THE END OF TRAFFIC AND THE FUTURE OF ACCESS: A ROADMAP TO THE NEW TRANSPORT LANDSCAPE
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Preface: Transport is Interesting, Again

Less than two decades into the new millennium, transport is becoming interesting (again?). Such resurgence is why we initiated this book in 2015. Revolutionary technical advances are taking root; evolutionary social forces are responding; together, these phenomena are changing how people access and exchange goods. Transport and planning discussions are now being reshaped, prompting even seasoned transport professionals to appear as neophytes. Our aim with this work is straightforward: to reframe the evolving nature of debates about transport and to shape perspectives about the future of transport in cities.

Each person’s perspective is shaped by their own experiences. Both of us have sat in Minnesota car dealerships on gray and snowy April days while our so-called ‘tickets to freedom’ received their 15,000 mile\(^3\) checkup. In these times, we have each contemplated the volume of salt that the car was exposed to over the past year and incremental quantities of rust our car accrued. We are not alone in these experiences. They are familiar for those who have lived north of the US’s Mason-Dixon line. In such gloomy environs, one feels little joy associated with auto-mobility. One surprising reflection on all of this is that little has changed in these respects (or significantly improved) for as long as most people can remember.

The 1950s created the institutions and the financing tools needed to greatly expand transport infrastructure. After the onset of the US Interstate Highway System, the 1970s version of the Clean Air Act aimed to address the environmental costs of cars, and subsequent policies have had noticeable success in improving air quality. Public transport, mired in ‘crisis’ since the 1950s, received a large infusion of federal capital. Not surprisingly, transport planners in the 1980s were vexed with suburban ‘gridlock.’ They spent time chasing inexpensive strategies based on transport system and travel demand management as the roll-out of the highway network slowed.
Planning buzzwords in the 1990s focused on growth management and concurrency (between development of land and the provision of infrastructure), so that public facilities were ‘adequate.’

Proclaimed as the largest public works project in the world since the Pyramids, there are good reasons the Interstate Highway Act left many legacies. An oft unrealized impact, however, is that for the next half-century, transport centered on the themes of deployment (rolling out the highway network), and management (better operating the system). Transport planning in the Interstate Era focused on more roads here, removing bottlenecks there, better managing capacity over yonder. Innovation, technological or policy, took a back seat. So did doing anything exciting in transport.

The 1992 Highway Bill, more formally the Intermodal Surface Transportation Efficiency Act, mildly deflected the highway centric trajectory of US transport investments. Reducing the negative externalities attributed to auto use received increased attention; other modes received a boost of funding and acknowledgement. The reaction against auto-mobility gained steam with the warning whistle of rising greenhouse gas emissions and the observations of climate change. In some cities, initiatives might center less around reducing car use and more around enhancing other transport options. Either way, less changed than one would have expected given the revolution in information technologies over the same period.

But now, starting in the 2010s, growing on seeds laid earlier, rapidly transforming transport systems in communities of all sizes are experiencing creative innovation. Globally, cities are witnessing new forms of information and communication technologies coupled with new real-time data enabling new approaches to share resources. These changes are invoking fresh flows of goods and information and allow people to achieve activities in ways unavailable just a few years ago. Borrowing from Thomas Kuhn’s popular 1962 book *The Structure of Scientific Revolutions*, discussions ring of a paradigm shift. Transport practitioners are encountering anomalous new behaviors that the historically accepted paradigms have difficulty explaining.

What is certain in the future is that humans will maintain desires. Whether for stuff, skills, smarts, esteem, solace, security, salvation, spirituality, space, scenery, love, or socializing, these desires and the way they are accessed change with the times. Most desires have historically been satisfied by moving stuff while traversing distances across physical geographies. People transport themselves to collect some things; they expect other things to come to them. Moving

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4 The Intermodal Surface Transportation Efficiency Act is refreshingly abbreviated ISTEA (and pronounced Iced Tea).

