

# Mr Tompkins' curious gloves

Mr Tompkins sells gloves. Not ordinary gloves, mind. They are called "Rainbow Gloves" because you can make them any colour you like. They come in a special box with a dial on the front. Before opening the box, you dial up the colour you want, press a button and give the box a shake. Then, when you open the box, you have a pair of gloves the exact shade you wanted. Mr Tompkins' Rainbow Gloves are very popular and his factory and distribution centre on the equator is very busy sending pairs of gloves all over the world.

One day, Mr Tompkins' niece, Alice, who lives at the North Pole, ordered a pair of gloves for a wedding. When they arrived, she dialled up the colour she needed (white), but when she opened the box she was dismayed to find that it contained only one left-handed white glove. Later that day, she complained about this to her brother Bob (who lives at the South Pole), and he mentioned that he, too, had received a parcel from his uncle. Urged on by his sister, Bob opened the box and found a right-handed white glove. "It's the other one of the pair!" he exclaimed. "That's spooky," said Alice. "How did your glove know what colour *mine* was?"

After a few more glove orders, Alice and Bob established that whoever dialled up a colour first would cause both gloves to be the same colour. Puzzled, they decided to take a holiday together to Switzerland, where a group of distinguished scientists were holding a public meeting at a research institute there. At the end of the meeting, Alice bravely stood up and, having described the curious behaviour of her uncle's gloves, asked if anyone could explain how the trick worked. Chairing the event was Mr Justice Newton, an elderly gentleman wearing a red gown and a long grey wig. He had a stern countenance and an air of gravity about him. When Alice asked her question, he frowned. "It is perfectly obvious to me that there is no way that dialling up a colour on one box can affect the colour of the glove in the other box, so the gloves must have been the same colour to start with. Shall we move on to the next question?"

Bob was about to protest, but at that instant there was a blinding flash of light and a crack of thunder. "No!" bellowed a deep voice. "The question is far from settled. Alice has raised a question of deep philosophical and practical interest and I demand to be heard." The speaker had a conical hat, a long beard and a staff, the end of which glowed brightly. "Oh dear," muttered Newton under his breath. "It's Dumblebohr, the quantum wizard."

"You must understand", the wizard bellowed, "that the only observable realities are realities which are observed. If this were not the case then magic would be impossible. And without magic, there would be no mobile phones, no supermarket checkout lasers, no atomic bombs, no computers – the modern world would be quite impossible. My esteemed colleagues at Copenhogwarts have helped me work out the fine details of how to calculate the probabilities of any event being observed and how these probabilities change over time, and I can't see why you are not satisfied with that. As soon as both parcels are opened, both gloves reveal themselves to be the same colour. Full stop."

"That's all wrong!" piped up a small voice from under



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a table. "Newton is right. The boxes always contain gloves of the same colour. What happens is that Mr Tompkins manufactures an infinite number of pairs of boxes with every possible colour, each of which inhabits a different universe. In fact, every time there is the possibility of a different outcome from an experiment the universe splits into an infinitude of..."

"Don't be ridiculous!" shouted Dumblebohr, banging his staff on the floor. "It's that pip-squeak Everett again! Wait till I get my hands on him."

"Order! Order!" called Newton. "Alice wants to say something." She stood up. "Well, with the greatest respect, I have an idea that perhaps wizard Dumblebohr and Everett are both partially right. Let's imagine that, when a quantum process is occurring, reality is *suspended* for a while. It is as if nature tries out all the possible outcomes according to Dumblebohr's excellent method, but at some point, some instability – perhaps due to gravity or something else we do not yet understand – causes the wavefunction to collapse and one single reality asserts itself. In fact," she said, warming to her subject, "if we accept this idea, we can explain all of the bizarre experiments which I have read about without having to rely on 'action at a distance' or 'multiple universes', and what is more, at the end of the day we can genuinely say what really happened, even during the period of time when reality was suspended. We don't have to pretend it is impossible to say what colour the gloves are before we open the boxes. If they turn out to be pink, we can say with certainty that that is because they always were pink. The other possibilities simply didn't materialize."

"Bah!" said Dumblebohr, disappearing in a puff of smoke. "Bravo!" whispered Bob. "Well, Alice, it's possible you may be onto something," said Newton, beaming at her kindly. "But what causes reality to emerge from suspension? And how, precisely, might one test the idea that reality is suspended during a quantum process?"

"I don't know," admitted Alice. "Does anyone have any ideas?"



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