ROCK STARS

Israel Cook Russell (1852–1906)

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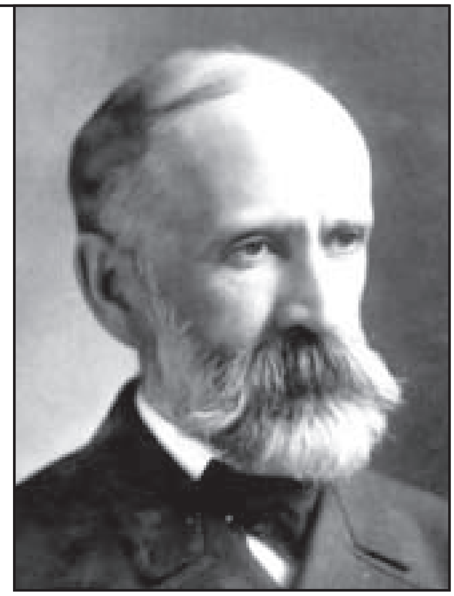

Israel Cook Russell (courtesy the U.S. Geological Survey photo archives).

BACKGROUND

Israel Cook Russell (1852–1906) was one of America's leading early pioneers in geomorphology and glacial geology. He served as a U.S. Geological Survey geologist for most of his career, first full-time and later, after he joined the University of Michigan faculty, as a seasonal employee. He was president of the Geological Society of America in 1906, vice-president of the American Association for the Advancement of Science in 1904, president of the Michigan Academy of Science in 1902, and a member of a host of other alpinist and geographical societies. His research focused on geomorphology, reflecting his interest in surficial processes.

Russell was born in upstate New York in 1852 into a family whose ancestors were early settlers in New England. He earned a bachelor of science and civil engineering degree from the University of the City of New York in 1872 and a master of science degree in 1875. He visited New Zealand in 1874 as a member of the U.S. Transit of Venus Expedition. As no provision was made for work in natural history on this expedition, Russell obtained an appointment as "photographer" and acquired the necessary skills in a hurried course under noted physicist Ernest Rutherford (1871–1937). These skills were put to extensive use the remainder of his life and account for the majority of photographs in his publications. After New Zealand, he joined Columbia University as an assistant professor of geology in 1875.

In 1878, Russell was hired as an assistant geologist on George Montague Wheeler's (1842–1905) U.S. Geographical Survey West of the 100th Meridian, working in Colorado and New Mexico (Gilbert, 1906). In 1880, he was appointed assistant geologist in the newly formed U.S. Geological Survey and aided Grove Karl Gilbert (1843–1918) in studying pluvial Lake Bonneville. During the 1880 field season, Russell traveled alone some 5500 km on horseback through the northern Great Basin, undertaking reconnaissance in a region he was to visit repeatedly throughout his career. He rather liked the wild and, though slight of build, he had the "capacity for sustained effort and endurance," without which his more strenuous explorations would have been impossible (Gilbert, 1906, p. 667).

PLEISTOCENE GLACIATION AND PLUVIAL LAKES

In 1881, Russell undertook a reconnaissance of both the pluvial Lake Lahontan and Mono Lake (later named pluvial "Lake Russell" in his honor) in the western Great Basin. At its maximum, Lake Lahontan covered 13,500 km^2, with a maximum depth of 268 m (Russell, 1885). Active faults bound many of the mountain ranges that would have appeared as "peninsulas and islands during the existence of the lake [dividing] its surface into a number of irregular water bodies that were connected by narrow channels" (Russell, 1885, p. 31). In addition to reviewing depositional features characteristic of shorelines, such as terraces, barrier beaches, sea cliffs and deltas, he identified three tufa morphologies—"lithoid" (compact, encrusting, stony), "thinolitic" (orthorhombic prismatic crystals), and "dendritic" (branching, mushroom-shaped)—deposited in succession accompanying lowering lake levels. From tufa deposits, Russell delineated three periods in the history of the lake: the first when the lake filled its basin to within 10 m of the highest tufa, the second when the surface marked a shore line 120 m lower, and the third at an intermediate elevation some 70 m below its high stand.

