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One small beep brings prime number glory to Missouri

Ian Sample, science correspondent
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If it takes 700 computers nine years to find the answer, it must be one beast of a question. But for researchers in Missouri, on a quest to find the world's largest prime number, it was all worthwhile.

In mid-December, a reassuring beep signalled the end of the long search, and one of the computers came up with a prime number with the mysterious name of M30402457. Made up of 9.1 m digits, it trounces all others discovered so far.

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Prime numbers are positive numbers divisible only by themselves and the number one, such as 2, 3, 5 and 7. The number discovered in Missouri falls into a special category called mersenne prime numbers. These are expressed as the number 2 raised to the power of "p" minus one, where "p" is also a prime number.

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For Steven Boone and Curtis Cooper at Central Missouri State University, it was a moment to remember. "It's a huge achievement, we're really excited," said Dr Boone. "People ask why we do this. It's like going on a quest. We're looking for something incredibly rare," he said. "It's the icing on the cake."

And then there is the financial incentive. The person who finds the first mersenne prime number more than 10m digits long stands to win \$100,000 (£58,000), the prize of the Great Internet Mersenne Prime Search competition.

The researchers began the project by commandeering a few hundred of the university's computers to crunch away at the problem. In the nine years since, the number of computers joining the hunt grew to 700.

The algorithms used in the search were sent out to computers around the college campus and run quietly in the background without the user noticing. The programmes work through increasingly high numbers and test each one to see if it is a mersenne prime.

"At first, it would take one computer three months to check one number. Now, we've more powerful computers, so it's taking around 25 days for each number, but the higher we go, the more calculations we need to do," said Dr Boone. To confirm their number was prime took 30m separate calculations.

The Missouri team's number beats the figure discovered by Martin Nowak, a German eye specialist with a passion for mathematics, by more than 1m digits. His number, revealed in March, was a mere 7.8m digits long.

Dr Boone said there might be practical applications of the work. "This pushes computer scientists to develop algorithms that run highly efficiently, and that benefits the future of computers," he said.

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