WASHINGTON'S STEEPEST MOUNTAIN FACES

Stephen Fry

Mountains with precipitous faces are dramatic. Anyone who has walked the Cascade Pass Trail and viewed the imposing north face of Johannesburg Mountain can attest to that. Europeans also have long admired and been impressed with the steep faces of peaks such as the Matterhorn and Eiger.

Ever since my first neck-stretching views of Mount Index from the Stevens Pass Highway over twenty years ago, I have been intrigued with steep mountain faces. The glaciated Cascades and Olympics provided an ideal area to study such a topic, and in time my research expanded to encompass the world.

METHODOLOGY

To quantify the steepness of mountain faces and walls, I chose three horizontal distances (only the .1 mile and 1 mile are used in this presentation), and determined the maximum vertical drop (MVD) within these set distances.

Once measured, the MVD can be used as a yardstick to compare the maximum steepness of one mountain with another.

The most accurate and detailed maps available were used to determine the MVDs of the mountains listed. In the United States, most of my measurements were from current 1:24,000 or 1:62,500 USGS topographic maps. Around the world, the scale of maps varied from 1:25,000 for the Matterhorn and Mount Everest, to 1:250,000 for K2 and Annapurna I.

The process of measuring the MVDs simply involves using a caliper or precise ruler as a gauge. In many cases the starting point of an MVD is not the summit, but farther down the face. I often used a free-standing ten-power magnifying lens to assist the measurement of the MVDs.

The faces I have listed as Washington's steepest each are distinctly separate faces. This method avoided biasing the list toward the big walls of Baring Mountain, Davis Peak, Mount Index, Bear Mountain, and Booker Mountain.

ACCURACY

The accuracy of the data is mainly dependent on two factors: measurement error and the reliability of the topographic maps. Most of the error introduced into the MVD data originates from the lack of perfectly accurate topographic maps.

The total possible error for the United States MVD data in .1 mile ranges from 3% to 6%. The total possible error for the United States in 1 mile is likely no greater than 3%.

For mountains outside the United States, the reliability of the topographic maps varies greatly. Generally for most of the mountain faces I have listed, the accuracy is the same as the United States.

But for the declivitous faces of the Himalayas and Karakoram, the MVDs are less accurate (see table). The MVD date in 1 mile for these select locations could be in error by as much as 10%. Mount Everest and Lhotse are notable exceptions: here the accuracy levels are similar to United States standards.

COMPARISONS

One of the most interesting aspects of this steepness data is the ability to compare one mountain with

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IN .1 MILE	MVD	face	IN 1 MILE	MVD	face
1. Baring Mountain	2000'	NNE	1. Davis Peak	5381'	NE
2. "S Hozomeen Mountain"	1950'	N	2. Johannesburg Mountain	5160'	N
3. Davis Peak	1830'	NE	3. Luna Peak	5035'	N
4. "SE Twin Spire"	1780'	E	4. Elephant Butte	4960'	N
5. Mount Index	1740'	NE	5. Hozomeen Mountain	4926'	W
6. "Copper Lake Wall" [1]	1740'	NE	6. Colonial Peak	4901'	N
7. Bear Mountain	1680'	NNE	7. Mc Millan Spire	4900'	N
8. N Peak Garfield Mtn	1670'	NE	8. Whitehorse Mountain	4850'	N
9. Booker Mountain	1660'	NE	9. Mount Rainier	4830'	NNE
10. "SW Hozomeen Mtn"	1660'	N	10. Jack Mountain	4820'	NE
11. "SW Hozomeen Mtn"	1640'	W	11. "S Hozomeen Mountain"	4820'	E
12. Tomyhoi Peak	1610'	E	12. Colonial Peak	4816'	SE
13. "Peak 7895"[2]	1600'	NW	13. Chimney Peak[5]	4800'	E
14. Mount Shuksan[3]	1580'	N	14. Storm King	4770'	NE
15. Three Fingers	1580'	E	15. Mount Shuksan[6]	4759'	S
16. Mount Bullen	1560'	NE	16. Buck Mountain[7]	4753'	NE
17. "S Hozomeen Mountain"	1540'	E	17. Mount Spickard	4704'	E
18. Hozomeen Mountain	1510'	W	18. "Peak 6972"[8]	4692'	NE
19. "Pass Creek Cliff"[4]	1500'	SW	19. Mount Terror	4671'	NE
20. Lemah Mountain	1490'	WNW	20. Booker Mountain	4660'	S

