

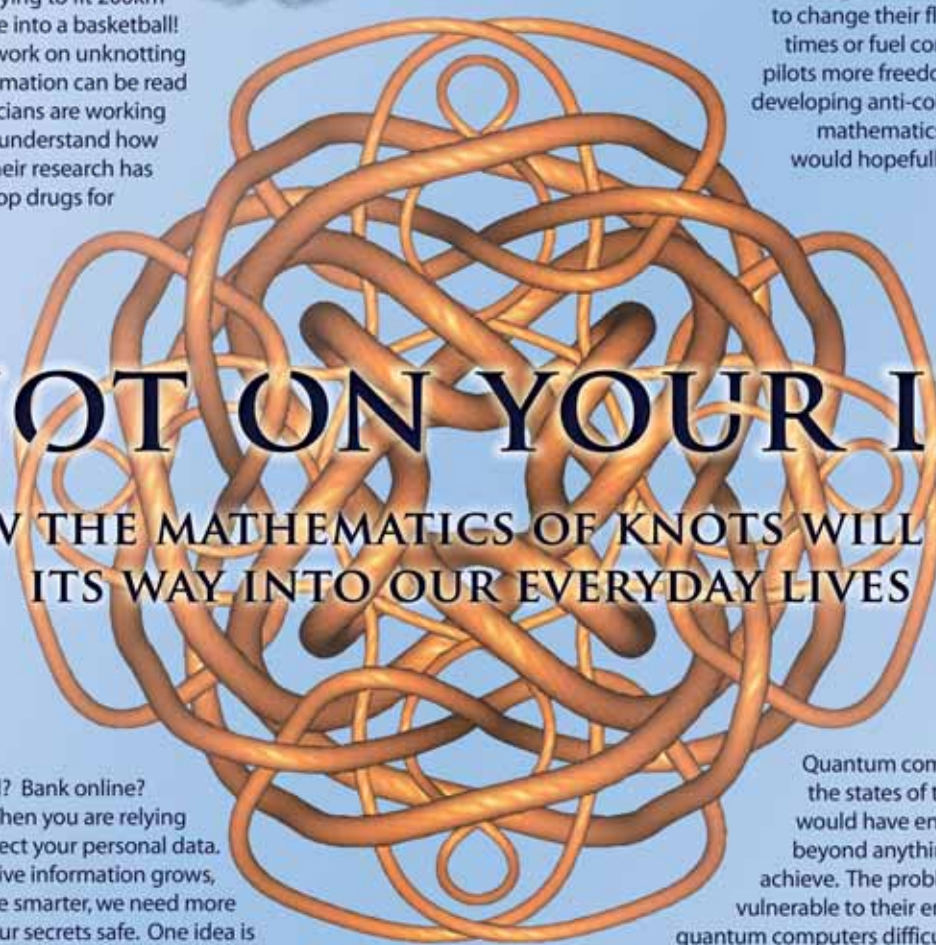
DNA is tightly packed into our cells and usually gets tangled up and knotted. Imagine trying to fit 200km (125 miles) of fishing line into a basketball! Enzymes in our bodies work on unknotting the DNA so that its information can be read and copied. Mathematicians are working with biologists to try to understand how these enzymes work. Their research has already helped to develop drugs for fighting cancer.



Today, nearly all aircraft fly along fixed paths and are told what to do by ground-based air traffic control. This is so that aircraft have the least possible chance of colliding. But it means that pilots are not free to change their flight paths to improve travel times or fuel consumption. In order to give pilots more freedom in the skies, scientists are developing anti-collision systems based on the mathematics of braids. In the future this would hopefully lead to more flights, fewer delays and safer journeys.

KNOT ON YOUR LIFE

HOW THE MATHEMATICS OF KNOTS WILL FIND ITS WAY INTO OUR EVERYDAY LIVES



Do you use a credit card? Bank online? Use wireless internet? Then you are relying on mathematics to protect your personal data. As the amount of sensitive information grows, and as criminals become smarter, we need more obscure ideas to keep our secrets safe. One idea is to use the complexity of knots to encrypt our data. It's quite easy to tie a complicated knot into a piece of string (encryption) but very hard to undo the knot or work out which exact knot you tied (decryption). Such techniques may become commonplace over the next few years.

Quantum computers store information in the states of tiny particles. In theory they would have enormous processing powers, beyond anything normal computers could achieve. The problem is that particles are very vulnerable to their environment, making reliable quantum computers difficult to build. Mathematicians have found a way to braid the particles, giving a structure that is very robust and unlikely to acquire errors. This has made quantum computing a real possibility for the future.

IMPROVING SECURITY OF



PERSONAL DATA

BUILDING
QUANTUM
COMPUTERS

