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What are the Risks of AVs in Cities? History Offers Clues

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If history is a guide, the implementation of automated vehicles (AVs) will reshape our cities in ways large and small. Railroads created dense, compact cities, while the emergence of automobiles encouraged low-density, horizontal development. Transportation technology has long inspired social, economic, and cultural developments in cities. What will be the effects of AVs on urban areas?

Too much is unknown to make reliable predictions about AVs' specific effects on cities. Most experts expect autonomous technology to reduce crash deaths, but they agree on little beyond that. Some predict AVs will reduce traffic and emissions; others insist AVs will increase them. Some forecast AVs to encourage compact, sustainable urban development, while others argue they will unleash a wave of environmentally destructive sprawl. Much remains in flux, as suggested by the ever-growing list of acronyms for new variations of the vehicles: FAVs, SAVs, CAVs, HAVs, CASEs, SAEVs, and so on.[1]

But cities are paying attention and beginning to plan for the new technology. In August, Chicago announced a new mobility task force chaired by former US Secretary of Transportation Ray LaHood, the largest city yet to convene a body to approach emergent transportation technologies.[2] Continued business investment has quickened the pace of technological advance, and many cities predict the vehicles will become a regular feature of their streets within a decade.

As policymakers strategize about the future of mobility in cities, they would be well served to look to the past. History can guide cities to ask the right questions about the promise and peril of new mobility technology. Parallels abound between today and the turn of the twentieth century, just before cars began pouring onto US city streets, and Chicago's new mobility task force harkens to an older planning effort – the 1909 *Plan of Chicago* – which was itself profoundly affected by new

transportation technology. That cars did so much not just to disrupt the *Plan*, but also to remake the idea of the street itself, shows the unexpected consequences new transportation can have for cities. The lesson for cities is clear: they must approach new transportation, whether automobiles or AVs, in a proactive and holistic fashion.

The *Plan*: From Chaos to Order

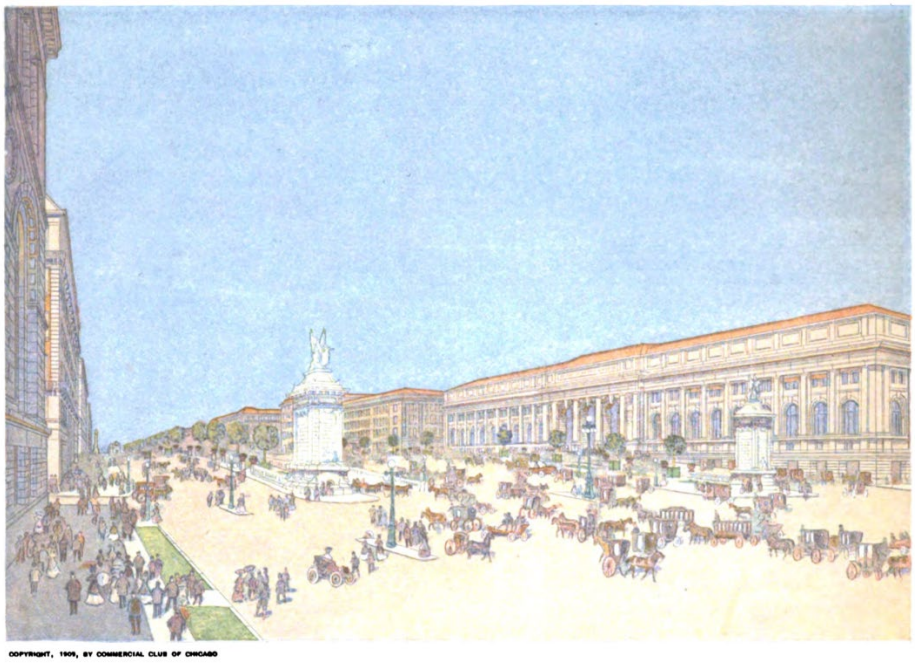
The *Plan of Chicago*, authored by famed architect Daniel Burnham and his assistant Edward Bennett, was the most celebrated civic effort of its day and the first comprehensive city plan that addressed nearly every aspect of urban life. Commissioned by the powerful Commercial Club of Chicago and endorsed by the city government, it proposed to transform the chaotic city into a beautified commercial metropolis. Burnham and Bennett championed a lake front park system, an expansive system of outlying forest preserves, new transportation facilities, and a massive civic center, among many other projects.[3]

