



Photograph by Victoria Brown, used with permission

## CALCULATING

# Communion

BY CRIS FOEHLINGER

It was a wow moment – seeing Pope Benedict XVI, surrounded by a sea of bishops and priests on April 17 at the new Nationals’ baseball stadium in Washington, D.C. In attendance: more than 46,000 people to celebrate Mass.

Daniel Kravatz Jr., a Millersville University math whiz who graduated in May, was among the thousands who packed the stadium. Little did he know that his honors thesis in mathematics would play a role in the communion offering during the Mass.

Before the Pope’s arrival, an usher asked a group of college students seated in the “nose bleed” section of the stadium if anyone was a math major.

“I happened to be sitting near the end of the row when they asked for help,” Kravatz said. “They had a dilemma they couldn’t solve. My thesis dealt with something similar so I could help.”

The problem was how to direct worshippers to communion in an orderly fashion in those sections of the stadium that had an odd number of rows. A plan was in place for those sections with an even number of rows.

When Kravatz saw the diagram of the stadium, he realized it was similar to the project he worked on for the past eight months. “I knew immediately that I could apply my thesis and suggested a flow that worked.”

“MATH SHOWS UP IN THE ODDEST PLACES.”

— DANIEL KRAVATZ '08

Kravatz was able to calculate how to best move people in and out quickly, easing the flow of worshippers taking communion.

“Basically, I started with the first row, then the third row, then the second. That way, when people returned to their seats, they weren’t stumbling over each other,” he said. “Math shows up in the oddest places.”

Because of the time crunch, the ushers were only able to get word to about half of the ushers in the stadium’s upper sections so not all the areas were directed the same way.

“It was so cool to see my work in progress because my sections were more efficient.”

Communion for the estimated 46,000 Roman Catholics took just 15 to 20 minutes because of the vast number of clergy participating.

Helping to solve the problem relating to communion was especially significant to Kravatz, who is now studying at St. Charles Borromeo Seminary in Philadelphia.

To see the Pope “was great. He was just inspirational,” Kravatz said. “Seeing all the priests there was awesome. There were 1,300 priests celebrating Mass—and the chanting was wonderful.”

“I felt a calling after a lot of prayer, so I needed to check out this avenue,” he said, adding the decision was made long before he attended the Pope’s Mass.

“I have been very involved in campus ministry,” Kravatz said. “I went on a retreat with the Diocese of Harrisburg this past summer and everything they said made sense. The Diocese of Allentown accepted me, so I will explore this road.”

Kravatz and fellow Millersville student Channing Dale received the tickets provided to the campus congregation by the Diocese of Harrisburg.

Father Steven Fauser ’98, who returned to Millersville in January as

the campus priest, offered the ticket to Kravatz because of his devotion to the church.

“Daniel is conscientious and looks out for others. I appreciate everything he did here,” said Fauser. “He will make a great candidate [for the priesthood].”

“It was pretty cool that he could use his math for something like this,” he said.

Kravatz, an Honors College graduate, based his suggestions on his thesis, *Diagonal Approximations on an  $n$ -gon and the Cohomology Ring of Closed Compact Orientable Surfaces*—a new combinatorial construction for any polygon.

Essentially, he studied flows on surfaces in three-dimensional space.

He chose math after taking a physics course his first year. “Physics is too applicable,” he joked. “Actually, math is like physics without all the labs.”

Dr. Ronald Umble, professor of mathematics and Kravatz’s thesis advisor, said his student’s thesis was very creative. “I think it’s publishable.”

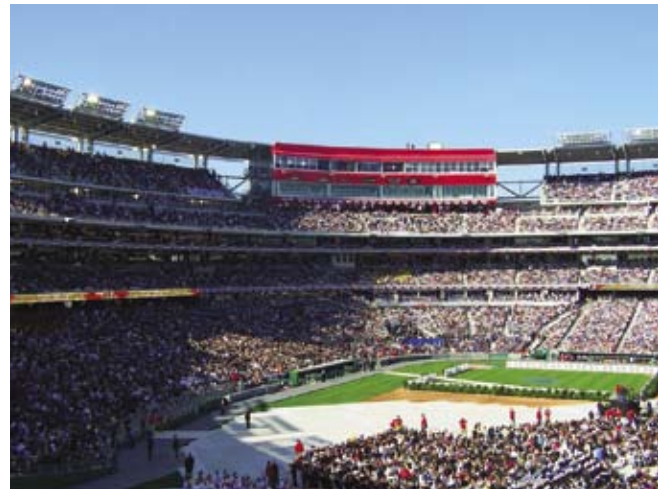
Umble said the thesis introduces a new way to represent certain geometric objects algebraically. His method transforms surfaces such as spheres or doughnuts into algebraic structures, just as the “slope  $m$ ” and “ $y$ -intercept  $b$ ” transforms a line into the equation  $y=mx+b$ .

“An important advantage of Dan’s method is its simplicity. Understanding the classical method requires a year of study at the graduate level, but any third year undergraduate math major can understand and apply Dan’s method,” he said.

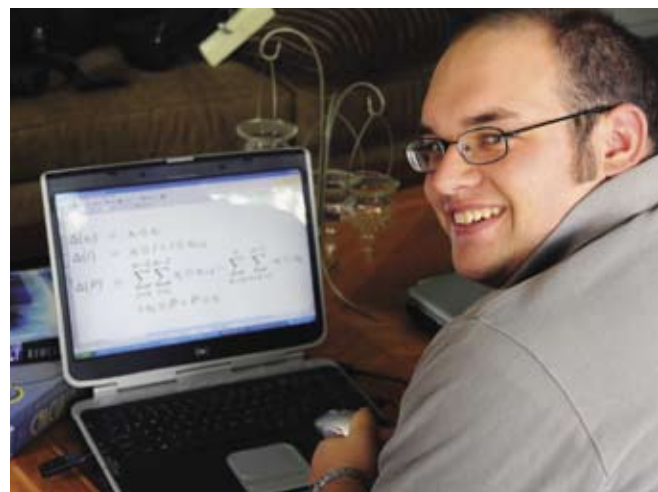
“Dan is a neat guy,” Umble added. “He is a good mathematician with great potential. He could go in any direction and he has chosen church work. I support that.”

Kravatz hopes the logical training gained through his mathematical studies at Millersville will help him with the philosophy courses he will study at the seminary during the next six years. “They are both ultimately searching for the truth,” he said.

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Serving communion to a packed stadium presented a unique mathematical challenge.



For his honors thesis, Daniel Kravatz '08 worked with three-dimensional objects.