Project Scientist of the LACIE transition project. Beginning in 1978, he has lead a series of research projects in Pattern Recognition under a program for Agricultural and Resources Inventory Surveys Through Aerospace Remote Sensing (AgRISTARS). Currently he is the NASA Science Manager of a fundamental research program in Mathematical Pattern Recognition and Image Analysis. Dr. Heydorn is a Registered Professional Engineer in the State of Ohio and a member of the American Statistical Association and Sigma Xi.

10
Thematic Mapper Data Processing

SESSION CHAIRMAN: Paul E. Anuta

Paul E. Anuta is Associate Program Leader for Data Handling Research at the Laboratory for Applications of Remote Sensing (LARS) at Purdue University. He received a B.S., Electrical Engineering, Purdue University in 1957; M.S.E.E., University of Connecticut in 1962; and an M.S. in Computer Science, Purdue University in 1967. Mr. Anuta joined the LARS staff in 1967 and has researched data handling systems for a multispectral aircraft scanner system, interferometer spectrometer, and other sensors. He is responsible for research and evaluation of remote sensor data preprocessing techniques. Key data handling research areas are image registration, geometric correction, and resolution enhancement of satellite multispectral imagery. His current interests are in the area of multitype data integration and preprocessing and analysis methods. He is a member of Tau Beta Pi, Eta Kappa Nu, The Institute of Electrical and Electronics Engineers, and the American Society of Photogrammetry.

11
Geographic Information Systems

SESSION CHAIRMAN: 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 Department, 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 computers 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.

SEGMENTATION OF MULTI-SOURCES IMAGES AND GEOCODED DATA MANAGEMENT

R. JEANSOULIN

Laboratoire LSI
Toulouse Cedex, France

Manuscript not available at time of printing.

Closing Plenary

Remote Sensing Technology's Role in Providing Resource Information in the Future

SESSION CHAIRMAN: Nelson de Jesus Parada

Dr. Parada is Director of INPE.

THE FUTURE OF REMOTE SENSING: THE BRAZILIAN PERSPECTIVE

N. DE JESUS PARADA

Instituto de Pesquisas Espaciais
Sao Jose dos Campos, Brazil

Manuscript not available at time of printing.

THE FUTURE OF REMOTE SENSING: THE FRENCH PERSPECTIVE

J. GERARD-ROUSSEL

Centre National D'Etudes Spatiales
Paris, France

Manuscript not available at time of printing.

THE FUTURE: GLOBAL ECOLOGY AND HABITABILITY OF THE EARTH

C. WOOD

Space Applications Board/National
Research Council
Washington, D.C.

Manuscript not available at time of printing.

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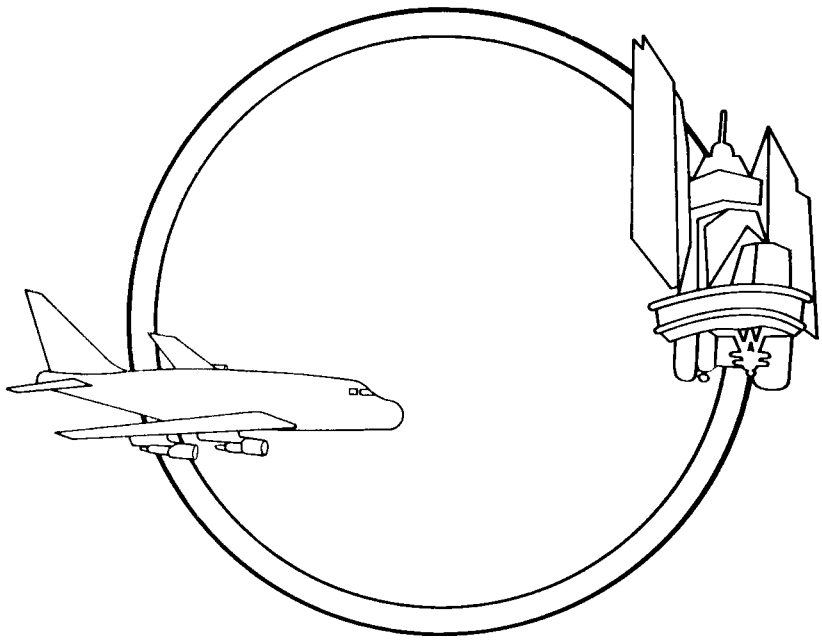

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