Experts are in Lowell to ride

By DANA FRANCIS
Sun Staff

LOWELL – Mathematicians from around the world are meeting at the University of Lowell this week to catch the latest wave in mathematics during a conference that one professor said will "put Lowell on the map" in the scientific community.

All the excitement is over wavelets, a relatively new way of analyzing complex data.

On paper, the wavelet looks relatively unassuming – a blip on a graph.

But it is drawing scientists from the Soviet Union, France and elsewhere to Lowell because of its potential applications in computing, robotics, music synthesis, noise filtration, image enhancement, signal analysis and other fields.

"It's a very, very hot topic for a combination of reasons," said ULowell math professor and conference organizer Mary Beth Ruskai.

"It is attracting people from an extraordinary variety of subspecialties. It has very wide applications and it is also very interesting to pure mathematicians."

Ruskai originally planned for 40 to 50 participants but now is looking at approximately 175. She had to reserve a larger meeting room and expected even more to sign as the five-day conference began today.

"Although wavelets are a brand new subject, they've already generated important applications in diverse fields such as geophysics, image reconstruction and computer science," said Gerald Kaiser, associate professor of math at ULowell. "Many people are excited because they may lead to new ways of looking at old problems."

Among the fields represented are math, electrical engineering, computer science and physics. Representatives from industry, universities and the U.S. Naval Surface Warfare Center in Silver Spring, Md., are among those registered.

Ruskai obtained a $22,700 grant from the National Science Foundation to fund the meeting, which is the first major research conference on wavelets in the United States.

The wavelet may not revolutionize the world, but it has generated enough excitement in the sometimes subdued mathematics community to bring top scholars from around the world to ULowell.

"This conference has really put Lowell on the map," said ULowell math professor Yuly Makovoz. "Everyone was talking about Lowell's wavelet con-

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ference when I went to a meeting at Texas A&M in March."

The major center for wavelet research so far has been in France, Ruskai said.

The principal speaker at the ULowell conference is Ingrid Daubechies who works at AT&T Bell Laboratories and is one of the country's leading experts on wavelets. A mathematical physicist originally from Belgium, Daubechies in 1984 won that country's Louis Empain prize, which is awarded once every five years to a young Belgian scientist for research done before the age of 29.

She is currently a National Science Foundation visiting professor for women in mathematics at the University of Michigan.

e the new wave in math

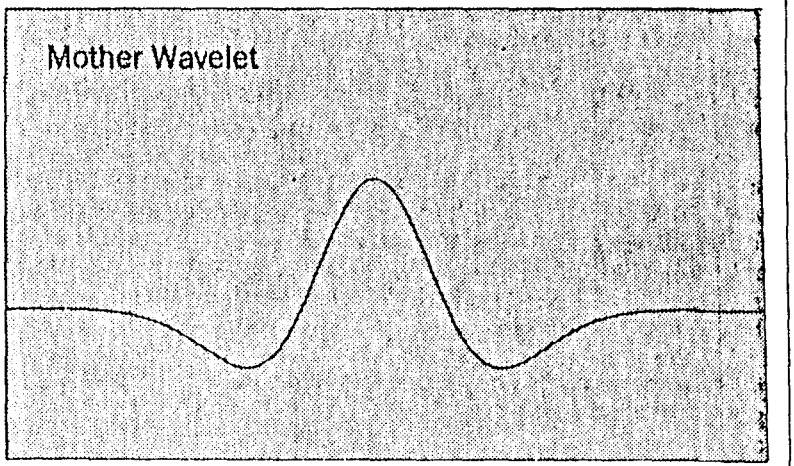
Wavelet explained: It simplifies analysis of data

LOWELL – The eyes of normally staid mathematicians light up when they talk about this week's national conference on wavelets. But ask what a wavelet is and be prepared to relive your worst mathematical nightmares.

At their most basic, wavelets provide a way for mathematicians and others to analyze and interpret complex data from sound waves, earthquakes and other signals.

But first it's necessary to dust off the mathematical mothballs and remember functions, which provide a way to map the relationship between two variables.

For example, one can express temperature as it relates to time by graphing time on a vertical axis and temperature on a horizontal axis. If it is 60 degrees at 3 p.m., 58 degrees at 4 p.m. and 55 degrees at 5 p.m., one can plot those points on a graph and connect them to form a curve that represents temperature as it relates to time.



Unfortunately, real-life problems do not usually present themselves so neatly. Interpreting complex data from radar signals or geological tremors often requires

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Wavelets: way to analyze data

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mathematicians to break it down into an unwieldy number of different functions.

Enter the wavelet, a function that can be stretched, compressed and shifted to interpret complex information.

Many functions are still being used, but they all have the same basic shape as the "mother wavelet."

"It's a set of basis functions that is generated by taking one function and stretching and shaping it," said ULowell math professor Mary Beth Ruskai.

"The trick is to find a set of simple functions that give you a good approximation by using only a small number of functions. Wavelets can do that."

New wave

Believe it or not, Lowell is well positioned to become the wavelet capital of the world.

If you have noticed a subtle infusion of rather absorbed, professorial or even dreamy looking sorts walking the streets lately, chances are they among the nearly 200 mathematicians and scientists from around the world who have descended upon the University of Lowell to participate in the first major conference on wavelets in the United States.

Rather than try to explain what wavelets are (a wavy blip on a graph is what they look like), it might be easier to just describe the conference as a mathematic coup for the University and the city.

"This conference has really put Lowell on the map," according to ULowell math professor Yuly Makovoz. "Everyone was talking about Lowell's wavelet conference when I went to a meeting at Texas A&M in March."

We've sure come a long way from textiles.

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