

## Filling in the gaps

The most realistic-looking way to depict terrain with hachures is to draw the lines everywhere, as Saxon military topographer, Johann Georg Lehmann did in 1799. His system of analytical relief representation, which he called slope hachuring, consists of a precise, nearly continuous network of hachure lines. Beginning with the then new technique of connecting points of equal elevation, called contour lines, he drew hachures running directly downhill from one contour to the next. Since contours are more closely spaced in steep regions, hachures there were shorter than those in the flatlands. The thickness of each hachure was drawn proportionally to the angle of the slope, so that steep slopes had heavy hachures and level areas had very fine, light hachuring. This made steep slopes look darker than level ground, mimicking the appearance of a vertically illuminated surface.

Since it showed the character of the strategically important high ground so well, Lehmann's method was adopted by most military surveys of the nineteenth century and remained in use well into the twentieth. But it too had limitations. It provided information about relative slope angle, but no numeric measurements of the steepness of the terrain could be made. Slope aspect (the direction the slope is facing) was somewhat ambiguous, and elevation was still only relative. All level areas got the same treatment, very fine hachuring or none, so that in complex terrain, it was difficult to determine if certain areas were low-lying plains or high plateaus.

To address the matter of ambiguous aspect, a technique called oblique shading was developed. Southeast slopes were drawn with slightly thicker lines than northwest to mimic the effect of illumination by a sun low in the northwest. Since this caused the even more troublesome ambiguity that now southeast slopes and steep terrain looked the same, this method never caught on as well as Lehmann's method of direct shading.



**Military Map Showing the Topographical Features of the Country Adjacent to Harper's Ferry, Va.**

**John E. Weyss, 1863. Washington.**

Weyss used Lehmann's engraved slope hachuring technique to show the steep, rolling terrain where the Potomac and Shenandoah Rivers cut through the Blue Ridge in the Appalachian Mountains at the junction of West Virginia, Maryland, and Virginia.

Harpers Ferry, located at the confluence of these rivers, played a key role in the American Civil War. One of the country's two arsenals had been established there by George Washington in 1789. The Chesapeake and Ohio Canal was built along the north shore of the Potomac River in 1833, followed a year later by the arrival of the Baltimore and Ohio (B&O) Railroad. Whoever controlled Harpers Ferry controlled arsenal, canal, and railroad.

The Civil War was fought primarily by hilltop reconnaissance. Balloons were just beginning to be used for aerial scouting, but they were still largely unreliable. Both Confederate and Union forces relied on the highlands for surveillance of the landscape and also to potentially see the enemy on the move. Accurate maps of the topography had never been in such high demand.