" " —name unofficial

[1] south of Copper Lake, USGS Silverton
[2] USGS Mount Spickard
[3] north face of Jagged Ridge
[4] south end of Mineral Mountain Massif, USGS Mount Challenger
[5] Olympic Mountains; USGS Mount Steel
[6] south of Seahpo Peak
[7] USGS Holden
[8] Snowfield Peak massif, USGS Ross Dam

another. Although Baring Mountain's north face drops a respectable 2000 feet in .1 mile, it is not in the same league as El Capitan's 2900-foot drop.

Washington's Davis Peak's steep northeast face (MVD in 1 mile: 5381 feet) is the greatest drop for that distance that I have ever measured in the conterminous United States.

Using simple geometry, the average slope over a specified distance can be calculated. For El Capitan and Mount Fuji the average slopes for the MVD in .1 mile are 79.7° and 45.7°, respectively.

The maximum vertical of overhanging area in Washington is located on the north face of "South Hozomeen Mountain." Here 1000 feet of relief is indicated as one contour line!

Baring Mountain and Bear Mountain have been reported to have greater perpendicular or overhanging faces, but present map evidence does not support those claims.

As a final comparison, the next time you drive up Seattle's Queen Anne Avenue, be grateful that its MVD in .1 mile is only 80 feet! Although steep for a road, its MVD is more than twenty-five times less than the steepest section of the Matterhorn.

GEOLOGY

Some very unexpected facts were revealed when I studied the geology of the steepest mountain faces of Washington and the world.

The first revelation occurred in Washington. I discovered that of all the top twenty steepest faces in .1 and 1 mile, none contained a granitic rock as a major component of the face, except "Pass Creek Cliff" and a debatable situation regarding Bear Mountain.

All of the other steepest faces consist mainly of metamorphic rocks such as gneiss or greenstones, volcanic andesites or basalts, or sedimentary rocks.

First I thought it was a fluke, due to my original selection of only .1 and 1 mile horizontal spans. So I determined the twenty steepest areas in .5 mile for Washington. The outcome was the same.

The possibility was raised by a colleague that gneiss and volcanic rocks predominate in the North Cascades. This is true, but there is an abundant amount of granitic rock throughout the heavily-glaciated sections of the North Cascades. And within these sections shorter and less steep faces are found.

Finally I formulated the theory that the granitic rocks of Washington are more massive and less easily carved, while the gneisses and greenstones are most easily cut, so that a glacier could work on their slopes as a knife would on butter.

Yet the metamorphic rocks (the predominant rock type for Washington's steepest faces) still have the required integrity to remain intact.

The second discovery was on a worldwide basis. This second hypothesis is preliminary and subject to more study.

Simply stated, the MVDs in .1 and 1 mile for some of the highest mountains in the world are found on the south faces, not the north faces as might have been expected. In many of these the south face is not only the steepest, but it is also significantly steeper than any other face.

This phenomenon can be explained by a freeze-thaw theory submitted to me by Professor Stephen Porter, University of Washington Geology Department. Although he doesn't necessarily support my south face theory, he did provide me with a possible explanation for it.

First, because the Himalayas, Karakoram and Alaska Mountains are so

The spectacular east face of "Southeast Twin Spire," located near Mount Spickard in North Cascades National Park.

high, they can support glaciers on all their sides.

Second, for those mountains in the northern hemisphere, the sun will have the greatest effect on the southerly slopes.

Thus during a day's time at these extreme altitudes, the sun will thaw the rock and at night the temperature will plummet and freeze the rock again.

The continual freezing and thawing will substantially weaken the rock, and make it susceptible to severe erosion. The presence of even a small, yet active, glacier will then result in stupendous faces, which are seen on the south faces of the mountains in the Himalayas, Karakoram, and Alaska Mountains.

