

# Traffic Jams, Pedestrian Streams, Escape Panics, and Optimal Production

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Why are vehicles sometimes stopped by so-called “phantom traffic jams”, although they all like to drive fast? What are the mechanisms behind stop-and-go traffic? Why are pedestrian counterstreams normally organized in lanes, while nervous crowds are “freezing by heating”? How do oscillating pedestrian streams at bottlenecks come about?

Some years ago, it was believed that human behavior in pedestrian and freeway traffic is dominated by socio-psychological factors. Today, we know the self-organization principles underlying these effects and how to model them realistically. For illustrative reasons, we will compare computer simulations and video recordings of pedestrian streams in normal and panic situations, and of stop-and-go waves in vehicle traffic.

We will, then, address the following questions: Why are there several different kinds of congestion, and how are they related? Why do most traffic jams occur considerably before the road capacity is reached? Can a temporary reduction of the traffic volume cause a lasting traffic jam? Under which conditions can speed limits speed up traffic? Why do self-organizing systems tend to reach an optimal state? How can overreactions to advanced traveller information be avoided, and what do they have in common with stock markets?

Moreover, can the order in pedestrian crowds be increased by obstacles? Why do panicking pedestrians produce dangerous deadlocks? What is behind the faster-is-slower effect and how can it be applied to the optimization of production processes?