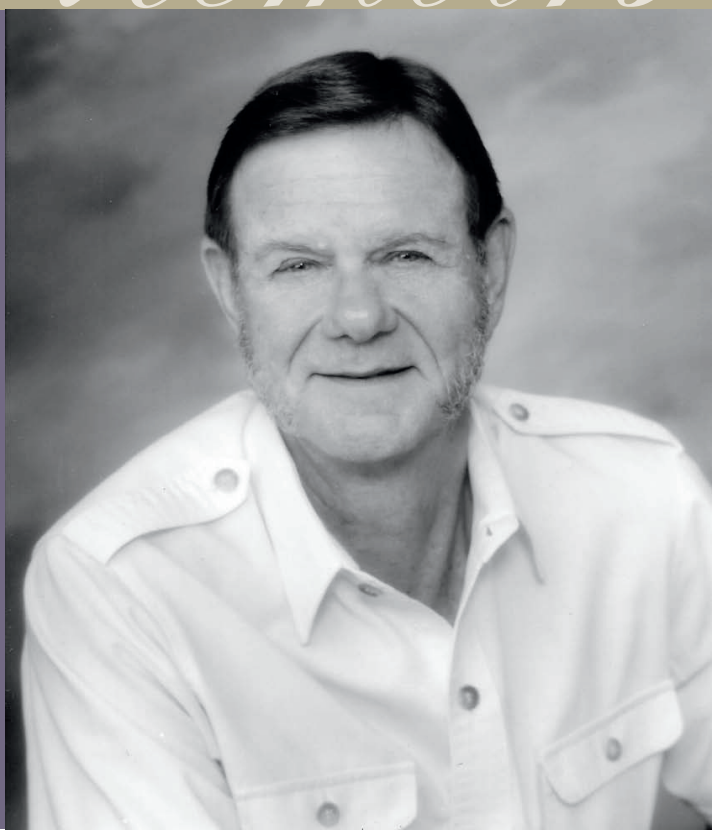
William R. Dickinson

1931-2015

BIOGRAPHICAL *Memoirs*



A Biographical Memoir by
Jon Spencer

NATIONAL ACADEMY OF SCIENCES

WILLIAM RICHARD **DICKINSON**

October 26, 1931–July 21, 2015

Elected to the NAS, 1992

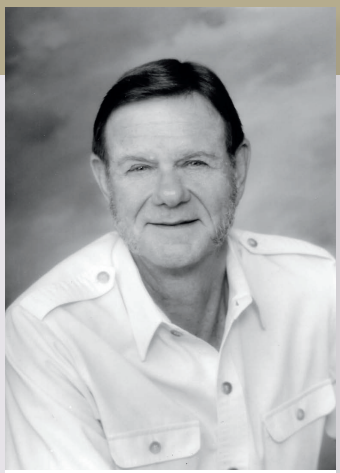


Photo provided by the Dickinson estate.

By Jon Spencer

William R. Dickinson was a prolific writer and synthesizer who contributed greatly to a remarkably diverse set of geological sub-disciplines between the time of the plate-tectonics revolution of the late 1960s and his death at 83 in 2015. Known to friends and colleagues as "Bill," Dickinson is best known for his identification of relationships between sandstone petrology and tectonic setting and for classifying sedimentary basins by plate-tectonic context. His early contributions included recognition of a relationship between magma chemistry and depth to subduction zones in magmatic arcs. Following the plate-tectonics revolution, he and his students, first at Stanford and later at the University of Arizona, were especially effective at identifying and characterizing regional depositional systems and associated tectonic environments. After he retired in 1991 he worked with George Gehrels at the University of Arizona to determine Phanerozoic sand sources and dispersal paths for North American sandstone units based on uranium-lead (U-Pb) geochronologic analysis of zircon sand grains. Bill also wrote many synthesis papers concerning tectonic evolution of various parts of southwestern North America and on issues of global tectonics. Following a field season of geologic mapping in Fiji in 1965 he began working with archaeologists to trace the sources of prehistoric pottery based on the mineralogy of sands contained in the pottery clay. He collaborated with archaeologists for almost 50 years, resulting in a large number of publications.

