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Study finds cause of traffic jams – too much traffic

By Roger Highfield
Science Editor

A PROFESSOR claims to have worked out the science behind what causes a traffic jam – put simply, it is too many cars on the road.

Prof Yuki Sugiyama, of Nagoya University in Japan, has spent more than a decade puzzling the problem.

In the *New Journal of Physics*, a study by his research team explains why we occasionally get caught in jams for no obvious reason.

He says it has nothing to do with obstructions such as accidents or roadworks, but is simply the result of there being too many cars.

The team applied techniques to model the movements of particles to real-life moving traffic and found that even tiny fluctuations in the number of cars on the road cause a chain reaction which can lead to a jam.

To demonstrate this, the team studied cars driving around a circular track. They put 22 cars on the road and asked the drivers to go steadily at 19mph. While the flow was initially free, if a driver altered his speed it reverberated around the track and led to brief standstills.

Prof Sugiyama says: "Although the emerging jam

in our experiment is small, its behaviour is not different from large ones on highways.

"When a large number of vehicles, beyond the road capacity, are successively injected into the road, the density exceeds the critical value and the free-flow state becomes unstable."

The research suggests it might be possible to estimate critical density of routes, enabling roads to be built to suit the number of drivers that need to use it.

Mathematicians led by Dr Gábor Orosz, of the University of Exeter, have conducted similar work but included the reaction time delay of drivers.

They found that the late reactions of drivers – by even one second – can have serious knock-on effects when driving at much higher speeds than in the Japanese study.

"In a typical situation a vehicle dropping its speed from 80mph to 65mph may cause a ripple that later vanishes, while dropping its speed from 80mph to 62mph may cause a ripple that is amplified and leads to traffic jams," said Dr Orosz.

He adds: "We are currently developing algorithms for radar-guided computer controlled cruise-control devices that could cut down overbraking and keep traffic smooth."