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Students Investigate Bat Wings and Caterpillars

Beth Rogers Thompson

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Students investigate bat wings and caterpillars

Colliding stars, bat wings, caterpillars and trees. This is math? Something tells me we've come a long way from Algebra I.

The students sketching these figures on blackboards and computer screens had come from colleges across the nation. Led by Linfield math Professors Chuck Dunn and Jennifer Nordstrom, they participated in the National Science Foundation's Research Experiences for Undergraduates (REU). Linfield was one of four schools in the Willamette Valley Consortium for Mathematics Research hosting the eight-week program.

The teams met biweekly at one of the campuses to discuss their projects, socialize and hear invited speakers. For example, Ben Gum of the AXA Rosenberg international investment-management firm spoke at Linfield about careers in finance for mathematicians.

The Linfield team's research was in graph theory. More specifically, competitive graph coloring. Don't think bar graphs and fever charts. Enter the caterpillars.

Basically, students used the structure of a caterpillar- (or star-, wing- or tree-) shaped graph, applying various rules, to determine winning game strategies.

Two players would theoretically take turns coloring the graph's dots (vertices). "Alice," who always goes first, wins if all vertices can be colored legally; "Bob" wins if one vertex or more has to be left uncolored. It gets increasingly complicated as the designs grow and the vocabulary shifts to theorems and proofs.

It pains a mathematician to be asked how this relates to the "real world." It falls under the auspices of pure, not applied, mathematics. But loosely, it has some applications in computer science, Dunn says.

The proliferation of undergraduate research is relatively new, Nordstrom says.

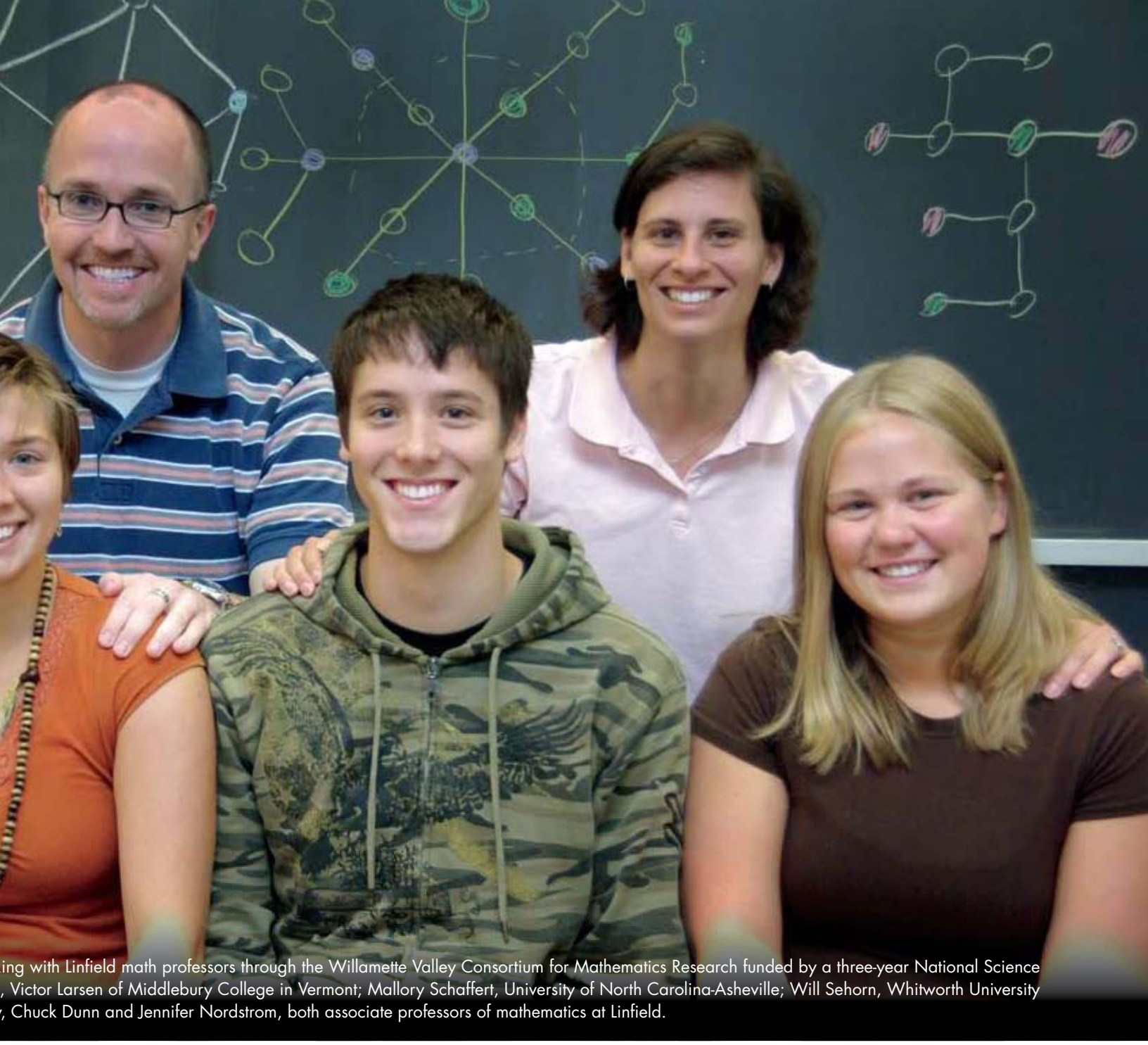
"Twenty years ago, it was very elite; only a handful of students were involved. Now, it's becoming part of the expected package of applying to grad schools."

