Math

Warshauer's aim is to 'kindle excitement'

y SUSAN HANSON
taff Writer

For 10 years now, Dr. Max Warhauer has taught mathematics at outhwest Texas State University. uring this time, he has worked on esearch in quadratic forms, comuter science, and mathematics edcation. He has attended the Instiute for Retraining in Computer cience, and he has served as a conultant at Microelectronics and omputer Technology Corporation Austin. What has given him the reatest intellectual satisfaction?

None of these, Warshauer admits. When I was in the 10th, 11th, and 2th grades in high school," he says, attended a special summer mathmatics program at Ohio State Uniersity. As I look back now more han 20 years later, having graduated from the University of Chiago with a B.A. in mathematics in 973 and from Louisiana State Uniersity with my Ph.D. in 1979, I can ay that this experience was not nly the most exciting period of earning in my life, it was the beinning of a lifelong pursuit of nowledge and learning in mathematics and the sciences.

"I can still hear Arnold Ross tellng us, 'Think deeply of simple ings,' and recall the sleepless ights as I struggled to grasp the otion of a mathematical proof and complete problem sets that chalenged and inspired each particiant in the program--many of whom ent on to get their Ph.D. in mathmatics. It amazes me how much nergy I had then.

"It has always been in the back of y mind," Warshauer says, "that othing was ever as fun, as chalenging, or as truly rewarding as the ays I spent at Ohio State." Warhauer's dream, he says, has been to reate a similar program at Souwest Texas State, a program that ould "teach a new generation of igh school students to think mathmatically, to question, to explore, nd to reason carefully, rigorously, nd precisely." This summer Warhauer's dream is coming true.

Set for June 4-29, the SWT Honrs Math Camp has been designed y Warshauer; Dr. Don Hazlewood, hairman of the Department of lathematics; and Dr. Ron Brown, irector of the SWT Honors Proram. "The camp is for students om the 10th through the 12th rades," Warshauer says, "so even if ou've graduated high school, you an participate. In addition, we're oing to have a few college juniors articipating."

Thirteen high school students and four college students, approximately half of whom are from San Marcos, will be taking part in the program this year. All will be living in a dormitory on campus and attending classes five days a week.

"The courses themselves don't require any background," Warshauer says, "but they're at college level. The idea is really to teach students to think mathematically. The same principles are used in all different fields of mathematics."

What is involved in "thinking mathematically"? "In many subjects, there might be disagreement on what you can assume," Warshauer says, "but in mathematics, we begin with definitions that are agreed on and understood. The logic is very precise and thought out.

"Mathematics is a very social kind of endeavor," he adds. "What we're trying to do is give proofs that other people can understand."

How does one construct a mathematical proof? "It's really a matter of filling in steps," Warshauer says. "To me, the biggest difference between this and other methods is the preciseness and rigor of the argument."

Students will have an opportunity to learn this process firsthand during the summer math camp. "You don't learn mathematical reasoning by *talking* about it or hearing, 'This is how *other people* do it," Warshauer says.

Using the Ohio State program as its model, the SWT Honors Math Camp will offer a course in number theory, as well as a computer-based course using the Boyer-Moore proof checker. Each class will meet for one hour a day, Monday through Friday.

Describing it as "one of the oldest branches of mathematics," Warshauer says that the course in number theory will focus on the properties of integers, primes, prime factorization, Euclid's algorithm, Diophantine equations, modular arithmetic, and public key encryption or the creation of codes.

"The properties of integers may seem very simple," Warshauer admits, "but there are many unsolved problems. The subject matter is elementary, but very challenging.

"Carl F. Gauss, one of the all-time great mathematicians, remarked, 'Mathematics is the queen of the sciences, but arithmetic (number theory) is the queen of mathematics," says Warshauer, who will be teaching the course. "If one learns to 'think deeply of simple things,' then anything is possible."

The other mathematics course the students will take is "Logic: Induction and Recursion," taught by Dr. Don Hazlewood. In this course, Warshauer says, participants will learn to use a computer to check their arguments. More specifically, they will use the Boyer-Moore proof checker as well as Mathematica, which he describes as a "program for doing symbolic computations with a computer."

The final course on the schedule is an honors seminar which will meet three hours a week. "Ron (Brown) will introduce the students to college life and the resources available at the university," Warshauer says. "In general, it will help students think about their future and set goals for themselves."

