Foreword

One of the criticisms faced by the U.S. science community over recent years has been that it has not done a sufficient job of bridging the gap between basic research and the marketplace. Those who have been involved in high-technology product development will be the first to tell you that turning a scientific theory or conceptual algorithm into a real-life product or service is not an easy task. The applied science programs of the National Aeronautics and Space Administration (NASA) have been developed to assist researchers in both the private and public sectors accomplish this goal.

NASA's commitment to applied research is particularly evident in the field of remote sensing. The space agency provides technology, expertise, instruments, platforms, data, and resources to support a wide variety of remote-sensing applications. Remote sensing, and the application of digital imagery from space, is evolving from its roots in science, national security, and public information to the threshold of significant commercial benefit, wide-spread operational use in the public sector, and expansion of the Earth science research community's understanding of our planet.

The major engine leading to the growth in remote sensing applications is the advances in geographic information systems (GIS) technology and the recent sustained growth of low-cost/high-performance/multi-functional spatial datasets. These advances have led to the development of numerous local, regional, and global GIS applications. Continued technological and cost improvements have stimulated the demand for high resolution spatial and spectral data for use in mature and emerging market applications. Collateral growth and convergence of global positioning systems, data compression and delivery via new telecommunications media, and the awareness of the value of remote sensing in a number of areas that have not traditionally used this technology have also substantially increased the number of new remotely sensed products and services.

In the commercial sector, estimates of the scope and growth of the GIS/remote sensing industry vary, but generally agree that overall sales exceed $5 billion a year with the annual growth rates above ten percent. While aircraft and existing map data sales make up a large portion of this growth, the sale of digital satellite data is growing at a rate that is equal to or exceeds that of the other segments of the industry.

In the public sector, the realities of ever-decreasing budgets and ever-increasing demands for service have forced local, state, federal, and international organizations to seek new, more efficient methods to run their day-to-day operations. Many of these organizations are discovering how applications of remotely sensed data in areas such as resource management can bring about substantial savings in operational and personnel costs when compared to traditional methods of data acquisition.

Satellite imagery is also one of the most valuable tools available for research to monitor and predict trends in ecosystem and atmospheric changes accurately and to provide science-based guidance to decision makers on how to develop strategies to mitigate and adapt to these changes.

This special issue of *PE&RS* contains two types of papers – programmatic and technical. The two programmatic papers describe the opportunities available from several ongoing and planned NASA programs. The six technical papers describe the results of NASA-supported projects that have transitioned basic research results into either operational public sector applications or commercial products and services.

The technical papers were selected from the investigations of the Earth Observations Commercialization/Applications Program (EOCAP). In 1987, the NASA Office of Commercial Programs (now the Office of Advanced Concepts and Technology) and Office of Space Science and Applications, Earth Science and Applications Division (now the Office of Mission To Planet Earth) issued the first EOCAP NASA Research Announcement.

Twenty-one proposals were funded by EOCAP I, with an average project duration of three years. Selected proposals not only contain high scientific merit, but also a detailed implementation and/or business plan to move the proposed product or service from the results of a research project to an operational remote-sensing product or service. Additionally, proposers had to commit their own funds and resources to the success of the endeavor.

EOCAP was not established with the goal of expanding the state-of-the-science of remote sensing knowledge. EOCAP was established, however, to develop advanced remote-sensing techniques and methodologies into operational products and services. What is unique about these selected projects is that they are excellent examples of how project teams examined real-world problems and opportunities and developed successful applications to address them. The papers included in this special issue are as diverse as the program itself, ranging from the use of GIS technology to manage pipeline right-of-ways to the development of a data product used to improve weather forecasts.

It has been the experience of those involved with EOCAP that it is the programmatic and other non-technical hurdles that are sometimes the most difficult to overcome in this type of project. As well as discussing the technological advances made during these selected EOCAP projects, the papers also describe many other important aspects of these successful applications projects. These include the types of teaming arrangements that were required, experiences working with NASA and other governmental organizations, and how the project team worked towards making products ready to enter the marketplace and/or fit the needs of its projected end users.

