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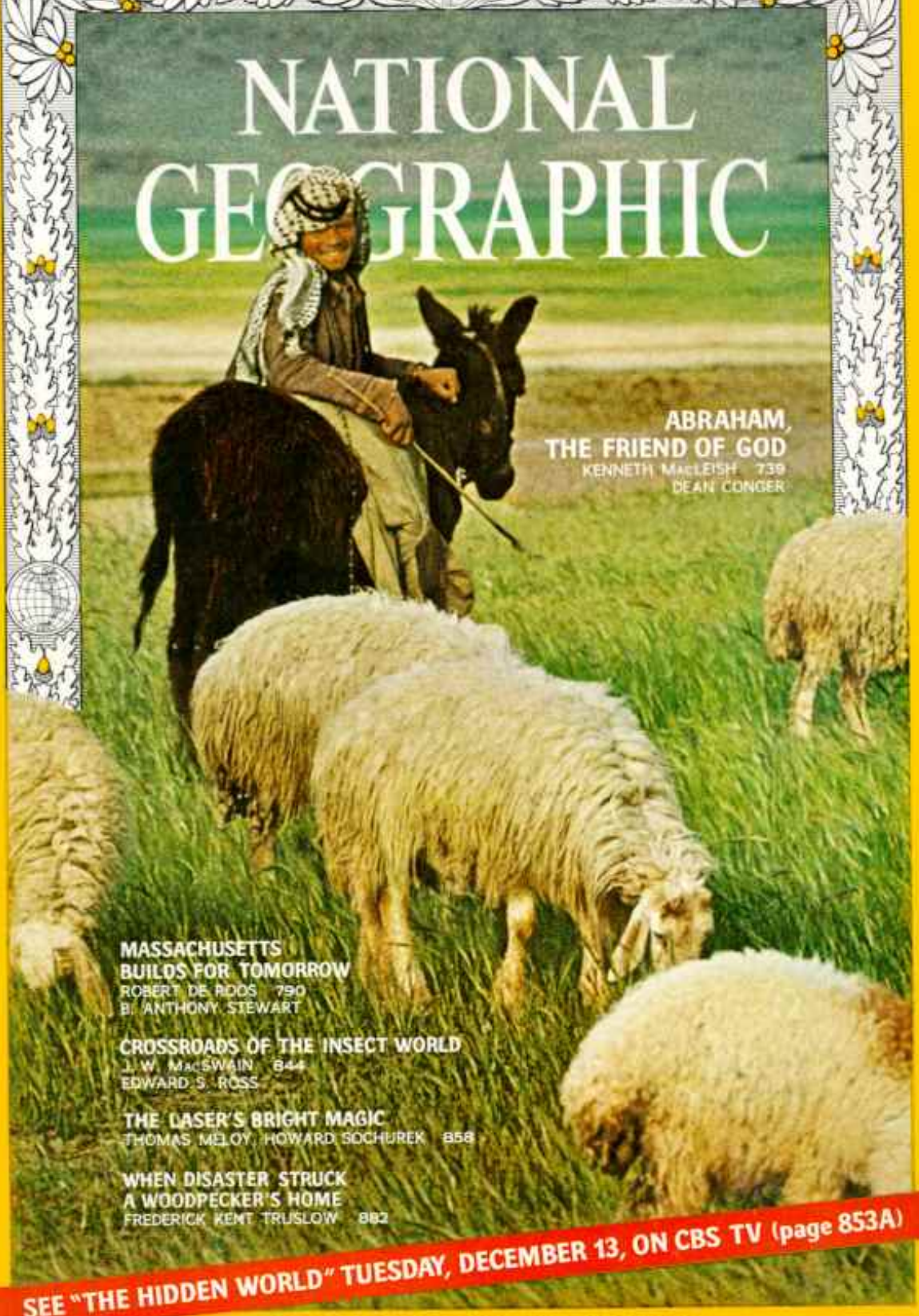
# NATIONAL GEOGRAPHIC





SEE "THE HIDDEN WORLD" TUESDAY, DECEMBER 13, ON CBS TV (page 853A)

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much smaller antenna, is more difficult for an enemy to detect or jam.