William Richard Dickinson was born in Nashville, Tennessee, on October 26, 1931, the fourth of six children. His parents, Jacob McGavock Dickinson, Jr., and Margaret Adams (née Smith), owned and operated the Travellers Rest Arabian horse stud farm, which is now a museum under the auspices of the Colonial Dames of America. The core of the house at Travellers Rest, where Bill and his younger siblings were born, was built by Bill's great-great-grandfather Judge John Overton in 1799. Bill's father had been a

war hero who fought in France in WWI and who commanded the Second Brigade of the volunteer Tennessee State Guard during WWII. Bill's paternal grandfather, Jacob McGavock Dickinson, Sr., had been Secretary of War for two years under President Taft. It was said that Taft referred to him as "that damned rebel," because he had fought for the Confederate cavalry in 1865 at the age of 14. Notable Dickinson relatives include Charles Dickinson, who was shot and killed by future U.S. President Andrew Jackson in a duel in 1806, and Almeron Dickinson, who was killed at the Battle of the Alamo in 1836.

In 1946 Bill's family and their 60 horses moved to Rancho Oso on the Santa Ynez River north of Santa Barbara, but the move was a financial failure and contributed to his parents' bitter divorce. During his two years at Rancho Oso, Bill traveled extensively in the Santa Ynez Mountains, commonly on horseback. He once mentioned that he was not impeded in later understanding of the Franciscan Complex as a tectonic mélange because he had seen so much of it in the Santa Ynez Mountains and could see its chaotic structure. During the summers of 1948 and 1949 Bill traveled to Bluff, Utah, where he worked for a commercial outdoor explorer camp run by Kenneth I. Ross, who was also an avid river runner. During those summers Bill, Ross, and friend and later fellow Stanford University student Jon Lindbergh rafted down the San Juan and Colorado rivers from Ship Rock to Lee's Ferry, and the Colorado from Moab to Hite—before Lake Powell was created behind the Glen Canyon Dam starting in late 1963. Bill saw many spectacular exposures of Paleozoic and Mesozoic rock units while river running, hiking, and traveling across the central Colorado Plateau. Many of those rock units he would get to know well decades later.

After graduating from Laguna Blanca School in Santa Barbara, Bill enrolled at Stanford in 1948 and received a B.S. in petroleum engineering in 1952. He then served two years as an officer in the Air Force, where he did airborne geodetic measurements across northern North America and the North Atlantic for the purpose of intercontinental ballistic missile guidance. Bill had taken a course called "Geology for Engineers" at Stanford, taught by Aaron Waters, and decided after that to pursue geology rather than engineering. Bill received his M.S. in 1956 and Ph.D. in 1958 from Stanford and then promptly joined the university's geology faculty. Both his M.S. thesis and Ph.D. dissertation were field-oriented, mapping-based studies, the first in the Santa Lucia Mountains of coastal central California and the second in the southern Blue Mountains area in eastern Oregon. He had many mentors at Stanford, including Konrad Krauskopf, Ben Page, George Thompson, Charles Park, and Siemon Muller, but mentioned Robert

Compton as especially influential. (Note: Si Muller and Jon Lindbergh camped out in the hills behind Stanford at different times because they couldn't afford rent - a situation in stark contrast to later Silicon Valley affluence!)

Bill was tall with a deep voice and a commanding presence, typically wore a cowboy hat in the field, and enjoyed talking at length with ranchers about horses, grazing, and issues surrounding ranching and living in the rural West. He had an excellent ear for stories and amusing incidents and repeated them to family and friends. An article about Bill in the university newspaper, *The Stanford Daily*, referred to him as "Cowboy Bill" (Ingersoll, 1975). He always spoke well of the ranchers he encountered and later in life was outspoken in defense of their economic needs and lifestyle.

In 1965 Bill traveled to Fiji with his first wife Margaret Ann (Peggy) (neé Palmer) and young sons Ben and Edward, supported by funding from a Guggenheim Fellowship. He spent much time with a Fijian guide mapping volcaniclastic bedrock in western Viti Levu (the main island of the Fiji archipelago) and offshore islands. The family traveled to New Zealand and southeastern Australia as well, and Bill became familiar with the broad outlines of southwest Pacific geology as understood at the time. He was impressed by the fact that most of the geologists he talked to, unlike North American geologists, accepted the concept of an ancient Gondwana supercontinent and its later fragmentation and fragment drift.

