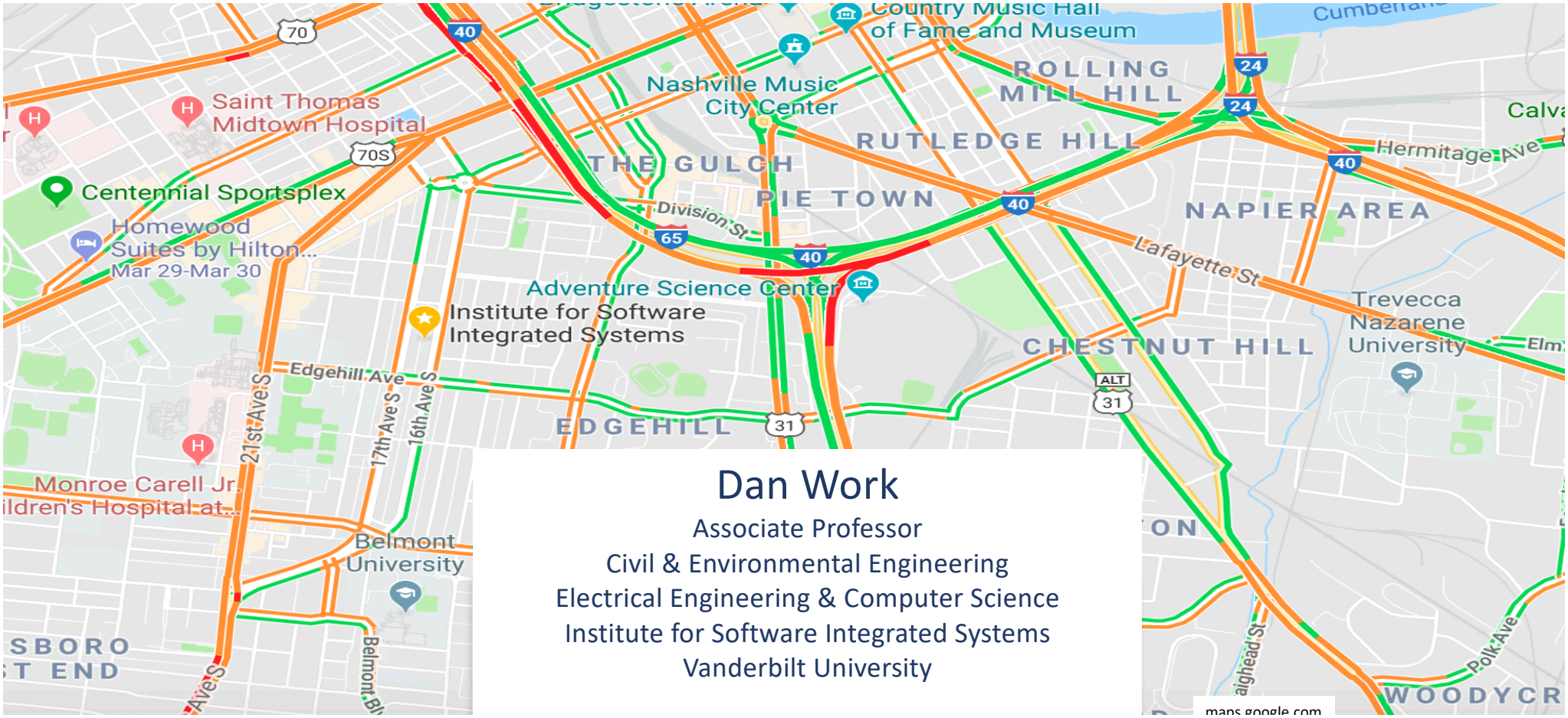
Will autonomous cars cure congestion?



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Will automated vehicles increase travel demand?

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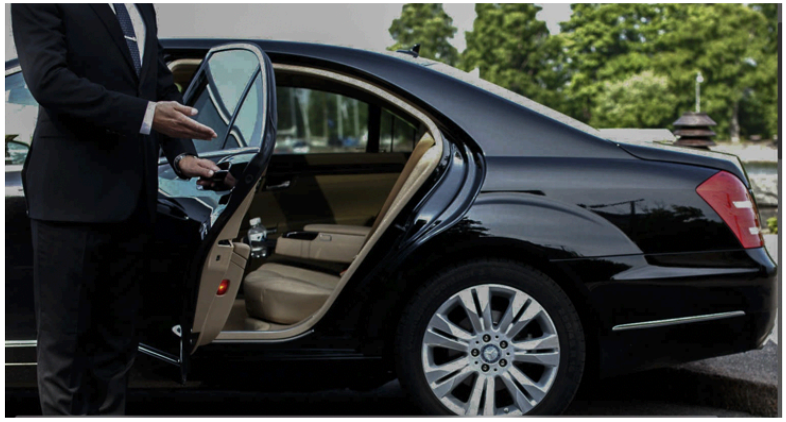
Probably.