5 (Kuhn 1962).
forward, there is heightened uncertainty about how they will seek to access (or possess) things they care about it. What is paramount for the transport business is to uncover ways to ease how these desires are achieved in ways that comport with goals for which cities claim to be aspiring (e.g., livability, environmental preservation, social cohesion).

In this book we first explore the welcome notion that traffic – as most people have come to know it – is ending and why. We depict a transport context in most communities where new opportunities are prompted by the collision of slow, medium, and fast moving technologies. Fast moving technologies include computers and communication technologies, especially adopted by younger travelers. With an average life span of 11 years, cars would represent medium-moving technologies. The topology of the road network itself is the slowest moving of all, having been in place for years and unlikely to change much in the future. We juxtapose other changes likely to have a near-term impact, including a range of emerging technologies, such as autonomous vehicles, electric vehicles, transit improvements, and better networking of car and cab sharing, referred to as mobility-as-a-service (MaaS).

We develop a framework to conceptualize transport and accessibility more broadly. In this framework, transport systems are being augmented with a range of information technologies.

More specifically, the first part paints a picture about the End of Traffic: data, history, and trends. We focus on what has actually happened (Chapter 1), why what is happening is a good thing (C. 2), the underlying causes (C. 3), how the inevitable conflicts between the timeframes of change keep transportation practice lagging far behind imagined transportation potential (C. 4).

The second part examines upcoming processes that are shaping the future of transport, and their consequences: Electrification (C. 5), Autonomy (C. 6), Connectivity (C. 7), Mobility-as-a-Service (C. 8), Demassification (C. 9), Dematerialization (C. 10), Delivery (C. 11). While these changes are still mostly too small have been measured in the system statistics. We have begun to see the tip of the iceberg in their transformative potential. We look at how even the laggard transit modes will be affected (C. 12). Then, we consider changes to land use (C. 13).

In the third part, the book builds to prescribe planning, finance, and design strategies for communities themselves and more specifically, those responsible for shaping the provision and use of infrastructure in such communities to embrace that better reflect changes. We prescribe new design aspects and priorities for
rights-of-way consistent with the end of traffic (C. 14). We recommend pricing strategies to accelerate the end of traffic (C. 15). These might happen, but they cannot happen without active public direction (unlike the technology changes of dematerialization, electrification, automation, sharing, and cloud commuting, which are on trajectories if not entirely independent of public policy interventions, mostly so). Our last chapter (C. 16) charts paths forward for how transport will redeem itself.

There are things that might happen on their own (with a minimal amount of public policy interference). There are things the public can make happen through directed policies. There are things the public can prevent from happening with policy. We think the culmination of results presents an optimistic perspective, though some have referred to the ideas stated herein as “refreshingly unromantic.” This scenario has causes and effects, and can be compared with a status quo scenario (where traffic neither rises nor falls much) and one where traffic resumes its once seemingly remorseless march upward. We then offer priorities to accelerate these trends. Why delay positive outcomes like the end of traffic congestion, the end of tailpipe emissions, the end of car crashes, and the end of having to pay attention while driving?

This work is far from the first book on the future of transport issues, and we hope not the last. A similar work appeared almost two decades ago by the person to whom this work is dedicated (Bill Garrison); he offered observations back then which remain on-point today, if slow to take root. The content herein derives from our personal observations of and reflections on transport practice and scholarship. The text grew largely out of David’s Transportist blog6 which he has been writing since 2006; far fewer ideas may have sprouted in Kevin’s blog, Vehicle for a Small Planet.7

Our purview admittedly has three limitations. First, most references and supporting data are United States focused. International readers may appreciate the changing dynamics, but will need to apply the concepts appropriately (easier done in Canada, Australia, New Zealand, and in many parts of Europe). Many of the trends are unfolding globally, albeit at different rates. Second, the phenomena that we describe mostly apply to urban transport systems from the developed world (sometimes referred to as the West or the Global North, though it encompasses very east and south places like Australia and New Zealand). Third, our assessment and projections for several phenomena risk being a bit cavalier in the interests of brevity and readability. This is not a journal article. We would like it to be read. Some conjectures might
be unsettling for a few people. We mitigate such ‘brushing off’ by documenting assumptions and relevant citations in the margins.