The Office of Advanced Concepts and Technology has since issued two additional EOCAP NASA Research Announcements, EOCAP II and EOCAP III, in 1989 and 1993, respectively. The name of the program has been revised slightly to the Earth Observations Commercial Applications Program to reflect that the program now focuses solely on commercial applications. The Office of Mission To Planet Earth at NASA Headquarters is currently investigating the possibility of developing a follow-on public sector applications program. The projects described in this special issue were participants in EOCAP I and II.

The two programmatic papers describe two very different NASA remote-sensing programs. One paper highlights NASA's Commerical Remote Sensing Program (CRSP), which is managed at Stennis Space Center, Mississippi. The paper discusses the several options that companies have to chose from CRSP's menu of partnership programs for the private sector.

The other programmatic paper is an overview of NASA's Earth Observing System (EOS) and the EOS Data and Informa-

tion System (EOSDIS). This paper discusses the various components of EOS and the structure of types of data available through, and method of access to, the EOSDIS, which will deliver an unprecedented amount of Earth science and global change data to researchers worldwide.

NASA is committed to the continued support of applied remote sensing projects. The papers included in this special issue are but the tip of the iceberg and we encourage you, the mapping science community, to take advantage of the NASA programs highlighted here and to communicate directly with the NASA offices listed in the programmatic papers regarding other technologies and datasets currently being developed to address the issues that confront you in your work to find new applications of remotely sensed data.

Special thanks go to Ron Birk of the SSC Group, Sverdrup Technology, Inc. Without his guidance, insight, programmatic and technical knowledge, and hard work, this issue would not have been possible.

Guest Editors for NASA Special Issue

Vincent V. Salomonson
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Vincent V. Salomonson is presently the Director of Earth Sciences of the Earth Sciences Directorate of the Goddard Space Flight Center, NASA. In that capacity, he is responsible for overseeing and coordinating the activities of over 400 scientists in the Directorate who are actively involved in research of the Earth-Atmosphere system using advanced technology. He is also serving as the Science Team Leader for the Earth Observing System (EOS) facility called the Moderate Resolution Imaging Spectrometer (MODIS). Prior to assuming his present position, he served at Goddard as the Deputy Director for Earth Sciences (1988-1990), Chief of the Laboratory for Terrestrial Physics (1980-1988), Project Scientist for Landsat 4 and 5 (1977-1989), Head of the Hydrospheric Sciences Branch (1973-1980), and as a research meteorologist (1968-1973). Prior to coming to Goddard, he spent 3 years as Weather Officer in the United States Air Force (1959-1962). His academic training includes a BS degree in Agricultural Engineering from the Colorado State University (1959), a BS degree in Meteorology form the University of Utah (1960), an MS degree in Agricultural Engineering from Cornell University (1964), and a Ph.D. in Atmospheric Science from the Colorado State University (1968). His publication record shows over 100 publications in scientific journals, conference proceedings, and NASA reports. Service to professional societies has been provided in several capacities. For example, he was Author-Editor of the Water Resources Assessment Chapter (Chapter 29) in the *Manual of Remote Sensing*, Second Edition, published by the American Society for Photogrammetry and Remote Sensing [(ASPRS)1983]. He served as an Associate Editor of the *Photogrammetric Engineering & Remote Sensing* journal (1985-1987), an Associate Editor for the Remote Sensing of Environment journal (1985 to present), and Associate Editor for the *International Remote Sensing of Environment* journal (1985-1988). He also served as the ASPRS as the Director of the Primary Data Acquisition Division (1988-1989), Vice President of the Society (1989-1990), President-Elect (1990-1991), President (1991-1992), and Past President (1992-1993). He also serves as a member of the Executive Administrative Committee for the IEEE Geoscience and Remote Sensing Society and was the General Chairman of the International Geoscience and Remote Sensing Society Symposium (IGARSS-90) held in Washington, DC in May 1990.

