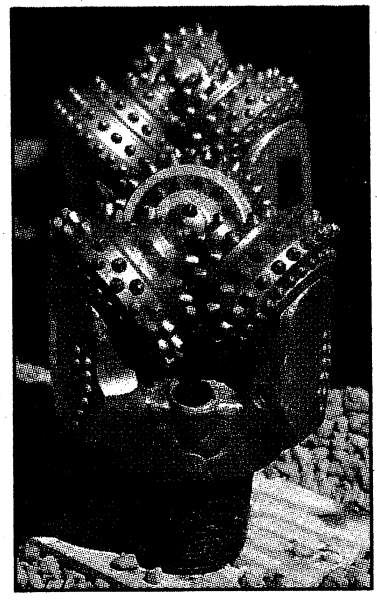
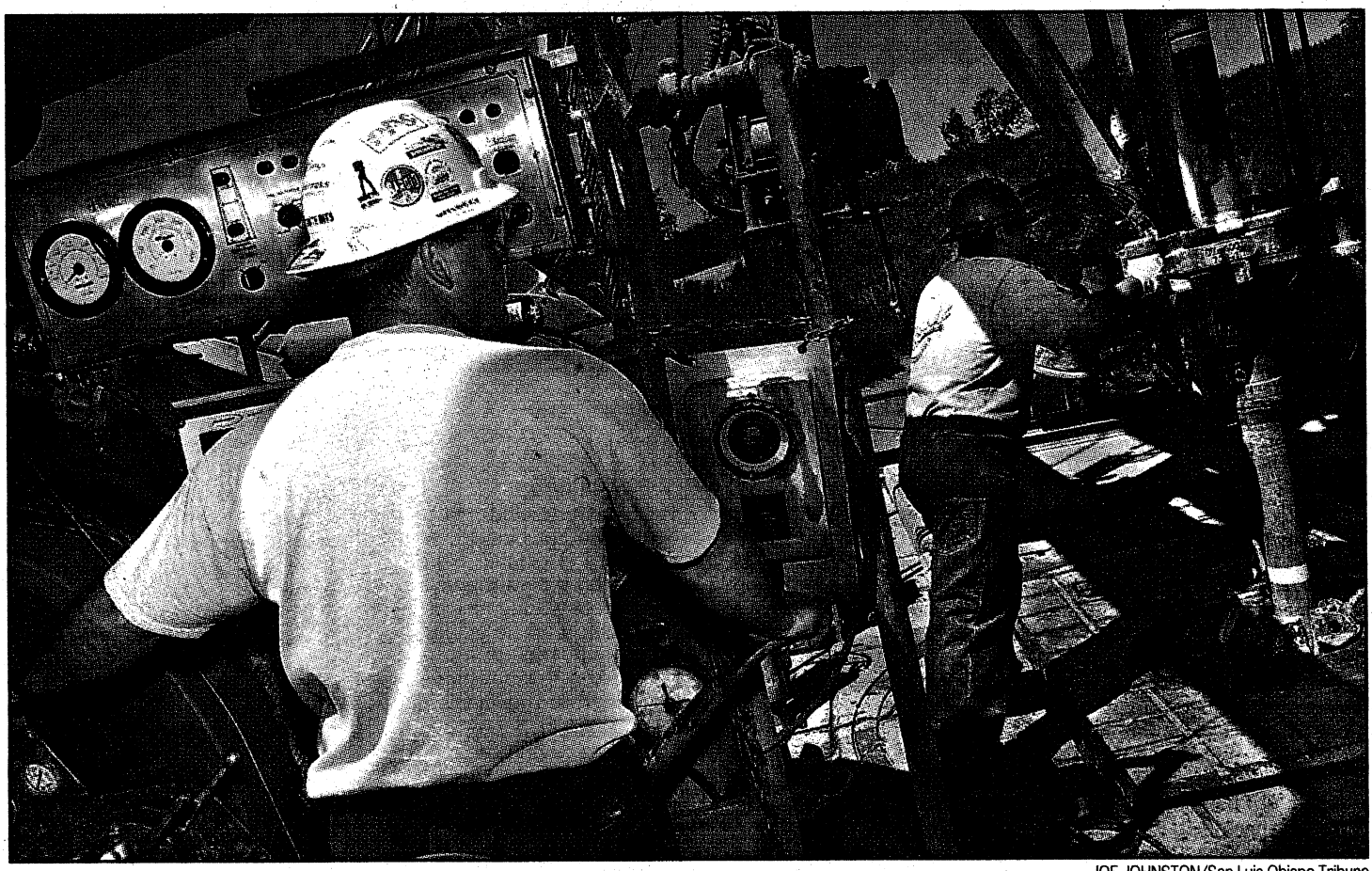
Monterey County Herald, September 30, 2004 Thursday; Page A1

