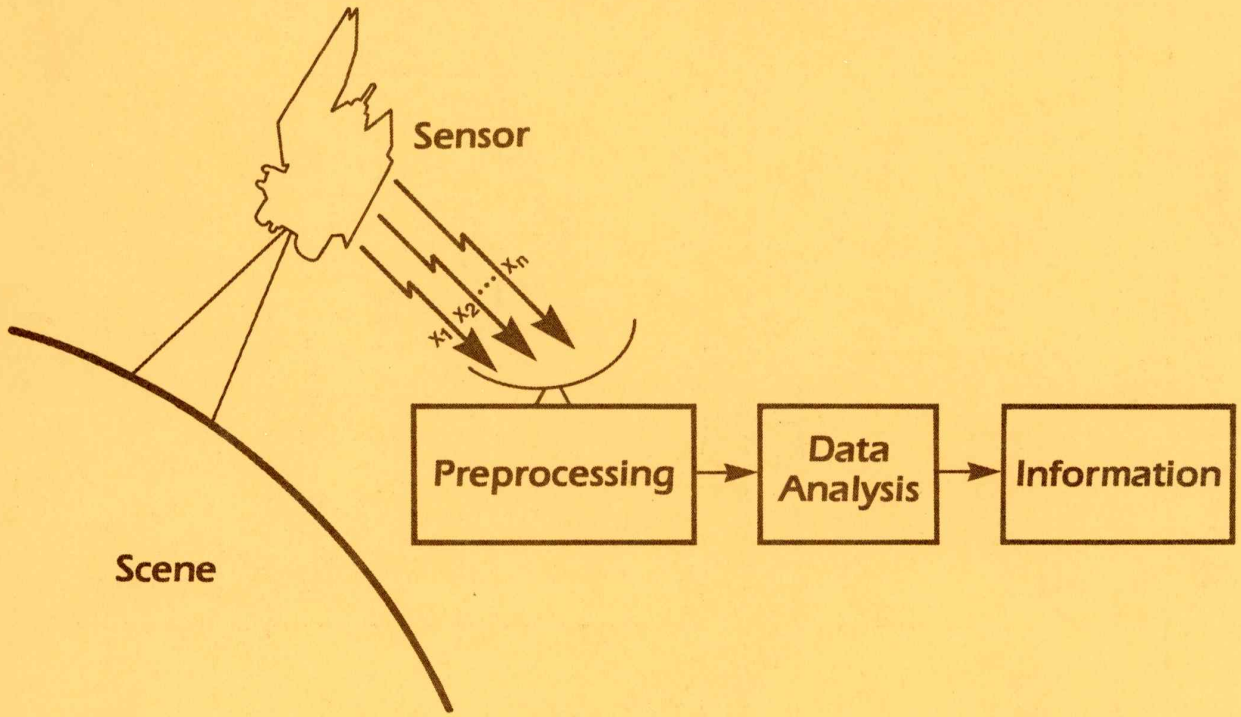
Eighth International Symposium

Machine Processing of Remotely Sensed Data

with special emphasis on

Crop Inventory and Monitoring



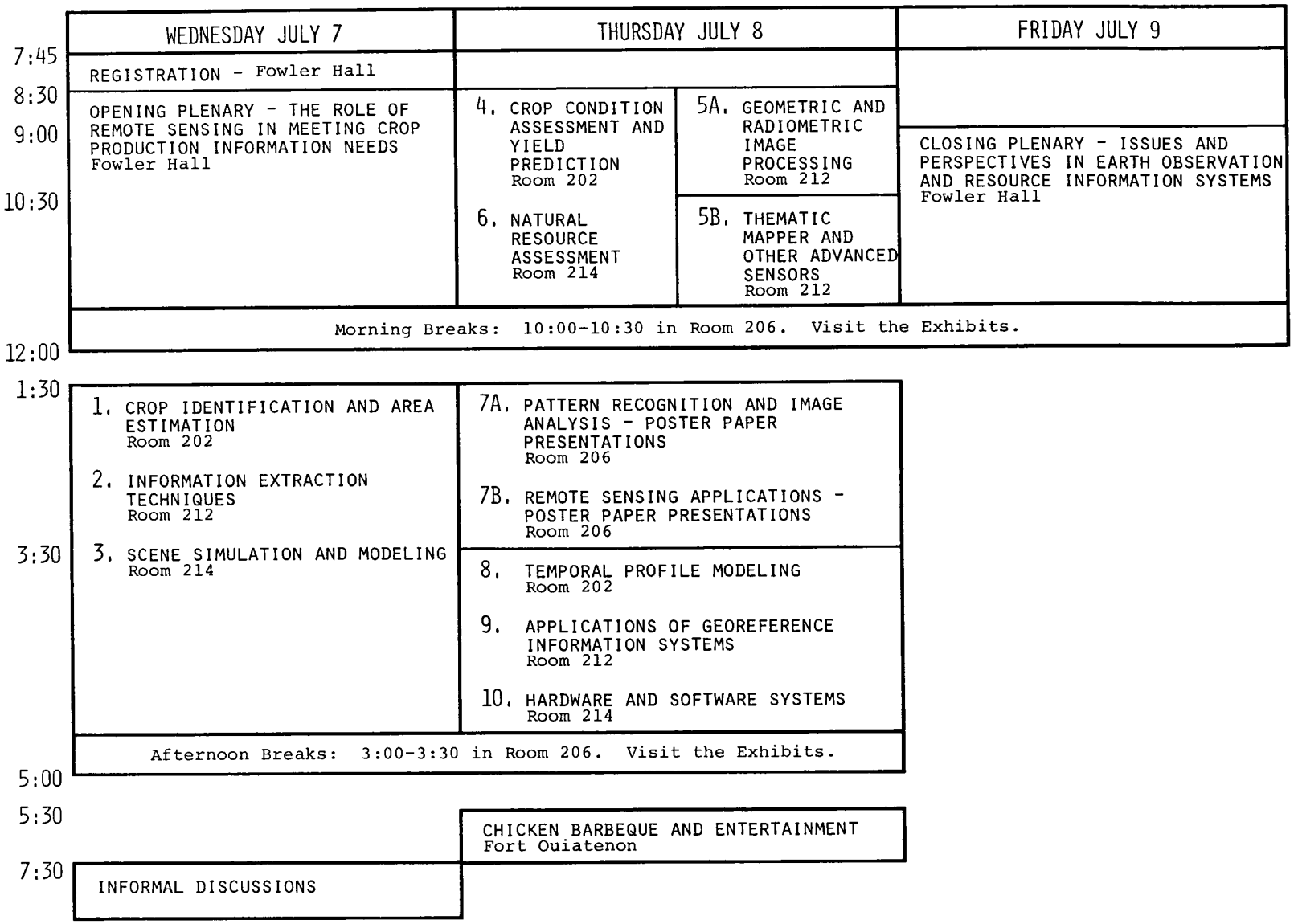
July 7-9, 1982

Proceedings

Purdue University

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

Symposium at a Glance



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Preface

The 1982 symposium, emphasizing Crop Inventory and Monitoring, considers the latest scientific advances and technological improvements in how to effectively use satellite remote sensing to obtain crop production information. The symposium serves as a forum for exchange of new ideas and results in research and applications of digital analysis and machine processing of remotely sensed data. Eighty-five of the more than ninety papers which will be presented at the symposium are included in these proceedings.

In reading the papers contributed to this year's symposium, the progress which has been made in recent years in the application of Landsat technology for crop inventory is very apparent, as is the potential for still further advancement in the technology. It is hoped that many of the new findings reported in this proceedings will find their way to operational use and will contribute to improvement in our capability to inventory and monitor earth resources.

A large measure of the success of this symposium is due to the organizations that co-sponsor the symposium with Purdue University. As chairman I am indebted to the program committee and session chairmen for assisting me in organizing the technical sessions. The cooperation of the contributing authors is greatly appreciated--with their help a greater percentage of papers are included in the proceedings than ever before. The many contributions of Douglas Morrison, Sue Ferringer, Darlys McDonald, Sandra Adams, and John Almon in preparation for the symposium are gratefully acknowledged.

