Reviews of Previous Volumes:

This lively presentation of an amazingly wide spectrum of happenings in mathematics is impressive ... [this book] should be presented to a wide audience even outside mathematics, which could be fascinated by the ideas, concepts and beauty of the mathematical topics.

—European Mathematical Society Newsletter

An excellent resource for high school mathematics teachers and their students.

—Mathematics Teacher

Here undergraduates might easily make their first acquaintance with a topic that could shape the course of their future studies and, beyond that, their professional lives. An essential acquisition.

—CHOICE

Stylish format ... largely accessible to laymen ... This publication is one of the snappier examples of a growing genre from scientific societies seeking to increase public understanding of their work and its societal value.

—Science & Government Report

Mathematicians like to point out that mathematics is universal. In spite of this, most people continue to view it as either mundane (balancing a checkbook) or mysterious (cryptography). This fifth volume of the What's Happening series contradicts that view by showing that mathematics is indeed found everywhere—in science, art, history, and our everyday lives.

Here is some of what you'll find in this volume:

Mathematics and Science

- **Mathematical biology:** Mathematics was key to cracking the genetic code. Now, new mathematics is needed to understand the three-dimensional structure of the proteins produced from that code.
- **Celestial mechanics and cosmology:** New methods have revealed a multitude of solutions to the three-body problem. And other new work may answer one of cosmology's most fundamental questions: What is the size and shape of the universe?

Mathematics and Everyday Life

- **Traffic jams:** New models are helping researchers understand where traffic jams come from—and maybe what to do about them!
- **Small worlds:** Researchers have found a short distance from theory to applications in the study of small world networks.

Elegance in Mathematics

- **Beyond Fermat's Last Theorem:** Number theorists are reaching higher ground after Wiles' astounding 1994 proof: new developments in the elegant world of elliptic curves and modular functions.
- **The Millennium Prize Problems:** The Clay Mathematics Institute has offered a million dollars for solutions to seven important and difficult unsolved problems.

These are just some of the topics of current interest that are covered in this latest volume of *What's Happening in the Mathematical Sciences*. The book has broad appeal for a wide spectrum of mathematicians and scientists, from high school students through advanced-level graduates and researchers.

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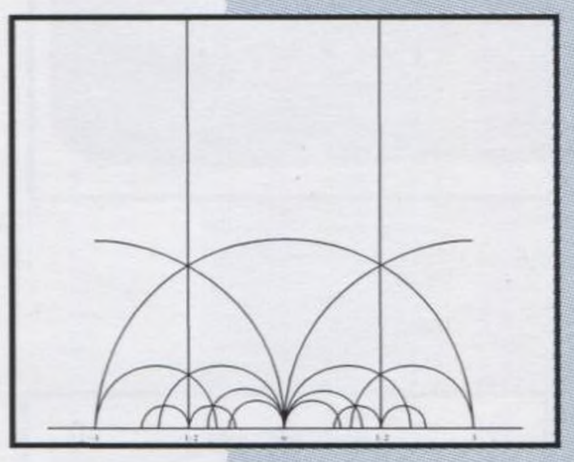
New Heights for Number Theory 2

Progress proceeds apace in the post-Fermat world of elliptic curves and modular forms.

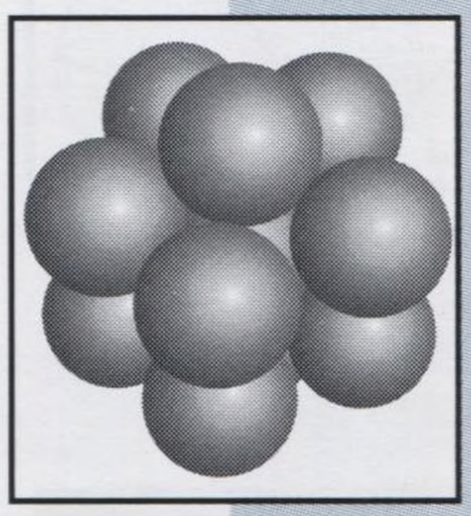


A Mathematical Twist to Protein Folding 12

Powerful statistical methods are helping researchers elucidate the three-dimensional structure of life's most important molecules.

Nothing to Sphere But Sphere Itself 22

A centuries old problem—the Kepler conjecture—has yielded to new insights and some dogged computation.

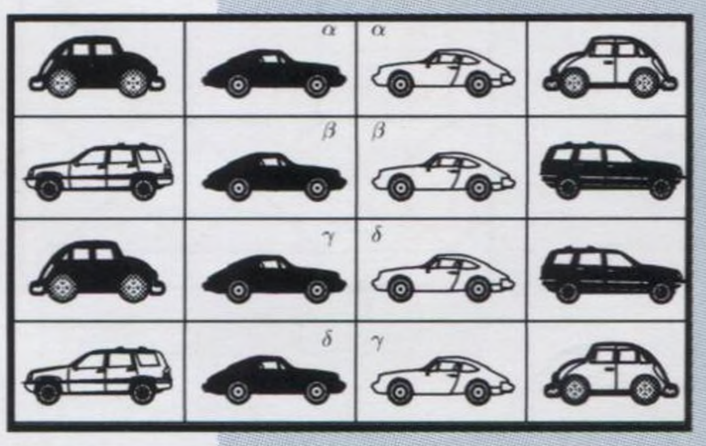


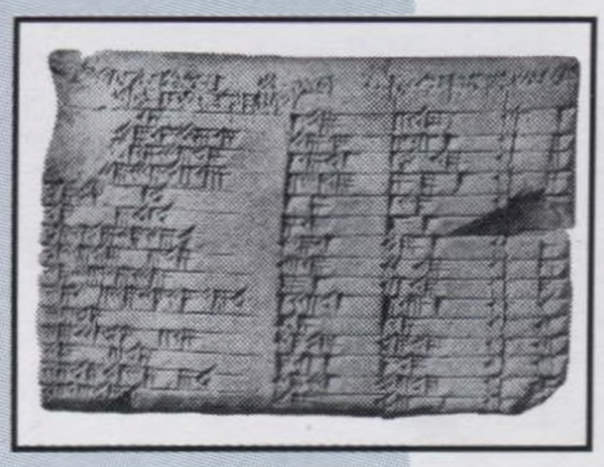
Finite Math 32

Is the universe finite? Observations of the cosmic microwave background and a new mathematical algorithm may provide an answer.