Scientists dig for clues to cause of earthquakes



DOZENS MORE INSTRUMENTS GOING UNDERNEATH PARKFIELD TO STUDY AFTERSHOCKS



JOE JOHNSTON/San Luis Obispo Tribune

Driller Jim Dobbs, left, and other workers add a new piece of drill pipe at EarthScope's San Andreas Fault Observatory in Parkfield on Sept. 2. Top: Two of the special drill bits used to bore through granite, sediment and sandstone on the EarthScope project.

By ANDREAS von BUBNOFF
Herald Correspondent

Tuesday's magnitude-6 earthquake in southern Monterey County caused a flurry of activity Wednesday, with geologists installing additional seismometers and other instruments to measure the continuing aftershocks as thoroughly as possible.

Over the next few weeks, geologists plan to install 80 seismographs at depths of up to 1½ miles below the surface along the San Andreas Fault. The intent is to completely record and analyze lingering aftershocks from Tuesday's big event.

By analyzing seismic data from greater depths, scientists are hoping to get as close as possible to the underground sites where earthquakes are actually generated.

"We are trying to get that in as soon as we can because we want to be able to catch as many aftershocks as we can," said Stephen Hickman, a researcher with the U.S. Geological Survey.

Inside
Earthquakes, up close and personal. **A14**

Over the past two decades, geologists and seismologists had placed dozens of delicate instruments measuring activity along a 30-mile stretch of the fault in the Parkfield area, said Hickman. The region has received star treatment because earthquakes stronger than magnitude-6 have occurred in the Parkfield area about once every 22 years since 1857 and this one was "long overdue," since the last one was in 1966, said Mark Zoback, a professor of geophysics at Stanford University.

Among the hundreds of aftershocks set off by Tuesday's tremor was a magnitude-5 shaker that hit at 10:12 a.m. Wednesday, almost exactly 24 hours after the quake that sent geologists scurrying to Parkfield.

About five hours later on Wednesday, an unrelated magnitude-5 quake centered in Kern County jolted parts of Central and Southern California, setting off rock slides in the southern Sierra Nevada foothills but, like Tuesday's quake, apparently causing no injuries. That quake was centered near Arvin, some 150 miles

Please see **Quake page A14**

Earthquake research

These are a couple of techniques employed by scientists:

Crustal deformation
Plate motion produces distortion or deformation in the surface of the Earth near active faults. Several techniques are used to measure this deformation, including GPS, 2-color Electronic Distance Meters (EDMs), strain meters, magnetometers, tilt meters, and water level monitors.

Seismology
The locations of earthquakes reveal where active faults are located and where faults may be "locked." Studies of the waves from these earthquakes help map the structure of the Earth's crust, the orientation of stresses in it, and the movement of the faults within it.

Source: U.S. Geological Survey

Quake

From **page A1**

southeast of Parkfield.

By late Wednesday, there had been more than 500 aftershocks from the Tuesday quake.

The shaking has returned Parkfield to its hallowed position in the world of earthquake science. The tiny town, population 37, is in a remote, hilly area of southern Monterey County almost squarely on top of the 800-mile fault that forms the boundary between underground geologic plates that produce earthquakes when they grind and move.

In addition to the hole that now extends 1½ miles deep, geologists also are in the midst of analyzing data from seven underground seismometers that were in place Tuesday inside a second hole next to it to gather more accurate information about the composition and density of the area.

"The seismic data are like a sonogram in a doctor's office," Hickman said.

The overall drilling project, called "San Andreas Fault Observatory at Depth," is a collaboration between the USGS and several U.S. universities.

Drilling of the main hole broke ground June 11 and reached a depth of about 1½ miles two weeks ago when the drilling was stopped for the season, Hickman said. He said there would be no drilling in the winter because seasonal rains limit access to the remote drilling site. In addition, the scientists need time to analyze the seismic data gained over the summer, including the huge mass of data collected Tuesday.

The researchers plan to use that data to help them determine what direction to aim the main hole, Hickman said. He said the main hole is directed at an area and depth where weaker "microearthquakes" occur about every two years and scientists can fine-tune the experiment by angling the hole deep underground.

"We are sort of drilling into a natural laboratory," Hickman said.

By understanding such smaller earthquakes, scientists hope to eventually understand how larger quakes are generated.

Andreas von Bubnoff can be reached at 646-4459 or avonbubnoff@montereyherald.com.