MORE THAN ONE WAY TO PRESERVE A WATERFALL

Why does a waterfall not erode itself into a flat river? The classic geologic model for waterfall erosion assumes a two-layer system: An upper layer of relatively strong rock over a base of relatively weak rock. The churning of the water once it falls undercuts the cliff's soft base first, eroding it until the harder top layer collapses. With erosion constantly occurring at the base, the cliff side stays steep, preserving the waterfall. Niagara Falls has remained steep this way, says geologist Michael Lamb of Caltech in Pasadena, Calif.

But Lamb and William Dietrich of the University of California at Berkeley wondered how waterfalls without that geology — such as columns of volcanic basalt hardened from lava flows as in Iceland — might also remain steep. The researchers set up lab experiments in which water streams flowed over rows of brick stacks representing basalt columns. They found that stacks of bricks that leaned in the direction of a waterfall's flow tended to break off as whole stacks, preserving the steepness of the "cliff." Stacks of bricks that leaned against the direction of waterfall flow, on the other hand, tended to fall off brick by brick, smoothing out the brick (or cliff) face over time. Therefore, waterfalls made of vertical basalt columns will likely stay steep if they lean in the direction of waterfall flow.

"It's really not been appreciated that there are other possible mechanisms to preserve waterfalls," says Lamb, whose results are published in the Geological Society of America Bulletin. He adds that the new model could also link certain cliffs on Mars — thought to be made from basalt-like rocks — to waterfalls.

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New research explains how waterfalls stay tall in areas with basaltic columns like Svartifoss in Iceland.

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