

## PHOTONICS

A major effort during 1981 was the organization of the 15th International Congress on High Speed Photography and Photonics scheduled for August 21-27, 1982, in San Diego.

In 1981, there was increasing interest in the science of Photonics. (Photonics is a word that was coined to express the interrelationship of photography and electronics. It is defined as "the field of science in which photons are the principle carriers of information.")

Countries leading the development of equipment contributing to the advance of high speed photography and photonics include the US, the UK, France, West Germany, the USSR, the People's Republic of China, and Japan. The USSR is doing a great deal of research at the P.N. Lebedev Physical Institute and the All-Union Institute of Optical-Physical Measurements, among others. Research in the field of high speed photography and photonics is going on in China at the Sian Institute of Optics and Precision Mechanics in Xian.

### New Developments

With the use of lasers, video systems, computer reconstruction of images and space telemetered reproduction, photography has changed dramatically from the original camera and silver halide film combinations.

Cameras and image recording systems are making use of microcomputers and integrated circuits to eliminate human error and to make the composition of the picture the area of concern.

High altitude photography from planes and satellites is used to examine the terrain for military reconnaissance and for agricultural studies.

Scientific and instrumentation uses of video systems have led to increased development of high speed recording capabilities for both black-and-white and color. Both analog and digital systems provide data analysis capabilities of 12,000 frames/sec. Time can be frozen to show movement stopped to 1/20,000 sec.

A framing camera potentially capable of cine photography at frame rates of 30 billion frames/sec. Nils Abramson, Royal Institute of Technology, Stockholm, Sweden, described a holographic technique by which the limited coherence light length of a laser is used to illuminate movement of the subject's image across a holographic plate.

### New Equipment and Systems

New types of cameras and systems have been developed and improvements have

been made to others. A dual camera Instar IV Motion Analysis System, manufactured by Video Logic Corp., can provide 400 frames/sec. A typical setup includes two cameras and an Instrobe (spot strobe source). This system is an example of the video systems that are replacing the rotating prism cameras that dominated the field of high speed data acquisition until about 10 years ago. High speed video has grown from of 200 frames/sec to 12,000 frames/sec, and since the frame rate is bandwidth limited, it can go still higher.

One of the newest systems to enter the field is the Spin Physics SP2000 Motion Analysis System. This system can record in color up to 2,000 frames/sec on ½-in tape. By dividing the frames into two, three, or six segments horizontally, it can provide 12,000 frames/sec. The system can record for about one minute at 2,000 frames/sec and about 25 minutes at 60 frames/sec. It provides almost instant playback capability. The TV camera is small and includes a removable video monitor. The sensor used in the camera is a metal oxide silica (MOS) photo capacitive array consisting of 192 × 240 charge-accumulating cells which equal 46,080 picture elements (pixels). The system cannot be damaged by overexposure to light and has sensitivity approximately equal to a 50 ASA film speed. The control panel is a membrane touch type providing a choice of recording format.

The Imacon 790 high speed image converter camera, distributed by Marco Scientific Corp., has a speed range of 10,000 pictures/sec to 20 million pictures/sec. The streak mode has a range of 100 μsec to 1 nsec. The camera was used as part of an instrumentation arrangement at NASA-Ames Research Center to measure dynamic pressure of the stream flow in an arc-driven shock tube operating at Mach 7.

A new rotating prism camera was developed by Photec Corp. It is constructed on the single shaft principle using an 8-sided rotating prism and an 8-frame sprocket on one shaft coupled to a segments disc shutter. It has no internal relay lenses.

A new image intensifier was developed by John Hadland Ltd. for use with the Imacon 790 and 675 cameras. It is designed to provide medium gain full field intensification.

Redlake Corp. developed the Fastax II, Model 48, a 16-mm addition to the Fastax line. It has a frame rate of 50 to 10,000 frames/sec.

### Flight Research

Flight Research, a Geotel Company, has developed instrumentation cameras for a number of years. A recent development is

the 35-mm Model 705-A designed for high speed intermittent stop/start operations. It produces high resolution, pin registered motion pictures at speeds ranging from 25 to 360 frames/sec.

### Santa Barbara Research Center

The investigation of space has been aided by many instruments developed by the Santa Barbara Research Center. Several hundred hours in space have been logged by more than 50 different sensor systems.

Although the Landsat Multispectral Scanner has achieved spectacular success in carrying out the Earth Resources Survey mission, NASA has set more far-reaching goals for the future. To achieve these goals, the Santa Barbara Center and Hughes Aircraft Company are developing the Thematic Mapper to be launched onboard Landsat-D in 1982. Major improvements include ground resolution 2.5 times better than that presently obtainable, and a total of seven spectral bands, each with finer spectral resolution and greater radiometric accuracy.

### Conclusion

In this fast moving world of technology and the possible opening of the new frontier of space for human colonization in the future, the importance of the development of new equipment and techniques and new ways of looking at things cannot be overestimated. The new science of Photonics, now little past its infancy, is fast becoming one of the more important disciplines that is needed to influence and advance the well-being of mankind. — *Lincoln L. Endelman*, Vice-President for Photonic Affairs.

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