This third edition has some enhancements while still following the format of the first two. We grew tired of coming up with excuses for why we could not deliver copies to our parents or to offer you a physical, signed copy. So we are pleased to partner with the Network Design Lab and now offer a physical print edition; the first two editions were released in e-versions only. We inserted revisions throughout reflecting updates to data charts and further graphics that support many of our arguments. And, we changed the order of some text and combed other parts to ensure greater readability and streamlining of ideas. Reviews of past editions of this work appreciated the lively and personal nature of the writing. We retained this feature.

Even if transport is not your bailiwick, there is something interesting for you here. We aim for a quick read – and to encourage you to think outside your immediate realm. By the end of this book (this evening, if you so choose) you will appreciate the changing times in which you live. You will, we hope, appreciate what is new about transport discussions and how definitions of accessibility are being reframed. You will be provided with new ways to think about transport that syncs with a radically changing landscape. Even if transport is not your bailiwick, we think there is something interesting for you here because we conjecture about the places where at least two-thirds of the global population will live by 2050 and how they will satisfy their daily needs. We hope you enjoy reading our prospects.
Dateline: June 29, 2056

Today marks the 100th Anniversary of the Interstate Highway Act in the United States. Let’s reflect on how travel has changed over the past century.

Remember traffic? It was only 40 years ago that residents across the globe complained about getting stuck in traffic. Normal ‘around town’ errands were ensnared in snarled interchanges. Remember when it sometimes took three times longer to cross town than it ‘should have?’

But even back then – and largely unnoticed by the naked eye – new transport patterns were taking root. The significance of these patterns, however, failed to be realized. Car traffic leveled off in the
beginning of the century and has fallen fairly steadily ever since. A few keen observers picked this up, but many transport agencies were in denial at the time. Back then, analysts offered two possible futures:

- The first forecast that per capita vehicle travel would pick up on its upward path based on the previous century – a forecast reminiscent of the proverbial ostrich with its sand-encased head.

- A second forecast acknowledged that per capita vehicle travel remained flat, but one where overall traffic grew with population increases. Major transport providers asserted the need for new and wider roads, despite falling traffic overall. More capacity demanded new resources, requiring additional revenues. Many claimed that though private vehicle use was falling across the developed world, on average, it wasn’t falling in their jurisdiction. And, there were still unsolved problems that don’t go away just because travel isn’t increasing.

Most public officials failed to anticipate what actually happened. This third future was one where per capita vehicle travel fell significantly. Even acknowledging the initial dip in travel (at least in the US), most observers attributed it to gas prices and the Little Depression of the second Bush Presidency. What went largely unrealized was that travel began dropping before the economy tanked.

**Remember work?** Our great-grandparents (of the World War II era) went to their job six days a week, only taking off for the Sabbath, from the time when they were teenagers. And, their parents worked from childhood, which had yet to be invented. The workforce generally got a full two-day weekend in the middle of the twentieth century. Around the turn of the century, many companies started granting every-other Friday off (the 5/4 schedule). The 3-day weekend was celebrated every other week as the norm. About a decade ago, workers moved to a 9 hour day, 4 days per week at the office, and the other 4 hours were ‘at home’ work. The rise of the Internet dissolved the once strict separation of home and work. The half of the population that worked in offices could no longer leave work at the office. So they brought their personal lives into the workplace, living what sociologists call the ‘blended life.’ By 2025 taking every-other Monday off (the 4/3 schedule) was established for office-workers at most large firms. Today, half-days on Wednesdays are common for many office workers, with only Tuesdays, Wednesday, and Thursdays as interactive collaboration
days. In today’s ‘flipped’ office, people file ‘paperwork’ at home on their own computers, and only show up for collaborative work and meetings.

