Is the Pacific plate tearing itself apart?

A recently discovered valley running across the seafloor in the South Pacific may mark the place where Earth's outer shell has started to tear, opening up one of the freshest wounds on the surface of the globe, according to a pair of geophysicists.

Other researchers, however, are split over the new hypothesis, with some contending that the 800-kilometer-long valley is merely an ancient scar from the days of the dinosaurs.

Flanked by steep ridges, the seabed canyon lies about 1600 km northwest of New Zealand. "The thing that's so unusual about this is that it's so straight," says Christopher Small of Columbia University's Lamont-Doherty Earth Observatory in Palisades, N.Y. Small and his colleague Dallas Abbott describe the South Pacific feature in the September GEOLOGY.

Scientists identified the valley only within the last few years, as the Defense Department released satellite measurements of ocean-bottom gravity. The gravity maps, which reflect seafloor topography, have revealed thousands of seamounts, ridges, and other structures (SN: 12/16/95, p. 410).

Small and Abbott unofficially named the recently discovered trough after the Louisville seamount chain, a line of submerged volcanoes that connects with the westernmost end of the trough. That convergence point is a busy geological intersection; it happens to be the place where two tectonic plates collide.

Tectonic plates are pieces of the planet's outer shell, or lithosphere, that are continually jostling each other. At the western end of the Louisville trough, the leading edge of the Pacific plate dives under the Australian-Indian plate. This process, called subduction, is creating the Tonga-Kermadec trench, one of the deepest chasms on Earth.

Small and Abbott propose that the Pacific plate is not exiting gracefully. The Louisville seamount chain lies on the Pacific plate, and one of its volcanoes has gotten stuck while sliding beneath the Australian-Indian plate, they say. The stress created by that reluctant seamount may have caused the seafloor east of it to start tearing apart, creating the Louisville trough, suggest the two scientists. Sooner or later, however, the seamount will either break off or slip into the Earth, relieving the stress on the plate.

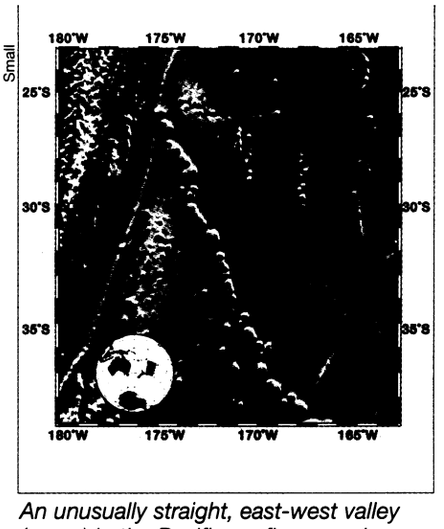
The scientists base their hypothesis on gravity maps of the area, coupled with a few old bathymetric surveys made by ships. Such a scenario challenges accepted ideas about how plates behave. Geologists think that most new seafloor rifts develop where plates are youngest and weakest—at their birthing places. At such sites, called mid-ocean ridges, two plates pull apart and molten rock wells up from beneath to form new plate material. By contrast, the Pacific plate is thought to be mature and tough where it reaches the Tonga trench.

The new hypothesis, says Small, "might mean that the old, strong plates are not as strong as we think."

Such speculations don't hold water, according to Peter F. Lonsdale from the Scripps Institution of Oceanography in La Jolla, Calif. "The concept that a piddling little seamount, 3 to 4 km high, is going to crack a plate that is 100 km thick really strains my credulity."

Lonsdale, who has visited the trough region in three expeditions, offers a more mundane explanation. Rocks collected from the area and other evidence suggest that the valley formed during the Cretaceous period, when that patch of seafloor was young, he says. At that time, the weak plate rifted and formed a trough, a relatively common occurrence in young oceanic lithosphere.

Small and Abbott say that the Louisville trough may be an ancient rift, but it lacks the topography characteristic of others. Lonsdale will gather more evidence when he returns to the South Pacific in January. —*R. Monastersky*



An unusually straight, east-west valley (arrow) in the Pacific seafloor puzzles geologists.

DNA links reported for schizophrenia

A new DNA investigation of more than 100 families suggests that a gene located on chromosome 13 contributes to at least some cases of schizophrenia, a severe mental disorder that usually first appears in young adults.

A specific sequence on chromosome 8 also shows signs of boosting susceptibility to schizophrenia for some people who possess the signature sequence on chromosome 13, reports a research team headed by genetic epidemiologist Ann E. Pulver of the Johns Hopkins Medical Institutions in Baltimore.

"What's exciting is that we have the first evidence to support the theory that different sets of genes can create a susceptibility to schizophrenia," Pulver says.

Earlier efforts to locate susceptibility genes for schizophrenia have had mixed results. Some evidence indicates that an unidentified gene on chromosome 6 contributes to the disorganized thinking, delusions, and hallucinations typical of this mental ailment (SN: 2/7/98, p. 91).

Pulver's group recruited families with predominantly European backgrounds to diminish genetic variation in the sample. The team employed a narrow definition of schizophrenia, so as not to include people with related disorders, and consulted long-term clinical records to confirm the schizophrenia diagnoses.

The researchers obtained DNA from blood samples collected from 54 people diagnosed with schizophrenia and 309 members of their extended families, who also completed psychiatric interviews. Molecular markers tagged DNA sequences on chromosomes 1 through 22.

A particular sequence on chromosome 13 appeared markedly more often in those diagnosed with schizophrenia, the scientists report in the September NATURE GENETICS. A "suggestive" statistical link emerged for a chromosome 8 region, they say.

A second study consisted of an additional 51 adults diagnosed with schizophrenia and 248 of their family members. A genetic link to the chromosome 13 and 8 areas was found in families in which some members had schizophrenia and others showed eccentric and withdrawn habits diagnosed as schizophrenia spectrum personality disorder. A genetic link only to chromosome 13 characterized the families in which several members had mood disorders, as well as hallucinations and delusions.

The latter finding coincides with an unpublished study directed by psychiatric geneticist Sevilla D. Detera-Wadleigh of the National Institute of Mental Health in Bethesda, Md. It finds the same chromosome 13 sequence often in family members diagnosed with bipolar disorder, or manic depression. Schizophrenia and bipolar disorder may share some susceptibility genes, Detera-Wadleigh holds.

Pulver's data suggests that a gene on chromosome 13 increases the likelihood of schizophrenia, but her study does not definitively show that it sometimes combines with a chromosome 8 gene to promote the disorder, comments psychiatrist Elliot S. Gershon of the University of Chicago Pritzker School of Medicine. —*B. Bower*