Driving America

What Makes a Traffic Jam

ANATOMY OF A TRAFFIC JAM

For commuters, perhaps the most maddening situations on the road are the mysterious traffic jams that seem to develop spontaneously, even when there's no accident or construction to create a bottleneck.

One of the nation's foremost traffic researchers, University of Maryland engineering professor Hani S. Mahmassani, explains that these "phantom jams" are caused by a combination of physics and human nature. "If we didn't have to deal with drivers' reaction times," he explains, "we could fit four times as much traffic on the highways."
3 p.m. Situation Normal
Traffic is flowing smoothly, with random fluctuations as drivers vary their speed and change lanes. But the number of vehicles is increasing, spelling trouble ahead.
3:05 p.m. The Tipping Point

The number of vehicles has exceeded the limit that the highway can handle (usually somewhere in the vicinity of 2,400 drivers per lane per hour). Drivers continue to do the same random maneuvers, but they have less room.
3:10 p.m. The Trigger

When someone switches lanes or changes speed, the driver behind that car momentarily taps his brakes. The drivers behind that car see the brake lights. They take a fraction of a second to react, and then begin to brake as well.
3:15 p.m. The Slowdown

The slowing effect rolls down the highway in a wave, so that within five minutes, the jam-up already may extend for nearly a mile. Once the reaction starts, the route’s capacity to handle traffic may diminish by 40 percent.
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3:20 p.m. An Escalating Mess

With the jam approaching 2 miles in length, other cars keep trying to get on the road from ramps, further aggravating the situation. The jam won’t dissipate until drivers are warned by radio traffic reports or road signs that they should divert to an alternate route.