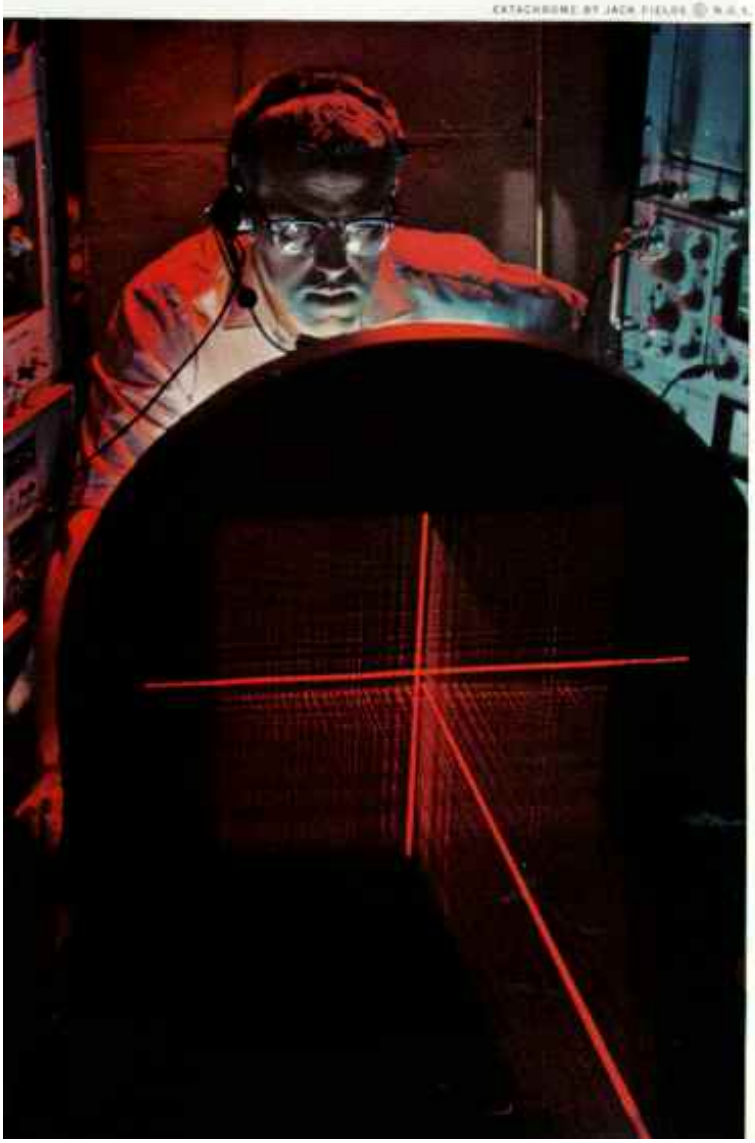
The laser's enormous advantage lies in its almost perfectly parallel, or collimated, radiation. When passed through a telescope-in-reverse, the beam diverges as little as a third of an inch in a mile of travel, and thus dissipates its power very slowly.

Four years ago, a ruby laser considerably smaller than those now available shot a series of pulses at the moon, 240,000 miles away. The beams illuminated a spot less than two miles in diameter and were reflected back to earth with enough strength to be measured by ultrasensitive electronic equipment. The beam of a high-quality searchlight, if it reached that far, would spread out to several times the moon's 2,160-mile diameter.

Such fantastic directivity, combined with brightness, gives the laser incalculable value for a host of jobs in war and peace. For example, here are some of the most important potential uses:

- Finding the range for precision bombing, and—in portable form—battlefield pinpointing of such targets as tanks.
- Illuminating targets for reconnaissance and for artillery fire.
- Guiding the blind with laser-flashlights whose distance-echoes are translated into audible signals of varying pitch.
- Probing the atmosphere to determine its composition.
- Warning pilots of obstacles ahead by picturing them on cockpit TV screens.
- And, if current experiments succeed, clearing up one of aviation's greatest mysteries: Why have jet planes in rare instances crashed in perfect weather?

Aeronautical experts believe the cause may



**New standard of straightness:** Beelines and arrows, once regarded as symbols of directness, curve sharply as compared to this focused laser beam (left), used to align a new electron accelerator at Stanford University, Palo Alto, California.

The sharply defined red beam striking the center of the screen has traveled two miles along the underground tube of the accelerator. When the beam hits squarely on the pattern, electronic instruments tell the physicist, Dr. W. B. Herrmannsfeldt, that the alignment is correct within one- or two-thousandths of an inch.

The accelerator, built with Atomic Energy Commission funds, will be used in basic research on the structure of atomic nuclei.

**Highlighting dust motes** in a 21-foot-diameter irrigation tunnel near Aztec, New Mexico, a helium-neon laser beam keeps the 280-ton tunneling machine at right boring straight through solid rock.

Groups of photocells (not visible) serve as a target for the laser. Should the tunneler stray, lights on the operator's console tell him what correction to make.

The laser-guided machine drifted less than an inch off course in a mile and a half.