**Remember office buildings?** Once the heart of cities, we soon discovered high-rise office towers were overbuilt after real-time telecommunication became ubiquitous. Office buildings were reconfigured to be mostly meeting space, with some interim work spaces that became more like cafes or pubs than the cubicles satirized in the 20th century comic strip *Dilbert* and the turn-of-the-century movie *Office Space*. After the commercial real estate bubble popped in the famous Skyscraper Crash, many office buildings were torn down or adapted into living space, others remain vacant. With the daily office grind being a phenomenon of the past, work trips cratered.

**Remember the ‘American Dream’ of a house in the suburbs?** Some downtowns were virtually abandoned by business after the Skyscraper Crash. This helped undercut new residential construction in the suburbs, and suburban land prices fell, attracting lower income immigrants, who subdivided large tract mansions into housing for large extended families, and leading to a measurable ‘white-flight’ back to the center city, as former suburbanites colonized vacant and reconfigured office buildings. While the suburbs were now less expensive, some actually gained population. Lower income residents still own cars, but not as many. The traditional 2- and 3-car garage is being transformed into a workshop, living space, or small store. More urban living, much of it in abandoned and remodeled office buildings, reduced the distances people needed to travel. Many 20-somethings live in these windowless, but well-connected, skyscraper dorms, while artists have begun to occupy and see inspiration in the detritus of the late 20th century skyway network. Cities began to encourage accessory housing, and conversion of garages to apartments.

**Remember the long-term career?** On average, our parents and grand-parents stayed in the same industry (if not the same firm) from high school or college until age 65 or so. Now in 2056, half the population doesn’t enter the regular workforce until age 30. The other half leaves well before age 60. They work three different ‘full-time’ jobs over the course of a career. Individual firms used to cultivate employees, paying for training. Now a 10-year series of unpaid (or low-wage) internships while simultaneously attending
school online or part-time and engaging other pursuits is the norm. Many just receive the Universal Basic Income and have dropped out of the conventional workforce altogether. Over time, the workforce has continued its drop as technology-enabled productivity reduced the value of older workers. With fewer people working, there were fewer work trips.

Remember shopping? Physically traveling to a store used to be the norm for everything. Then came catalogs. Catalogs morphed on the Internet (remember the Amazon.com boom?). Acquiring things now is now clearly a combination of the occasional physical trip to the store (likely for nostalgia-sake or simply entertainment), letting 'bots and virtual agents do the work for you especially for regular stocks like paper towels, napkins, and Spam. And so now most goods get delivered. Going shopping continues its long 50 year drop, and consumption of material goods has declined with it.

Remember advertising? Internet Adblockers, video-on-demand, and other time-shifting technologies diminished advertising in people’s lives. Ads did not disappear, and many companies now want to coat road surfaces with new digital ad-delivery technology. Cash-strapped road agencies are looking favorably on sponsored roads. With less window shopping and a decline in advertising, the culture became less materialistic.

Remember long-distance trucking? Decentralized manufacturing, including 3-D on-demand printing, has begun to replace long-distance shipping of many goods, which can now be made locally. Teamsters used to steer the truck, which are now controlled remotely. Trucking as a profession has seen a long decline.

Remember owning a car? Nearly a century ago, owning a Pontiac Firebird (or better yet, a Corvette) meant having ‘made it,’ at least in the US. By 40 years ago it was possible for most city-dwellers to sell their cars and not replace them. By 30 years ago, it become common-place. The taxi – the ultimate in shared vehicles – was transformed from a niche mode to the mainstream. Instead of having a high cost of owning a car but a very low cost per trip, now there is a higher cost per trip, making people think twice, and use cars less. With fewer trips by car, traffic dropped even more.
**Remember the SUV?** The Sport Utility Vehicle and pickup truck were used for daily transportation by nearly half the population, though few of them transported much in the way of goods. With vehicles on-demand, when people use cars, they ride in single-passenger cars, saving money and space.