Marvin E. Bauer, Chairman
1982 Symposium

Symposium Chairman

Marvin E. Bauer

Research Agronomist, Department of Agronomy, and Program Leader, Crop Inventory Research, Laboratory for Applications of Remote Sensing, Purdue University.

With B.S. and M.S. degrees from Purdue University in Agriculture and Ph.D. degree from the University of Illinois in Agronomy, Dr. Bauer joined the LARS staff in 1970. He is a member of the American Society of Agronomy, Crop Science Society of America, IEEE Geoscience and Remote Sensing Society, American Society of Photogrammetry, and several honorary societies. He is the author of more than 30 publications on the spectral characteristics of crops and the application of remote sensing technology to crop identification, area estimation, and yield prediction. He is Editor-in-Chief of the journal Remote Sensing of Environment.

Dr. Bauer has had key roles in the design, implementation, and analysis of results of several major remote sensing projects, including the 1971 Corn Blight Watch Experiment and the Large Area Crop Inventory Experiment. He has been the principal investigator of a Landsat investigation for crop identification and area estimation. Currently he is principal investigator at LARS of the AgRISTARS Supporting Research Contract with the NASA Johnson Space Center and serves as technical leader of research being conducted to quantify and model the radiation characteristics of agricultural crops and soils in relation to their agronomic properties.

