This special issue of Remote Sensing of Environment is dedicated to results from research carried out under two NASA-sponsored Multisensor Aircraft Campaigns (MACs) focused on forest ecosystems: the FED (Forest Ecosystems Dynamics) study, which focused on a research site near Howland, Maine (Levine et al., 1993) and the OTTER (Oregon Transect Terrestrial Ecosystems Research) study, which examined the vegetation gradient in western Oregon (Peterson and Waring, 1993).

NASA supports a variety of aircraft-based remote sensing instruments directed toward exploring possible future space-based observatories for terrestrial research. In recent years, NASA has actively pursued study sites where numerous investigators coordinate their research objectives and activities, and supporting aircraft flights are concentrated in Multisensor Aircraft Campaigns. This approach not only makes for more efficient use of aircraft hours, but it also fosters cross-collaboration of research activities between scientists of diverse interests and expertise. The research carried out under the First International Satellite Land Surface Climatology Project (ISLSCP) Field Experiment (FIFE) and the Geological Remote Sensing Field Experiment (GRSFE) are two of the better known examples of NASA MAC activities.

The OTTER and FED MAC activities were developed at approximately the same time and were carried out during the growing seasons of 1989 and 1990. In both cases, the objectives were to study forest ecosystems to better understand the contribution that remotely sensed observations can provide in ecosystems research. The real contrast between the studies, other than being on opposite coasts of the United States, is that the FED MAC was dedicated to a single research site in northern Maine, whereas OTTER explored the variation of ecosystems that occurs longitudinally across a severe moisture gradient in western Oregon. As a result, studies at each of the six OTTER research sites were less intensive that those which were carried out at the single FED MAC site. The contrast in observed ecosystems and methodology encouraged NASA to support both forest ecosystem studies simultaneously. The apparent imbalance in this issue, between presentations from the FED MAC (10) and the OTTER MAC (4), is explained by the coincident publication of a special issue of Ecological Applications dedicated to the OTTER studies (Peterson and Waring, 1993).

The diversity of research encouraged by MAC studies is well demonstrated in these reports. Not only are all portions of the electromagnetic (EM) spectrum considered, but the scales of analysis extend from plant cells to the 200 km Oregon Transect. For the newcomer to remote sensing research, the range of subjects discussed here may seem chaotic and overwhelming. The context for this diversity is found in the primary objective of NASA aircraft missions—assessment of advanced remote sensing concepts. Theoretical understanding of electromagnetic energy/matter interactions suggests that there is considerable information contained in EM measurements which is not exploited by existing spaceborne sensor systems. However, there are sufficient imponderables in the theoretical knowledge of terrestrial EM interactions such that collection of empirical observations is warranted.

The current compliment of NASA aircraft experimental sensor systems covers a considerable range of advanced remote sensing system concepts. The AVIRIS (Airborne Visible Infrared Imaging Spectrometer) and ASAS (Advanced Solid-state Array Spectroradiometer) are both directed toward more fully exploiting the spectral reflectance properties of terrestrial materials in the solar irradiance portion of the spectrum. AVIRIS is primarily directed...
toward high spectral resolution measurements, whereas ASAS concentrates on the anisotropy of surface directional reflectance. The TIMS (Thermal Infrared Multispectral Scanner) provides multiple wavelength observations in the thermal infrared emissive portion of the spectrum. The AIRSAR (Airborne Synthetic Aperture Radar) is designed to explore multiple-frequency, multiple-polarization active microwave remote sensing. Each of the presentations in this issue is dedicated to one or more aspects of exploiting the information content of these advanced sensor systems, specifically in relation to studies of forest ecosystems.

Each of the reports contained herein can be considered building blocks for future applications of these advanced sensor systems. Relative to active microwave or RADAR remote sensing, Salas et al. explore the variations in tree dielectric properties as a function of species and time. Weishampel et al. consider the nature of backscatter signals as a function of spatial scale and Lang et al. assess the causes of strong backscatter signals from red pine plantations. Ranson and Sun employ multitemporal SAR images to conduct forest land cover classification in Maine, and Moghaddan et al. consider use of SAR data to evaluate variations of standing biomass across the Oregon Transect. Smith and Goltz present a new modeling approach to the simulation of forest canopy thermal patterns, which should be of considerable value in thermal infrared remote sensing.

Studies in the solar reflective region consider both detailed spectral structure and bidirectional reflectance patterns. Rock et al. measure detailed spectra of leaf optical properties and sample branch stacks for selected species and age classes from the FED-MAC site. Gowd et al. consider the spectral reflectance properties of landscape components at the six OTTER field sites. Lawrence et al. compare remotely sensed reflectance spectra from three airborne spectroradiometers (AVIRIS, ASAS, and SE-590). Johnson et al. evaluate the relations between canopy biochemistry and AVIRIS reflectance spectra in Oregon. Levine et al. consider possible relations between underlying soil properties and variations in spectral vegetation index measurements at the Howland, Maine site. Deering et al. present detailed ground measurements of canopy spectral, bidirectional reflectance properties. Abuelgasim and Strahler consider the relationship between ASAS bidirectional measurements and a geometrical canopy model in Oregon, whereas Ranson et al. explore the information content of ASAS measurements collected in Maine.

In total, the contents of this issue present an important update on the current state of remote sensing research in the early 1990s. There is clearly progress being accomplished with a range of possible alternate sensor systems. It is also evident that the field is becoming more specialized and complex. For example, in this issue there is no consideration of possible synergies in combining observations from the solar reflective, thermal infrared, and/or microwave regions. Given the difficulties in exploring within any one of these EM regions, it is not surprising that such interactions are not yet considered. However, with the preservation and publication of these observations on readily accessible media such as CD-ROMs and floppy disks, the opportunities for bright, new students to product major new remote sensing discoveries seem almost limitless. We hope that the contents of this issue may, in part, serve as encouragement for such efforts.

REFERENCES