Burnham and Bennett devoted special effort to revamping the street system. Chicago's streets, like most cities', were synonymous with chaos. Rapid, unregulated growth created a traffic crisis magnified by the confusion of the street itself. Streets lacked signage, stoplights, or crosswalks. They hosted a range of uses, from travel to hawking goods to play for children. People moved according to custom, not law or signage, and they often ignored the basic rule of street use – keep to the right. Pedestrians stood for streetcars in the center of the roadway, crossing wherever they found an opening. Drivers of horse-drawn vehicles loaded and unloaded cargo wherever convenient, blocking others in the process. Horses also died in the streets – about 5,000 in 1909 alone – which further snarled traffic until the Bureau of Streets removed the carcasses.[4]

Randolph and Dearborn, c. 1909

Burnham and Bennett's street plan sought to bring order to this chaos. The planners envisioned streets as a functional public space, simultaneously useful and beautiful. They would move traffic far better than any previous street scheme, but they would also serve as vital, beautified, and ordered places for residents of the disorderly city. In the planners' eyes, it was an idea broad and ambitious enough to benefit all. Manufacturers and shippers would benefit from improved circulation; landowners would benefit from improved land values; and all residents, in the *Plan*'s formulation, would benefit from uplifting surroundings.

The *Plan*'s proposed street system followed a division of labor. What Burnham and Bennett designated as "boulevards" were a statement of civic beauty, lined with landscaped vegetation and monuments. "Avenues" were to be traffic arteries, whisking people, streetcars, and commercial traffic through the city with efficiency. But because the planners viewed both classes as a form of public space, each was to be useful *and* beautiful regardless of designation. Michigan Avenue (a boulevard, despite its name) would be the most landscaped street in the entire *Plan*, yet would also carry the most traffic. Congress Street, an avenue, would be a traffic artery yet serve as the street grid's axis of north-south symmetry. Burnham and Bennett regarded this as a crucial aesthetic feature, as they believed such elements would encourage moral behavior and respect for civic institutions. Neglecting symmetry in the street grid, they wrote, would be "a crime against good taste that could never be atoned for." The *Plan* embraced a holistic view, treating streets as spaces with many more functions than moving traffic.[5]



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CXV. CHICAGO. PROPOSED BOULEVARD ON MICHIGAN AVENUE; VIEW LOOKING NORTH FROM A POINT EAST OF THE PUBLIC LIBRARY. ALSO DEVELOPMENT OF THE PROPERTY EAST OF BEAUBIEN COURT, IN WHICH A RAILWAY STATION MIGHT BE INCORPORATED.

The proposed Michigan Avenue boulevard.

The public embraced Burnham and Bennett's visionary proposals, and within months of publication, the city-chartered Chicago Plan Commission (CPC) was successfully lobbying the city council to implement its proposals. In just ten years after the *Plan*'s

publication, the CPC pushed through a striking number of big projects: Michigan Avenue, Wacker Drive, and other street projects along with the lake front park system, the Cook County Forest Preserves, and a host of other proposals.[6]

The Traffic Crisis

But this pattern of success came to an abrupt halt around 1920. The CPC faced an unanticipated challenge: huge, growing numbers of cars on city streets. Burnham and Bennett had in fact considered the emergent technology when authoring the *Plan*, but they concluded cars' main effects would be "in promoting good roads and reviving the roadside inn as a place of rest and refreshment." The situation in 1920 made clear they had underestimated its impact. Chicagoans owned 90,000 cars that year, and by 1924 more than 1,000 new vehicles were coming onto the city's streets each week. Use patterns changed, too: rather than so-called "pleasure driving," car owners began commuting in the vehicles, stressing the street system at its most crowded times. The *Tribune* noted the unintended consequences of building a wide, tranquil, Burnhamesque boulevard, which had now become "a thoroughfare of traffic, almost as noisy as a railroad right of way." Only ten years after the *Plan*, a new traffic crisis was eclipsing the chaos of turn-of-the-century city streets.[7]