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Opening Plenary

The Role of Remote Sensing in Meeting Crop Production Information Needs

SESSION CHAIRMAN: Don Paarlberg

Born in 1911, Don Paarlberg farmed with his father and brother in Lake County, Indiana, from 1928 to 1936. He graduated with honors in Agriculture from Purdue University in 1940 and received M.S. and Ph.D. degrees in Agricultural Economics from Cornell University in 1943 and 1946. He joined the agricultural economics faculty and did research at Purdue University from 1946 to 1953. From 1953 to 1961 he served in the Eisenhower Administration as Assistant to the Secretary of Agriculture (1953-57), Assistant Secretary of Agriculture (1958-60), and Food-For-Peace Coordinator (1960).

In 1961 he returned to Purdue as Hillenbrand Professor of Agriculture Economics and engaged in teaching and research until 1969. In 1969 he returned to Washington, serving for eight years as Director of Agricultural Economics in the Department of Agriculture and as Economic Advisor to the Secretary of Agriculture. In 1976 he became Assistant Secretary of Agriculture.

Now Professor Emeritus, Purdue University, he is an active writer, speaker, and consultant. He is the author of numerous papers and several books on agriculture policy, including Farm and Food Policy: Issues of the 1980's published in 1980.

1
Crop Identification and Area Estimation

SESSION CHAIRMAN: David R. Thompson

Dr. David R. Thompson received B.S., M.S., and Ph.D. degrees in agronomy-soils 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 presently conducting research utilizing Landsat MSS data for crop development stage, crop condition and soils. He is a certified professional agronomist and soil scientist.

2
Information Extraction Techniques

SESSION CHAIRMAN: R. Kent Lennington

Dr. R. Kent Lennington obtained the B.S.E.E. and M.S.E.E. at the University of Texas at Austin. His masters research was in the area of the analysis of bioelectric data. Following this, he obtained an M.A. degree in Statistics in 1971 and a Ph.D. in Electrical Engineering in 1975, also at the University of Texas. His dissertation research was devoted to the cluster analysis of biological population data.. After spending two years teaching Electrical Engineering at the University of Missouri at Kansas City, he joined Lockheed Engineering and Management Services Company in 1977. His work there has centered on applying pattern recognition techniques to the analysis of multispectral satellite data for the purpose of estimating the area planted to various crops. He is currently the supervisor of the Pattern Recognition Section at Lockheed.

3
Scene Simulation and Modeling

SESSION CHAIRMAN: David E. Pitts

David E. Pitts was born in 1939 in Oklahoma City, Oklahoma. He attended the University of Oklahoma majoring in Engineering Physics (B.S.-1961, M.S.-1964). He joined the NASA Johnson Space Center in 1963 to design atmospheric density models of the planets for heatshield design for Gemini, Apollo, Skylab, and advanced manned planetary missions. He returned to the University of Oklahoma on a Sabbatical to complete a Doctorate of Engineering in Meteorology (1971). He has participated in the design and conduct of remote sensing experiment programs at NASA such as: Apollo 9, Skylab EREP, Landsat, LACIE, and various aircraft experiments. His current assignment is as the Head of the Radiation Characterization Section which is conducting research into remote sensing of crop identification, condition, and crop stage as part of the Supporting Research Project of AgRISTARS.

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4
Crop Condition Assessment and Yield Prediction

SESSION CHAIRMAN: Edward T. Kanemasu

Dr. Edward T. Kanemasu is professor of agronomy and leader of the Evapotranspiration Laboratory at Kansas State University. He received B.S. and M.S. degrees from Montana State University and Ph.D. from the University of Wisconsin. He has been a faculty member at Kansas State since 1969 where he conducts research on evapotranspiration, water use efficiency, radiation, energy and water balances, temperature and spectral reflectance characteristics, and growth and yield modeling of crops. Dr. Kanemasu is a Fellow of the American Society of Agronomy and has served as associate editor and technical editor of Agroclimatology and Crop Modeling for the Agronomy Journal.

5A
Geometric and Radiometric Image 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.

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5B
Thematic Mapper and Other Advanced Sensors

SESSION CHAIRMAN: Richard D. Juday

Richard Juday holds degrees in Physics (B.A., Rice, 1965) and Remote Sensing (M.S., University of Houston/Clear Lake City, 1979). He joined the Johnson Space Center (then the Manned Spacecraft Center) in 1966, working with radiation hazard to astronauts from solar, geomagnetically trapped, and artificially induced particle radiation. He has been active in earth observations since 1970 when he became Experiment Development Manager for a Skylab experiment. His principal interests are color display of numerical imagery and image registration.

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6
Natural Resource Assessment

SESSION CHAIRMAN: Richard H. Gilbert

A graduate of the University of Illinois with a B.S. in Agronomy, Mr. Gilbert has also done graduate work at Iowa State University and Purdue University. After joining the Soil Conservation Service, U.S. Department of Agriculture, he mapped soils in 39 counties in three States. In 1973 he joined the staff of the Laboratory for Applications of Remote Sensing at Purdue University on an interagency transfer that lasted 2 years. He was involved with the use of remote sensing techniques by State government while at LARS.

