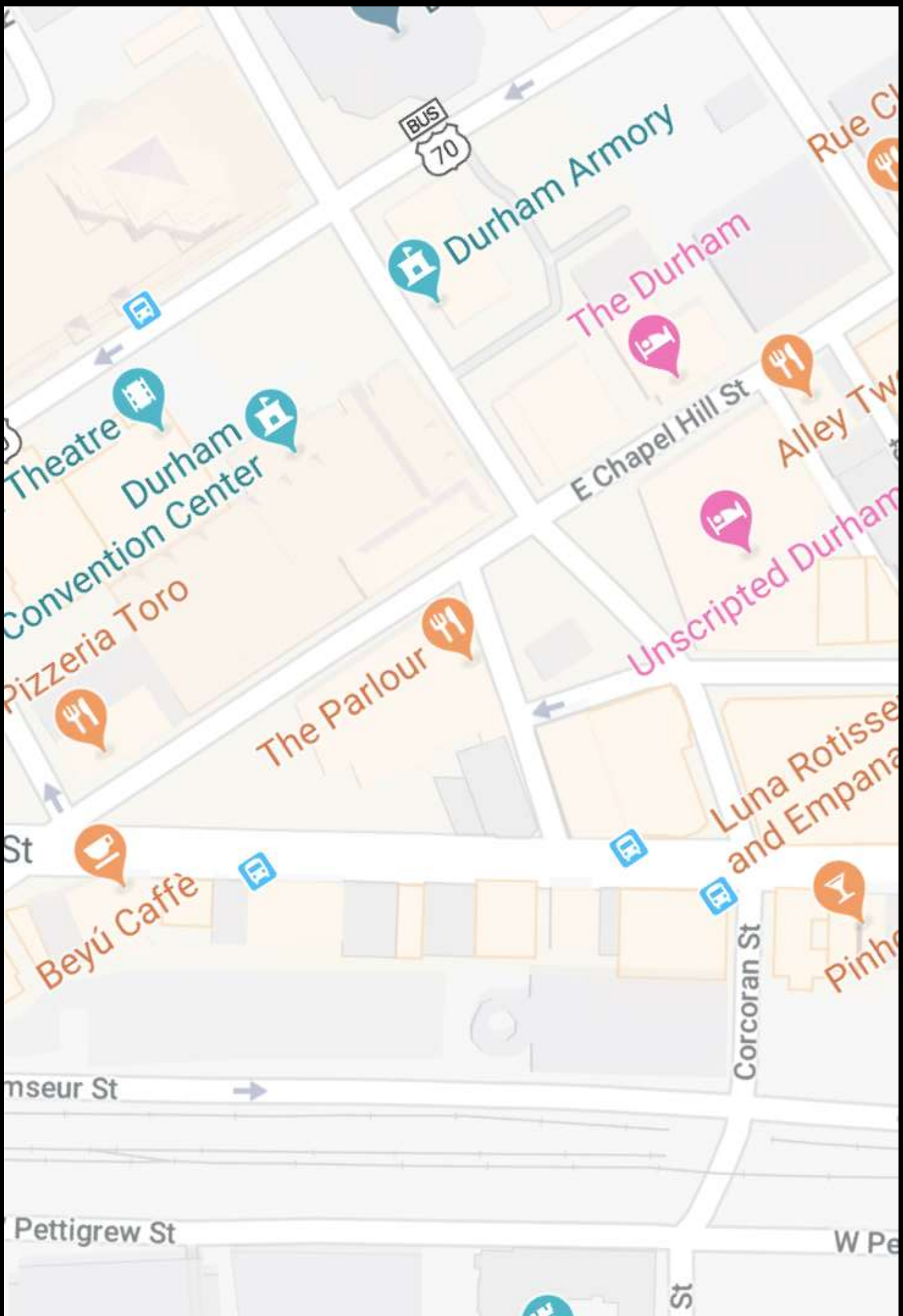
FUTURAMA 3

Selling techno-utopian mobility to save car dependency

Peter Norton
Department of Engineering and Society
University of Virginia

Durham
April 24, 2019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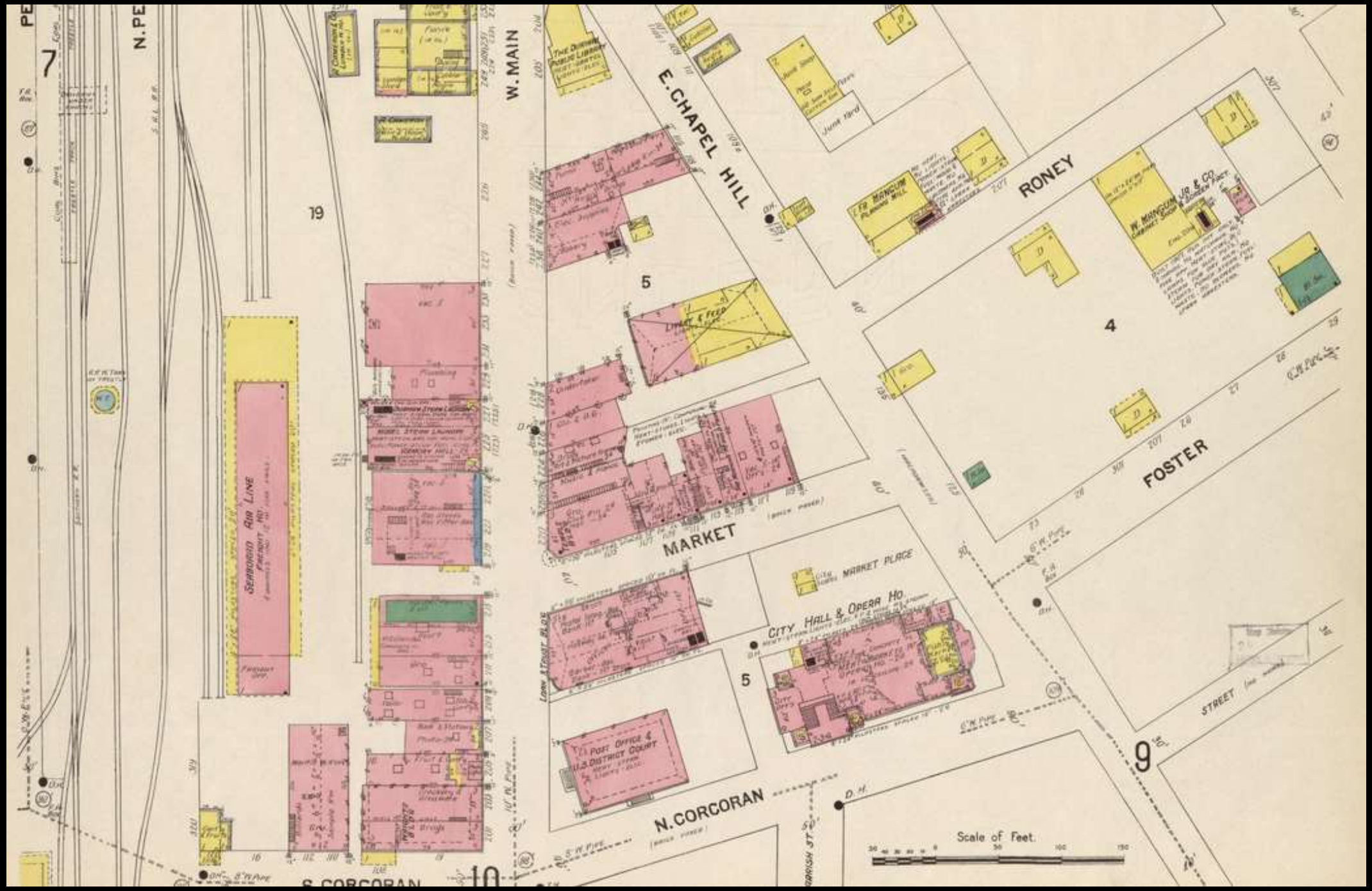