Following his return to Stanford, he and New Zealand geologist Trevor Hatherton identified a relationship between depth to the inclined seismic zone beneath arc volcanoes and the potassium content of arc magmas, and concluded that arc-magma genesis occurred at ~100 km depths and not at much shallower levels as had been proposed (Dickinson and Hatherton, 1967). It was another year or two before it became clear that inclined seismic zones revealed the subsurface location of descending tectonic plates and that magma genesis was related to plate subduction. Their discovery of the relationship between the two variables was a significant contribution to understanding subduction-related magmatism that also offered the potential to better identify ancient subduction regimes. The history of Bill's transition from "casual stabilist" to plate-tectonic mobilist, and his participation in the plate-tectonic revolution at the time of this discovery, are well described in his book chapter "The coming of plate tectonics to the Pacific Rim" (2001).

Bill had an aptitude for languages, and while in Fiji working with a Fijian guide he became somewhat fluent in Fijian and developed insights into Fijian culture. In a 2014 email to Bob Dott, Bill wrote of this experience:

All islanders focus like a laser beam on interpersonal relations. As a young scientific tiger on the make, I had previously viewed other people as something between a nuisance and just woodwork. Fiji taught me the folly of that approach to life. I began to view people as a resource and potential collaborators, and to study them with care for their own sake. I am convinced that I became a better teacher, a better advisor, and a better programmatic operative post-Fiji.... It is probably no accident that my convening of the 1967 Stanford-USGS San Andreas Conference and the 1969 Asilomar Penrose Conference came in the immediate wake of my 1965 sojourn in Fiji.

Bill Dickinson with Fijian field guide Silasa, probably in the 1980s.
(Photo by Jackie Dickinson.)

Plate Tectonics and Mountain Building

The 1969 Geological Society of America (GSA) Penrose Conference that Bill convened at Asilomar in Pacific Grove, California, was titled "The Meaning of the New Global Tectonics for Magmatism, Sedimentation, and Metamorphism in Orogenic Belts." Orogenic belts, where the Earth's crust has been deformed upwards by the movement of tectonic plates, are zones of ancient and modern mountain building. The plate-tectonics revolution, originating largely with studies of ocean basins, paleomagnetism, and seismology, was yielding new insights into the origins of orogenic belts. The Asilomar Penrose Conference was a roaring success at revealing to a large number of geologists how plate tectonics provided a framework for understanding the origin and assembly of the diverse elements that make up orogenic belts. The term "subduction," although not new to geology, was applied for the first time to converging plate boundaries where the ocean lithosphere descends beneath magmatic arcs (White et al., 1970). Bill thought that the success of this conference was a highpoint in his career. In his own words, "The plate tectonic revolution in geoscience came along just about the time I

had my professorial feet solidly on the ground, and I rode that rocket for a number of years…," and "The plate revolution was indeed as much fun as a barrel of monkeys. We kept asking ourselves how we could have been so dumb for so long. But we also knew we were in the cat[bird] seat and could carry the day just by plowing straight ahead."

Regardless of his early insights in studying arc magmatism, Bill's main focus, in both teaching and research, was on relations between tectonics and sedimentation, with special emphasis on sandstone petrology, sand sources, and regional depositional systems. Several of his research publications in the years following the 1969 Penrose conference were directed at broad problems of sedimentation and tectonics, with titles such as "Relations of andesites, granites, and derivative sandstones to arc-trench tectonics" (1970), "Plate tectonic models of geosynclines" (1971), and "Plate tectonics and sedimentation" (1974). His most-cited papers, however, address methods for studying sandstones in thin section (a microscope slide) and the implications of sandstone petrology for tectonic setting. Strongly influenced by his early career experience with igneous rocks, Bill took an approach to sandstones that was similar to that of an igneous petrologist studying rocks in thin section. His 1979 paper with Stanford graduate student Chris Suczek, titled "Plate tectonics and sandstone compositions" and published by the American Association of Petroleum Geologists, is widely cited and representative of this research focus.

Impromptu award presented to Bill at the end of the Asilomar Penrose Conference. (Photo by Jon Spencer.)