**Remember driving in downtown?** Cities began to outright ban cars within core areas. Since most residents did not own cars, this became an easy political sell. In those cities, walking, bike, scooter, and bus use soared. This affected not only residents, but anyone going to the city. Cars remain popular for trips outside of cities, but there are fewer cars, fewer car trips per resident, and relatively fewer non-city residents.

**Remember traffic lights?** Without traffic lights, we never would have managed to obtain urban auto-mobility. It was critical scaffolding for the twentieth century auto-dominated city. Today they are preserved in selected districts only for their historic authenticity, not as actual control devices. Traffic is now controlled by signals conducted invisibly through radio spectrum, rather than with colored lights designed for the human driver’s eyes, while discrete in-ground sensors detect and guide pedestrians across busy intersections. Today’s downtowns are largely car-free zones, so these new controllers are just at the edge of the urban core.

**Remember gas stations?** We used to pour liquid petroleum into the tanks of our cars, and burn gasoline for energy, creating smog and greenhouse gases as unwanted byproducts. Today all new cars and trucks are electric, and the gas guzzlers have largely been removed from the road. It will take decades for the environment and climate to recover from the more than a century of pollution.

**Remember waiting for the bus?** Most areas built before 1950 in the US (now housing roughly one-third of the US population) have seen significantly improved transit service, with real-time information about arrivals and schedules. With more urban residents and fewer cars, the demand for transit picked up. Agencies were able to run more buses with the uptick in demand, further encouraging bus use, and now bus-powered urban transit agencies (some of which have a few legacy rail lines) are one of the few profitable branches of government. New autonomous buses powered by now widespread renewable energy have lowered costs. Transit organizations now see ridership levels they last saw in the
1940s. Buses in the suburbs were canceled though.

**Remember seeing the highway?** Without the urban interstate, today’s cities would look much different. For freight, we are now in a world with self-driving delivery vehicles and aerial drones that our parents scoffed at. *Through* traffic could always avoid the central city, *to* traffic can be carried on surface streets as needed. Vehicles are considered a nuisance when they are seen or heard, even when they are safe and clean. Today’s freeways have been rebuilt as high-capacity tunnels, carrying not-only driverless but especially passenger-less vehicles. Construction of course was costly (and disruptive), but with advances in robotic tunneling technology, further automation, and the right economic model, this was justified in cities across the world.

**Remember parking your car?** We eliminated most urban parking lots and garages, both because cars can drive farther away to park, and because shared vehicles can be in motion for much more of the day. Urban space is too valuable to let it be used by idle cars. Cars now drop you off near your destination and go on their way.

**Remember free roads (and free parking)?** Strangely, we didn’t used to charge for the use of roads, or for parking cars, and then complained when roads were congested and people spent minutes cruising around blocks looking for spaces to park their cars. In the early 2020s, the two-decade long decline in Gas Tax revenue due both to declining demand and increasing electrification of the fleet finally enabled the push for mileage fees. With the New Rationalism movement, economists implemented their most cherished idea, and most radical change on society: charging for roads. First it was implemented for the new electric vehicles, which didn’t pay gasoline taxes, but then for all cars after EVs came to dominate. By 2025 the government enacted a number of reforms to get the federal government out of local transportation, and encourage states to toll their highways. While gas taxes were eliminated, refinery taxes were implemented. The government also put in place carbon and other externality taxes to replace income taxes. More importantly, agencies implemented off-peak discounts, with higher peak prices. Trips that were not urgent at rush hour on Tuesday, Wednesday, and especially the very busy Thursday afternoon in the summertime turned out not to be particularly urgent at all, and total travel dropped more. These pricing reforms finally drove the knife into the heart of traffic congestion. While
there was grumbling, and a few riots, almost everyone valued their own time more than they realized.

Looking forward, transport academics at the University of Sydney’s new Boulder campus foresee that new light-weight robo-copters will make roads and tunnels obsolete, and people will just take off vertically from their driveway or roof, and go anywhere they want. With newly-low cost housing conveniently available in rural areas, maybe living in cities loses some allure, and travel will rise rapidly again.