The automobile crisis upended the work of the Chicago Plan Commission. In contrast to Burnham and Bennett's holistic vision of streets, the CPC began to focus on the limited task of moving cars. Even some efficiency-minded observers at the time noted this made for unsound policy. A 1923 study determined that streetcars carried three quarters of passengers but generated only ten percent of street traffic. Transit improvements would solve the crisis far better than cars.[8]

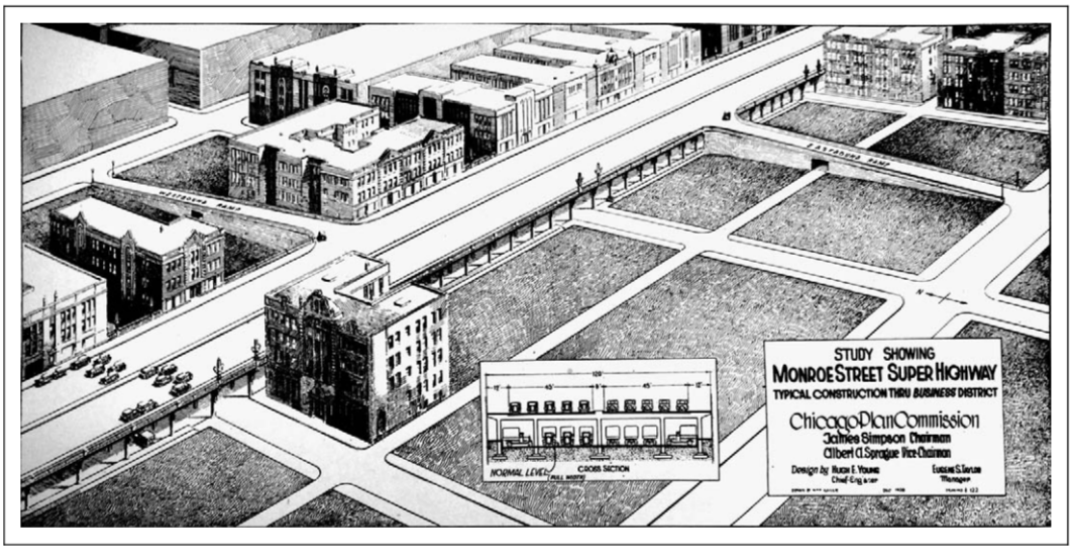
The Collapse of the *Plan*

Nevertheless, the CPC deepened its focus on automobile traffic to the detriment of its other work. It effectively abandoned its mandate to promote the 1909 *Plan*. In 1921, it endorsed 100 proposals, of which 96 were street projects. By 1928, it had created four new "special committees," each devoted to a different aspect of street improvements. It generated new plans which explicitly rejected Burnham and Bennett's idea of streets as public space. Landscaped boulevards, a Burnham hallmark, were scrapped. Projects the CPC championed in the teens were now built with striking alterations. After renovations, Michigan Avenue, one of the *Plan*'s aesthetic showstoppers, lacked the landscaped medians and park-like atmosphere Burnham proposed. Instead it appeared as a wide swath of unadorned asphalt, quickly becoming one of the city's major automobile arteries. On one segment, city officials even removed fourteen feet of sidewalk to create two new "auto lanes."[9]

Michigan Avenue, c. 1925

The CPC's embrace of a narrow focus on accommodating car traffic reflected a broader change in the uses of city streets. Automobile congestion inspired Chicago's Yellow Cab Company to install the first system of automatic traffic signals in 1923, an improvement which, although popular, reshaped traffic flow for the benefit of motorists. Pedestrians were granted a short amount of time to cross streets – only at corners, never mid-block – while the roadway itself became the domain of cars. The concept of "jaywalking," meant to denote crossing a street mid-block, also appeared at this time, further elevating the car as the owner of the street. Such ideas had confronted resistance in the early teens, but found wide support by the 1920s, chipping away at Burnham's notion of streets as a broadly useful and uplifting public space.[10]