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City Hall & Opera Ho.
Post Office & U.S. District Court
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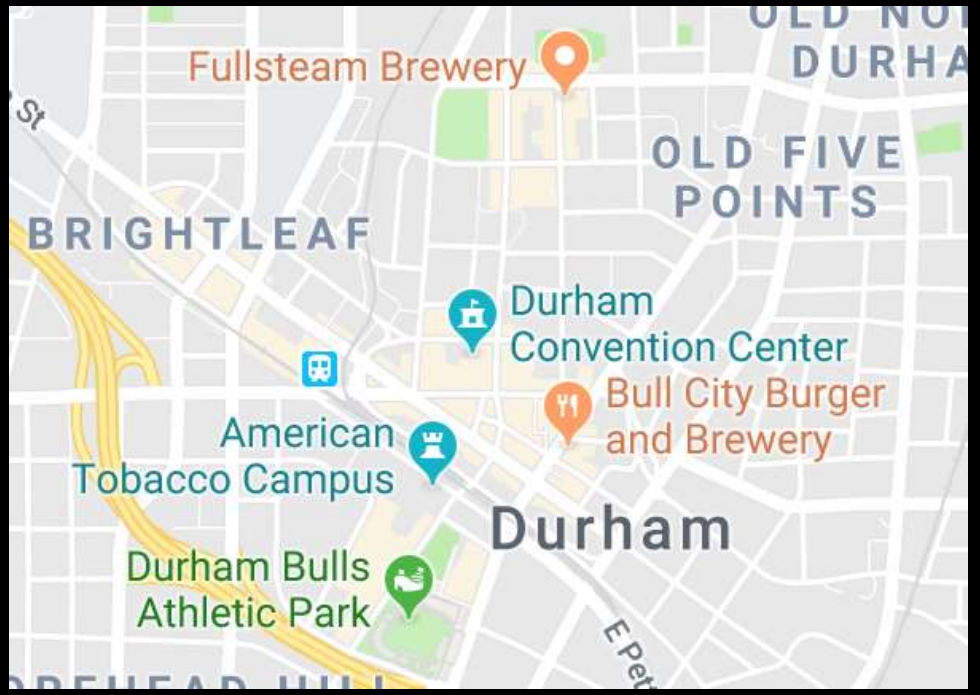