"It's significantly different from the classroom, where there are known results," Dunn says. "Here they're working without a net. All of these are original projects."

Students from four universities around the country spent eight weeks work
Foundation grant. Participating in the program are, front row, left to right
in Washington; and Lynnette Snyder, Simpson College in Iowa; back row

Victor Larsen had taken a graph theory course last spring at Middlebury College, "so it was really nice to jump into something familiar but more in-depth." He plans to attend graduate school and become a math professor. As a math tutor, Larsen knew he liked to talk and teach; his Linfield experience confirmed that he also enjoys research.

Nordstrom says REU benefits Linfield, as well as the students. "Our students shared their research with Linfield summer research students and faculty in other disciplines. This helps create a community of scholars here at Linfield and helps expose Linfield students to research in other disciplines. Re-



ing with Linfield math professors through the Willamette Valley Consortium for Mathematics Research funded by a three-year National Science , Victor Larsen of Middlebury College in Vermont; Mallory Schaffert, University of North Carolina-Asheville; Will Sehorn, Whitworth University , Chuck Dunn and Jennifer Nordstrom, both associate professors of mathematics at Linfield.

gionally, we worked with Portland/Salem area faculty as part of the consortium. Additionally, it helps build Linfield's reputation among area colleges and universities."

The students also present their work at national mathematics conferences, providing wider exposure for Linfield's strong undergraduate research program and helping to build national name recognition, Nordstrom added.

Next summer, Linfield will host another research team, which will include a high school teacher in addition to four college students.

– Beth Rogers Thompson

Editor's Note: *Linfield was one of four schools in the Willamette Valley Consortium for Mathematics Research hosting the eight-week program, in the second of a three-year NSF grant. The others were Willamette University, Lewis & Clark College and the University of Portland. Each hosted a team focusing on a project related to faculty research interests in number, graph and game theory; probability and statistics; geometry; computer science; or applied analysis. The Linfield team comprised Victor Larsen of Middlebury College in Vermont; Mallory Schaffert, University of North Carolina-Asheville; Will Sehorn, Whitworth University in Washington; and Lynnette Snyder, Simpson College in Iowa. Linfield student Krista Foltz '10 joined the Willamette University team to broaden her mathematical horizons and further explore an area of graph theory and probability.*