The Mathematics of Traffic Jams 42

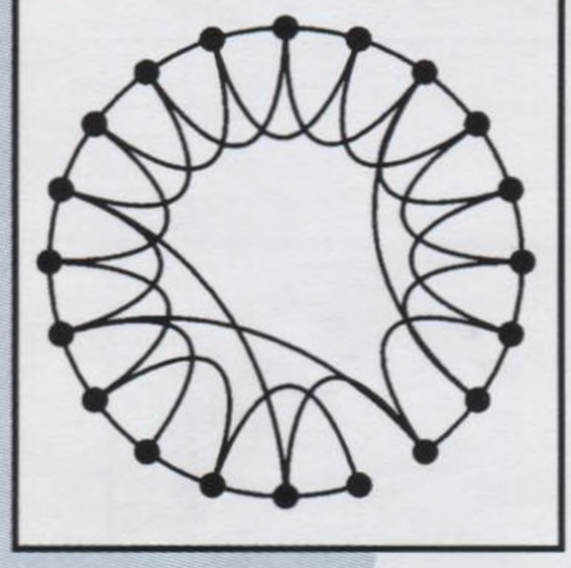
Computer models are helping researchers understand where traffic jams come from—and maybe what to do about them.





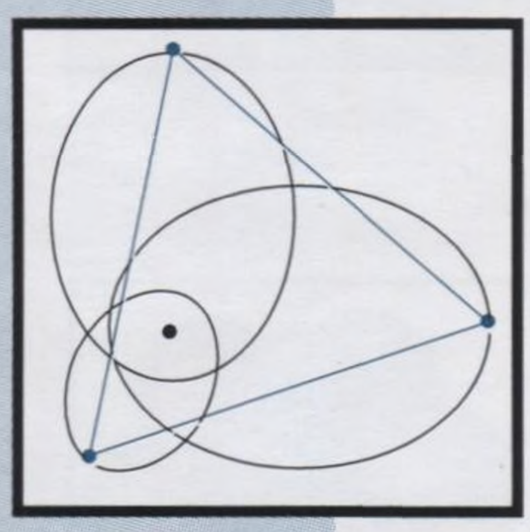
Rewriting History 54

Plimpton 322 is one of mathematicians' favorite cuneiform tablets. But what did it mean to the scribe who composed it?



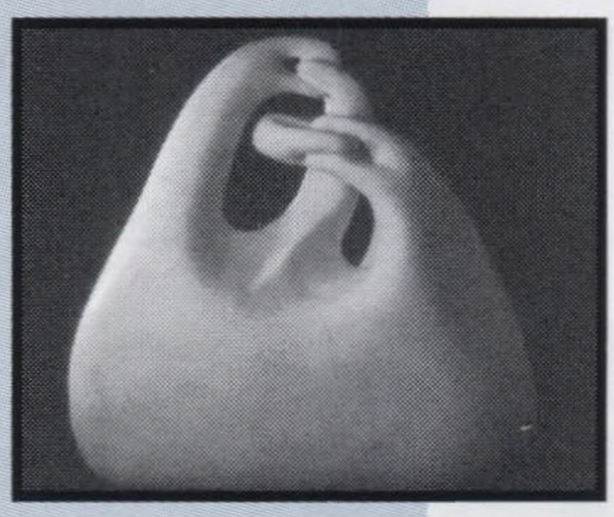
It's a Small, Big, Small, Big World 60

Researchers have found a short distance from theory to applications in the study of small world networks



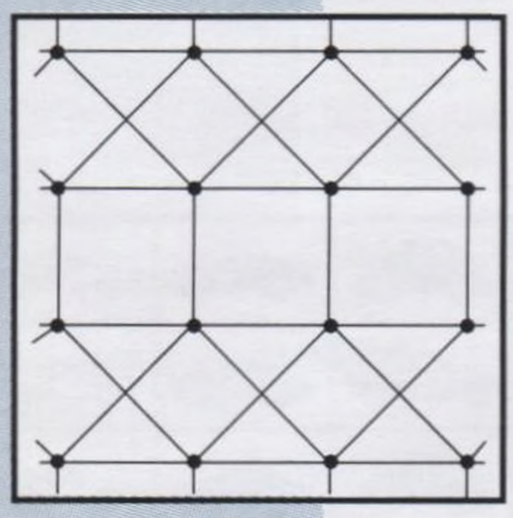
A Celestial *Pas de Trois* 68

New methods have revealed a multitude of solutions to an old problem in celestial mechanics: the orbital motion of three bodies.



Think and Grow Rich 76

The Clay Mathematics Institute has singled out seven important problems in mathematics, with a $1 million dollar prize for each.



Ising on the Cake 88

A new theorem helps explain why statistical physics has had such a hard time with one of its central problems.