This changing vision did not go uncontested. In 1929, Burnham's co-author Edward Bennett denounced the CPC's plan to build a starkly utilitarian "superhighway" just south of the proposed Congress Street avenue—ruining the *Plan*'s central axis of symmetry. (That highway was never built.) After a protracted spat, covered breathlessly by local newspapers, the CPC fired Bennett, thus symbolizing the death of the *Plan*'s vision for streets as public space.[11]



The Monroe Street Superhighway, object of Edward Bennett's ire. Designed by Hugh Young. Source: West Side Superhighways, 52.

Building a Better City

In streets, Daniel Burnham and Edward Bennett found a tool in creating a more prosperous, humane, and functional city. But after the emergence of the automobile, the guiding question for planners shifted, dominated by the problem at hand. How could they make automobile travel through Chicago easier? Narrow questions bred narrow solutions. The result was their abandonment of Burnham's vision, both for streets and the *Plan* as a whole.

Their commitment to serving cars above all laid the intellectual groundwork for the extravagant auto-centric planning disasters of the post-World War II era, culminating in the urban freeways that destroyed and divided neighborhoods on an epidemic scale.

Transportation technology – whether automobiles or autonomous vehicles – cannot be an end in itself. New technology exists within a rich urban fabric of people, places, and ideas, each of which it might alter in different and unanticipated ways.

But evidence suggests policymakers have yet to seriously consider the potentially transformative effects of AVs on city life. Nearly all regulatory measures taken by the state and federal governments so far have focused on easing the deployment of automated driving systems—making the vehicles street legal, for example, or pre-empting the right of local government to prohibit them.[12] These measures serve useful purposes in easing the path to implementing the technology, but they also highlight the scant attention being paid to cities and their people. Rather than try to manipulate the technology to achieve greater ends, policymakers have again focused on accommodating it.

These shortcomings stand in contrast to some notable encouraging signs. In March, Oregon established an autonomous vehicle task force with the mandate to study potential long-term effects of AVs on land use, street design, transit, and workforce changes, among other considerations.[13] The members of Chicago's task force

includes a broad range of advisors, not just business, legal, and technology sector representatives but also land-use experts and advocates for pedestrians and cyclists.[14] Perhaps the most intentional of them all is the National Association of City Transportation Officials' *Blueprint for Autonomous Urbanism*, a guide to so-called "people-centric design" which uses the disruption of AVs to put forward a new conception of the street which promotes transit, pedestrian facilities, and revives the notion of the street as public space.[15]

Will AVs change our cities? Most likely yes. But whether they enrich urban life or detract from it will depend on whether leaders can integrate the vehicles into a larger vision for a more livable city. Already, policymakers have something that Burnham, Bennett, and the Chicago Plan Commission did not: the benefit of their historical example.

City leaders should consider the following recommendations to achieve their long-term goals in addressing the rise of autonomous vehicles:

1. *Cities must empower bodies to study the opportunities and risks of autonomous vehicles in holistic fashion.* Task forces should include a broad range of members, particularly those representing pedestrians, cyclists, and mass transit users. Among their areas of focus, they must have a mandate to study the potential effects of AVs on city life.

2. *Cities must recognize that AVs will not solve their problems.* Unless properly managed and planned for, AVs are likely to worsen traffic congestion and increase dependence on cars. Traditional transit options will always be orders of magnitude more space and energy efficient than single-occupancy AVs.

3. *Cities should consider the guidance of the National Association of City Transportation Officials in redesigning streets for autonomous vehicles.* The potential disruption of AVs creates a once-in-a-lifetime opportunity to remake streets oriented towards people rather than cars. Better transit infrastructure and pedestrian facilities can markedly improve quality of life and traffic efficiency.

