



Introduction: Where are the "hot" earth science projects in the Jemez Mountains region

Fraser E. Goff

1996, pp. 99. <https://doi.org/10.56577/FFC-47.99>

in:

Jemez Mountains Region, Goff, F.; Kues, B. S.; Rogers, M. A.; McFadden, L. S.; Gardner, J. N.; [eds.], New Mexico Geological Society 47th Annual Fall Field Conference Guidebook, 484 p. <https://doi.org/10.56577/FFC-47>

This is one of many related papers that were included in the 1996 NMGS Fall Field Conference Guidebook.

Annual NMGS Fall Field Conference Guidebooks

Every fall since 1950, the New Mexico Geological Society (NMGS) has held an annual [Fall Field Conference](#) that explores some region of New Mexico (or surrounding states). Always well attended, these conferences provide a guidebook to participants. Besides detailed road logs, the guidebooks contain many well written, edited, and peer-reviewed geoscience papers. These books have set the national standard for geologic guidebooks and are an essential geologic reference for anyone working in or around New Mexico.

Free Downloads

NMGS has decided to make peer-reviewed papers from our Fall Field Conference guidebooks available for free download. This is in keeping with our mission of promoting interest, research, and cooperation regarding geology in New Mexico. However, guidebook sales represent a significant proportion of our operating budget. Therefore, only *research papers* are available for download. *Road logs*, *mini-papers*, and other selected content are available only in print for recent guidebooks.

Copyright Information

Publications of the New Mexico Geological Society, printed and electronic, are protected by the copyright laws of the United States. No material from the NMGS website, or printed and electronic publications, may be reprinted or redistributed without NMGS permission. Contact us for permission to reprint portions of any of our publications.

One printed copy of any materials from the NMGS website or our print and electronic publications may be made for individual use without our permission. Teachers and students may make unlimited copies for educational use. Any other use of these materials requires explicit permission.

This page is intentionally left blank to maintain order of facing pages.

INTRODUCTION: WHERE ARE THE "HOT" EARTH SCIENCE PROJECTS IN THE JEMEZ MOUNTAINS REGION?

FRASER GOFF

Geology/Geochemistry Group, Los Alamos National Laboratory, Los Alamos, 87545

When I first came to Los Alamos in 1978, I was told that I ought to look carefully at the volcanic rocks and stratigraphy of the Jemez Mountains region because this was truly a classic geologic spot, especially Valles caldera. But I was also told that there really was not much science left to do here because, after all, the Jemez had already been mapped by R.L. Smith, R.A. Bailey, and C.S. Ross.

The sheer beauty of the Jemez had an instant effect on me. Within a couple months of being hired by the Laboratory, I started to poke around in Cañon de San Diego, down in the southwest Jemez, because I had heard there were hot springs hidden in the canyon, and I had a love affair with hot springs. Besides, I had been hired to work on geothermal energy (never mind that it was Hot Dry Rock), and it seemed like a young caldera with hot springs ought to provide something interesting to investigate.

The plumbing of the hot springs in the canyon was the first thing I pondered. A geothermal well was drilled at Jemez Springs and I volunteered to take fluid and cutting samples. Then a detailed geologic map was needed of the canyon to define structural controls on fluid flow. While mapping, I was amazed at the large size of the hot spring system at Soda Dam. How long had it taken to form the travertines and was the formation of these ancient deposits constant or cyclic?

One thing led to another. By 1980, my colleague and friend, Jamie Gardner, had joined forces with me, and the U.S. Department of Energy wanted to spend money on scientific core holes. Geothermal exploration and development by private industry inside the caldera was going "belly-up", but we believed that there was still much to learn. We questioned if one could intelligently drill scientific holes without knowing the ins and outs of the volcanic history of the area. How can the Toledo caldera apparently sit on the northeast side of Valles caldera when the two large ash-flow sheets are so big and so symmetrical around Valles Caldera? Should we dare remap parts of Valles? Should we remap key areas in the older volcanic rocks and obtain a few new dates? Perhaps chemical analyses would be useful on waters and gases, as well as rocks. In addition to chemistry, shouldn't we also obtain isotopic analyses?

As we got to know and better understand the region, others wanted to join in. We took a lot of people on tours into the Jemez. It was one thing to merely drive down the paved road through the Jemez and look at road cuts. It was far better to hike into the endless canyons and mountains to unravel the geologic story, and to ski to hot springs when rocks were covered by snow to determine if the waters have the same compositions during summer and winter.

From 1984 to 1988 we drilled three scientific holes and found alteration features and ore minerals that resembled those in commercial epithermal deposits. The cores from those holes answered many questions, and are still fascinating to study. More people got involved and a fair amount of U.S. government research dollars were spent on their efforts, although we were always prepared to spend more, should it come

our way. A lot of scientific papers were written, and we took turns being editors of special volumes.

Times change, wheels turn. Volcanology and geothermal energy investigations in the Jemez have given way to environmental concerns, to hydrogeology, and to Quaternary studies. There are many new faces running around in the Jemez, finding out new things that we never thought to investigate. And more people now live in the region. Elbow room is becoming scarce. The Jemez Mountains will always draw a share of professionals, students, and laymen who love volcanic rocks and processes, and who love hydrothermal fluids and their relations to ores, but the big research dollars are now funding other projects.

Los Alamos National Laboratory lies astride the Pajarito fault zone, one of the biggest and most active fault systems in the state of New Mexico. Since the Laboratory still has a mission to develop and maintain national security, shouldn't we be certain that Laboratory buildings are safe from future earthquakes? What is the Recent history of the faults in this region? Are these faults a threat to the Laboratory and Los Alamos town? And what stories do ancient stream deposits and present soil profiles tell us about movement along these faults, climatic changes, and other Quaternary processes?

Past Laboratory activities generated different types of chemical and radioactive wastes, both solid and liquid. These wastes were dumped, buried, and poured into a variety of holes, pits, sumps, and canyons. Are these wastes still contained where they were disposed? Did anything leak? Can some of these disposal areas be renovated? Could families live safely on renovated sites?

The Laboratory and Los Alamos town site obtain over 95% of their potable water from an aquifer residing in sedimentary rocks of the Rio Grande rift. The "main aquifer" varies in depth from about 300 to 600 m. To tap the aquifer, most wells are drilled through Bandelier Tuff into the underlying rift-fill deposits. Does the Laboratory have an impact on this aquifer that would affect other nearby communities and pueblos? Where does all the water come from? Is the supply endless? Does the Bandelier Tuff behave as a vadose zone and is it otherwise impermeable to fluid flow?

Smaller-scale but similar issues have faced other Jemez communities as populations have grown. More people are curious about water, safety, and development of resources. As a result, new geologic maps must be produced that reflect regional concerns about neotectonics and hydrology. And when geologists walk around to map or take samples, they usually find something new and more questions that need to be answered.

I sincerely think that the 47th Field Conference will be a memorable one. The geologic setting is truly exceptional and the three day trip will showcase both old and new directions of research in the Jemez Mountains. My colleagues throughout New Mexico and elsewhere have been an endless source of inspiration.