

ASTRONOMY

Technology drives surge in telescope improvements

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Contrary to common perception, astronomers no longer peer through telescopes while sketching in their notebooks. Instead, we monitor our observations on computer screens in rooms adjacent to the dome or in the warmth of our offices thousands of miles from the observatory.

This dramatic change in the way we gather and analyze data was driven by advances in digital-detector technology, mirror and telescope fabrication and automation. These technologies, some of which have found their way into household items, share much of the credit for the remarkable astronomical discoveries in recent years.

The light-gathering capacity of telescopes surged in the 1980s when the Charge Couple Device, the revolutionary solid-state imagers found in commercial digital cameras, replaced photographic film.

Switching from Kodachrome to CCDs let astronomers image stars and galaxies 40 times fainter and six times more distant than previously possible.

The 5-meter mirror diameter barrier was broken in the 1990s as giant telescopes mushroomed on remote mountaintops in Arizona, Hawaii and Chile.

The twin 10-meter Keck telescopes perched on Mauna Kea stand eight stories tall and weigh 300 tons apiece. In spite of their great size, they are able to find and track celestial objects with nanometer precision. Novel mirror design and remote sensing technology made it possible to build them for a reasonable cost.

Assembled from 36 hexagonal segments working together as a single mirror, each segment is continually adjusted by computer-controlled pistons to maintain sharp focus as the telescope tracks the sky. The two Kecks together toppled the light-gathering power of the legendary 5-meter Hale telescope on Palomar mountain eight times over.

That feat was topped recently by Europe's Very Large Telescope, an array of four 8-meter telescopes in Chile. Now, telescope mirrors are being built quickly and economically.

Several telescopes in the planning stages will incorporate segmented mirror and multiple mirror technologies with diameters ranging from 30 meters to 100 meters.

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