Scale of Feet.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Bull City Burger and Brewery
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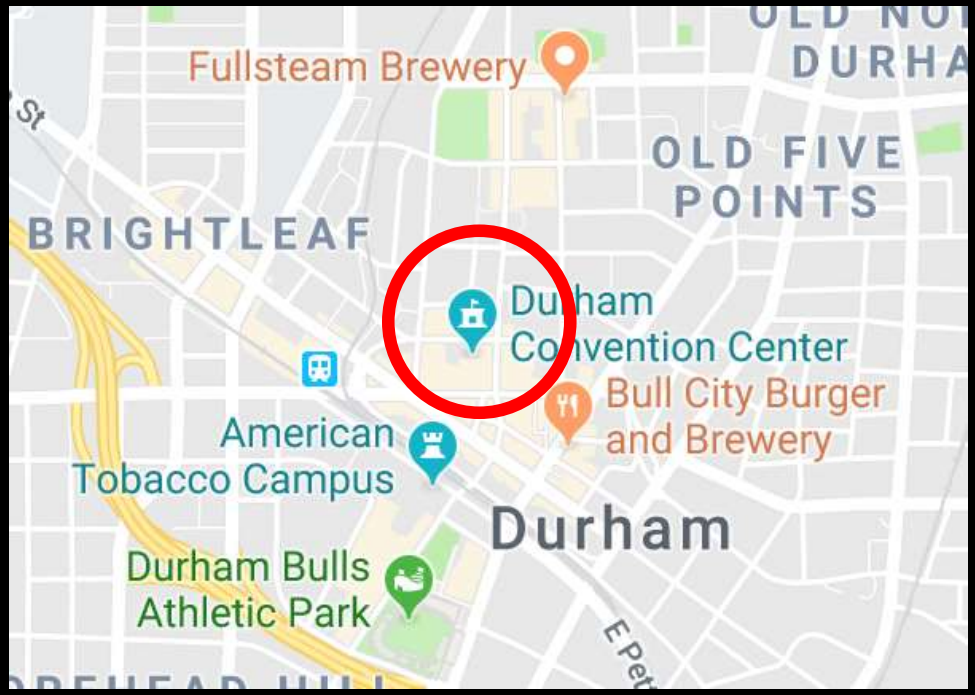
Durham
Durham Bulls Athletic Park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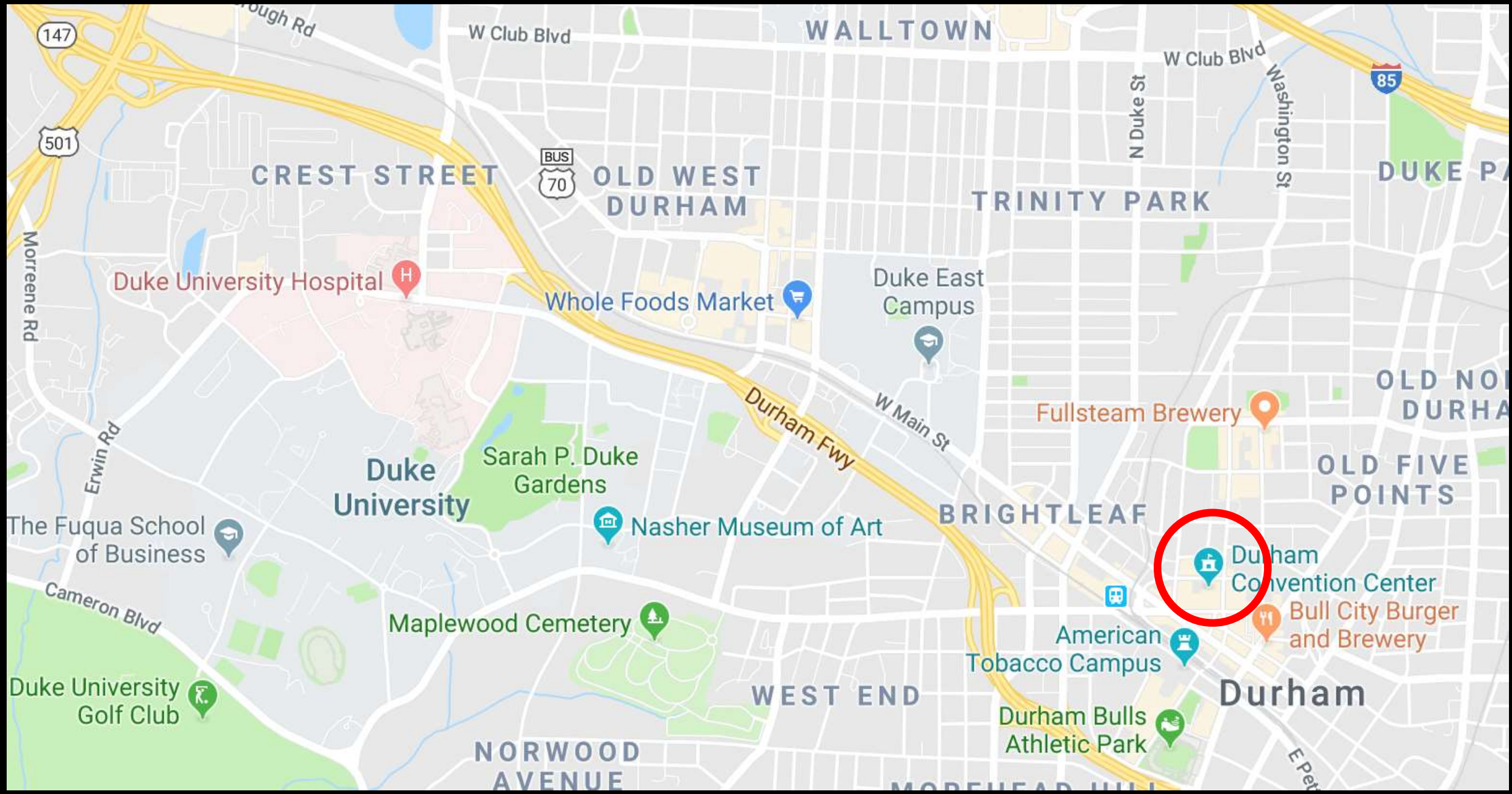
