

deep basement rocks of the continent, called COCORP for Consortium for Continental Reflection Profiling. "Study of the continental basement rocks is one of the frontiers of geology," says Oliver. He is chairman of the COCORP program, which is using seismic reflection technology from the petroleum industry for basic geophysical studies of the deep crust. One of COCORP's profiles of the crust across the Rio Grande Rift shows a strong reflection at a depth of 20 kilometers which, says Oliver, corresponds to the top of the magma body proposed by Sanford.

A study of the crustal structure of the Rio Grande Rift analyzing Rayleigh waves from nuclear blasts and natural earthquakes shows that the crust is about 30 kilometers thick beneath much of the rift, G. R. Keller of the University of Texas at El Paso reports. This is about 10 kilometers thinner than the crust beneath the northern Colorado Plateau and the Great Plains.

Marshall Reiter of the New Mexico Bureau of Mines and Mineral Resources reports that terrestrial heat flow measurements along the rift indicate a narrow ribbon-like high (about 2.5 heat flow units) along the western part of the rift structure. He proposes that the crust along the western part of the rift is extensively fractured, allowing magma to rise in the fractures and also allowing groundwater to percolate downward and be heated by the magma.

Another confirmation of high heat flow comes from a technique known as silica geothermometry applied to groundwater at several thousand points. Results reported by Chandler A. Swanberg of New Mexico State University show that the rift is characterized by a ribbon of high silica geotemperatures. This ribbon has well-defined boundaries between the rift and the Colorado Plateau to the west and the midcontinent to the east. Studies by R. J. Bridwell of the Los Alamos Scientific Laboratory show that 5 to 10 million years of constant heat loss is required to create the present thermal anomaly. He notes that regional extrusive volcanism along the central rift began 5 to 10 million years ago, continuing intermittently to the present. He postulates that throughout that time heat has flowed to the surface due to transport of magma upward into the upwarp beneath the thinned lithosphere.

What effect has all this crustal extension had on the observed mountains along the rift? John K. Sales of the State University of New York at Oneonta has put together a comprehensive theory of continental rifting and applied it to the Rio Grande Rift. Extension of the crust allows the freeing of fault blocks to assume levels and tilts appropriate to their geometry. As he puts it:

"During continental extension normal faults form at  $\pm 30^\circ$  to the vertical axis of maximum compression (gravity), segmenting the crust into apex-downward

triangular prisms (grabens) which sink low like a keel boat and apex-upward triangular prisms (horsts) which float high like a flat-bottomed barge."

Depending on the geometry of the faults, some of the blocks along the rift margin become uplifted, like the Sandia uplift northeast of Albuquerque and possibly the Sangre de Cristo uplift of Colorado. When the blocks approach pyramidal shape, abnormally high motion upward (possibly Pikes Peak) or downward (the Albuquerque Basin) may result.

What's intriguing about Sales's studies of the creation of present-day mountains and basins along the Rio Grande Rift is that he has managed to duplicate the effects in the laboratory. Using plaster models, he has shown that when particular fault geometries undergo extension, various blocks tilt, drop, rise, and so forth, in just the way they have in nature to create particular mountains along the Rio Grande Rift. It is an elegant laboratory demonstration of the workings of nature. □

## Smokey Bear dies; buried in own park



*In die VIII Novembris, anno domine MCMLXXVI, obiit Fumulus, ursus amatus noster. Requiescat in pace.*

Smokey Bear, the orphaned cub that became a living symbol of forest fire prevention, died peacefully in his sleep Nov. 8 at the National Zoo. He was returned to his native New Mexico for burial in Smokey Bear Historical State Park.

Officially, of course, Smokey still lives. Last May the original Smokey and his mate, Goldie, were quietly moved out of their official residence to make way for a frisky 6-year-old, who has now been given the title and symbol of the Smokey legend—a ranger's hat and fire-fighter's shovel. When the original, "Old Smokey" died, he had been living in a simple grotto on the zoo's Bear Row, his only identification "American Black Bear."

As they say in the advertising trade, Smokey was too valuable a "property" to let go. The only animal in America with his own zip code (20252), Smokey brought in more than \$1.5 million to the National Forest Service through license agreements on his trademark. Yet, when it came time for him to retire, Congress could never get around to allocating funds for a proposed new grotto in New Mexico.

Old Smokey's relationship with the Forest Service went back to June 1950, when a Forest Ranger found him as a five-pound cub, less than a year old,

clinging to a charred tree after a forest fire in New Mexico's Lincoln National Forest. Veterinarians treated his burned paws (he walked with a limp the rest of his life) and a game warden's daughter fed him from a bottle until he was well enough to be taken to Washington.

There he became the living representative of the already famous Smokey Bear poster character and tapped a deep source of respect for wildlife that is the latest expression of a frontier heritage. Through animated commercials, his gruff bass voice supplied by a local radio announcer, Smokey contributed substantially to the growing environmental consciousness of a generation of Americans. His simple message became one of the best-recognized slogans of the emerging television age: "Remember, only *you* can prevent forest fires."

The effectiveness of this message could be seen in Smokey's own popularity. At times he received 13,000 letters a week, and so many people started sending flowers for his "funeral" that the Forest Service last week scurried about trying to find some more constructive outlet for the spontaneous outpouring of affection. Young Smokey has already inherited much of this goodwill, and almost any Sunday afternoon at the National Zoo will find a group of children pressing on the glass partition to watch the rambunctious young bear climbing and running.

By contrast, Old Smokey was always "an easy going bear," and toward the end mostly slept or lay about. By human standards Old Smokey was 26-going-on-80, and his keepers were considering euthanasia as his arthritis got steadily worse. Then one morning he didn't come out of his den and Goldie would not leave his side. □

## NAS adds support for DNA guidelines

All research on recombinant DNA, regardless of whether it is funded by government or private industry, should follow the guidelines set by the National Institutes of Health, according to a resolution passed by the Council of the National Academy of Sciences.

The NIH guidelines (SN: 7/3/76, p. 3) ban certain types of experiments and establish levels of safety precautions to match estimated potential hazards of other experiments. Currently only researchers funded by NIH are required to adhere to these restrictions.

The National Academy of Sciences, the country's most prestigious organization of scientists and an official adviser to the federal government, will set up a standing committee to aid NIH in future revisions of the guidelines. The committee will also encourage continuous assessment of the benefits and risks of DNA research. □