

# NASA TECH BRIEF

## NASA Pasadena Office



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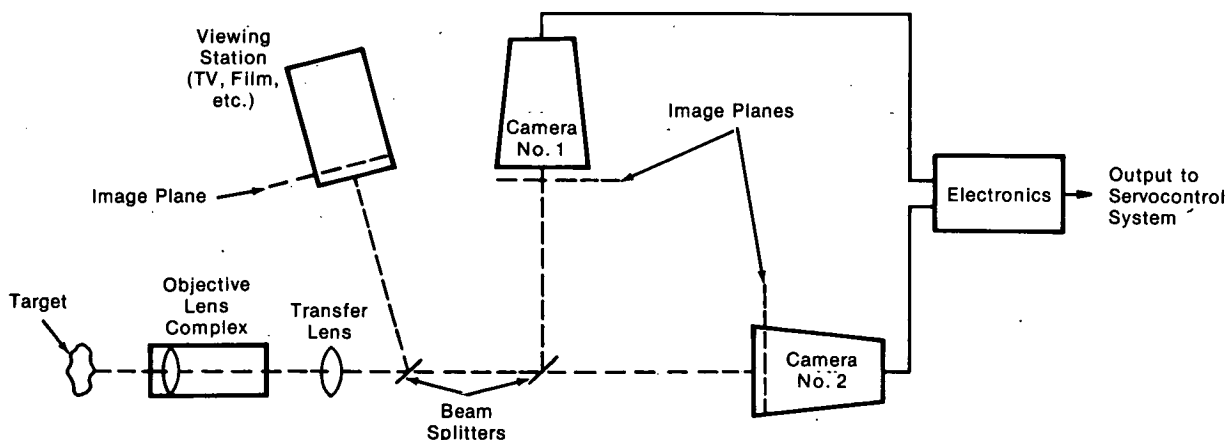
### Automatically-Focusing Microscope System for Live Tissue Observation

Coronary and other live tissue microcirculation is studied with the help of microscopes and often microscopic cinematography. Live tissue motion, especially in the case of the coronary bed, presents focus difficulties. Presently used equipment is readjusted manually which makes it difficult to operate for slow moving targets and impossible to maintain focus on the moving heart. An automatic focusing system was developed to eliminate this difficulty.

The system includes a focus-sensing arrangement which controls a servo to keep the microscope constantly focused on the target. The microscope objective is moved along the optical axis. As shown in the figure, the system includes two video cameras that are used as transducers for sensing focus. The incoming visual image is split by the beam splitter so that one-half of the information is fed to each camera. Camera No. 1 is located so that the microscope image plane is in front of the image tube target, whereas camera No. 2 is positioned so that the microscope image plane appears behind the target of its image tube.

In operation, the signal obtained from one camera is processed by differentiation and filtering to produce dc voltage which is fed to the inverting input of the difference amplifier. The signal from the other camera undergoes similar processing but is fed to the noninverting input of the difference amplifier. The amplifier output serves as a position signal for actuating the servocontrol system. A portion of the position signal is further differentiated to produce a velocity reference signal. This signal is also fed to the servocontrol system.

In addition to the focusing system servocontrol, two extra controls are used to provide lateral (X-Y) motion to the table supporting the target. These are operator controlled. The table is operated through a pair of micrometer heads. Other built-in system features include provisions for a movie camera and for real-time television viewing.



Focus-Sensing Subsystem

(continued overleaf)

**Note:**

Requests for further information may be directed to:

Technology Utilization Officer  
NASA Pasadena Office  
4800 Oak Grove Drive  
Pasadena, California 91103  
Reference: TSP75-10048

**Patent status:**

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

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