I believe this tendency toward ultra-steep faces is not seen in lower mountains or mountains in mild environments, mainly because temperature fluctuations aren't nearly as great, and most of these low mountains in the northern hemisphere cannot support glaciers on their south sides.

So the formation of the steep faces in Washington was almost entirely controlled by glaciers. Professor Peter Misch, University of Washington Geology Department, stated to me that most all of these listed faces were carved by glaciers about 10,000 years ago, during the last ice age. Professor Misch expects the next ice age to modify the present cliffs and simultaneously produce new declivities.

CLIMBING

Considering the geology, it shouldn't be astonishing that most all of Washington's twenty steepest mountain faces in .1 and 1 miles have not been climbed by the steepest routes. In fact, for .1 mile faces Two through Five on the chart have not been climbed by *any* route.

The lack of granitic rock on most all of the steepest faces in Washington results in most of the faces being extremely dangerous to climb.

MAXIMUM VERTICAL DROP FOR SELECTED MOUNTAINS OF THE WORLD

name/location	MVD .1-mile	face	MVD 1 mile	face
Mount Everest (Nepal-China)	1837'	SW	6627'	SW
K2 (Pakistan-China)	1500'*	SSE	7400'	SSE
Lhotse (Nepal-China)	2706'	S	9058'	S
Annapurna I (Nepal)	†3000'*	WNW	8754'	WNW
Gurja Peak (Nepal)	2500'*	S	†10100'	S
Mount Mc Kinley (Alaska)	1620'	S	7050'	S
Mount Logan (Canada)	1500'*	SE	8050'	SSW
Kilimanjaro (Tanzania-Kenya)	750'	SW	4500'	SW
Matterhorn (Switzerland-Italy)	2067'	SE	5365'	S
Mount Whitney (California)	1600'	E	3174'	E
Mount Rainier (Washington)	1240'	W	4820'	NNE
Pikes Peak (Colorado)	1000'	N	2915'	N
Grand Teton (Wyoming)	1650'	N	4585'	NW
Eiger (Switzerland)	1100'*	NW	6758'	NW
Fujiyama (Japan)	541'	SW	3592'	SE
Mount Cook (New Zealand)	1400'	SW	5380'	SE
Mount Hood (Oregon)	1025'	W	3615'	W
Mount Stuart (Washington)	1240'	NE	4265'	N
Half Dome (California)	2290'	NW	4812'	NW
El Capitan (California)	2900'	S	3654'	SW

*value is approximation due to lack of detail or accuracy of map from which data was measured
†represents the world's highest MVD values that I have measured. Gurka Peak is in the Dhaulagiri Himal.

Gneiss, greenstone and andesite often don't have the cohesiveness necessary to enable safe protected technical climbs. For this reason, I do not advise anyone to attempt these faces (especially the MVD in .1 mile cliffs).

There are few climbers in the Pacific Northwest who could ascend these faces safely.

Probably the greatest mountaineering triumph on Washington's steepest cliffs was made on Baring Mountain, on the east edge of the north face.

Ed Cooper, Don Gordon and Fred Beckey made the first ascent in July, 1959. Even so, the party followed a section which has a MVD in .1 mile of approximately 1200 feet, thus avoiding Baring's steepest section (an MVD of 2000 feet in .1 mile).

ACCESS

While climbing these faces is a questionable proposition, viewing them can be done with complete safety. Washington's steepest mountain faces can be seen from trails, ridges, valleys, and even roads.

Mount Rainier's Willis Wall can be easily sighted from downtown Seattle (on a clear day). Other walls like the east face of "Southeast Twin Spire," however, would take two full days of trail travel to gain a close vantage point of this spectacular face.

Fred Beckey's *Cascade Alpine Guides* give at least passing mention to most of the faces I have listed for Washington. In addition to climbing information, these books provide trail descriptions as well as a potpourri of photographs.

Hopefully many of you will get the chance to gawk at these breathtaking precipices during future hikes. Their sheer faces are inspiring and very memorable.

end

Stephen Fry is a Signposter who lives in Woodinville, Washington.

.1-mile and 1-mile MVD ideas conceived and measured by Stephen Fry, from 1972-1984.

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