Private prescription:

A thought-provoking tonic on the lighter side

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Buttered bread, odd socks and knotted rope – urban myths or scientific fact?

In 1884, James Payn, the celebrated Victorian novelist and satirist, wrote [1]:

> 'I had never had a piece of toast
> Particularly long and wide
> But fell upon the sanded floor
> And always on the buttered side.'

The propensity of buttered bread or toast to always land butter-side down is probably the most famous of all the manifestations of what is nowadays referred to as Murphy's or Sod's Law, defined in the *Chamber's English Dictionary* as: 'the law that states that the most inconvenient thing is the most likely to happen, or if there is a possibility that something will go wrong, it will.'

Although many jokingly blame all their misadventures on the existence of Murphy's Law, many scientists regard it as an old wives' tale, an urban myth, lacking any basis in fact. This is where they are wrong. Contrary to orthodox opinion, many of the manifestations of the law have roots in statistics, rigid body dynamics and other branches of physics; even its discoverer was a real person.

Background

The history of the origin of the law is, like the law itself, shrouded in myth. In a somewhat whimsical paper in 1967, Klipstein [2] suggested that the discoverer was an engineer named Edsel Murphy and that the reason why he is practically unknown to other engineers and scientists is that he was the victim of his own law. Destined for a secure place in the engineering hall of fame, something went wrong. However, recent research by Robert Matthews [3], the science correspondent of *The Sunday Telegraph* (UK) and a regular contributor to *New Scientist* and other publications, has revealed that Murphy was, in fact, Edward A. Murphy, a US citizen born in 1918 in Panama who graduated from the US Military Academy, West Point (NY, USA), in 1940 and served as a pilot during the 1939–1945 war. Subsequently, he became a research and development officer at the Wright-Patterson Air Force Base near Dayton (OH, USA) where he was involved in a project to test the effects of rapid deceleration on humans using a rocket sled. A harness fitted with strain gauges had been developed to measure the forces on the volunteers in the tests, and it was while testing in 1949 that it was noted that after some apparently successful runs, the records showed that the harness had failed to work properly. A detailed investigation found that all the crucial wiring had been carried out incorrectly. It was reported that Murphy, when he heard of this, observed that if there was a way for a technician to make mistakes, that would be the way things would be done. It was in a subsequent press conference that this remark was amended and took on its classical wording.

Murphy went on to have a distinguished career in the development of pilot escape systems for the X15 rocket plane and the Apollo space missions. In these, he came to view the 'law' as an excellent philosophy for safety-critical engineering design and that all designers should always try to foresee and counter the actions of human blunders. However, when he died in 1990, Murphy's name was destined to be associated with the perversity of everyday events and, by failing to have his name associated with his own interpretation of the law, he did unintentionally become its first victim.

If something can go wrong, it will.

Buttered bread, odd socks and knotted rope

Manifestations of Murphy's law are widespread. Klipstein [2] actually lists well over 50 in engineering alone. However, the most famous are also the most familiar: why rope or string so often acquires knots; why there are so many odd socks; why places on maps are so often in the most awkward places on the page; why it fails to rain when one is carrying an umbrella; and, undoubtedly the most famous of all, why buttered bread or toast so often falls butter-side down.

In the case of buttered bread or toast, Matthews [4] has shown that the problem

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is not what happens if the bread is thrown up in the air, because here the result will always be similar to that of tossing a coin, but what happens if the bread slides off the edge of a table or plate at waist height. The key to the dynamics and the state of the bread depends on whether the gravitational torque is large enough to enable the bread to rotate into a butter-up position in the time taken for it to free-fall under gravity to the ground. By modelling the bread as a thin, rigid, rough lamina, and solving the equations of motion, Matthews was able to show that bread or toast sliding off a table or plate really does have a bias towards butter-down landings, and that this effect persists for all heights below 2.5–3.0 metres. The best hope of combating Murphy's law of tumbling toast is to cut the sample into squares of about 20 mm width or by giving it a large horizontal velocity, for example, by giving it a swipe with the hand, to minimize the rotation-inducing gravitational torque.

Matthews has applied similar scientific and mathematical analyses to the other manifestations of Murphy's law. In the case of odd socks, he has applied the theory of combinatorics (a branch of mathematics dealing with the problems of packing, selection and permutation) to show that the disappearance of socks is indeed heavily biased towards the accumulation of odd socks [5]. In the case of knotted rope, he has applied the concept of self-avoiding random walks originally applied to the entanglement of polymer chains to show that the phenomenon of spontaneous knotting is well-founded [6]. In fact, in all the cases Matthews has studied, he has shown that there is a totally rational explanation and that there are ways of combating the effects [3].

Indeed there is now ample evidence that Murphy's law does in fact have a basis and that a whole range of everyday phenomena do have a bias towards the worst possible outcome. Robert Burns was scientifically correct when he wrote in his poem 'To a mouse' in 1786:

> 'The best laid schemes o' mice an'
> men Gang aft agley.'

References

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