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Encyclopædia Britannica

tectonic landform

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any of the relief features that are produced chiefly by uplift or subsidence of the Earth's crust or by upward magmatic movements. They include mountains, plateaus, and rift valleys.

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Whereas erosion shapes landforms, their origins lie in tectonic processes that build the major structures of the Earth. The word tectonic is derived from the Greek word *tekton*, which means "builder." Tectonic processes build landforms mainly by causing the uplift or subsidence of rock material—**blocks**, layers, or slices of the Earth's crust, molten lavas, and even large masses that include the entire crust and uppermost part of the planet's mantle. In some areas, these processes create and maintain high elevations such as mountains and plateaus. In others, they produce topographic depressions, as exemplified by Death Valley in the western United States, the Dead Sea in the Middle East, or the Turfan Depression in western China. Virtually all areas below sea level have been formed by tectonic processes.

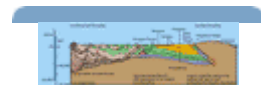


Figure 1: East-west cross section of the fold and thrust belt in eastern Idaho (left) and the ... Adapted from Robbie Gries, "Oil and Gas Prospecting Beneath Precambrian of Foreland Thrust Plates in Rocky Mountains," *The American Association of Petroleum Geologists Bulletin*, vol. 67, no. 1 (January 1983); © copyright 1983, The American Association of

Mountain ranges and plateaus result either from the uplift of the Earth's surface or from the emplacement of volcanic rock onto the surface. Many mountain ranges consist of chains of volcanoes that are made up of rocks derived from depths of tens of kilometres below the surface. Some plateaus are created by huge outpourings of lavas over vast areas. In addition, the intrusion of molten rock into the crust from below can raise the surface. Many other mountain ranges have been formed by the overthrusting of one terrain or block of crust over an adjacent one, which is another mechanism that uplifts the surface (**Figure 1**). Similarly, the folding of rocks at the surface creates the ridges and valleys that define some mountain chains. These processes of **overthrusting** (or underthrusting) and folding result from horizontal forces that cause crustal shortening (in its horizontal dimension) and crustal thickening. Finally, heating and thermal expansion of the outer 100 to 200 kilometres of the Earth can uplift broad areas into either

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Figure 2:
Idealized cross
section of a
tectonic valley
showing the
subsidence and
rotation of ...

mountain ranges or plateaus.

Similarly, tectonic valleys, basins, and depressions of smaller size can form by the reverse of two of the processes mentioned above. Crustal extension (in its horizontal dimension) and crustal thinning occur where two blocks of crust move apart; a valley or basin forms between such blocks where the intervening segment of crust has been thinned and its top surface subsides ([Figure 2](#)). Likewise, subsidence of the Earth's surface can occur by the cooling and the thermal contraction of the outer 100 kilometres of the planet. Plateaus and entire mountain ranges can subside by this mechanism to form large basins in some areas.

Virtually all large-scale landforms are the result of both tectonic processes that built the large differences in elevation and erosional processes that sculpted the relief of such areas into their individual shapes. Thus, it might be said that tectonic processes built the Alps, but erosional processes gave the Matterhorn its unique profile. In all cases, erosion acts to reduce differences in elevation, but when the rate of erosion is not too rapid, landforms created by tectonic processes can persist for hundreds of millions of years after the processes have ceased to operate.

Peter H. Molnar

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