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*Geology of the Colorado 14ers:  
Structure, Origin, and Serendipity*

**Speaker: Peter K. Blomquist**

Mountains in Colorado are ubiquitous. Colorado has the most peaks over 14,000 feet in the Lower 48 states, with 54 such peaks collectively known as “Fourteeners”, and the highest, Mt. Elbert, reaches 14,433 feet. Located in nine mountain ranges within the Colorado Rockies, all Fourteeners are either hosted by Precambrian continental crust, or rocks intruded into or deposited upon it. Geology of the 54 Fourteeners consists primarily of 70% igneous, 13% sedimentary, and 17% metamorphic rocks. The Rockies are anomalous as a major mountain range, being 750-900 miles distant from an active tectonic margin. This distance is atypical when compared to other mountain ranges of the world, which are all within 350 miles of active plate margins, and most are less than 250 miles from a plate margin.

The Colorado Fourteeners originated after the Laramide Orogeny. Formation of these peaks began in the Cretaceous with subduction of the Farallon Plate beneath the overriding North American Plate. The Farallon Plate began with a steep descent, flattening out to nearly horizontal, then moved eastward under the North American plate, in a process called flat slab subduction. This movement across and under Western North America raised the Rockies, affected volcanism, and defined the Laramide Orogeny. After further cooling, the Farallon Plate sank at a steep angle into the asthenosphere.

A regional post-Laramide erosion surface exists across Colorado, which may have been uplifted as much as 10,000 feet during post-Miocene time. As was common in many older mountain belts, this ancient surface had an initial elevation of about 4,000 feet, and the postulated uplift would have raised the surface to that of present summit levels greater than 14,000 feet. Modern summit elevations cluster between 14,000 and 14,433 feet. Spatially, the Fourteeners cluster in central Colorado, a region of anomalously high heat flow, with most of these peaks either along the flanks of the Rio Grande Rift or at the intersection with the Colorado Mineral Belt. In general, elevations of the Fourteeners decrease with increasing distance from this intersection or increasing distance from the Rift flanks. A regional thermal process is implied and related to extension of the continental lithosphere.

The Colorado Fourteeners are the result of serendipity as a combination of the Laramide Orogeny, Rio Grande Rift, and Colorado Mineral Belt. The majority and highest Fourteeners are found proximal to the intersection of these three regional features, and the Fourteeners generally decrease in number and elevation distally. This may also explain why there are

no Fourteeners in any neighboring states and why many of the highest points of those states are proximal to the Colorado state line.

## Biography



Peter Blomquist has over 20 years of experience in a variety of positions across the oil and gas industry, including drilling programs, operations, geologic mapping, regional studies, prospecting, exploration, and acquisitions. His work history includes operating wells, from which he learned that the pumper never calls with good news. Peter is passionate about geology and its role in the business of profitably extracting oil & gas.

Peter has two degrees in geology: a bachelor's degree from the University of Minnesota and a master's degree from the Colorado School of Mines. He is currently a well site geologist for Diversified Well Logging. His geologic interests include fluvial systems, fractal geometry, paleokarst reservoirs, and exploration at all scales. He is a Registered Professional Geologist in Texas and Wyoming, a member of RMAG, AAPG, SEPM, and West Texas Geological Society, and is an accomplished mountain climber, having climbed 57 of the 59 Colorado 14ers.