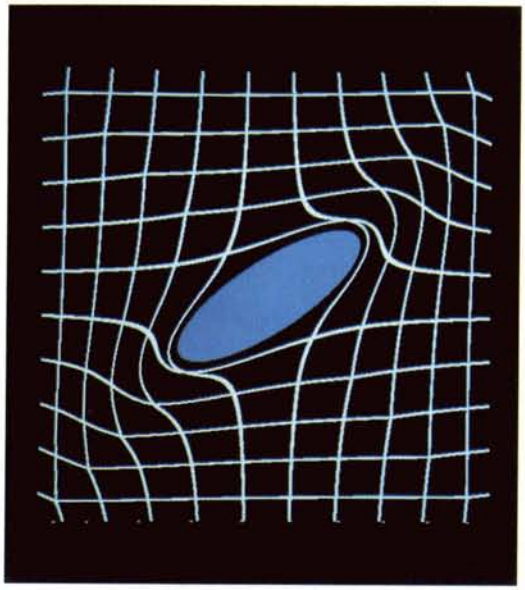
Image Processor

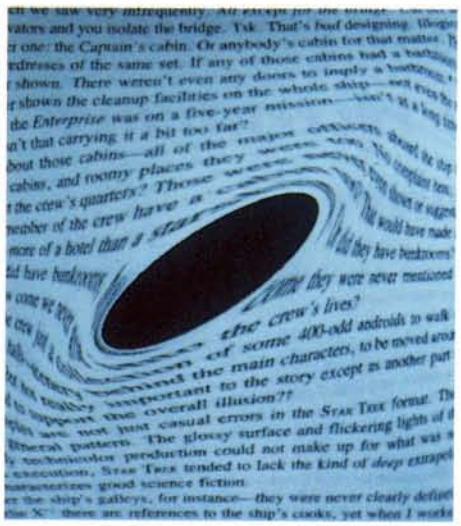
At right, a researcher is operating a Programmable Remapper, a digital image processing machine of novel design and function with important potential for alleviating vision problems encountered by people with retinitis pigmentosa, maculopathy and other vision impairments.

The Remapper is a research tool used to determine how to best utilize the part of a patient's visual field still usable by mapping onto this field of vision with manipulated imagery. If, for example, a person's central vision has deteriorated but peripheral vision is still intact, the image is warped or "remapped" onto the still-functioning portion of the eye. The system's developers plan to advance the technology to create a wearable prosthesis for visually-impaired people.

The Remapper is an offshoot of a NASA program for an image processor capable of simplifying, speeding up and improving the accuracy of pattern recognition in video imagery and to solve thereby problems associated with automated tracking/docking of spacecraft and autonomous planetary landings. The original specifications were drawn up by the Tracking and Communications Division of Johnson Space Center (JSC). The design was accomplished jointly by JSC and Texas Instruments, Inc., Dallas, Texas, working under contract to JSC. Dr. Richard D. Juday is JSC project manager. Dr. Jack M. Younse is Texas Instruments' program manager and Dr. Jeffrey B. Sampsell is the company's manager for development of the Remapper.

Early in the program, the Remapper's potential for application to human low vision problems became apparent and NASA's Technology Utilization Office provided funds to pursue research toward that application. The U.S. Army Missile Command saw another application—a more effective system for "teach-





ing" missiles to recognize tanks on the battlefield — and joined the development group. The group is pursuing all three applications — space, battlefield and human low vision — and Texas Instruments is also considering the Remapper as a future industrial robotic vision system.

For the human low vision application, NASA assembled a team composed of Dr. Juday, who is manager of Robotic Vision Development at JSC, and Dr. David S. Loshin of the University of Houston's College of Optometry. In its current form, the Remapper is commercially available from Texas Instruments as a tool for optometric research.

The Remapper makes it possible to "push around" an image so that more of the image structure falls onto the still-functional portions in the retina of a vision-impaired person. Drs. Juday and Loshin are evaluating the potential of remapping as a prosthesis for certain forms of human low vision. At upper left is a grid that has been remapped, meaning that all the information behind the blind (blue oval) area has been remapped outside the blind spot; at lower left, the remapping is demonstrated on a printed page.

The Programmable Remapper works at video rates; what is seen on the monitor screen is what is actually seen by the subject, and no computer analysis is necessary. Thus, the system has strong possibilities as a prosthesis if planned "shrinkage" can sufficiently reduce the size and cost of the device to make it practicable as a portable image correction device. The Remapper, worn on a belt or elsewhere on the body, would warp the image to correspond to the patient's vision characteristics and the viewing task he is attempting; the patient would then view the warped image on a small video display in front of one or both eyes. Drs. Juday and Loshin believe that the essential miniaturization of the system could be accomplished in five years.