Blum and his colleagues used the isotopic ratios of several elements to compare drill samples from Manson with pieces of tektite glass found in K-T boundary sediments from Haiti. This chemical fingerprinting technique revealed that the Manson impact could not have created the Haitian glass. "The Manson samples are about as different as you can get," Blum says.

The same technique shows a "striking similarity" between the Haitian glass and rocks from Mexico's Chicxulub crater, suggesting that the Haitian samples formed from the Yucatán rock, says Blum. Although oil company geologists discovered the Chicxulub structure in the late 1970s, only within the last two years have researchers recognized the formation as a K-T crater.

After the identification of Chicxulub, some geologists who had previously worked on the Manson crater wondered whether K-T boundary sediments contain evidence of both impacts. Indeed, in the Rocky Mountains, sediments dating to this time show two distinct clay layers, possibly from the two impacts.

New evidence, however, argues against the idea that Manson left a widespread imprint. Wayne R. Premo and Glen A. Izett of the U.S. Geological Survey in Denver came to this conclusion by dating zircon crystals found in K-T sediments from Colorado, a technique first used last year by another team. These crystals — remnants of the rock originally hit by the impactor — are roughly 550 million and 330 million years old. Because the rocks at Manson are much older, the zircons suggest that the Iowa impact left no appreciable mark in the Colorado sediments, says Premo.

Maureen B. Steiner of the University of Wyoming in Laramie reports that early analysis of the magnetic orientation in the Manson drill samples indicates the Manson crash occurred roughly 200,000 years before or after the Chicxulub impact. On the basis of this evidence, Eugene M. Shoemaker of the USGS in Flagstaff, Ariz., suggests the two strikes most likely came from comets, perhaps knocked loose from the Oort cloud at the edge of the solar system.

In terms of global effects, geologists believe the Chicxulub crash did almost all of the damage because it was so much larger than the Manson hit. Early analysis of the buried Mexican crater indicated it was 180 km across, which would make it the largest known crater on Earth. But Virgil L. Sharpton of the Lunar and Planetary Institute in Houston reports that a new study of gravity measurements hints that the Chicxulub crater spans almost 300 km, making it one of the largest in the solar system. Scientists think such a crash blocked out sunlight and chilled Earth for several years before spawning a global heat wave that lasted perhaps a millennium. *— R. Monastersky*

Using light to focus chilled chromium atoms

To fabricate microscopic circuits on silicon chips, semiconductor manufacturers typically shine light through a mask onto a photosensitive surface to create the necessary patterns. But the width of the mask's lines limits the fineness of features that can be etched on a chip.

To create much finer features, some researchers have been exploring the possibility of using light itself as a lens to guide atoms to particular positions on a surface. Last year, Gregory L. Timp of AT&T Bell Laboratories in Holmdel, N.J., and his collaborators demonstrated the effect with sodium atoms (SN: 3/14/92, p.166). Now, Robert J. Celotta and his colleagues at the National Institute of Standards and Technology (NIST) in Gaithersburg, Md., have shown that light can also be used to position chromium atoms.

"The work that Celotta has done is really a big step forward," Timp says. "He has moved atomic physics to the center of the periodic table. He has proved . . . that you can, in principle, use any element that you want."

In separate reports, Timp and Celotta described their findings at last week's American Physical Society meeting, held in Seattle.

To deposit parallel lines of sodium atoms on a silicon surface, Timp and his co-workers first cool a beam of sodium atoms to temperatures of less than 1 millikelvin. The cooled beam then passes through a standing wave of laser light, which nudges the atoms into certain paths in the same way that a pattern of ripples on the surface of a pond focuses sunlight into a comparable pattern of bright and dark areas on the pond's bottom.

The researchers have obtained indirect evidence that their technique deposits evenly spaced lines of sodium atoms about 300 nanometers apart and probably less than 100 nanometers wide. But because sodium reacts readily with stray atoms and molecules still roaming the ultrahigh vacuum in which the experiment is done, the pattern deteriorates too quickly to be imaged.

Chromium reacts far less readily than sodium, but it takes a much higher temperature to create a beam of chromium atoms. The NIST team had to go to great lengths to produce the beam and then cool the atoms to temperatures low enough for a standing light wave to focus the beam into narrow lines.

"We were pleased just before the meeting . . . to come up with images of the chromium lines," Celotta says. "They look to be quite high resolution." *— I. Peterson*

Revealing the sun's solitary vibrations

The sun rises, its face warm, placid, reassuring. But on closer inspection, our home star actually behaves like a bubbling cauldron, with heat-driven convection currents setting vibrations ringing throughout its interior.

Astronomers began tuning in to these vibrations in the 1970s and have since learned a great deal about the sun's dynamics (SN: 7/2/88, p.8). Now, researchers have hit upon a new way of extracting information from this solar symphony. The technique, developed by NASA solar physicist Thomas L. Duvall Jr. and his colleagues at the National Solar Observatory (NSO) in Tucson, Ariz., may enable astronomers to use individual acoustic waves traveling through the sun to study its interior, much as seismologists use the echoes of earthquakes to probe geologic structures deep within the planet.

"This really brings us a little closer to what's being done in terrestrial seismology," says Duvall. The researchers report their findings in the April 1 NATURE.

Usually, helioseismologists observe the entire spectrum of solar vibrations simultaneously. The sun, they have discovered, resonates most strongly at specific frequencies, or pitches, much like an enormous pipe organ. The new technique enables researchers to track the motion of individual acoustic waves, which emanate from a relatively thin, active layer near the sun's surface.

These waves travel downward into the sun, where changes in density bend them back up toward the surface. The waves deflect off the underside of the surface, creating ripples that astronomers can observe from Earth. Each wave can repeat this process 50 or more times.

"This is a major advance," declares John W. Leibacher, director of the NSO and an early practitioner of helioseismology. The technique, says Leibacher, may help researchers probe smaller regions of the sun, perhaps illuminating the mysterious subsolarian processes that generate sunspots.

However, the proof of the new method will be in the doing, comments solar physicist Timothy M. Brown of the National Center for Atmospheric Research in Boulder, Colo. As it stands, the technique may prove somewhat insensitive to low-frequency vibrations, Brown says. This may hobble efforts to chart relatively slow, albeit massive, flows of material far below the sun's surface, he explains. Nonetheless, he adds, the technique represents "an important move in the right direction." *— D. Pendick*