

Plates, plumes and Yellowstone

Modern geophysical theory considers earthquake belts to be the boundaries between huge, shifting plates of the earth's crust and upper mantle. Movements of one plate relative to another set off seismic and volcanic activity. How then to account for the intermountain seismic belt in the western United States? This zone extends northward through central Utah and continues along the border between Idaho and Wyoming and into the northern Rocky Mountains in Montana. It is far from the boundary of the North American and Pacific crustal plates along the West Coast (exemplified by the San Andreas Fault in California). Yet there were 2,000 earthquakes of about magnitude 3.0 or greater along the intermountain seismic belt during the period 1961-1970. How can they be explained?

Two geophysicists, Robert B. Smith of the University of Utah and Marc L. Sbar of the Lamont-Doherty Geological Observatory, have some intriguing answers. They propose in the *AUGUST GEOLOGICAL SOCIETY OF AMERICA BULLETIN* that the earth's crust in the intermountain West is divided into several subplates. Two of them, which they have named the Northern Rocky Mountain and Great Basin subplates, appear to be moving west with respect to the stable portion of the North American plate. But they are also slowly moving apart in a north-south direction.

Smith and Sbar further propose that the subplate motions and stresses are primarily a result of a mantle plume now centered beneath the Yellowstone Park region. Mantle plumes are areas of upwelling beneath the crust hypothesized by some scientists to account for, among other things, the creation of volcanic island chains in the Pacific.

The geophysicists note soon-to-be-published data on the ages of volcanic features along the Snake River in Idaho that shows an eastward drift of volcanic centers at a rate of 4 centimeters per year. This leads them to suggest: "The east-trending Snake River plain may represent the track of [the] mantle plume or hot spot as it moved to its present position beneath Yellowstone Park."

The motion may continue eastward into the geological future. "We postulate that seismic and volcanic activity along the intermountain seismic belt may continue and migrate eastward as new crust is being fragmented and extended incident to the relative westward motion of the North American plate."

The dryline's invisible curtain

An invisible curtain separates dry desert wind from moist air in the lee of the Rocky Mountains over the southern Great Plains. This "dryline" occurs most frequently in west Texas and Oklahoma during the spring and early summer but is sometimes observed as far north as Nebraska and the Dakotas.

The dryline seems to be a favored location for the development of thunderstorms. A recent four-year study of radar echo formations showed that of all the storm cells existing within 200 miles of the dryline, 78 percent had first formed within 10 miles of it.

Joseph T. Schaefer of the National Oceanic and Atmospheric Administration's severe storms laboratory in Norman, Okla., has obtained computerized results showing that the daytime movement of the dryline is determined by surface heating of the earth rather than by naturally occurring west winds. But the fundamental question of why the dryline is conducive to thunderstorm formation remains unanswered.

R&D analysis: Soft funds, less clout

The National Science Foundation has published two analyses of R&D funding levels and what they mean—one for Government funding and one for total national expenditures and resource development.

In the last decade, the number of dollars spent for research and development has risen steadily, but when inflation is taken into account, the total amount of funding in "constant dollars" has leveled off and the funding by Government has decreased. The peak purchasing power of the technical community thus came around 1968 and has been decreasing, on the average, half a percent a year ever since. Federal constant dollar funds have been decreasing even faster, an average of 2.4 percent a year.

The upshot is that total financial commitment to R&D now stands at about 2.3 percent of the gross national product, compared to 3.0 percent a decade ago. The R&D portion of the national budget is now around 6.5 percent, compared with 12.6 percent a decade ago.

The Federal Government now supports just over half of all R&D in the United States. More than half that money goes to one agency, the Department of Defense, which also received this year's largest agency expenditure increase. NASA, on the other hand, once accounted for 27 percent of Federal R&D but now has fallen to 17 percent. Federal priorities: Development gets about twice as much as applied research, applied research gets about twice as much as pure.

The statisticians did report one major bright spot: The employment doldrums may be ending for scientists and engineers. Technical employment has begun to rise slightly.

Of science, survival and spying

For every James Bond, the world's intelligence gathering establishments contain dozens of faceless scholars, studying in secret most of the same problems and developments of human events that concern scientists, historians and policy makers everywhere. Two writers in the June *PUBLIC SCIENCE* argue that technological innovation and the international character of the most pressing problems dictate a "democratization" and opening up of these hidden studies.

"The new opportunities offered by science and technology for the procurement and processing of information," writes Steven Dedijer of the University of Lund, Sweden, "are dwarfing the importance of spying in intelligence production." W. Murray Todd of the U.S. National Research Council agrees: Priorities of intelligence should now concentrate on such international problems as how to stabilize social and economic systems and put military might last. He notes that Secretary of State Henry Kissinger has already alluded to this need when he called for development of a global early warning system to foresee trade crises. (Both writers have worked in the intelligence community.)

Grants for atheists only

The British prize their eccentrics as an indispensable part of the national heritage, but when businessman Ray Turner offered \$2.4 million to science—only if the researchers eschewed any religious beliefs—he raised a storm of protest. According to the July 18 *NEW SCIENTIST*, when the applicants learned that some of them had been excluded for having religious beliefs, members of both persuasions protested so vehemently that Turner grumpily withdrew his offer. "I thought [scientists] would be more objective," he said. One might wish the same for science benefactors.