Bill and his first wife separated in 1967. In 1970 he married Jacqueline "Jackie" Spencer (née Klein), who was my mother. Jackie loved to travel with Bill and for the rest of their lives together she went almost everywhere with him. For their honeymoon in 1971 they traveled to Fiji, where they backpacked to interior villages that had been alerted by radio to the travelling Americans. Upon arrival Bill would present a ceremonial gift—a *sevusevu*—of kava root (the traditional mild intoxicant) previously purchased at a store,

and they both would participate in a kava-drinking ceremony with the village chief and assembled dignitaries. Jackie thought this was a delightful and fascinating adventure. Their honeymoon, however, ended on an unfortunate note when they both contracted dengue fever in Tahiti and were sick at home for weeks after.

Bill and Jackie Dickinson, Stanford, ~1975. (Photo by Jon Spencer.)

Bill had been at Stanford almost continuously since 1948 and was ready for a change, and Jackie loved the desert. In 1979 they moved to Tucson, where Bill joined the faculty of the University of Arizona (UA). The Department of Geosciences at UA had a strong program in structure and tectonics, and Bill was enticed by their energy and activity.

Bill believed that his academic activities and those of his students gained legitimacy if they were applicable to problems outside academia. With his background in petroleum engineering he was well aware that new understanding of sedimentary-basin genesis and evolution gained from the plate-tectonics revolution could potentially influence oil and gas exploration strategies. In the mid-1970s Bill was a convener and speaker for several short courses concerning tectonics, sedimentary basins, and petroleum geology, and many of his graduate students went on to pursue careers in hydrocarbon exploration. During his early years at UA Bill and colleagues Peter Coney and George Davis founded the Laboratory of Geotectonics, which was a vehicle to attract paying industry members from both hydrocarbon and metal exploration and production companies. These companies sent some of their geologists once a year to a geologic symposium at UA. Both students and faculty presented their latest research, and students were introduced to potential employers. Registration fees were used exclusively to support graduate students. Students and faculty also learned from industry geologists about insights gained from proprietary research. In 1981 the Laboratory of Geotectonics, in conjunction with the Arizona Geological Society, hosted a two-day symposium at UA titled "Relations of tectonics to ore deposits in the southern Cordillera," which was attended by approxi-

mately 1250 geoscientists and included field trips with almost 700 participants. Bill and William Payne were the program chairs and editors of the resulting technical publication.

Bill authored or co-authored 165 articles in refereed journals (89 after he retired), six monographs, 68 chapters in books and symposia proceedings, 150 abstracts, and over 200 other publications, altogether involving 255 co-authors. He participated, as either a convenor or speaker, in 82 topical symposia. He served as chairman of the National Research Council's Geological Sciences Board (1981-1983), Board on Earth Sciences (1982-1984), U.S. Geodynamics Committee (1992-1996), and Panel on Geodynamics of Sedimentary Basins (1995-1996). In 1992 he was elected to the National Academy of Sciences, and he served as chair of its Geology Section from 2003 to 2006. In 1994 he was president of the Geological Society of America. Bill received several prestigious awards, including the GSA Penrose Medal (1991), the GSA Sloss Award for Sedimentary Geology (1999), and the Society for Sedimentary Geology Twenhofel Medal (2000), in addition to the 2014 GSA Rip Rap Award for archaeological geology. In 2015 he was awarded the first annual Distinguished Alumni Award from the Stanford School of Earth, Energy, and Environmental Sciences.

Bill's principal university teaching assignments at Stanford and UA included classes in introductory geology, field geology, sedimentology, sedimentary petrology, depositional systems, and basin analysis. By the time he retired in 1991 he had served as the primary advisor for 84 graduate students at Stanford and UA. Their theses and dissertations were primarily concerned with sedimentary rocks, and almost all involved field work and focused on tectonic setting and evolution. Most of his field work and that of his students was pursued in Western states.