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Cameron Blvd
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Bull City Burger
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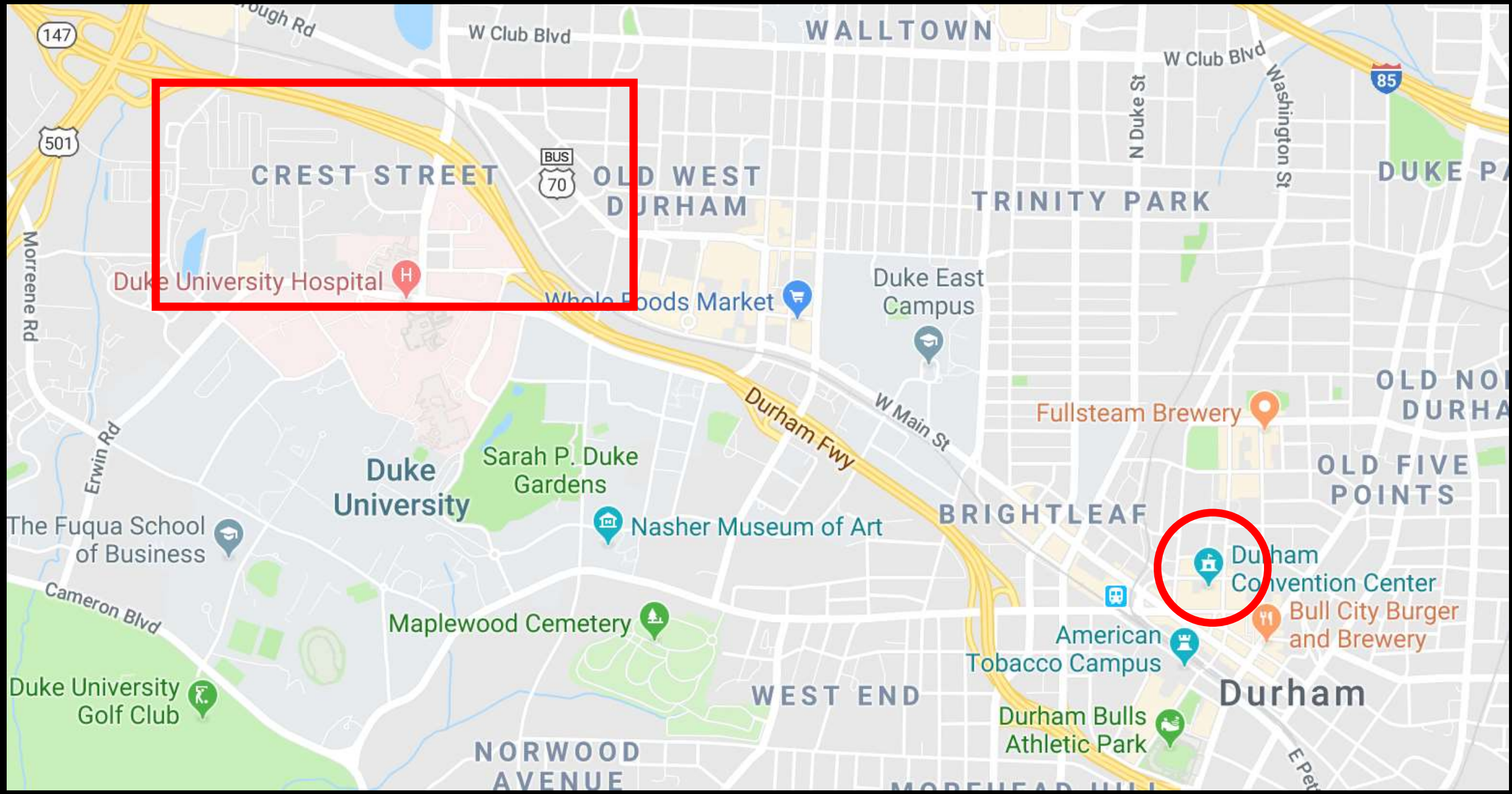