In 1975 he was transferred to Washington, D.C., where he was assigned as leader of the newly formed Remote Sensing Team. He served in that capacity until December 1979 when he was assigned to his present position as Manager of the AgRISTARS Soil Moisture Project.

7A
Pattern Recognition and Image Analysis
Poster Paper Presentations

SESSION CHAIRMAN: Douglas B. Morrison

Douglas B. Morrison received his B.S. degree from Montana State and his M.A. in Speech from the University of Washington, following three years in the service with U.S. Air Corps as a navigator. Additional graduate work was taken at Northwestern University and Purdue University.

After several years of personnel work with industry, Doug returned to education in 1969 at Purdue University. He began at LARS in June of 1974 with the new (at that time) Technology Transfer Program Area and has been Training Coordinator under that program since then.

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7B
Remote Sensing Applications
Poster Paper Presentations

SESSION CHAIRMAN: Douglas B. Morrison

Douglas B. Morrison received his B.S. degree from Montana State and his M.A. in Speech from the University of Washington, following three years in the service with U.S. Air Corps as a navigator. Additional graduate work was taken at Northwestern University and Purdue University.

After several years of personnel work with industry, Doug returned to education in 1969 at Purdue University. He began at LARS in June of 1974 with the new (at that time) Technology Transfer Program Area and has been Training Coordinator under that program since then.

8
Temporal Profile Modeling

SESSION CHAIRMAN: Richard C. Cicone

Richard C. Cicone's educational background is in the area of mathematics and computer sciences having completed his M.S. at the University of Michigan in 1978. In eight years with the Environmental Research Institute of Michigan, his efforts have been in the area of civilian remote sensing. Working extensively for NASA/JSC and GSFC, he has participated as researcher and manager in a variety of programs including SKYLAB, CITARS, NFAP, LACIE, and most recently AgRISTARS.

9
Applications of Georeference Information Systems

SESSION CHAIRMAN: Joseph K. Berry

Dr. Joseph K. Berry is an Assistant Professor of Forestry at Yale University where he teaches several graduate level courses in the application of computer processing in natural resource fields. His current research involves the development of cartographic modeling techniques and the application of computer-assisted map analysis to natural resources planning.

10
Hardware and Software 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 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 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.

Closing Plenary

Issues and Perspectives in Earth Observation and Resource Information Systems

SESSION CHAIRMAN: Robert B. MacDonald

Robert MacDonald is currently chief of the Earth Resources Research Division, Space and Life Sciences Directorate at the NASA Johnson Space Center. At NASA he has served as Chief Scientist for Earth Resources Programs (1978-80); Chief, Earth Observations Division (1972-78) and Manager of the Large Area Crop Inventory Experiment. Prior to moving to NASA he was Technical Director of the Laboratory for Applications of Remote Sensing at Purdue University from 1965 to 1971. He was a research engineer with IBM Corp. from 1958 to 1965.

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8. TEMPORAL PROFILE MODELING

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9. APPLICATIONS OF GEOREFERENCE INFORMATION SYSTEMS

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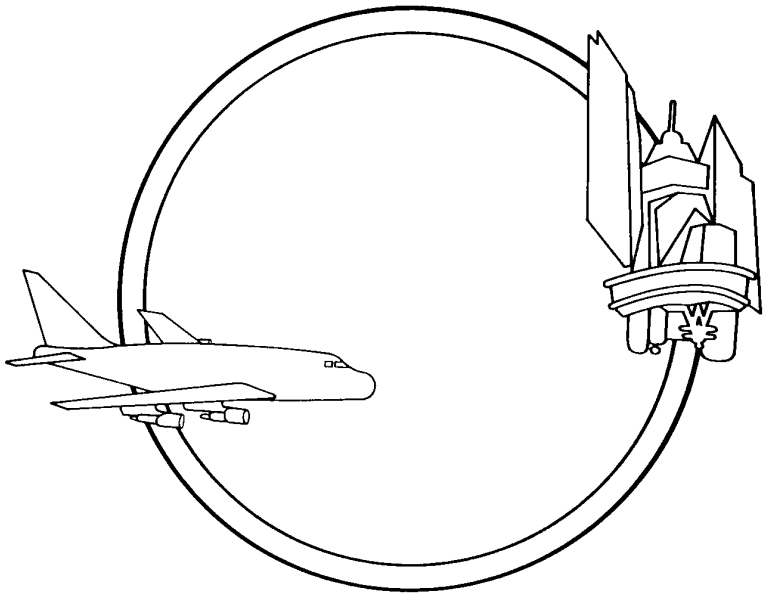

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