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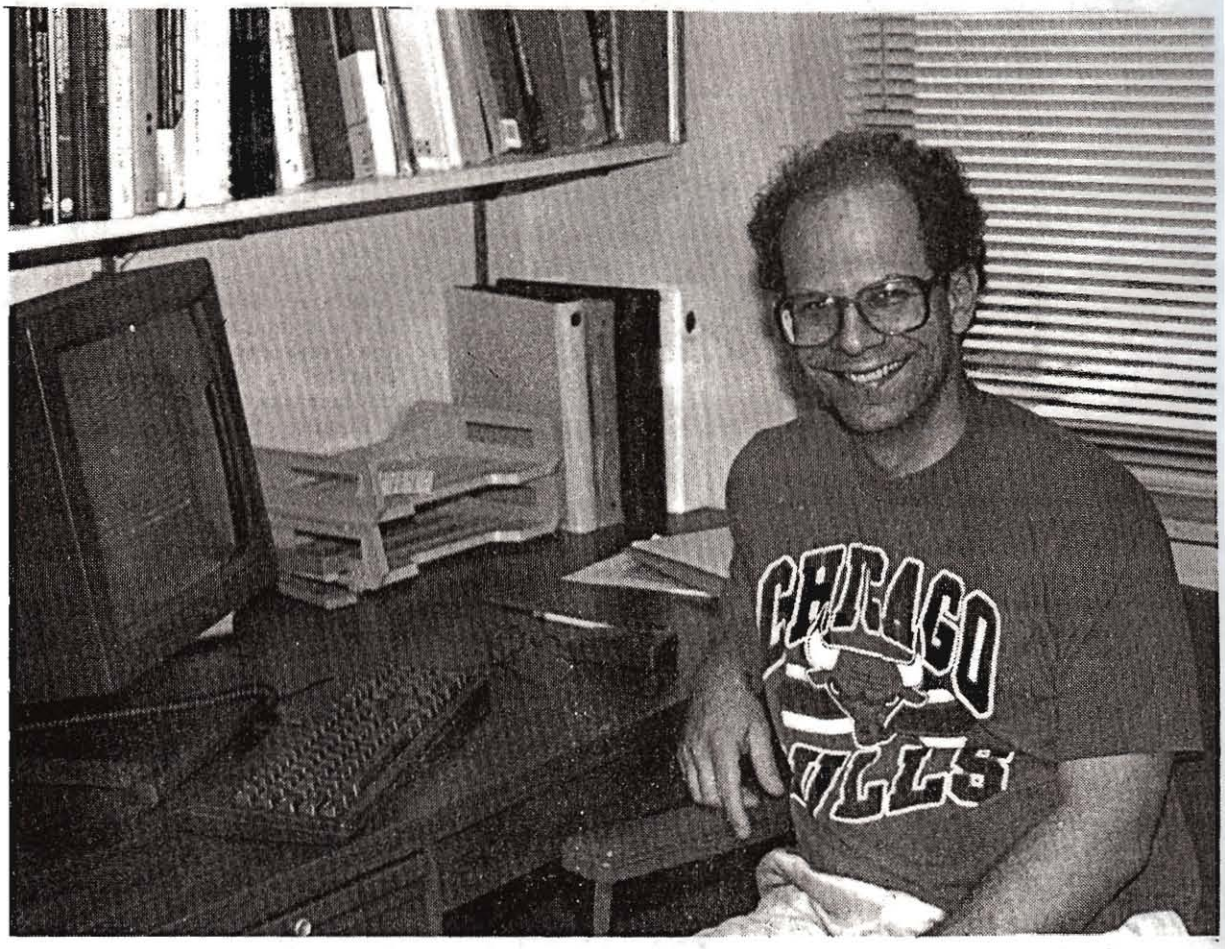

DR. MAX WARSHAUER

Math

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Although students will receive no credit for the two math courses, those who attend SWT will be admitted to the Honors Program and get credit for the Freshman Seminar.

Important as they are, the classes will be just one facet of the summer math camp. "On Fridays," Warshauer says, "we'll have colloquiums given by people in industry and academics. I don't want students to think that mathematics is an esoteric subject. It's about thinking."

Colloquium speakers will be Carl Pixley of Microelectronics and Computer Technology Corporation of Austin; Avi Silberschatz, a member of the computer science faculty at the University of Texas; and Mike Starbird, a member of the UT mathematics faculty.

Finally, Warshauer says, the schedule will include numerous social and recreational events as well. "During the week," he says, "the students will work really, really hard, so on the weekends they should play really, really hard."

Not only will the camp open and close with a banquet, but each Friday during their stay at SWT, students will be treated to a picnic at Cape's Camp. Weekend activities will include trips to Pedernales Falls, the San Antonio River Walk, Enchanted Rock, the L.B.J. Ranch, and New Braunfels.

"We've gotten a lot of community support for the program," Warshauer says. Sponsors thus far include the San Marcos Lions Club, the Balcones Kiwanis Club, Thermon, the Hays County Sheriff's Department, the Merrick Foundation, the SWT Honors Program, and the SWT Department of Mathematics.

At present, Warshauer says, cost for each participant is $650. Once the camp is extended to six weeks, however, tuition will increase and scholarships will be even more important.

"We want to develop enough support through donations to create an endowment and offer scholarships to students who couldn't otherwise afford it," he says. "We need a permanent endowment of $250,000."

The goal is ambitious, but Warshauer believes the investment is worthwhile. "When we give a scholarship to someone who is already in college, it may not do as much good as giving a scholarship to a high school student," he maintains. "It's important to plant the seed of ability when the student is young. What we want to do is kindle excitement."

Too often, he admits, math is taught in a "routine, monotonous way. If the problems are interesting and challenging and exiting to work on, then I think many kids get interested in math.

"Math for its own sake is boring," Warshauer says, "but we're not interested in that kind of math. Math is really refined human thinking, and I believe that people do enjoy learning how to think."

The Missionaries and the Cannibals

Test your own thinking skills with the following problem: An island was inhabited by three cannibals and three missionaries. Because the typhoon season was approaching, it became necessary to evacuate the island. Thus, the cannibals and missionaries built a boat to carry themselves to the mainland. Unfortunately, the boat would hold only two people, so it was necessary to make several trips.

However, the missionaries were aware that if there were ever more cannibals than missionaries in any location (either on the island or mainland), then the cannibals would revert to their old ways and eat the outnumbered missionaries. Hence it was necessary to plan the crossing in such a way that this never occurred.

One last important consideration--although each of the missionaries knew how to operate the boat alone, the missionaries were able to teach only one of the cannibals the necessary techniques. If either of the untrained cannibals attempted to operate the boat alone, the boat would immediately capsize and the passengers would be eaten by man-eating sharks. How could the cannibals and missionaries transport themselves to the mainland without loss of life?