All geologists who undertake field studies of rocks in orogenic belts are confronted with the problem of discerning past geologic history from a complex, incomplete, and fragmentary record. In addition to field mapping, a diverse and growing set of techniques is available to the geologic detective. One of the pleasures of this type of research is the opportunity to study and understand the underlying physics, chemistry, biology, and mathematics of such techniques so as to use them most effectively. Bill excelled at identifying and applying the diverse methods that he and his students thought necessary to understand problems of geologic history and tectonic setting. This was all a great and fascinating challenge to him, throughout his geologic career. His infectious enthusiasm, encyclopedic knowledge, excellent memory, and intellectual sharpness, all with a dash of humor, made Bill a pleasure, and for some a challenge, to work with.

At Stanford some of his first graduate students studied ash-flow tuffs and plutonic rocks (including Pete Lipman, Marjorie Korringa, Rich Schweickert, and Jim Bateson). His largest research program, however, focused on the stratigraphy, facies, sandstone composition, and structure of the California Coast Ranges, with many theses and dissertations from Stanford students including Steve Graham, Ray Ingersoll, Darrell Cowan, Dick Ojakangas, Ernie Rich, Charlie Mansfield, Ken Helmold, Dave Chipping, Vic Cherven, Letha Slagle, Tommy Casey, and Joe Ruetz. Similar studies of the Coast Ranges of Oregon were done at UA by Paul Heller and Paul Ryberg. Most or all of these graduate students were exposed to the problems of interpreting subduction complexes, regardless of whether such rocks were actually in their field areas. Continuing with this research topic, Peter Swift's UA Ph.D. dissertation was directed at a 1.7 billion-year-old subduction complex east of Tucson.

After the plate-tectonics revolution, Bill and his graduate students developed another research focus on the Paleozoic sedimentary geology and tectonic setting of the western and southern margins of North America. Strata thrust onto the Paleozoic passive margin in central Nevada during the Antler orogeny were the subject of Chris Suczek's Stanford dissertation, while the sedimentary consequences of Antler orogenesis to the east were studied by Art Saller and Dwight Harbaugh (Stanford) and Kate Giles (UA). Bill worked with Stanford graduate students Steve Graham and Ray Ingersoll on Paleozoic tectonics on the southeastern margin of North America that led to a 1975 article titled "Himalayan-Bengal model for flysch dispersal in Appalachian-Ouachita system." Plate-tectonic activity along Paleozoic continental margins resulted in changes in sedimentation at distant, continental interior areas that were the subject of theses and dissertations by Terry Jordan and Jon Matti (Stanford) and Rich Armin, Lynn Soreghan, Larry Lemke, and Rex Knepp (UA).

Bill Bilodeau's 1979 Stanford Ph.D. dissertation on the Mesozoic Bisbee basin in Arizona began a new research focus on extensional sedimentary basins. UA students continued to study this complex, fragmented basin, leading to theses by Margaret Klute, Kerry Inman, Barbara Beatty, Rob Risley, Laurel Vedder, and Kermit Jamieson. Tim Lawton, one of Bill's UA graduate students who studied Mesozoic thrust-belt foreland geology, later collaborated with Bill on a synthesis of Bisbee basin geology. Many of Bill's students at UA studied the structure and stratigraphy of areas affected by Cenozoic extension in Arizona, including Tom Goodlin, Jeff Grover, Roger Mark, Jack Yarnold, Bill Weibel, and Jim Walsh. In addition to supervising graduate students, Bill, with characteristic energy, engaged with other graduate students doing research in related fields.

Arizona LaserChron Center

Following his retirement in 1991, Bill began working with UA geoscience professor George Gehrels at the recently opened Arizona LaserChron Center, a laboratory that was equipped to determine the age of large numbers of sand grains of zircon. Present in almost all sands, zircon is a trace silicate mineral that is highly resistant to wear and decomposition and incorporates substantially more uranium than most other minerals. The gradual radioactive decay of this uranium to lead allows determination of the age of the grains, once the uranium and lead are liberated from the sand grain by a laser pulse, followed by their immediate isotopic analysis in a mass spectrometer. An early and dramatic discovery made through this process was that the picturesque Permian and Jurassic sandstones of the Colorado Plateau were derived largely from the Appalachian Mountains! Bill and George also outlined a method for determining maximum depositional age from detrital-zircon geochronology datasets. In addition, Bill examined biases in detrital-zircon provenance interpretations by identifying two periods of Proterozoic igneous activity in North America that produced magmas with greater zirconium concentration and, by inference, greater zircon abundance than for other periods of magmatism. Bill made much use of the Kolmogorov-Smirnov test for comparing detrital-zircon datasets from different sandstone samples in order to determine the potential for derivation from similar versus different sand sources. His seemingly endless enthusiasm for detrital-zircon geochronologic research could be viewed as an extension of his earlier microscope studies of sandstones that were also directed at determining provenance. The only significant research Bill left unpublished at his death in 2015 was a monograph on Colorado Plateau sandstones and their origin as determined partly from a large set of detrital-zircon sandstone samples.

