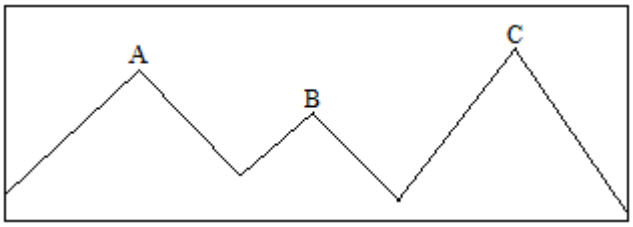
Mountain Prominence

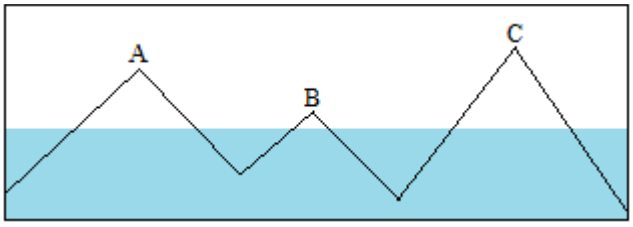
The prominence of a mountain is the difference in elevation between the summit and the lowest point along the ridge that connects the mountain to higher land. This definition is not completely well defined, because a single mountain may have more than one such ridge.

Consider a flood that covers all but the tops of mountains. The mountain tops would then be islands. Now, suppose the waters recede. At some point, the individual islands will start to connect to one another, forming larger islands. For a particular mountain, the *moment* it connects to a larger island such that this new island has points of elevation higher than the given mountain, this point of connection becomes its defining saddle, or *key col*. The prominence of the mountain is then the vertical differential between this key col, and the summit.

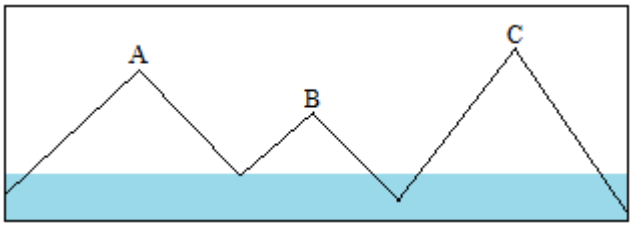


In the above figure, A, B and C represent mountains. B connects to A and C via two low points, or *passes*, on a ridge. The pass between B and C is lower. However, the pass between B and A occurs sooner, connecting B to A (higher land) than does the path between B and C. Thus, the prominence of B would be measured from the pass between B and A.

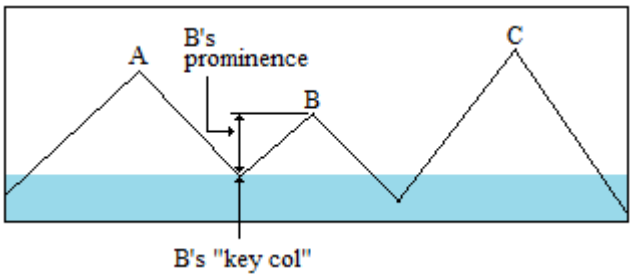
Here's a "flooded" view of this same situation:



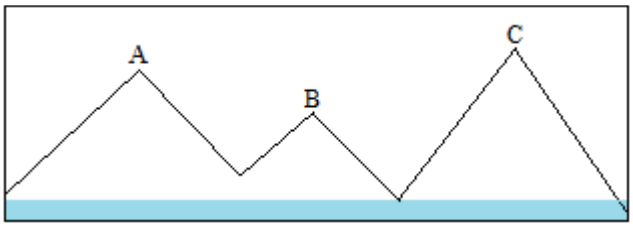
Mountains A, B and C are three separate islands. Their passes are covered by water. Now, the waters recede:



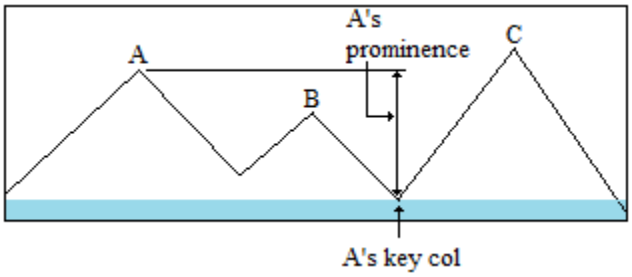
The pass between B and A appears first. B and A are now connected as a larger island, still separated from C. Since A is higher than B, B's key col is now found, it being the pass connecting B to A. B's prominence can now be determined.



What about A's prominence? To find the prominence of A, we need to find its own key col connecting A to higher land. In terms of finding A's prominence, all lower mountains, including B, play no role. Suppose the waters recede more:



Now the island containing A is connected to a larger island with higher land, that being mountain C. Mountain A's key col in the image above is the saddle between B and C. Note that B plays no role in this calculation. It's as if B is not there.



