DANGER LURKS AT BASE OF CALIFORNIA'S FOOTHILLS

Cosmologists get favorable media attention for explaining time in unfamiliar ways.

When geoscientists do so, however, they're usually ignored, especially after disasters like the recent deadly earthen debris flows in Montecito, Calif. There, in the foothills north of Los Angeles, muddy slurries moving like cement carried boulders, tree-stumps, houses and corpses down toward the sea.

The routine, longer-term schedule of earthly processes can barely be heard beneath the urgent din of human tragedy. Being human, I mourn the losses of Montecito residents. Being a science writer, I feel compelled to unearth the explanations beneath what happened.

Nearly 30 years ago, writer John McPhee described how superficial memories of fatal disasters can be: "Most people along the mountain front are about as mindful of debris flows as those corpses were." This was from his influential article, "Los Angeles Against the Mountains," published first in The New Yorker, and then in a book ironically titled "The Control of Nature."

Rereading it in the aftermath of Montecito raises the question: How much control do we have? The economic pressure to find buildable land in the hills of southern California is as powerful as it is relentless, pushing us back into harm's way time after time. This explains why house foundations are being excavated into mudflow deposits. McPhee described how one homeowner built a fortified garage with doors on both ends to let the debris flow through it, rather than push it over.

Building on a canyon floor in the Los Angeles foothills is like building on a tidal flat and then acting surprised when the tide returns. Though the repeat time for debris flows is years to decades, and irregular, this does not change the inevitability of their return.

Consider the drip of water from a leaf on a misty day. Slowly and invisibly, the mist creates a film of water that is pulled down by force of gravity, and together by the force of surface tension. A threshold is crossed, the drop falls, the system resets, and the process begins again. This will continue, drop after drop, until the weather changes.

Now consider the landscape of the foothills of the San Gabriel Mountains north of Los Angeles. Strong rock moving up from below meets carbonic rain falling from above. The result is regolith, a weathered layer of sand and mud. The climate toggles back and forth between tinderbox droughts and soaking rains, both of which have happened in the past year. Ecologically, the regolith supports a discontinuous cover of fire-loving vegetation like chaparral, which requires being burned to compete with other plant types. The ash from each fire adds waxy residues to the soil, making it virtually waterproof.

Between fires and drenching rains, the regolith created on hillsides accumulates grain by grain into rills and ravines, tumbling down like heavy bread crumbs. This steady pour of "dry ravel" gathers into cones and small fans that fill or flank every low spot. When the runoff enhanced by the waxy soils meets the mass of accumulated dry ravel in low spots, the result is a stiff, dense, syrupy flow that self-propagates by incorporating whatever lies in its path.

As with every flush of a toilet, the rills, ravines and canyons of the foothills must be emptied so they don't overflow. The result is nature's balance.
Consider the cosmological balance of Earth's stable distance from the sun. The gravity of the sun pulling us inward is exactly offset by the centrifugal force of the Earth's inertia pushing us outward. The result of this push-pull is our ideal distance from the sun.

Now consider the rugged hillside landscape of southern California. The steady upward push of tectonic uplift is closely matched by the downward pull of gravity toward the Los Angeles basin, and thence to the sea. Maintaining this scenery requires the intermittent flushings known as debris flows.

One final point. The media insists on calling Montecito's debris flows mudslides. Perhaps the word "slide" sounds more dramatic, adding buzz. This dumbs down the reader and distorts the facts. The body count for California's largest landslide on the Big Sur coast last year was zero. The count for Montecito's debris flows has already reached 20.