

An ancient, complex game examined

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North Dakota State University mathematics doctoral student Lindsay (Merchant) Erickson is fascinated by the ancient game of Nim. A two-player pastime of combinatorial game theory, Nim's origins date hundreds of years ago in China.

"[Nim](#) is a game of perfect information, meaning that both players know what their opponent is doing at every step, and there are no elements of chance involved," Erickson explained, noting there is only one solution to the general game.

"Nim's not as difficult as mathematicians would like you to believe - I've taught the game to third graders. In fact, the only person to ever beat me in the general game of Nim is a third grader," said Erickson, who earned her bachelor's degree in [mathematics](#) at NDSU in 2006.

Now, Erickson has taken the game in a new direction, using graphs so

the solution of the general game does not apply. Erickson's 60-page doctoral dissertation, "The Game of Nim on Graphs," demonstrates different solutions are dependent on the structure of the graphs. It's an intricate study of the complex game, with the goal to discover winning strategies and predict who will be the victor.

In her work, she extended the game to mathematical graphs such as complete graphs, Petersen graphs, hypercubes and bipartite graphs. Erickson assigned integer weight to each edge from a given vertex to correspond to the pile of stones used in an ordinary [game](#) of Nim. She took into account nearly every possible move and ended up putting her supporting materials on a CD, because the graphs would have filled a 2,000-page appendix.

An outstanding student, Erickson has received three National Science Foundation fellowships, a dissertation fellowship through the Graduate School and numerous scholarships. She also studied mathematics one summer in Hungary.

"So often I'm told, 'Oh, my gosh, you're getting a Ph.D. in math. You must be so smart,' " she said with a laugh. "Well, I'm good at math, but don't expect me to write an English paper. It's not going to happen."

A native of Moorhead, Erickson will earn her doctorate in May. She hopes to find a post-doctoral position and eventually work at a research university.

As she nears graduation, she feels NDSU has prepared her well. "The faculty of my department have worked quite a bit in the last few years at implementing new programs and seminars to help students prepare to enter the work force. We are encouraged to attend conferences and give talks, as well as teach our own courses whenever possible. All of these areas are significant to the work we will do post-graduation."

Provided by North Dakota State University

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