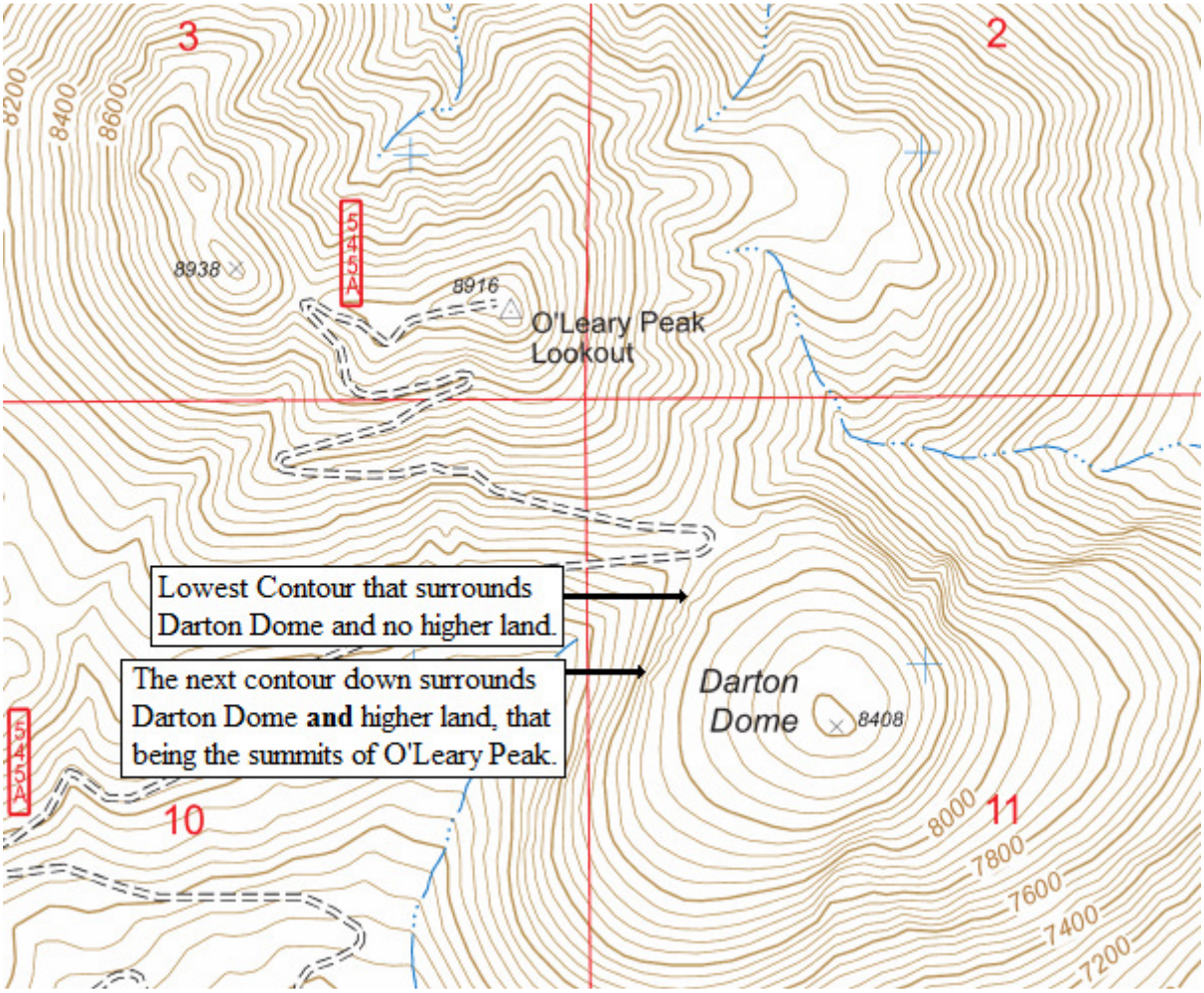
Mountain C's prominence would be found in the same way, expanding ever outward to encompass more land. In this manner, a *lineage* is developed. In the above image, B's *parent* is A, and A's parent is C, and so on. All lineages lead to the highest point on the land mass. Such "land mass" highpoints have prominence figures calculated from sea level.

Prominence Using Topographical Maps and Contour Lines

Another way to describe prominence is as follows:

It is the difference between a mountain's summit elevation and the lowest contour surrounding the peak, but no higher peak.

Consider the example below, showing Darton Dome in northern Arizona.



Darton Dome has a summit elevation of 8,408 feet. Look *carefully* at the contours that surround it. They are spaced every 40 feet. The contour representing 8,080 feet surrounds Darton Dome and no higher land. The next contour down, representing 8,040 feet, surrounds Darton Dome *and* higher land, the summits of O'Leary Peak. The pass connecting Darton Dome to the higher land is between 8,040 feet and 8,080 feet, or interpolated as 8,060 feet. Thus, Darton Dome's prominence is approximately 8,408 – 8,060 = 348 feet.

Most topographical maps list a summit's elevation, but not elevations for passes. Thus, a pass's elevation must be interpolated from the contour lines surrounding it. This results in three flavors of prominence:

- **Clean.** The minimum possible prominence based on a reading of the contours. This is the absolute lowest figure of a mountain's potential prominence. In the above image, the lowest contour that surrounds Darton Dome and no higher land is at 8,080 feet. Thus, Darton Dome's clean prominence is 8,408 – 8,080 = 328 feet.

- **Optimistic**. This is the maximum possible prominence. It is nearly guaranteed that the mountain's prominence will not exceed this figure. In the above image, the next lower contour that surrounds Darton Dome and higher land is at 8,040 feet. Thus, Darton Dome's optimistic prominence is 8,408 – 8,040 = 368 feet.

  In such cases, it is common to average the two figures, so that Darton Dome's prominence is about 348 feet.

- **True**. In the rare case when a pass's elevation is known, then the difference in elevation between the summit and pass can be calculated "exactly", insofar as the accuracy of these figures is stated and trusted.

Things can get a little messy when a summit elevation is not given. In such a case, its elevation must be inferred from the highest contour, so this adds an extra layer of uncertainty to the prominence calculation.

The definitive book on this subject is *The Finest peaks; Prominence and Other Mountain Measures*, by Adam Helman and available at Amazon. Prominence figures are given for most major mountains in the world and discussions as to how they were found.