



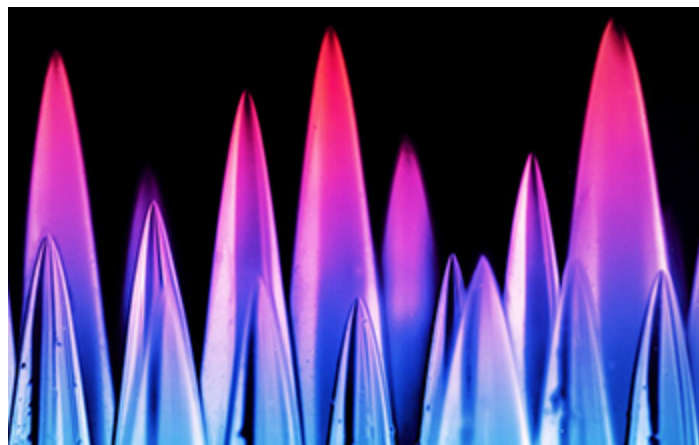
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Research News

## How do stone forests get their spikes? New research offers pointed answer

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Discovery offers promise for the manufacturing of sharp-tipped structures



This false-color photograph shows a "forest" of many candy pinnacles dissolved in water.

[Credit and Larger Version \(/discoveries/disc\\_images.jsp?cntn\\_id=301206&org=NSF\)](#)

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Stone forests -- pointed rock formations that resemble trees -- populate regions of China, Madagascar, and many other locations worldwide. They are as majestic as they are mysterious, created by uncertain forces that give them their shape.

A team of scientists has now discovered how these natural structures are created. The findings, reported in *Proceedings of the National Academy of Sciences* ([/cgi-bin/good-bye?https://www.pnas.org/content/early/2020/09/02/2001524117](#)), offer promise for the manufacturing of sharp-tipped structures, such as the micro-needles and probes needed for scientific research and medical procedures.

"This work reveals a mechanism that explains how these sharply pointed rock spires, a source of wonder for centuries, come to be," says Leif Ristroph of [New York University \(/cgi-bin/good-bye?https://www.nyu.edu/about/news-publications/news/2020/september/how-do-stone-forests-get-their-spikes--new-research-offers-point.html\)](#), a paper co-author. "Through a series of simulations and experiments, we show how flowing water carves ultra-sharp spikes in landforms."

The researchers note that the study also illuminates a mechanism that explains the prevalence of sharply pointed rock spires in karst, topography formed by the dissolution of rocks such as limestone.

In the [U.S. National Science Foundation <https://www.nsf.gov/awardsearch/showAward?AWD\\_ID=1805506&HistoricalAwards=false>](https://www.nsf.gov/awardsearch/showAward?AWD_ID=1805506&HistoricalAwards=false) -funded study, scientists simulated the formation of these pinnacles over time through mathematical models and computer simulations.

The researchers replicated the formation of these natural structures by creating sugar-based pinnacles, mimicking the soluble rocks that compose karst and similar topographies, then submerging them in tanks of water. The dissolving process itself created the flow patterns needed to carve the spikes.

The researchers speculate that these events happen, albeit far more slowly, when minerals are submerged underwater, which later recedes to reveal stone pinnacles and stone forests.

"A powerful aspect of this study is that the team used both experiments and mathematical modeling to show that a fluid can be brought into motion by the gravity-induced dissolution of a solid, and that pinnacle structures such as stone spires emerge from the process," said Ron Joslin, a program director in NSF's Directorate for Engineering.

-- NSF Public Affairs, [researchnews@nsf.gov](mailto:researchnews@nsf.gov) (<mailto:researchnews@nsf.gov>)