Chauffer Experiment

- Give people a chauffer and see what happens
- Overall: 76% more miles traveled and longer trips
- Retirees: 3x increase in evening driving 2x longer trips.
- Millennials: ¾ of cohort increased miles.
- 20% “ghost trips” (e.g., to pick up children, friends)



[Joan Walker/Science Magazine, 2017; CEO Chariot 2018; GM 2018]

Can autonomous cars improve roadway capacity?

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YES.

Automated Highways

- Need cars that talk, coordinate, and drive with high speeds and small gaps
- Up to 2-3x freeway capacity increase (in ideal conditions)

- *Main idea.* Move people/goods close together at high speeds

KTH Truck platoons

COMPANION

[Shladover et al. 94; Johansson et al. 15]

CARPOOL. Another way to move people together at high speeds

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[The Late Late Show With James Corden]

CARPOOL. Another way to move people together at high speeds

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[The Late Late Show With James Corden]

Taking the argument further…

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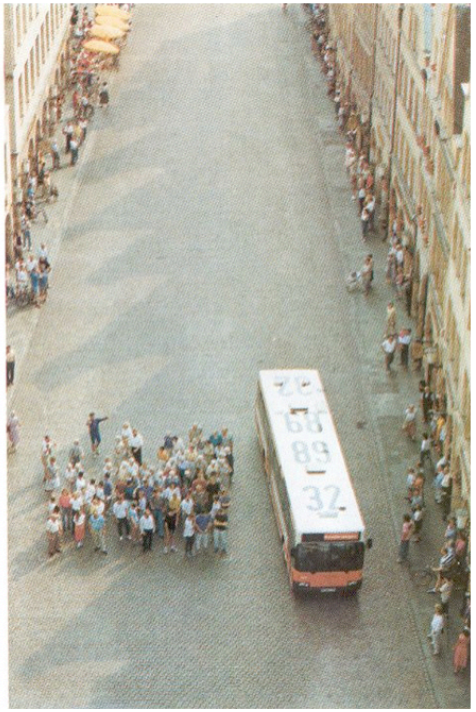
72 people
(bike)

72 people
(car)



72 people
(bus)

[Münster planning department, 1991]

Taking the argument further…

VANDERBILT

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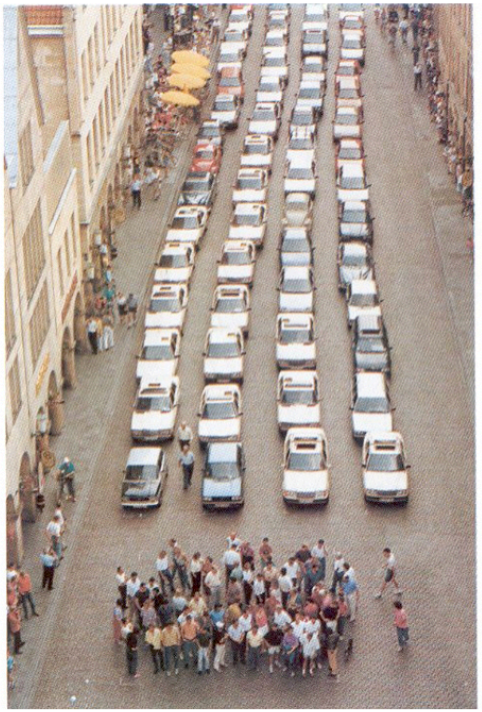
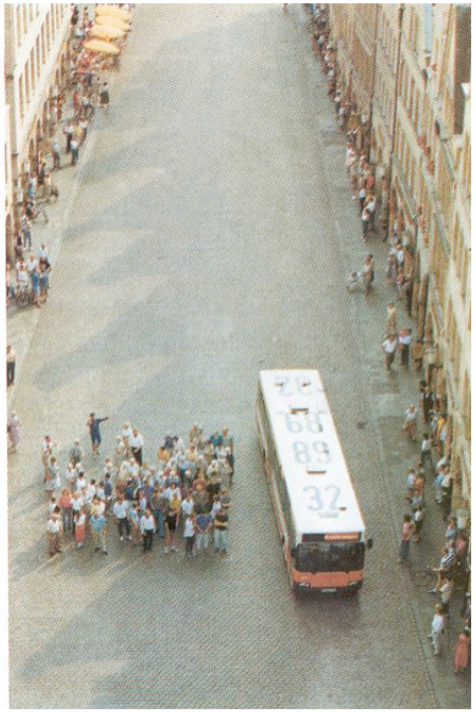