But no one thinks congestion is coming back; life is too short to waste sitting in traffic.
Part I

History
1

Climbing Mount Auto: The Rise of Cars in the 20th Century

Figure 1.1: Ford Model T. Source: Wikipedia.

In the early 20th century, automobile commuters brushed elbows along cluttered streetscapes with meandering pedestrians, righteous wagon drivers, streaming electric streetcars, and antagonistic horsemen. Rutted roads of gravel and dirt posed other challenges. Amidst this chaos, a new prospect was viewed from afar. Spurred by technological innovation, this new vision invoked a radical process to restructure streets, cities, and society.

Governments, consumers, and auto-makers sighted prospects of a
In 1924, a Chevrolet cost $525. (History 2017) Today a Malibu is about $20,000. Similarly the wage in 1924 was $0.56/hour (Wolman 1930) for a manufacturing worker, and today is $19.70/hour. (Trading Economics 2017) So the number of hours to buy a car has gone from 937 to 1015 (or essentially remained flat). Of course the Chevy today is much better and more reliable; and many more people have higher incomes than manufacturing workers, so more people could afford cars, and so did.

1 These brief slow downs in the inexorable rise in vehicle travel are usually attributed to the oil supply and price shocks in 1973-4 (Yom Kippur War), 1979-1981 (Iranian Revolution), early 1990s (Gulf War), and early 2000s (9/11).

peak in the distance. Atop it supposedly contained wealth, freedom, happiness, and everything in between.

Henry Ford began rolling a Model T off the assembly line in 1908 in the US. By 1911 one was produced every fifteen-minutes; 1923 saw one every 15 seconds (off of multiple assembly lines). Mass automobility spawned new strategies to reach that peak. The commoner could now acquire a car with four months of work. From the 1920s onward, the automobile was increasingly the dominant mode of travel in the US.

While the Great Depression slowed the auto’s growth, it did not result in decline. Despite the brief downturn during World War II and a few hiccups here and there, the pursuit to climb this uncharted territory was resolute. More than a dozen US Housing Acts spread over the 1930s, 40s, and 50s made it easier than ever to buy the pristine suburban home. General Dwight Eisenhower, while serving as Supreme Commander during World War II, witnessed the Autobahn in Germany. Recalling his earlier military convoys across the nascent American highway system after World War I, he recognized the military value of limited access highways. President Dwight Eisenhower helped marshal resources for the US to build a comparable system to that in Germany. The Interstate Highway bill had been mired in Congress for nearly a decade, stuck in debates about how to pay for it, much like his convoy had been mired on the dirt roads and collapsing bridges of post-World War I America. Coupled with policies in 1949 to stimulate ‘urban redevelopment,’ later broadened in 1954 to ‘urban renewal,’ monumental changes took root in cities. For Americans, this new roadscape meant accumulating more travel by car than other modes, or than anywhere else in the world.

Tectonic forces reinforced a continued march up what became Mount Auto. These forces include increases in:

Population. As there were more people, there was more collective daily travel to everyday destinations like work, school, and the store.²

Workforce participation. More women started working outside the home.

Income. With money, people can satisfy wants in addition to needs, and the means by which that income is acquired (work) required more travel as well.

Auto mass production. Ford’s process spread widely, thereby

² The population of prime working age peaked around 2000.
dropping the relative price of auto-mobility.

Developed area. Urban renewal gutted blighted and working neighborhoods alike. Metropolitan areas accommodated the automobile, new residential lots (and the houses sitting on them) got bigger. So did shops and offices – all of which were surrounded with parking lots.

Road networks. Roads better accommodated the car by getting wider, sparser, and more tree-like; new limited access freeways were constructed. Cars, and improved transport generally, made it easier for more people to reach more places in less time. By extending one’s reach, meant more choices, more specialization, more division of labor and more economic activity. Faster travel and more direct routes are half of this. Where people locate relative to the places they want to go is the other half.