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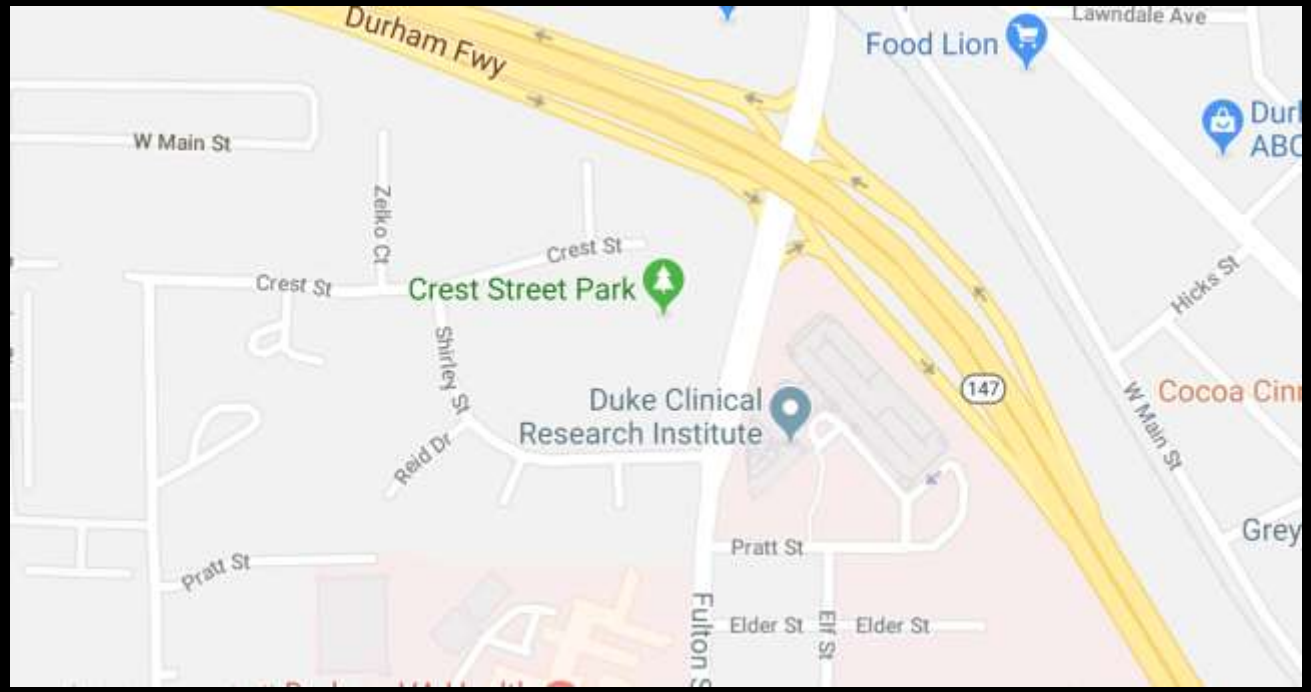
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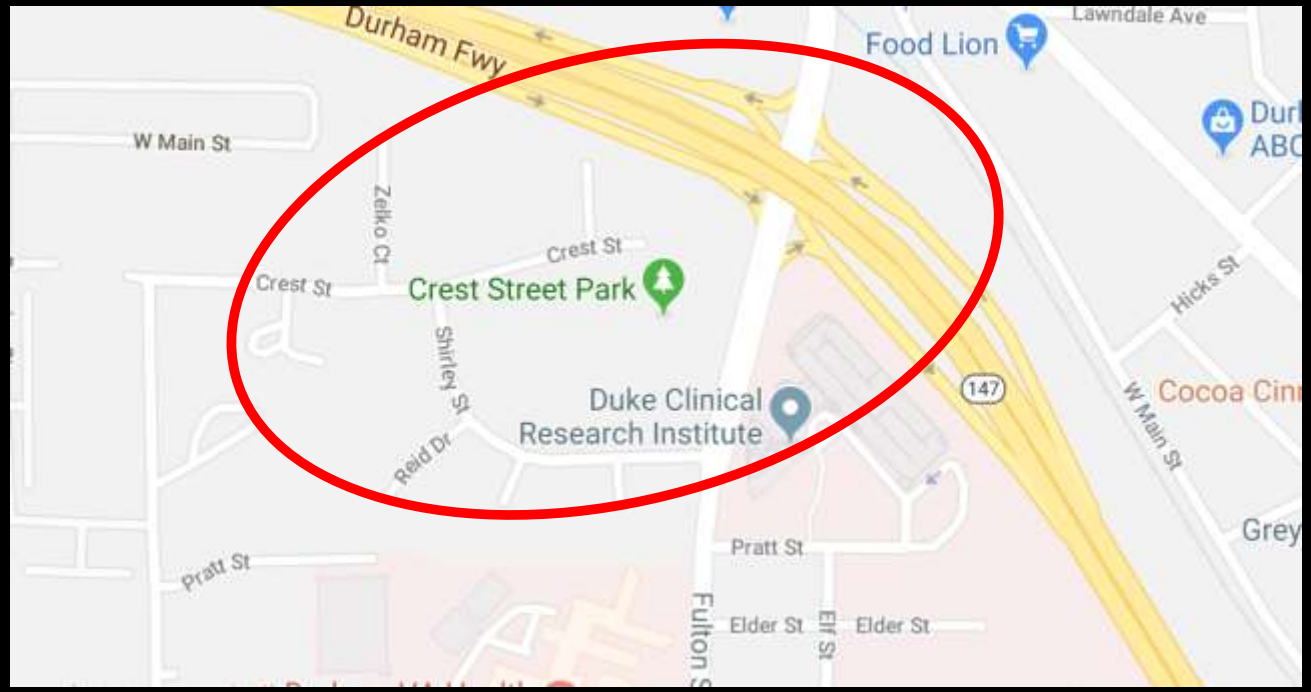
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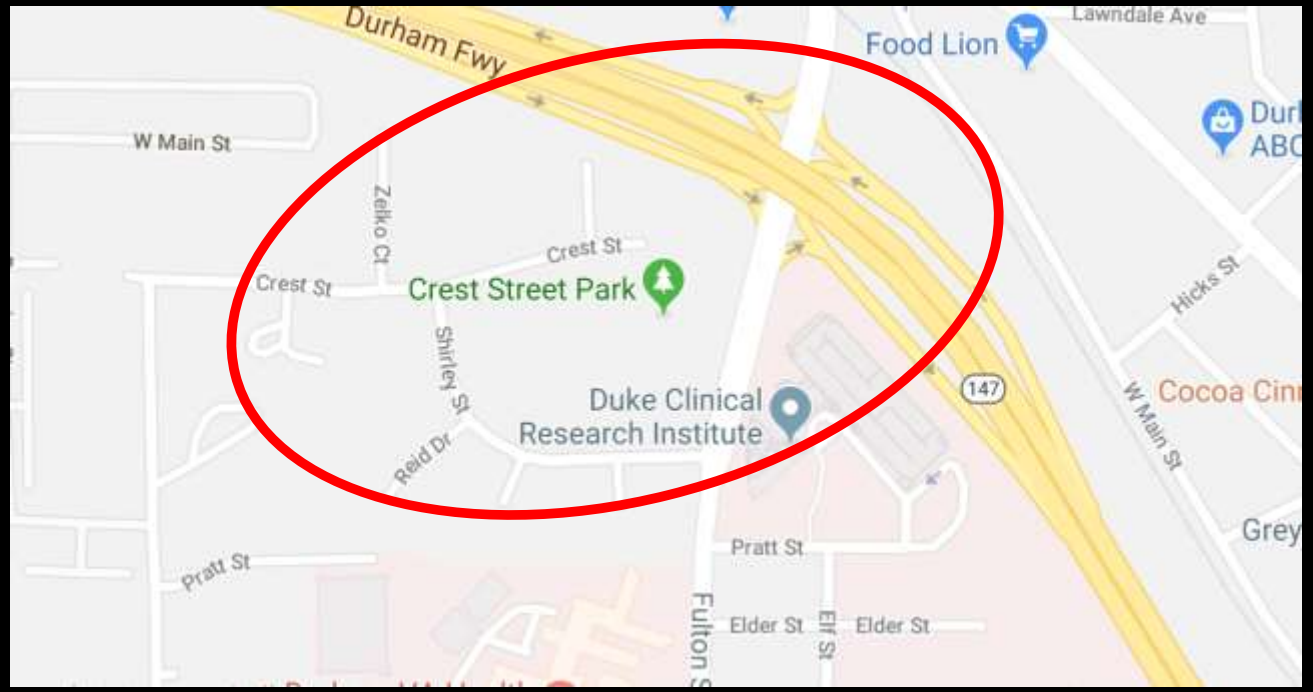
