SCIENCE

New Eyes on Hidden Worlds

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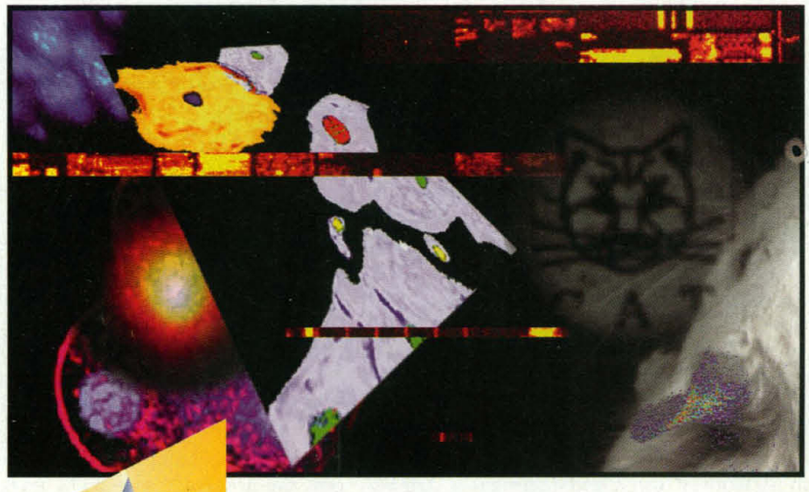
A Special Report



Picture this: the inner workings of a living cell, or the surface of another star. Once, scientists could see them only in their mind's eye, but now these and other unseen realms no longer need to be imagined. Thanks to advances in optics and electronics—among them lasers, ultrasensitive charge-coupled device detectors, and computerized control and image-processing systems—researchers in many fields are enjoying what amounts to a golden age of imaging. In this Special News Report, *Science* takes a look at some of the imaging technologies that are opening scientists' eyes to new worlds or letting them see familiar worlds in a new light.

The scanning tunneling microscope and its offspring are revealing atoms, molecules, cell-membrane channels, and other minuscule objects as individuals, each in its own environment. New microscopy techniques are allowing researchers to play peeping Tom on the inner lives of cells, watching organelles, genes, and even individual proteins go about their business. Molecules, too, need no longer be seen in still life, as demanding new techniques turn x-ray structures into movies that capture proteins in the process of changing shape. Some of the same technologies that are opening new views of the very small are also revolutionizing astronomers' views of the very large, as lasers, computer controls, and other wizardry multiply the seeing power of the world's largest telescopes.

Imaging is so pervasive in science that no single news report could do it justice. The rest of this issue of *Science* is testimony to the pace of progress: It contains no fewer than six Reports on advances in imaging or results obtained by new imaging techniques.

- "Optical biopsy" for high-resolution medical imaging (p. 2037);
- Magnetic force microscopy for studying the magnetic structure of materials that change their conductivity in a magnetic field (p. 2006);
- Near-field microwave microscopy of an electrically polarizable material (p. 2004);
- Fluorescence microscopy of the dynamics of stretched DNA molecules (p. 2016);
- Confocal microscopy combined with magnetic resonance to map light-emitting defects in diamond (p. 2012); and
- Multiphoton imaging to track communication between plant-cell organelles (p. 2039).

This issue also includes a Research News story on new directions in brain imaging, an area where feats of seeing the unseeable—human thought processes—are becoming almost routine.

–Tim Appenzeller and Colin Norman

Also see related Reports on pages 2004, 2006, 2012, 2016, 2037, and 2039, and the Research News story on page 1974. The online version of this Special News Report on *Science*'s Web site includes links to related sites.