

October 24, 2003

SCIENCE JOURNAL

## Readers Take a Stab At Tips for Traffic -- Many Are Illusions

By SHARON BEGLEY  
Staff Reporter of THE WALL STREET JOURNAL  
October 24, 2003

Never let it be said that Science Journal walks away from problems, especially when they are as central to modern existence (judging from reader mail) as traffic.

The [Oct. 3 column](#)<sup>1</sup> described research showing how even slight perturbations in dense traffic, such as a pulse of vehicles from a highway on-ramp, can trigger a shock wave that slows traffic to a crawl and keeps it there long after the pulse is history. When I called this inevitable, many readers countered that they had discovered schemes to keep rolling.

I have bad news and good news and bad news. The bad news is that many of these maneuvers don't get you where you're going any sooner, though some give the illusion of doing so. The good news is that "operations researchers," the (mostly) engineers who have studied traffic for decades, have uncovered ways to avoid some of the most exasperating congestion. The final bad news is that transportation agencies implement these ideas about as often as you get empty roads at rush hour.

Among the favorite home remedies are those meant to eliminate the shock wave that occurs when a road that's already at its traffic-carrying capacity gets walloped with something that, in lighter traffic, causes no problems. A reader in Santa Barbara, Calif., cites a squeeze where three lanes become two. To avoid getting stuck in, and exacerbating, the resulting wave of stop-and-go traffic, he suggests drivers cut their speed from 65 mph to 30 mph (104 kilometers per hour to 48 kph), beginning a few miles before the squeeze.

Alas, says engineer Hani Mahmassani of the University of Maryland, that's unlikely to work. "Once the head of a line of cars slows, that propagates backwards," he says. "You want cars to start merging way back of the squeeze and at constant speed to get maximum flow."


Other readers swear by hanging back from the end of the congestion. As Patrick McNally of Seattle wrote, "When I see one of these clumps ahead of me I ease off on my speed."

Here's where illusion comes in: Doing that will only postpone the inevitable. Once traffic ahead is clumped, there's nothing you can do in the rear to escape your fate, except on those rare occasions when you approach a clump just as it breaks up. In fact, braking far behind the clump can, depending on traffic density, trigger a second shock wave and attendant tie-up.

What you can do for your fellow sufferers is leave the front of the clump as fast as possible and make the guy ahead of you do likewise. God gave cars horns for a reason.

The same logic applies to another favorite, slowing enough as you approach a line of cars at a red light so you never actually stop. But while it may be satisfying to keep moving (and save gas), you don't get through any sooner, says Carlos Daganzo of the University of California, Berkeley.

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Cars that are pokey about accelerating when a red light turns green "create an incredible domino effect that delays drivers behind them," as reader Greg Saunders rightly says. Solution? "Giving people warning that it's about to turn green, just as the yellow indicates it's about to turn red," says Prof. Daganzo. That will save the second or two it takes drivers to accelerate.

U.S. Army veteran Craig Koskela has been trying to outsmart the vehicular version of "the Slinky effect" he met in the service. As he describes it, the front of a column of soldiers slows down, causing those in back to bunch up and then slow down even more to maintain spacing, at which point the guys in front are speeding up (having crested a hill, for instance), making the whole line string out so those in back sprint to catch up and bunch up worse than before. You get the idea.

He suspects that, on highways, you can avoid becoming part of a Slinky if you drive more slowly than the pack and stay in the right lane. This works if traffic is below critical density. But if the road is jammed, a slow car creates another perturbation; drivers mimic the vehicle in front of them, so if you decelerate so will everyone behind you, reducing flow.

Civil engineers have their own bag of tricks. Minimize road bumps, curves and inclines, which make drivers decelerate. Lengthen entrance lanes on highways so drivers can get up to speed before slipping into the main flow. Control the number of vehicles allowed to enter a highway at once, to prevent traffic density from reaching an unstable state in which the least little thing ties it up. After all, says Prof. Mahmassani, "Anything that causes other cars to brake -- driving too slowly in the left lane, not maintaining speed on an upgrade or to change lanes - - can cause a breakdown in traffic flow."

Which brings us to "platooning." Research in the 1950s showed that inserting gaps into the line of cars entering a tunnel -- let a bunch in, wait, let more in -- increases total flow. Why? Vehicles often lose speed on the uphill at the tunnel exit, creating a shock wave that travels back to the entrance. That can't happen when there are big gaps between clumps of cars.

Let's face it: Since dumb drivers are responsible for a lot of traffic problems, we have to hand the wheel to computers, at least on highways. Computer-driven cars could minimize perturbations and double a road's capacity, estimates Prof. Mahmassani. But if I had to guess, I'd say that drivers will give up the wheel when pigs fly.

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