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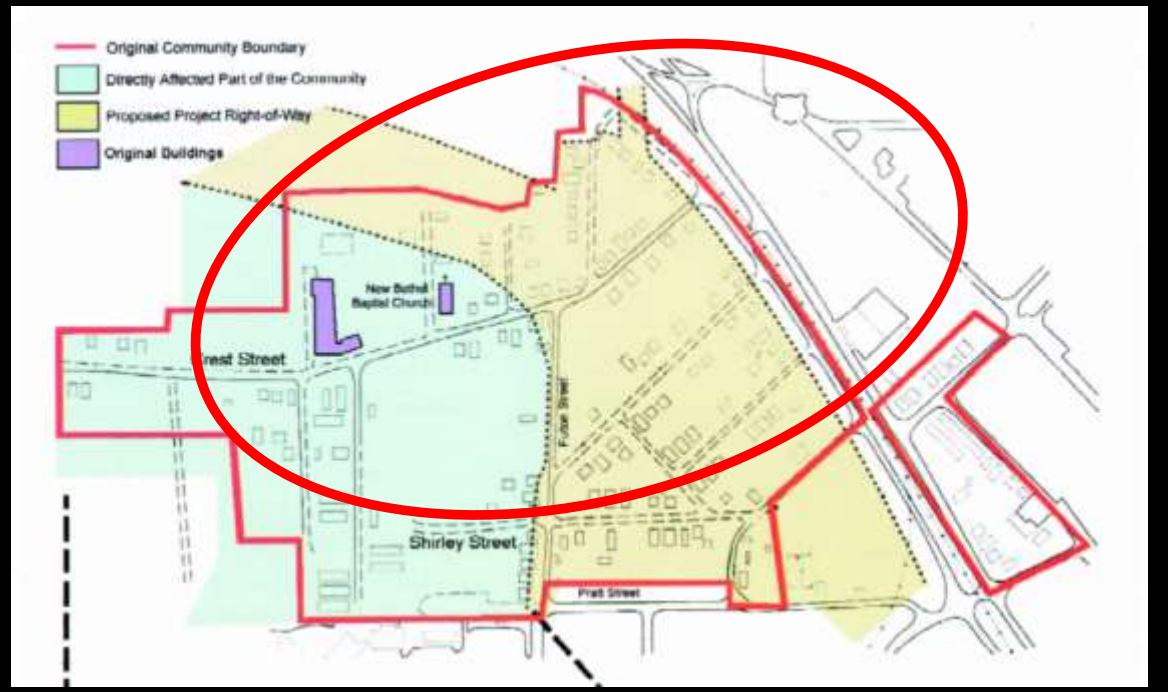
Original Community Boundary
Directly Affected Part of the Community
Proposed Project Right-of-Way
Original Buildings
Shirley Street
Pratt Street