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[1] Rhoda Miel, "CASE, ACES, or SAEV: What will we call electric, shared, self-driving cars?" *Automotive News* 7/31/2018, http://www.autonews.com/article/20180731/MOBILITY/180739890/autonomous-electric-shared-acronym (Accessed 10/15/2018). A sampling of the diverse acronyms can be found in the following pieces: Robin Chase, "Will a World of Driverless Cars be Heaven or Hell?" *CityLab* 4/3/2014 (Accessed 10/15/2018); https://www.citylab.com/transportation/2014/04/will-world-driverless-cars-be-heaven-or-hell/8784/; First Transit, "Shared Autonomous Vehicle (SAV) Mobility Solutions," http://www.firsttransit.com/services/shared-autonomous-vehicle-(sav) (Accessed 10/15/2018); Purdue University Discovery Park, "Connected and Autonomous Vehicles," https://www.purdue.edu/discoverypark/cav/ (Accessed 10/15/2018); Inrix, "Inrix AV Road Rules," http://inrix.com/products/highly-automated-vehicles/ (Accessed 10/15/2018).

[2] Mary Wisniewski, "Former U.S. Transportation Secretary Ray LaHood to Chair New City Transportation Task Force," *Chicago Tribune*, 8/31/2018. https://www.chicagotribune.com/news/local/breaking/ct-biz-lahood-transportation-task-force-20180831-story.html (accessed 11/2/2018).

[3] Daniel H. Burnham assisted by Edward H. Bennett, *Plan of Chicago* (Chicago: Commercial Club, 1909); Carl Smith, *The Plan of Chicago: Daniel Burnham and the Remaking of the American City* (Chicago: University of Chicago Press, 2006).

[4]Peter D. Norton, *Fighting Traffic: The Dawn of the Motor Age in the American City* (Cambridge: MIT Press, 2008), 47-8, 135-8; Paul Barrett, *The Automobile and Urban Transit: The Formation of Public Policy in Chicago* (Philadelphia: Temple University Press, 1983), 46-56; Samuel Kling, "Wide Boulevards, Narrow Visions: Burnham's Street System and the Chicago Plan Commission, 1909-1930," *Journal of Planning History* 12.3 (August 2013): 245-268; 1909 Annual Report, Chicago Department of Public Works, 236.

[5] *Plan*, 82-87. Quote comes from p. 114.

[6] Smith, 117-120.

[7] *Plan*, 42; Kling, 255; Eugene S. Taylor, "The Plan of Chicago in 1924, With Special Reference to Traffic Problems and How They Are Being Met," *Annals of the American Academy of Political and Social Science* 116 (November 1924): 224-7; "The Changing City," Chicago *Tribune* 5/17/1921.

[8] Barrett, 134.

[9] *A List of Suggested New Projects and Improvements in the Making* (Chicago: Chicago Plan Commission, 1921. Held by the Chicago History Museum, Papers of the Chicago Plan Commission, box labeled "Miscellaneous pamphlets, papers, outlines, etc."; Chicago Plan Commission *Executive Committee Proceedings*, 3/9/1928, 1371-4; Chicago *Tribune*, 12/3/1922.

[10] Norton, 65-104, 134-8; Barrett, 134-5.

[11] Eugene S. Taylor and Hugh E. Young, *West Side Superhighways* (Chicago: Chicago Plan Commission, 1929), 15; Edward H. Bennett and Harry Frost, *The Axis of Chicago* (Chicago: Chicago Plan Commission: 1929); Kling, 262.

[12] National Highway Transportation Safety Administration, "A Vision for Safety 2.0," 2017 report. https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/13069a-ads2.0_090617_v9a_tag.pdf (accessed 10/15/2018); National Conference of State Legislatures. "Autonomous Vehicles/Self-Driving Vehicles Enacted Legislation," 10/18/2018. http://www.ncsl.org/research/transportation/autonomous-vehicles-self-driving-vehicles-enacted-legislation.aspx (accessed 11/2/2018).

[13] Oregon Legislative Assembly. House Bill 4063. Signed 4/10/2018. https://olis.leg.state.or.us/liz/2018R1/Downloads/MeasureDocument/HB4063 (Accessed 10/15/2018).

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[15] National Association of City Transportation Officials. *Blueprint for Autonomous Urbanism*. https://nacto.org/publication/bau/blueprint-for-autonomous-urbanism/ (accessed 10/15/2018).