Personal recollections

I first got to know Bill when he began dating my mother, Jackie, when I was 14 in 1968. He soon began taking Jackie and her two sons (my brother, Brian, was two years younger) on backpacking trips to the Sierra Nevada and to the Big Sur area of the California Coast Ranges. This seemed like just fun for him, and although he pointed out geologic features, he certainly didn't overdo it. After he had teenage grandchildren it became apparent to me that he knew that teenagers were impressionable and that exposure to the outdoors in the West could make lifelong memories and stimulate new interests. I suspect that the time he spent outdoors as a teenager himself had just such an effect on him. I remember from when I was a teenager that Bill had a globe that he pondered at the dining room table. He was always happy to point out features and

explain new plate-tectonics insights. His willingness to share his time, both outdoors and at home, seems exceptional in retrospect, as he was a busy Stanford professor. When I went off to college I hesitated to declare geology as a major, because Bill's influence felt so overwhelming. The excitement of the plate tectonics revolution that he conveyed, however, made it irresistible.

Bill was never one to mince words. When I was a teenager I told him that my great-great grandfather, a Union soldier in the Civil War, had been shot in the hip, and carried the bullet in his body for the rest of his life. Bill shot back "maybe one of my relatives put it there." (Bill was no dislocated Southerner, however. As a teenager he ditched his southern accent as quickly as he could after girls in California laughed at him). His seemingly endless supply of stories from old times and from the field were variably amusing, hilarious, interesting, and insightful. One that impressed my brother and me was of a fellow geologist in Winnemucca, Nevada, who was too drunk to walk back to his hotel room so he crawled down the sidewalk while Bill walked along next to him. A policeman pulled up in his car and asked Bill "What's the matter with him?" Bill explained the situation, the cop watched a bit more, and then said "Well all right, but if he stops crawling I'm taking him in."

Geology and archaeology of the South Pacific

When Bill was in Fiji in 1965 he met New Zealanders Lawrence and Helen Birks who were excavating the Sigatoka Dunes archaeological site. They asked him if the distinctive Lapita pottery recovered by their excavations could be traced to the site of fabrication. Lapita pottery has a distinctive style and is widely dispersed from the Bismarck archipelago to Samoa, Fiji, and Tonga, a distance of 4000 km. Furthermore, it reflects initial colonization of islands southeast of the Bismarck archipelago in a rapid expansion approximately 3000 years ago. The pottery fragments, known as pot "sherds," contain sand, known as "temper" sands, which are mixed with the clay for added strength and other beneficial properties. Bill realized that temper sands would potentially identify the source areas of prehistoric pottery, as with sandstones, and agreed to study the sand in some pottery fragments and the dune sands (they were identical in this case). On his way home from Fiji Bill stopped at the Bernice Pauahi Bishop Museum in Honolulu and met with Richard Shutler Jr. The two decided to collaborate on identifying the sources of pottery from Oceanian archaeological sites, a collaboration that lasted four decades and led to many publications.

As is done with rocks, Bill had thin sections made of the pot sherds and then used a petrographic microscope to identify the minerals that made up the sand grains. Bill identified five main South Pacific temper-sand classes, each with distinctive mineralogy that reflects the tectonic setting and geologic history of the rocks from which the temper sands were derived. Some pot sherds were discovered to have been made far from their excavation sites, with prehistoric ceramic transfer distances of many hundreds of kilometers to over a thousand kilometers. Bill's collaboration with archaeologists lasted 49 years and included production of 292 numbered reports sent to collaborators. The 2258 thin sections from these studies that were in Bill's possession at the time of his death were donated to the Bishop Museum, which also has digital copies of the numbered reports. Bill's pot-sherd analyses and analysis techniques are summarized in Geological Society of America Special Paper 406 (2006).

