THE GREAT QUAKE: HOW THE BIGGEST EARTHQUAKE IN NORTH AMERICA CHANGED OUR UNDERSTANDING OF THE PLANET. By HENRY FOUNTAIN. New York: Crown Publishing, 2017. ISBN 978-1-101-90406-0; 978-1-101090407-7 (eBook), x + 278 p., b&w illus., endnotes, additional sources, index. Hardbound, US$28.00; Cdn$37.00.

Henry Fountain dissects the connections between Alaska's Great Earthquake of 27 March 1964 and geologists' perceptions of how Earth's crust slowly renews itself. Charles Darwin's synthesis of his and other naturalists' observations persuaded 19th century scientists to replace the idea of divine creation of fixed species with the theory that species of animals and plants evolve through processes of natural selection. That paradigm shift was rivaled by earth scientists' 20th century adoption of the theory of plate tectonics to explain relative mobilities of continental and oceanic units of our planet's crust. Fountain's background in journalism led him to inoculate this account against technical esoterica by humanizing his storytelling, making it a reflection on human ecology as well as a chronology of idea development in earth sciences.

In 1911, 31-year-old German meteorologist, Alfred L. Wegener, took his first steps toward proposing that continents drift across the surface of our planet, which he expressed in a treatise published in 1912. A revised and amplified version appeared in 1915 and was published in English in 1922. New York City hosted a geological symposium in 1926 that became a "kangaroo court" for rejecting Wegener's theory of continental drift (p. 64 – 65). At that time, Wegener could not identify a source of energy that could impart motion to continents. Wegener's ideas were discounted partly because they were proposed by someone outside the guild or discipline of formally trained geologists. It took four decades for North American geologists to drop resistance to the German meteorologist's notions of mobility in Earth's crust.

An American contemporary of Wegener who did belong to the geologists' guild, however, suffered a comparable rejection. J Harlen Bretz's wide-ranging field studies along the Columbia River in eastern Washington State from 1910 to 1924 led him to propose that the extensive feature he called the "Channeled Scablands" had been formed by one or more catastrophic floods of proportions neither seen nor imagined by geologists to be possible. The year after Wegener was discredited for his continental drift theory, Bretz was "lynched" intellectually at a meeting of the Geological Society of America in Washington, D.C. for failing to identify a source of enough floodwater to scour the Scablands. Unlike Wegener, who perished crossing Greenland in 1930 at age 50 (p. 65), Bretz lived to see his theories vindicated by geologists, beginning with observations by J.D. Pardee of the U.S. Geological Survey (USGS), who in 1940 identified a huge glacier-dammed lake that formed slowly and emptied explosively from watersheds tributary to the Columbia River in the late Pleistocene (Soennichsen, 2008).

Collateral effects of World War II included putting trained geologists like Harry Hess (p. 65 – 66) to sea in the vast Pacific Ocean, where they could map previously unknown seafloor features and then speculate on their origins. The war also elevated the strategic defensive significance of the Territory of Alaska and augmented both military and civilian populations of the territory. The western headquarters of the USGS in Menlo Park, California, developed an Alaska Branch, which was charged with searching for strategic minerals, including petroleum and coal, in Alaska. Earthquakes and tsunamis were not high on the Branch's list of priorities.

Don J. Miller, a field geologist with the Alaska Branch, and his younger protégé, George Plafker, conducted mineral surveys in 1952 and 1953 in the rugged coastal mountains southeast of Yakutat. Despite the low priority that the USGS assigned to studying Alaska's earthquakes, the two geologists recorded signs that giant harbour waves had episodically swept away entire swaths of living forest up to various elevations above sea level between 1853 and 1936. Forest trees bordered a T-shaped marine embayment incising coastal mountains, known in the Tlingit language as "Lituya."

A tragedy at Lituya in 1958 confirmed Miller's hypothesis that giant waves could originate from periodic earthquakes along the Fairweather Fault that forms the crossbar at the head of Lituya (p. 109). Three fishing boats at anchor in the outer bay with a total of six persons aboard experienced a powerful earthquake on 9 July. Minutes after they heard and felt the shock, the giant harbour wave, generated by a massive landslide near the head of the bay, raced seaward toward them. Miller documented that this 1958 harbor wave had not only sunk two of the three anchored fishing boats, but denuded a headland of living trees in its path to an altitude of 1720 feet (524 m)—still the world's altitude record for a harbour wave. Survivors reported the height of the wave that spread out to the mouth of the bay as being 50 to 75 feet (15 – 25 m) when it reached their vessels. The USGS published Miller's extended study of Lituya's giant waves in 1960 (p. 109 and p. 254: note to Chapter 8; Miller, 1960). Miller himself perished in 1961 while rafting a swollen river between geological mapping sites in Alaska. News of his former mentor's death reached George Plafker in a letter from the USGS addressed to him in Bolivia, where he was employed by Chevron Oil Company to identify promising sedimentary formations. That 1961 letter also invited Plafker to return to assume Miller's functions by conducting field studies for the Alaska Branch.

The first fragmentary news of widespread devastation in Alaska on 27 March 1964 reached Seattle and San Francisco that evening. Art Grantz and George Plafker learned that they were to fly the next morning from the Seattle symposium they were attending to a lightly damaged military airfield in Alaska, where a third Alaska Branch geologist, Reuben Kachadoorian, would join them. The trio was to conduct a geological and engineering reconnaissance of the extent and severity of Alaska's earthquake. Between 28 March and 10 April, the three geologists made impromptu surveys with logistics support from the military (p. 1 – 12). They performed under Alaska's challenging late winter-early spring conditions, which prudent field geologists normally avoid.

After their hectic two-week reconnaissance, the three geologists packed up their notebooks, exposed films, and recordings of interviews with survivors who had variously experienced the quake and its after-effects. Metaphorically, their retreat to California offices to write up reports and recommendations to the USGS paralleled some survivors' accounts of seawater receding from the coast before surging back in one or more destructive waves. The summer of 1964 would bring thousands of strangers surging into Alaska. Among newcomers would be inquisitive agency and academic investigators intent on analyzing the earthquake's causes and effects—an expanded USGS mission—while Alaska residents struggled to recover from personal losses and damaged infrastructure.

This book rewards readers with three propositions for the price of one. The first proposition is that the 1964 Alaska earthquake "changed our understanding of the planet" (the book's subtitle). The second is the "how," and the third is the who-deserves-credit? proposition. Only a few authors, beginning with John Nance (1988), fully agree with Fountain's (2017) contention that Alaska's earthquake helped clinch adoption of the theory of plate tectonics in 1967 – 68. More recently, John F. Dewey is the only one of 18 contributing authors to acknowledge Alaska's earthquake in Naomi Oreskes' (2003) volume on the history of plate tectonics debates. Similarly, with the second and third propositions, Roger Musson's (2012) treatise on future large earthquakes mentions neither Alaska's earthquake nor any proponents of its contributions to planetary understanding. On the other hand, Jerry Thompson (2011) agrees with Fountain in honouring George Plafker's central convention-busting interpretation as being the turning point in 20th century debates over plate tectonics. Careful readers will decide for themselves.

Besides being well illustrated with maps and some photographs not published elsewhere, the book is a compelling story and well researched. Its arguments on the three propositions identified in this review are an outstanding example of combining disciplines of journalism, science, and history into one account.

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