

# How a hike led to a math 'Eureka!'

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While on a hike, far from their desks and daily distractions, the mathematicians noticed patterns in the woods that solved their problem. Credit: Carol Clark.

Where do “eureka” moments come from? Emory mathematician Ken Ono found his on a hiking trail in north Georgia.

He and post-doctoral fellow Zach Kent were on the way to Tallulah Falls last October when the patterns they noticed in the trees, the leaves and the switchbacks on the trail suddenly revealed the mystery of the fractal repeating structure for partition numbers.

“We realized the process of these numbers folding over on themselves is very much like what you see in the woods,” Ono says. “It was kind of a poetic moment,” he recalls of looking out on a mountainous valley, knowing that nature had helped them crack a mystery that had baffled

some of the greatest minds in math.

“It’s been, honestly, my lifelong passion, this one question of the divisibility properties of these numbers,” Ono says.

Last year, the American Institute of Mathematics and the National Science Foundation funded a team led by Ono to tackle the problem. Ono, Kent and Amanda Folsom spent months building a theory to explain these divisibility properties, developing a framework that seemed to match the data.

“The problem for a theoretical mathematician is you can observe some patterns, but how do you know these patterns go on forever? We were, frankly, completely stuck. We were stumped,” Ono says.

The hike had been intended as simply a way to enjoy a beautiful day. “Going into the woods, escaping from day-to-day tasks, is actually vital for me and my work,” Ono says. “It gives me an opportunity to really focus on really difficult little questions that may fit into a bigger theory.”

So what is an “aha” moment? “The way I see it, it’s not something that happens to you instantly,” Ono says. “It just happens to be the moment that you realize the fruits of all your hard work.”

Provided by Emory University

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