A CASE AGAINST THE

EAST-WEST EXPRESSWAY EXTENSION:

A PEOPLE'S ALLIANCE POSITION PAPER

Durham Chapter, People's Alliance

P.O. Box 3053

Durham, N.C. 27705

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Durham, N.C. 27705

An unforeseen development like the Durham Research Triangle could, by itself, knock any traffic forecast into a cocked hat. An expected major increase in employment that failed to materialize could have similar results. Have you noticed that after NC DOT's 1990 traffic forecasts were sharply criticized, they came up with a new forecast for the year 2000 that showed lower volumes than their 1990 predictions?

The second mistake transportation planners make is to ignore the lessons of the past. We have long known that every transportation improvement, from the first horsedrawn streetcars, through commuter railroads, electric cars, buses, and expressways, has, in the long run, not reduced travel time, but rather it has resulted in longer and longer trips, while travel time has remained constant. We build new roads to reduce congestion and save travel time, but the end result is that people keep moving farther and farther from their jobs. NC DOT has made a trip table which shows in matrix form where people will be coming from and going to in the Durham area 20 years hence, and they use that same trip table whether new roads are built or not, and irrespective of how long the trips take. They prefer to ignore history, and hope

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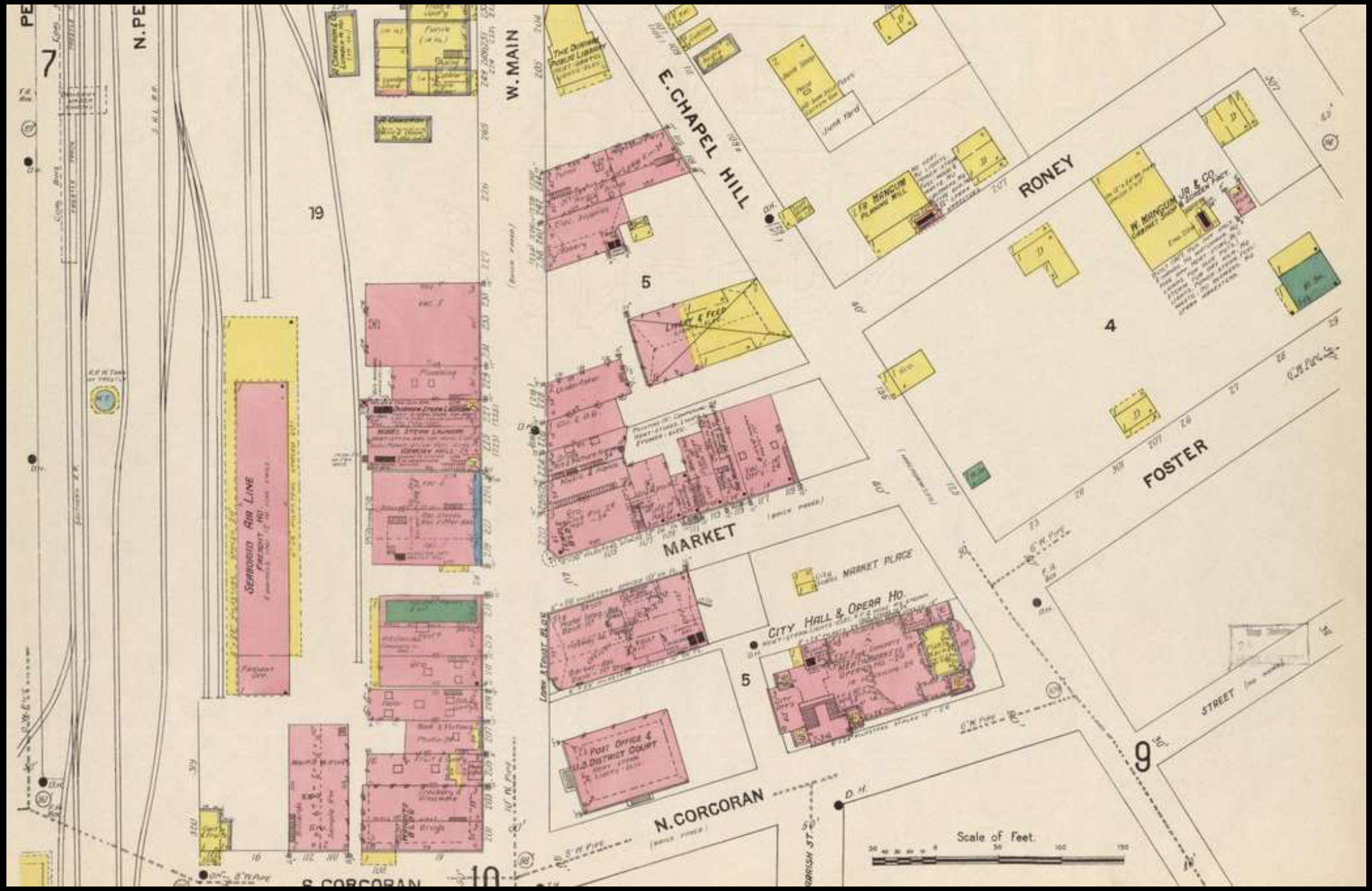
Low tech can be smart.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Scale of Feet.

