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# Acquisition of Remote Sensor Data with Linear Arrays

New sensor systems designed for Earth resources satellite missions are described with particular reference to the activities of the Primary Data Acquisition Division's Sensor Systems Committee.

IN THE FOLLOWING pages four articles are presented by leading authorities on the design, construction, and potential application of solid state sensor systems which incorporate charge transfer device (CTD) technology. These papers were solicited by the Primary Data Acquisition Division (PDAD) for a session, "Acquisition of Remote Sensor Data with Linear Arrays," held at the 1978 ASP-ACSM Convention last March. The subject of linear arrays was selected in order to acquaint photogrammetrists with the new sensors being developed for Earth satellite remote sensing activities and to stimulate interest in PDAD activities. The positive response of the audience indicated both interest and curiosity about linear arrays of charge coupled devices (CCD's), a new technology which has developed rapidly since 1970. Controversy over the Thematic Mapper (an improved multispectral scanner system planned for Landsat-D) and a proposed alternative solid-state multispectral linear array sensor system operating in what has become known as the "pushbroom" mode contributed to audience interest, as did NASA's plans for array sensors with 10 to 20 m instantaneous fields of view (IFOV) for the Stereosat and Space Shuttle missions. Areas of discussion included spectral sensitivity of silicon base CCD's, spectral bands required for Earth resource investigations, data transmission rates, signal-to-noise ratios, IFOV considerations, quantization (number of gray levels), sensor durability, data costs, and many other factors. These points are further considered in the individual papers.

Les Thompson of NASA's Goddard Space Flight Center, for example, describes the linear array pushbroom concept of operation and the performance of array systems employed in this mode. Points receiving specific attention include radiometric sensitivity, geometric fidelity, and radiometric correction. Richard Tracy and Robert Noll of Westinghouse Electric Corporation address the differences between scanners and array sensors, and focus on the merits of on-board microprocessors for real time data reduction. The practical and theoretical aspects of recording low-contrast targets are described in relation to the characteristics of array detectors by Ralph Wight of Fairchild Camera and Instrument Corporation. His discussion of the Time Delay and Integration (TDI) technique of improving signal-to-noise ratios and offsetting image motion illustrates a unique advantage of the array sensor system. The final paper, by A.P. Colvocoresses of the U.S. Geological Survey, compares the Thematic Mapper (Landsat-D) with a solid state sensor system incorporating multispectral linear arrays (MLA's). The functional, cost, and data processing advantages of MLA's for operational Landsat type missions are emphasized.

The scope and subject matter of these articles indicate the intensity with which new sensor systems are being developed and provide photogrammetrists with insights to the possibilities and problems associated with electro-optical sensor systems operating in a digital mode. The newly formed Sensor Systems Committee of the PDAD

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will be conducting investigations of these and other sensor systems in an attempt to assess their relative merits for photogrammetric/remote sensing tasks appropriate to the Landsat, Stereosat, and Shuttle missions. Persons interested in participating in the activities of the Sensor Systems Committee are invited to contact the author at the above address.

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## CALL FOR PAPERS

## Seventh Biennial Workshop on Color Aerial Photography in the Plant Sciences

**May 15-17, 1979**
**Faculty Club, University of California**
**Davis, California**

The Workshop will feature vegetation damage assessment, land use planning, vegetation mapping, and related fields of agriculture and resource management. If you are engaged in any discipline related to vegetation, from Agronomy to Zoology, this workshop should be of interest. As in previous years, the focus will be on the latest information on use and misuse of color and color infrared photography. An informal poster session with emphasis on techniques, tools or displays will be part of this workshop.

If you would like to present a paper at this workshop or participate in the poster session, we ask that you supply the following information:

- Title of Proposed Paper
- Author's Name, Address, Position, and Professional Affiliation
- Summary of Technical Content of Paper, approximately 200 words. (Note: this is not an abstract and will be used for review purposes only)
- Estimated Time of Presentation (not to exceed 20 minutes)
- Visual Aids Required

In order for papers to be considered for inclusion in the program, proposals must be received no later than March 15, 1979. Please submit proposals to

Planning Committee
Workshop on Color Aerial Photography
Attention: Mr. William M. Ciesla
USDA Forest Service
FI&DM/Methods Application Group
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