With more people attaining automobility, increasing distances (to attain larger lots and bigger buildings for less money) were compensated by faster speeds. So destinations became less convenient for the carless – the farther things are spread out, the less effective is walking or public transit – and thus making cars even more valuable. The growth in infrastructure supply fed the growth in demand; the ascent to the summit of Mount Auto was relentless.


By expanding capacity (i.e., building a road), much, though rarely all, of the additional capacity gets used in the short term by people switching routes, modes, and time of travel. Longer term impacts (i.e., development or behavior change) further reinforce the phenomenon.

The race to the summit of Mount Auto in the US persisted for almost a century owing the supposed ‘joys of automobility.’ But more recently – since the mid 2000s – climbers have been ambling around atop this peak of Mount Auto, asking ‘now what?’

Clouds have obscured their vision for years. Reports from the Department of Transportation, at least in the US, say they are losing elevation.

Figure 1.2 reveals that vehicle travel per person dipped for most of the 2000s and the early 2010s (total vehicle travel has dipped too, but not as severely owing to population gains). Per-capita vehicle travel is roughly where it was in the late 1990s and total vehicle travel

3 Mumford’s 1955 essay called: “Renewed Circulation, Renewed Life” can be found in the book The Roaring Traffic’s Boom (Mumford 1955). This title referred to Mitchell and Rapkin’s Urban Traffic: A Function of Land Use (Mitchell and Rapkin 1954). The more formal name for the Iron Law of Congestion or Triple Convergence is now ‘Induced’ or ‘Latent Demand.’ The use of these terms has become politicized. ‘Induced’ demand implicitly blames the freeway for more congestion. ‘Latent’ implies the demand was always there, and is now able to be realized. In any case, the whole concept is obvious from a micro-economics perspective. Both phenomena simply move the supply curve down and to the right on a downward sloping demand curve. Traffic engineers typically assume that new infrastructure does not change the demand for which they are designing. Sometimes the discussion is broadened a bit and goes by the ‘Cycle of Auto Dependence.’ All underscore the same thing. See: (Levinson and Krizek 2007) for a textbook explanation.


5 While the ‘Iron Law of Congestion’ (induced demand) implies that supply creates its own demand, this is true only to a point, while demand is growing faster than supply can accommodate it. If demand were not supply constrained, as in many rural areas where roads are well-below capacity, there is no induced demand. If demand is falling for other reasons, even if supply is rising, induced demand stumbles. And once maturity has set in and all the low-hanging fruit (high-benefit, low-cost projects) have been picked, the net cost of projects rises, fewer and fewer roads get built.

6 Mel Webber wrote a paper “The Joys of Automobility” (Webber 1992) in (Wachs and Crawford 1992) that argued that people rationally preferred the auto because of its flexibility and efficiency.
Figure 1.2: Climbing Mount Auto. The graph shows both linked and unlinked transit trips, as the way transit trips are counted has changed, and there is no continuous series of both over the entire period. Source: (US Census Bureau 1992; Highway Statistics 2016).

Figure 1.3: Roadways per capita in the United States (m) 1960-2013. Source: Based on (US Bureau of Transportation Statistics 2016).

only surpassed the 2007 peak in 2014 even with steadily increasing population. Context helps put the significance in perspective. These trends follow 90 years of steady, almost uniform increases in the amount of automobile traffic. Barring a few exceptions owing to war, economic downturns, or energy shocks, vehicle travel increased almost every year in the US for the entire twentieth century.

When humans ascend new peaks, it is a celebrated event. For example, during the writing of the first edition of this work, the rock climbing world was in awe witnessing the determination of two individuals, in January of 2015, who became the first ever to free climb the entire Dawn Wall in Yosemite National Park in the US. Has the true peak of Mount Auto been discovered? Is the decline in car use permanent? Should it be celebrated?

Some transport analysts suggest the peak is similar to what

\footnote{Bisharat 2015}
happened to fixed route transit service in the US (which is now well below one-fifth of its previous importance as described in Chapter 12). Others claim it is a brief hiatus from the steady march of increasing per capita vehicle travel that followed the same drumbeat almost continuously from 1910 to 2000. Some call the recent patterns of vehicle travel ‘trendlets.’ But what has gone largely unrealized was that travel began dropping before the economy tanked.

