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Not My Fault: Gary Carver: Farewell to a Humboldt Geology Icon

Lori Dengler for the Times-Standard

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Gary Carver studying the uplifted coastline following the April 25, 1992 magnitude 7.2 Cape Mendocino earthquake (photo Thomas Dunklin).

On February 19th, the geology community lost one of our pillars. Gary Carver stepped into the next dimension leaving an impact on his discipline, the Humboldt Geology Department, and generations of students and colleagues. With an aura and influence so big, it's a futile effort to condense his importance and legacy into these few words. Anyone who met Gary can write their own pages. These are mine.

A first meeting with Gary was never forgotten. Commanding a room or the field with his six-plus-foot presence, his eyes never wavered, and his formidable gaze was focused entirely on you. His questions quickly found the heart of what you were working on and inevitably led to side discussions. We used to joke that without his trademark red bandana, Gary's head would fly off his neck into the air because it was so full of ideas.

Gary joined the Geology Department in 1972 when the growing program needed a geomorphologist and more people to teach field camp. Geomorphology is the study of surface processes, and the North Coast is an ideal place to study rivers and hillslope processes. Gary

could map out landslides with the best of them, but he brought a new area of expertise with him. Neotectonics is the geologic study of volcanism, mountain building, and earthquakes. Gary's lifelong love of hiking and appreciating landscapes was the perfect foundation for recognizing the changes that tectonics can bring.

The term "neotectonics" was coined in 1948 to describe events of the past 20-million years but took off in the early 1970s when a young graduate student Kerry Sieh at Stanford employed a backhoe to trench the San Andreas fault zone. Sieh's work inaugurated the discipline of paleoseismology, a branch of neotectonics focused on earthquake faults. Many other geology programs quickly jumped on board and the University of Washington where Gary was studying was one of those.

Energy was a big driver of neotectonics interest in the 1970s. Oil was discovered in Prudhoe Bay in northern Alaska in 1968. Plan for an 800-mile-long pipeline to the port of Valdez in Prince William Sound were initiated soon after. Alaska had suffered through the magnitude 9.2 earthquake only four years earlier and the impacts of ground shaking and surface movements associated with faulting played a large part in the legal arguments that delayed construction for five years.

The Alyeska Pipeline Service Company designing the Trans-Alaska Pipeline employed Lloyd Cluff and Burt Slemmons to assess the fault hazard along the proposed path. Gary, newly hired at Humboldt, was one of the team of geologists to assist Cluff and Slemmons doing Alaska field work in 1973. The team identified four faults along the pipeline path and pointed to the Denali fault as greatest concern.

The 1,250-mile Denali fault arcs across southern Alaska, marked by distinct scars in the landscape from past earthquake slip. The geology team identified it as a strike-slip fault with movement similar to the San Andreas fault and capable of producing a M8 earthquake. An ingenious engineering solution was developed. The 48-inch diameter pipe would rest on sliders where it crossed the fault zone, capable of accommodating up to 20 feet of right-lateral strike-slip movement. On November 3, 2002, the system was tested. The Denali M7.9 earthquake produced 14 feet of slip, all contained in the zone the Alyeska geology team had identified. There was minor damage to a few of the slider supports and the pipeline was shut down for 66 hours to inspect and repair. But not a single drop of oil spilled and the pipeline study is a shining example of the cost benefits of using geologic techniques to assess faulting potential.

Gary's 1973 Alaska experience made a lasting impression on him and would remain a guiding tenet for the rest of his career. With an eye honed to spotting the telltale signs of faults in the rough terrain of Alaska, he quickly turned his attention to Humboldt County, walking miles over unmapped areas and sending students to complete senior theses on anything he found interesting.

Over the next decade, Gary and his students would fill in the map of known faults on the North Coast. His efforts were boosted after the 1975 M5.7 earthquake near Fortuna and the discovery of faults near the PG&E nuclear powerplant at King Salmon (see Not My Fault 11/13/21). Grants from PG&E supported more field work. When Bud Burke joined the Geology Department at Humboldt in 1979, Gary found a colleague and collaborator. Bud's expertise in relative age

dating of soils provided a new tool to identify the activity of regional faults. Estimates of fault rates and recent movement could be made by correlating the ages of different offset surfaces.

I began full-time teaching at Humboldt the same year Bud arrived. Those first few years were a blur, trying to keep by nose above water and a half-step ahead of my students. So much new was unfolding in our understanding of the North Coast tectonics. Gary and colleagues coined the term "fold and thrust belt" to describe our complex regional fabric of folds and faults and it seemed that every week a new wrinkle was exposed.

Those were heady days for our department. We hit nearly 300 undergraduate majors in 1980, many of them drawn into the program by Gary's magnetic personality. He taught at all levels and was particularly effective at converting students in other fields to switch to geology. He could even convince art, history, and other non-science folks to jump into geologic waters.

Gary and Bud provided the momentum to develop a graduate program. It was hard to start a new degree in the 1980s but teaming up with Math and Engineering, a geology option in Environmental Systems became reality and a new influx of students arrived to work in neotectonics and surface processes. These students went on to careers in environmental consulting and government agencies, and some completed PhDs and are now leaders at Universities and other research organizations.

Mother Nature provided an additional boost to Gary's work with plenty of earthquakes. Gary, Bob McPherson and I were just finishing up a paper on North Coast earthquakes (link at bottom), when the April 1992 Cape Mendocino earthquake sequence struck. The M7.2, 6.5, 6.6 earthquakes not only caused $60+ million in damages, it produced a tsunami recorded as far away as Hawaii and uplifted a 15-mile-long stretch of the coastline. Gary teamed up with Bob Rassmussen in Biology and students to use sea urchins and measured up to 5 feet of uplift in some areas.

So much happened following the 1992 earthquakes. Gary and a small group of scientists had been aware of the potential of great Cascadia subduction zone earthquakes and tsunamis, but most of the earth science community and few in government agencies knew anything about it. Gary and his wife Deborah began collecting oral histories of the native peoples on the North Coast before the earthquakes, but suddenly there was much more interest. He added paleotsunami studies to his tool kit, coring coastal areas for tsunami deposits and was able to correlate several areas to a corresponding Yurok or Tolowa story.

California put together a Planning Scenario for a larger earthquake in our area, making the threat of a local or near source tsunami much more widely known. NOAA launched the National Tsunami Hazard Mitigation Program in 1996. The media picked up the story too – Gary was featured in the August 1996 Rolling Stone article on California earthquakes, and a May 1998 issue of National Geographic. Gary's work was recognized in 1995 as Humboldt's Scholar of the Year.

The most closely I worked with Gary was on our 1992 California Geology article "Sources of North Coast Seismicity." We definitely butted heads during the process but arguments with Gary were always energetic, civil, and thought provoking. He had strong ideas and so did I but we both respected each other's expertise and let the science win out.

Gary Carver is near the top of my “most charismatic people” I have ever known list. He was passionate about geology and working with students and colleagues, but the real loves of his life were his family – Deborah, Terra, Molly, and granddaughter Juniper – and of course fishing.

Note: find the PDF of “Sources of North Coast Seismicity” at https://kamome.humboldt.edu/sites/default/files/Sources%20of%20North%20Coast%20Seismicity.pdf. It was published 33 years ago but the general story still holds.

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