In 1975, Dr. Salomonson received the Goddard Exceptional Performance Award for his work as Chairman of the NASA Sub-discipline Panel for Water Resources. In November 1976, Dr. Salomonson was the recipient of the NASA Exceptional Scientific Achievement Medal for outstanding contributions in the practical applications to the user community, and for developing and guiding NASA's water resources research program. In October 1983, he again received the NASA Exceptional Scientific Achievement Medal in recognition of his extensive contributions to land remote sensing for Earth science and resource utilization through his participation in the guidance of the Landsat Project and related science activities from their inception in the Landsat Program. The IEEE Geoscience and Remote Sensing Society (IGARSS) awarded the 1986 Distinguished Achievement Award to him for his significant technical contributions to satellite remote sensing. In May 1987, he was made an Honor Alumnus of the Colorado State University. In 1987, he was also awarded the William T. Pecora Award for his involvement in satellite remote sensing. In 1992, Dr. Salomonson was awarded, by the President of the United States, the rank of Meritorious Executive in the Senior Executive Service for sustained superior accomplishment in management of programs of the U.S. Government and noteworthy achievement of quality and efficiency in the public service.

C.L. Hill
Commercial Remote Sensing Program
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Chuck Hill is currently Deputy Director of the Commercial Remote Sensing Program (CRSP) Office at NASA's John C. Stennis Space Center, Mississippi. As Deputy Chief, Chuck has responsibility for the day-to-day operations of the CRSPs. He is an acknowledged leader in NASA's initiative with industry to stimulate space remote sensing applied research, technology development, and applications focused on market needs for information services. He was instrumental in designing and implementing CRSP's Earth Observations Commercial Applications Program (EOCAP), Visiting Investigator Program (VIP), and Space Act Applications (SAA) Program which form the partnership program base for industry/government co-funded remote sensing ventures. CRSP's programs have been widely accepted as models for risk-sharing partnerships between government and industry.

Chuck received a BS degree in Forest Management and a MS degree in Wildlife Ecology, both from Mississippi State University.

Mr. Hill has over 15 years of experience in applying remote sensing techniques and technology to Earth resources problems. He has received numerous awards for outstanding individual and group performance at NASA. He holds a number of memberships in professional organizations, including being a member and past President of the Mississippi Wildlife Society.

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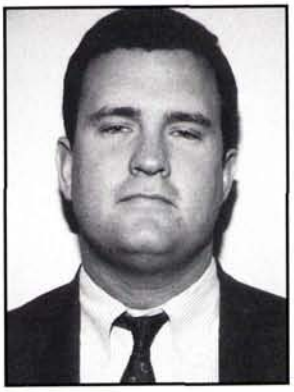

Rick Kelly is a Project Manager with WT Chen & Company's Space Technology Group in Arlington, Virginia. In support of NASA's Office of Mission To Planet Earth, he is presently working with the Office of the U.S. Global Change Research Program, serving as the Acting Program Associate for the Observations and Data Management Working Group.

Mr. Kelly has provided extensive Earth Science project management support to NASA Headquarters, Washington, DC supporting programs such as the Earth Observation Commercialization/Applications Office at Goddard Space Flight Center, Greenbelt, Maryland, where he provided project management and business outreach support.

Before joining WTC in 1989, Mr. Kelly was the Manager of Teleconference Marketing and Operations for the Public Service Satellite Consortium, Washington, DC, a Marketing Representative for Frost & Sullivan International Political Risk Services (now PRS, Inc.), New York, New York, and a staff member for two Texas State Representatives in Austin, Texas.

Mr. Kelly received a BA in Government from the University of Texas at Austin and a Master's Certificate in Project Management from the George Washington University. He is a member of ASPRS and the Project Management Institute and is a Staff Sergeant (Airborne) in the United States Marine Corps Reserve.