Collaborations with archaeologists led Bill to geologic evaluation of South Pacific archaeological sites. Geomorphologic changes were common during the thousands of years since settlement of typically coastal villages, but it also became apparent that sea level in the tropical South Pacific had fallen by up to 2-3 meters in the late Holocene and that beaches had migrated seaward away from initially coastal village sites. This led Bill to a systematic evaluation of middle to late Holocene Pacific island evolution relative to local sea level that included three components: global eustatic sea level, regional hydro-isostasy, and local volcanic and tectonic influences on island elevation. Hydro-isostatic changes resulted in late Holocene, low-latitude island emergence of ~1-3 m due to transfer of seawater to continental margins and high-latitude regions in a process termed "equatorial ocean syphoning" (Mitrovica and Peltier, 1991). Bill proposed in 2003 that some prehistoric colonization of Pacific islands followed geomorphic development of favorable coastal environments on atoll islands as relative sea level dropped following mid-Holocene hydro-isostatic highstand. The impact of Bill's long efforts in South Pacific geo-archaeology was recognized in 2014 by his receipt of the Rip Rapp Award from the Geological Society of America. Bill wrote: "Somehow the Rip Rapp strikes into my soul deeper than my other kudos… Maybe because all my work in the islands was a cross between serious science and sheer fun (you tend to forget the mosquitoes and sloppy boat rides and torrential rains and iffy quarters as time passes.)" (Email to Pete DeCelles, 2014.)

Bill was in Nuku'alofa, the capital city of Tonga, when he died of a heart attack on July 21, 2015, apparently in his sleep. Jackie had passed away less than three months earlier in a memory-care home in Tucson following a difficult 1-2 year period of declining

health. In Bill's field notes the day before he died, the last note he wrote was "all seems well settled in my mind now," referring to his understanding of the local geoarchaeology, but perhaps also reflecting on his own professional and personal life. Earlier Bill had mentioned to his younger sister, Edith, his satisfaction in being able to take care of Jackie to the end, and that he felt he had completed every major task he had undertaken in his life. An archaeological site at the village of Nukuleka, near Nuku'alofa, had been identified by Bill and archaeologist David Burley as a ~3000-year-old Lapita-era founding settlement. Bill was buried in Nukuleka following a Tongan funeral officiated by Lord Vaea ('Alipate Tu'ivanuavou Vaea), who had met Bill while chairman of the Tongan Traditions Committee. The funeral procession included the 30-member brass band from the Queen Salote (girls) College. This was all made possible because several prominent Tongans knew or had met Bill and Burley over the previous 25 years and respected and appreciated the work they were doing, and because of the tremendous effort by Burley to make it all happen. The funeral was a fitting end to the long and remarkably productive life of a great geologist who was still going strong at the age of 83 and doing what he loved to do.

REFERENCES

Dickinson, W. R. 2001. The coming of plate tectonics to the Pacific Rim. In *Plate Tectonics: An Insider's History of the Modern Theory of the Earth*. Edited by N. Oreskes. pp. 264-287. Boulder, Colorado: Westview Press.

Dickinson, W. R. 2006. Temper sands in prehistoric Oceanian pottery: geotectonics, sedimentology, petrography, provenance. Geolog. Soc. Amer. Special Paper 406.

Ingersoll, M. 1975. 'Cowboy Bill' Dickinson: the 'perfect' prof. *Stanford Daily*, October 16, p. 3-4.

Mitrovica, J. X., and W. R. Peltier. 1991. On postglacial geoid subsidence over the equatorial oceans. *J. Geophys. Res.* 96:20,053-20,071.

White, D. A., D. H. Roeder, T. H. Nelson, and J. C. Crowell. 1970. Subduction. *Geolog. Soc. Amer. Bull.* 81:3431-3432.

SELECTED BIBLIOGRAPHY

1967 With T. Hatherton. Andesitic volcanism and seismicity around the Pacific. *Science* 157:801-803.

1970 Interpreting detrital modes of graywacke and arkose. *J. Sedimentary Petrology* 40:695-707.

1971 Plate tectonic models of geosynclines. *Earth and Planetary Sci. Lett.* 10:165-174.

1974 Plate tectonics and sedimentation. In *Tectonics and Sedimentation*. Edited by W. R. Dickinson. Soc. Econ. Paleontologists and Mineralogists Special Pub. 22:1-27.