72 people
(autonomous car)



72 people
(bus)

[Münster planning department, 1991]

What to expect from a small number of autonomous vehicles (AVs)

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- A few AVs will not eliminate traffic congestion
  - As long as demand exceeds supply…

What to expect from a small number of autonomous vehicles (AVs)

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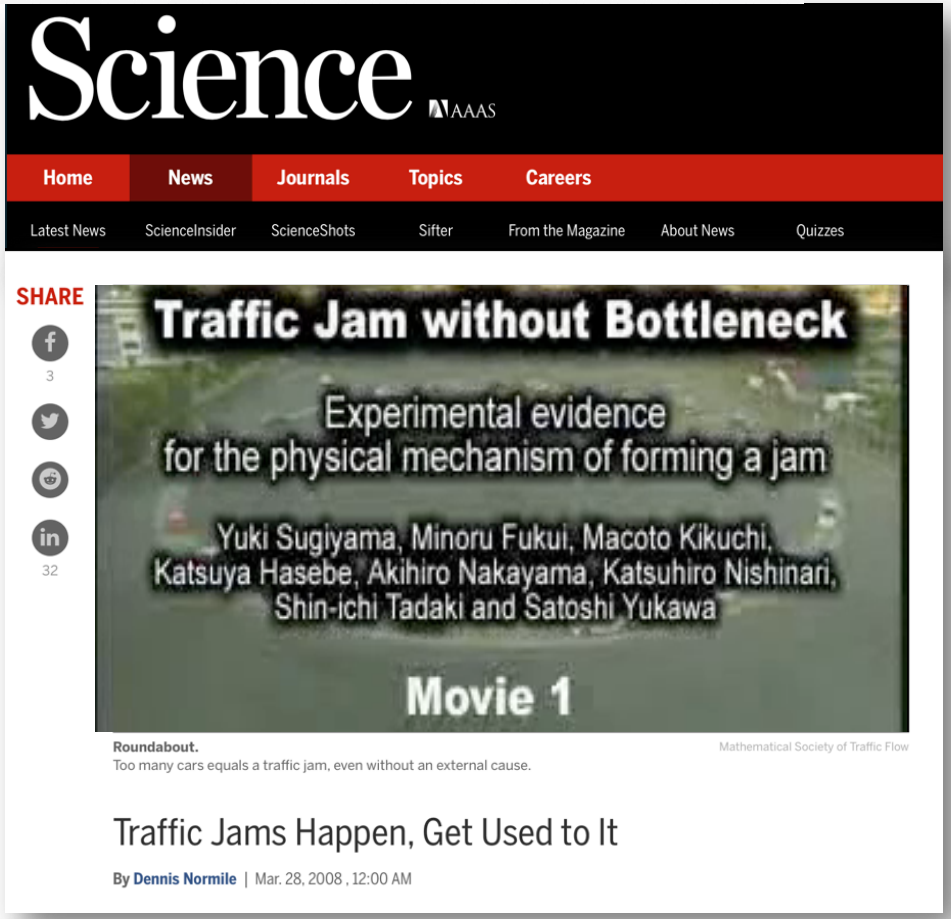
- AVs might not eliminate traffic congestion
  - As long as demand exceeds supply…
- CLAIM: A small number of automated vehicles can prevent "phantom jams" →



[Sugiyama et al. 2008]

Phantom jams occur on real roads too

[Joe Miroe (Youtube), 2017]

Dissipation of stop-and-go traffic waves via control of a single autonomous vehicle

[Stern, Cui, Delle Monache, Bhadani, Bunting, Churchill, Hamilton, Haulcy, Pohlmann, Wu, Piccoli, Seibold, Sprinkle, & Work, 2017]

Take home messages

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- Self driving cars won't solve all of our mobility problems
- But CAVs at moderate penetration rates can help smooth flow – experimentally demonstrated.
- Current autonomous vehicle systems have widely varying qualities, from a traffic perspective.