Russell visited the Sierra Nevada in 1881–1883 and demonstrated that small glaciers at the heads of drainages into the Mono Lake basin had been large valley glaciers during the Pleistocene. He mapped the extent of these ancient ice tongues based upon the distribution of drift, usually well defined at lower elevations by lateral and terminal moraines, and noted that "four of the glaciers extended a short distance below the highest of the terraces formed by the ancient lake. … The proof that the highest stage of the lake followed the maximum extension of the glaciers is thus abundant" (Russell, 1889, p. 369). He also noted the interaction between Sierran glaciers, Mono Lake, and volcanism associated with the range front fault (Russell, 1889, p. 371): "The evidence of late volcanic activity in Mono Valley is furnished by craters and lava flows which are more recent than the former high water stage of the lake and were formed after the last recession of the Sierra Nevada glaciers."

NORTHERN GREAT BASIN GEOLOGY

Russell undertook reconnaissance mapping of the northwestern part of the Great Basin in 1881 and 1882 and described the fault-block mountains, volcanic rocks, and playas. He recognized that the young extensional faults crosscut earlier-deformed rocks. First, rocks were plicated and crumpled into anticlinal and synclinal folds, then a second disturbance produced the present topography. He noted that the volcanic rocks are not folded, but are cut by younger faults, and thus are intermediate in age between the two periods of disturbance. The youthfulness of the second disturbance was demonstrated where faults continued through recent alluvial slopes and stream beds.

During his reconnaissance of the northern Great Basin and Columbia Plateau, Russell gave special attention to the genesis and features of plateau basalts. Lava on the Snake River Plain was extruded in two ways: by fissure eruption, which resulted in widespread blanketing sheets with extensive columnar jointing, and by more localized explosive eruptions, which produced cinder cones and a wide variety of volcanic bombs.

ALASKAN EXPLORATION

In 1890 and 1891, Russell conducted two pioneering explorations of the Mount St. Elias region under the auspices of the U.S. Geological Survey and the National Geographical Society. Landing through the surf at Icy Bay west of Yakutat in 1891, which resulted in the drowning of six men, the expedition attempted to maintain a straight course to Mount St. Elias. From the shores of Icy Bay, Russell and his team of five assistants trekked overland through thick forest to the margin of Malaspina Glacier, braving swift streams, mosquito swarms, and abundant bears. "Reaching the inner border of the forest-covered moraine, we had before us a vast expanse of barren moraine broken by thousands of crevasses, and diversified by pits and hollows holding lakes. Between the lakes rose huge pyramids and spires of ice of the most rugged description, each one sheathed with stones and dirt, which furnished only an insecure foothold" (Russell, 1896, p. 220).

Due to delays and the characteristic inclement weather of the St. Elias Range, Russell never did achieve the summit in 1890. He made a solo attempt on the summit in 1891 but was caught in a storm. To survive, he excavated a tunnel into the snow and made a chamber in which he passed the night. However, he did determine the summit elevation at 5485 m, at that time considered the highest peak in North America. On the second expedition (1896), Russell collected a Quaternary marine fauna preserved among faceted and striated stone-bearing glacial-marine sediments in the Chaix Hills, which rose through Malaspina Glacier to an elevation of ~1000 m, attesting to rapid orogenic uplift.

Mount St. Elias from Agassiz Glacier, Yakutat district, Alaska Gulf region, ca. 1892 (photo by Russell, courtesy U.S. Geological Survey photo archives).

MICHIGAN YEARS

As an academician, Russell felt that it was the duty of the university to select the few students of exceptional ability and encourage them to devote their lives to the task of carrying on research in the direction in which they were especially qualified. He wrote four textbooks on lakes, rivers, glaciers, and volcanoes, which he viewed as reading lessons for students of geography and geology. A fifth textbook was a treatise on the geography of North America that included not only coverage of physical and geological features, but also ethnology and political geography. Gilbert (1906, p. 666) wrote that Russell was not a theorist, but was "pre-eminently a scientific observer. His best work was in seeing, recording, and discussing the phenomena of a new field. His observation was sharpened by knowledge of existing theories, but not biased by them."

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