1975 Potash-depth (K-h) relations in continental margin and intraoceanic magmatic arcs. *Geology* 3:53-56.

1978 With W. S. Snyder. Plate tectonics of the Laramide orogeny, in Laramide folding associated with basement block faulting in the western United States, ed. V. Matthews III. *Geological Soc. Amer. Memoir* 151:355-366.

1979 With W. S. Snyder. Geometry of triple junctions related to San Andreas transform. *J. Geophys. Res*. 84:561-572.

With W. S. Snyder. Geometry of subducted slabs related to San Andreas transform. *J. Geology* 87:609-628.

With C. A. Suczek. Plate tectonics and sandstone compositions. *Amer. Assn. Petroleum Geologists Bull.* 63:2164-2182.

1983 With L. S. Beard, G. R. Brakenridge, J. K. Erjavec, R. C. Ferguson, K. F. Inman, R. A. Knepp, F. A. Lindberg, and P. T. Ryberg. Provenance of North American Phanerozoic sandstones in relation to tectonic setting. *Geolog. Soc. Amer. Bull.* 94:222-235.

1988 With M. A. Klute, M. J. Hayes, S. U. Janecke, E. R. Lundin, M. A. McKittrick, and M. D. Olivares. Paleogeographic and paleotectonic setting of Laramide sedimentary basins in the central Rocky Mountain region. *Geolog. Soc. Amer. Bull.* 100:1023-1039.

1991 Tectonic setting of faulted Tertiary strata associated with the Catalina core complex in southern Arizona. Geolog. Soc. Amer. Special Paper 264.

1996 Kinematics of transrotational tectonism in the California Transverse Ranges and its contribution to cumulative slip along the San Andreas transform system. Geolog. Soc. Amer. Special Paper 305.

1997 Tectonic implications of Cenozoic volcanism in coastal California. *Geolog. Soc. Amer. Bull.*109:936-954.

With B. P. Wernicke. Reconciliation of San Andreas slip discrepancy by a combination of interior Basin and Range extension and transrotation near the coast. *Geology* 25:663-665.

2001 With T. F. Lawton. Tectonic setting and sandstone petrofacies of the Bisbee basin (USA-Mexico). *J. South Amer. Earth Sci*. 14:475-504.

With T. F. Lawton. Carboniferous to Cretaceous assembly and fragmentation of Mexico. *Geolog. Soc. Amer. Bull.* 113:1142-1160.

2002 The Basin and Range province as a composite extensional domain. *Intl. Geol. Rev.* 44:1-38.

2003 Impact of mid-Holocene hydro-isostatic highstand in regional sea level on habitability of islands in Pacific Oceania. *J. Coastal Res.* 19:489-502.

With G. E. Gehrels. U-Pb ages of detrital zircons from Permian and Jurassic eolian sandstones of the Colorado Plateau, USA: paleogeographic implications. *Sedimentary Geol.* 163:29-66.

Evolution of the North American Cordillera. *Ann. Rev. Earth and Planetary Sciences* 32:13-45 & C1-C4.

2005 With M. Ducea, L. I. Rosenberg, H. G. Greene, S.A. Graham, J. C. Clark, G. E. Weber, S. Kidder, W. G Ernst, and E. E. Brabb. Net dextral slip, Neogene San Gregorio-Hosgri fault zone, coastal California: Geologic evidence and tectonic implications. Geolog. Soc. Amer. Special Paper 391.

2006 Geotectonic evolution of the Great Basin. *Geosphere* 2:353-368.

2008 Tectonic lessons from the configuration and internal anatomy of the circum-Pacific orogenic belt. In *Ores and Orogenesis: Circum-Pacific Tectonics, Geologic Evolution, and Ore Deposits*, eds. J. E. Spencer and S. R. Titley. *Ariz. Geolog. Soc. Digest* 22:5-18.

Impact of differential zircon fertility of granitoid basement rocks in North America on age populations of detrital zircons and implications for granite petrogenesis. *Earth and Planetary Sci. Lett.* 275:80-92.

.