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# Scientists Discover 15th Convex Pentagon Able To Tile A Plane

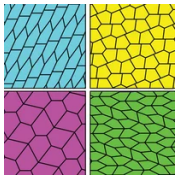
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TRANSCRIPT



THE TWO-WAY

**With Discovery, 3 Scientists Chip Away At An Unsolvable Math Problem**

NPR's Robert Siegel speaks with Julie Rehmeyer, a contributing editor at *Discover* magazine, about a newly discovered pentagon.

ROBERT SIEGEL, HOST:

Consider the ceramic on the floor beneath you. Those squares or rectangles tile the plane. That's a mathematical term, and finding a new shape that covers a flat surface using only exact copies of that one shape without overlapping or leaving any gaps is a mathematical challenge. All triangles can tile the plane, all quadrangles, too. But only 14 pentagons - five-sided shapes - could do it. Or so we thought, to the extent that we thought about this at all. Researchers have now discovered a 15th, and here to tell us about this new pentagon to tile the plane is Julie Rehmeyer. She's a math and science journalist and contributing editor to Discover Magazine.

Welcome back to the program.

JULIE REHMEYER: It's my pleasure, Robert, happy to talk to you.

SIEGEL: How big a deal this is?

REHMEYER: It's exciting. It's been 30 years since we've found one of these in the past. And now we've found another.

SIEGEL: Who found this new pentagon?

REHMEYER: Three mathematicians at the University of Washington - Casey Mann, Jennifer McCloud and David Von Derau. And David Von Derau is actually an undergraduate.

SIEGEL: And there have been many searches for these geometric shapes over the decades?

REHMEYER: There have. The first pentagonal tiling was found back in 1918. A

German mathematician, Karl Reinhardt, found the first five types of pentagons that will tile the plane, and the search has been on ever since.

SIEGEL: I'm looking at a representation of a plane that's been filled with this particular pentagon with identical copies of it, and it's odd to describe. It looks a bit to me the way home plate might appear to a drunken pitcher who's staring at it from 60 feet away.

REHMEYER: That's a great description. When they're all put together into a tiling of the full plane, to me it looks kind of like the back of a snake. It's quite a beautiful pattern.

SIEGEL: And is this just a piece of pure - not that it's a small thing - pure mathematics, or are there likely to be applications of a new pentagon with which you can tile a plane?

REHMEYER: Well, it's always hard to predict exactly what the applications will be, though I think one prediction is safe, which is that artists are likely to make use of this pattern. There's a very rich field of mathematical art. There are also likely to be more practical applications. Crystals form in these patterns. They make use of the patterns that are forced by geometry. Viruses also form - the structure of viruses are formed in similar ways. There may well be uses of it in engineering, in creating materials with novel properties that have molecular building blocks along these lines. But we will just have to wait and find out what clever scientists do with it.

SIEGEL: This particular pentagon was - well, I don't know whether we say, were they discovered, or created or derived by computer?

REHMEYER: That's right. This team did mathematical work to find a way of searching methodically through all the possibilities, and they're continuing to work on it.

SIEGEL: I'm thinking ahead to hexagons. Regular hexagons fit together as is. They tile the...

REHMEYER: That's right.

SIEGEL: ...But regular pentagons - that is, a pentagon with five equal sides - they don't tile the plane.

REHMEYER: That's correct. And you can figure that out for yourself just by giving it a try. If you do it, either you're going to have to make them overlap or you're going to have to leave gaps.

SIEGEL: It's a project for this evening.

REHMEYER: So to make them all fit together, somehow you've got to squish them around.

SIEGEL: OK, well, it's something to think about. Julie Rehmeyer, thanks for talking with us once again.

REHMEYER: Thank you.

SIEGEL: Julie Rehmeyer is a math and science journalist and contributing editor to Discover Magazine.

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