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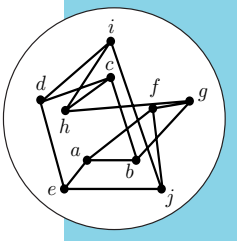
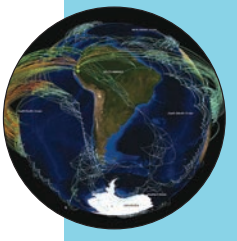
Dana Mackenzie
The ancient Japanese art of paper-folding is going high-tech, as engineers invent new devices that deploy or undeply by folding. These inventions lead in turn to challenging mathematical problems about assembly pathways, defects, and curved folds in flat materials.

18 **Prime Clusters and Gaps: Out-Experting the Experts**
Dana Mackenzie
Mathematics got its real-life Walter Mitty story in 2013, when Yitang Zhang shocked number theorists with the first finite upper bound on the minimum size of prime gaps. One of the oldest problems in number theory, the Twin Prime Conjecture, may now be within reach.

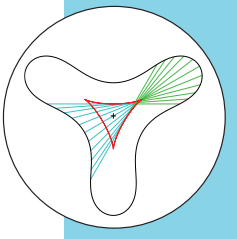
28 **The Truth Shall Set Your Fee**
Barry Cipra
When you pay a stranger, especially online, for help, how can you be sure you're getting honest answers? A new theory in computer science shows how rational self-interest dovetails with the pressing need for trustworthy computation.



36 **Climate Past, Present, and Future**
Dana Mackenzie
Change is everywhere you look in Earth's climate, and always has been. Throughout climate science, mathematical models help sort out what did happen (mass extinctions), what is happening (melting ice sheets), and what might happen (tipping points).

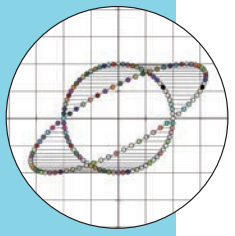


52 **Following in Sherlock Holmes' Bike Tracks**
Dana Mackenzie
In a story published in 1905, Sherlock Holmes incorrectly deduced which way a bicycle went, on the basis of its tracks. The subtle relationship between a bike's front and rear tracks recently helped mathematicians solve another Victorian-era problem on the operation of planimeters.



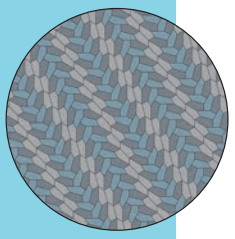
64 **Quod Erat Demonstrandum**
Barry Cipra

A proof is a kind of mathematical poem—and sometimes an epic one, at that. Two recent proofs, each years in the making, show the lengths to which mathematicians will go in the dogged pursuit of truth, including, these days, enlisting computers to double check their logic.



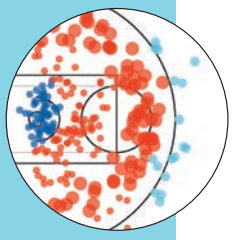
72 **The Kadison-Singer Problem: A Fine Balance**
Dana Mackenzie

Great problems come in many disguises. The Kadison-Singer problem, first posed as a problem in theoretical physics, popped up in many other mathematical contexts over more than half a century until it was finally solved in 2013 by graph theorists.



86 **A Pentagonal Search Pays Off**
Barry Cipra

Finding shapes that tile the plane isn't hard to do. Finding *all* of them is trickier. Mathematicians still don't know how many different convex pentagons are capable of tiling the plane. But the list, long stalled at 14, just inched up, thanks to a new algorithm and a computer search.



96 **The Brave New World of Sports Analytics**
Dana Mackenzie

In the last few years, professional sports have been swept by a new wave of statistical methods, or "analytics." These methods, coupled with new data sources like video capture, quantify elusive skills and challenge cherished assumptions about in-game strategy.