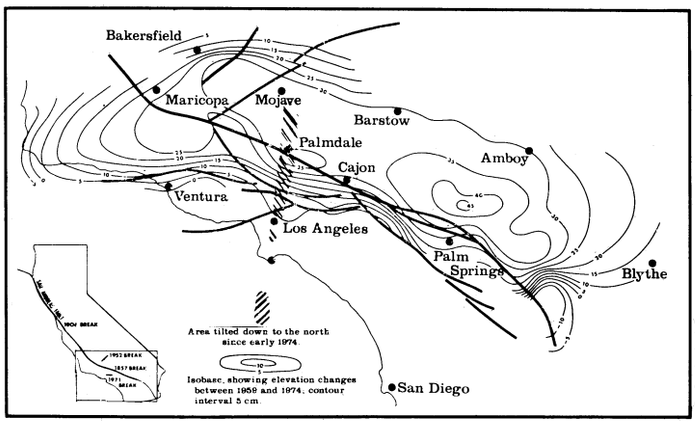
Palmdale bulge: Puzzling changes in shape



U.S. Geological Survey

Palmdale bulge: From the Pacific to Arizona border, uplift is now known to extend over 90,000 square kilometers. Part of the bulge, however, is dropping.

The uplift of land in southern California known as the Palmdale bulge has been found to cover a much larger area than originally thought, but part of it has also collapsed somewhat. In the meantime, the significance of both the bulge itself and these newly discovered changes in its shape remain perplexing puzzles.

The bulge was originally discovered last winter by U.S. Geological Survey scientists. The land swelling had apparently been underway since about 1960. At the time of discovery, the amount of uplift measured was as much as 14 inches. The areal extent was 12,000 square kilometers, roughly along a 190-kilometer axis extending from the Pacific Ocean to the Mojave desert and centered near Palmdale, north of Los Angeles.

The bulge has received close attention because similar swelling has occurred prior to some earthquakes in California and elsewhere. But such uplifts have also occurred without subsequent earthquakes. There is lively scientific debate on the subject.

The USGS now reports that both newly acquired geodetic data and further analysis of historical data show that the overall area of the uplift is much larger than previously judged. It now extends from Point Arguello eastward to the Arizona border, a distance of 600 kilometers, and is about 150 kilometers wide between Bakersfield and Los Angeles. Its total area is 90,000 square kilometers.

New level surveys, however, reveal that at least part of the area has collapsed vertically downward about 50 percent. At Palmdale, for example, the land rose nearly 14 inches between 1959 and 1974, but it has subsided about 7 inches since early 1974.

There is some evidence that these deformations may be but a part of a generally cyclic process. A less well documented uplift of about 12 inches apparently took place in the same area between 1897 and 1914, followed by collapse to earlier levels by 1926. It's now been shown that the 1971 San Fernando earthquake and a destructive quake in Japan in 1964 were preceded by uplifts. But no major quake is clearly associated with the uplift of 1897-1914.

Says Robert O. Castle, leader of the USGS team that discovered the Palmdale bulge: "These episodes of uplift and collapse continue to present a geological puzzle, the significance of which cannot yet be determined." □

Autism: Insights into the causes

Infantile autism is a rare and severe behavioral disturbance largely characterized by withdrawal and speech difficulties. According to the National Society for Autistic Children, most evidence to date suggests a biological cause for the disease. A psychological explanation—poor parenting—has been pretty well ruled out.

More insights into this apparently biologically based disease are now reported in the Feb. 24 NATURE by Susan Folstein and Michael Rutter of the Institute of Psychiatry in London. (Rutter is a leading authority on the causes of autism.) Their results suggest that an inherited cognitive abnormality can cause autism in some instances, that brain damage at birth can cause it in others, or that both factors can conspire together to trigger the disease.

Despite the rarity of a family history of autism, researchers have had several reasons to suspect hereditary influences. For instance, the two percent rate of autism in siblings is 50 times that of the general population, and a family history of speech delay is found in about one-fourth of all families with autistic children. However, reports of pairs of twins with autism have not shed much light on the genetic imput to this disease because most studies have concentrated on identical twins concordant for the disease. So Folstein and Rutter decided to probe the biological cause or causes of autism in both identical and fraternal twins where members were sometimes but not always concordant for autism.

With the help of the National Society of Autistic Children, schools for autistic children and hospital twin registers, they located 11 pairs of identical twins and 10 pairs of fraternal twins where at least one twin in each pair was autistic. More specifically, 17 of these 21 pairs were discordant for autism, and four were concordant. And all four that were concordant happened to be identical twins.

This clustering of autism in both members of each of the four identical twin pairs suggested a genetic cause for the disease. But how might some genetic defect express itself? Folstein and Rutter hypothesized that it might take the form of a cognitive abnormality, such as no-phrase speech until age three, an IQ of 70 or less, severely abnormal articulation after five years of age or scholastic difficulties requiring special schooling. All their autistic subjects, they found, met at least two of these criteria, vindicating their hypothesis. Yet they also noted that in most of the identical twin pairs, but in few of the fraternal twin pairs, co-twins without autism also showed some cognitive abnormalities. Thus it appears that an inherited cognitive disorder may underly autism, but not always be sufficient for its expression.

Folstein and Rutter then wanted to make sure that the cognitive abnormality that they had identified in all their autistic subjects and in some of their other subjects was truly inherited and not the result of some brain injury at birth. And indeed they found that it was inherited. None of the four pairs of identical twins concordant for autism had had a history of brain damage, and no twin with cognitive disorder in the absence of autism showed evidence of such perinatal brain injury.

On the other hand, Folstein and Rutter *did* find that brain injury at birth played a role in some of the cases of autism they studied. In 12 of their 17 pairs of identical and fraternal twins discordant for autism, the autistic twins probably or possibly suffered from brain injury whereas the nonautistic twins generally did not. And birth injury alone seemed enough to spark autism in some cases. For instance, in one identical twin pair discordant for autism, the autistic twin had experienced neonatal convulsions whereas the noninjured co-twin was healthy in every way.

Finally, some of the cases of autism seemed to have resulted from a combination of an inherited cognitive defect plus brain damage, Folstein and Rutter report. In three of five identical twin pairs discordant for autism but concordant for cognitive deficit, the autistic child had experienced a birth injury whereas the cognitively impaired nonautistic co-twin had not.

Thus autism may be triggered by an inherited cognitive abnormality, by brain injury at birth or possibly by both, Folstein and Rutter conclude. □