History will be the ultimate arbiter. However, this much is clear: evidence for ‘Peak Travel’ has been mounting. This does not mean there will never be a year in which car travel again rises (It rose overall and on a per capita basis in 2014-2016, for instance, years with an expanding economy and falling fuel prices). As Figures 1.3 and 1.4 show, car ownership per capita, and paved roads per capita are also down.

What about other dimensions of what has historically been called travel? The best source for reliable, recent, and aggregate statistics in this regard for the US comes in the form of the American Time Use Survey. This data source, starting in 2003 and for every year thereafter, tallies the amount of time Americans spend in various activities, including travel for ten different purposes as shown in Figure 1.5. For a full decade’s worth of data, it draws the same sketch. The amount of time spent in travel has declined six minutes – from 74.4 minutes to 68.4 minutes per day.

And as shown in Figure 1.6, at a more disaggregate level, persons born in the most recent cohorts are traveling shorter distances than people born earlier at the same point in their life. Similarly persons born in the most recent cohorts make fewer trips than persons born in earlier decades at the same age. We are not talking just about Millennials; this is true of Generation X as well.

Almost all things appear to be going down. Little is going up.
Data are suggesting that many people are driving less and ironically, Americans are leading the charge in this respect. In the absence of further external events (economic, technological, demographic, or social), the curve appears to have peaked, or at least plateaued.

Does auto-mobility indicate progress? Some economists point to high historic correlations between auto use and economic growth (Gross Domestic Product (GDP)) to argue that a drop in one affects the other. Few people support declining GDP. The transport industry (car-makers, road-builders, service operators) has long insisted that “What is good for General Motors is good for America.” In short, more is better: more cars, roads, and shipments are all better. On a personal level, many people see less auto-mobility as a threat to their personal quality of life – automobility provides most people with freedom and value – the ability to engage in daily activities at less time or out-of-pocket cost than current alternatives.

These arguments are short lived, however. Those in the transport industry are being slowly (and rudely) awakened from their dogmatic slumber by innovations from outside the sector. There is good reason to celebrate the discovery of the summit of Mount Auto. Not only can the climbers get onto more productive endeavors, but less traffic is good thing. Economies are changing. The old standby argument that society requires mobility to fuel economic growth is being undermined. The longtime correlation between GDP and distance traveled has broken. In fact, it would

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9 More precisely, Charles Erwin Wilson, in confirmation hearings to be Secretary of Defense, said:

“For years I thought that what was good for our country was good for General Motors, and vice versa. The difference did not exist. Our company is too big. It goes with the welfare of the country. Our contribution to the nation is considerable.”

10 (McMullen and Eckstein 2012; Badger 2015).
be quite depressing if it were otherwise, indicating that society cannot make the economy more energy-efficient or time-efficient.

**New transport patterns are taking root.** If only there were a single possible significant technological or social shift, these changes might be predictable. But most societies, at least most those who have been industrialized for some time, are currently dealing with several – and simultaneous – shifts in play. Perched from the vantage near the Peak of Mount Auto, both technological and social forces clouding a view of a prospective Mount Next.

**There is a convincing signal that driving, travel, and technology are behaving differently.** Technology has devastated many industries. Remember, back in the day, when print newspapers, travel agents, post offices, record albums, paper books,
land-line phones, and broadcast television mattered? We do not claim that technology is devastating travel in exactly the same way. Quoting Mark Twain, “History doesn’t repeat itself, but it does rhyme.”

Rather, technology is restructuring transportation in ways different from the past. There is always more to the story. In the end, traffic – and the automobile regime – as most have come to know and both love and hate it, are both demonstrating considerable signs of instability. A death may be coming. Just as cars rose to greatness in 20th Century America, it appears as if they are now experiencing wounds from several daggers.
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