Milwaukee circa 1900


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THANHOUSER COMPANY.
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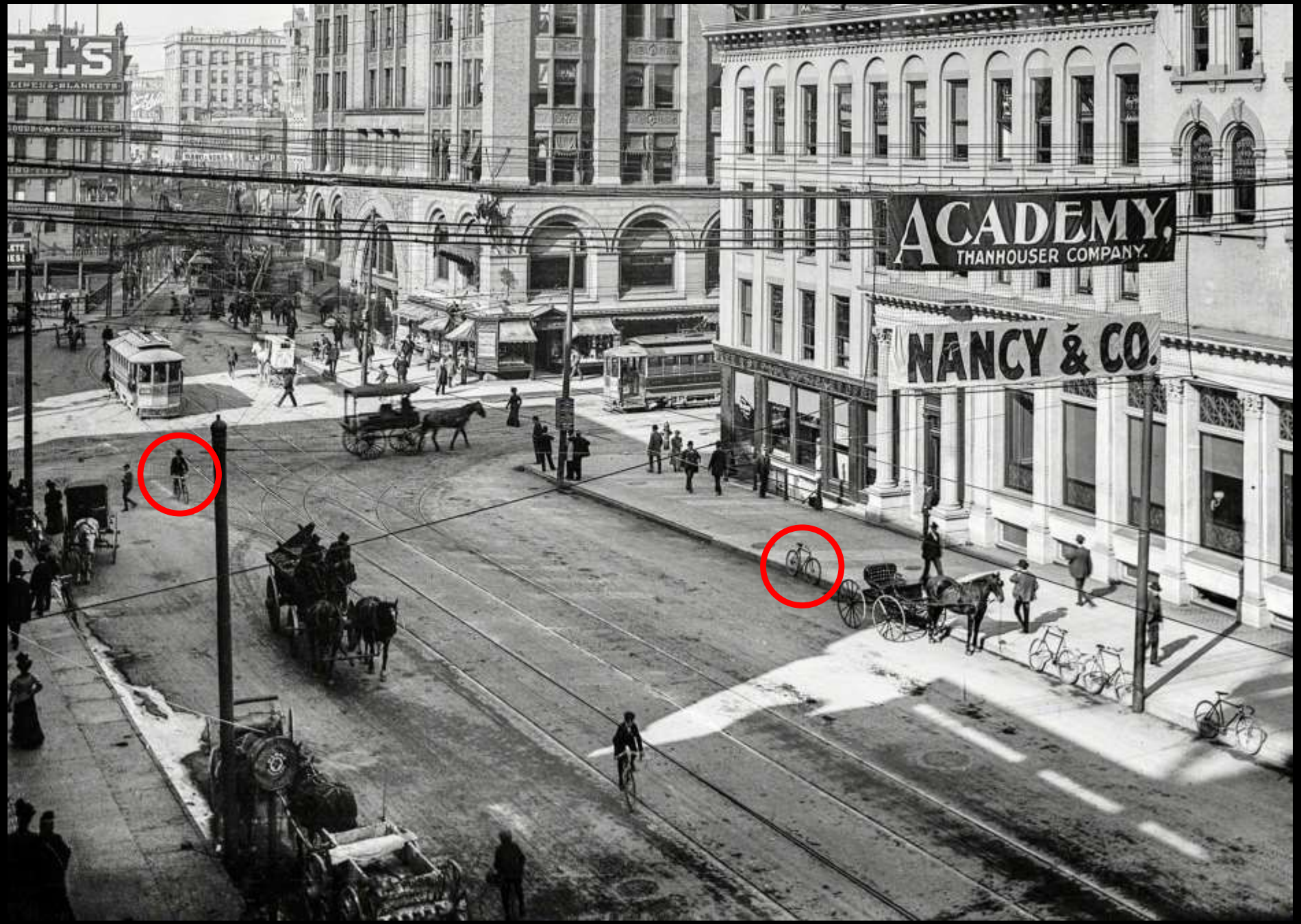
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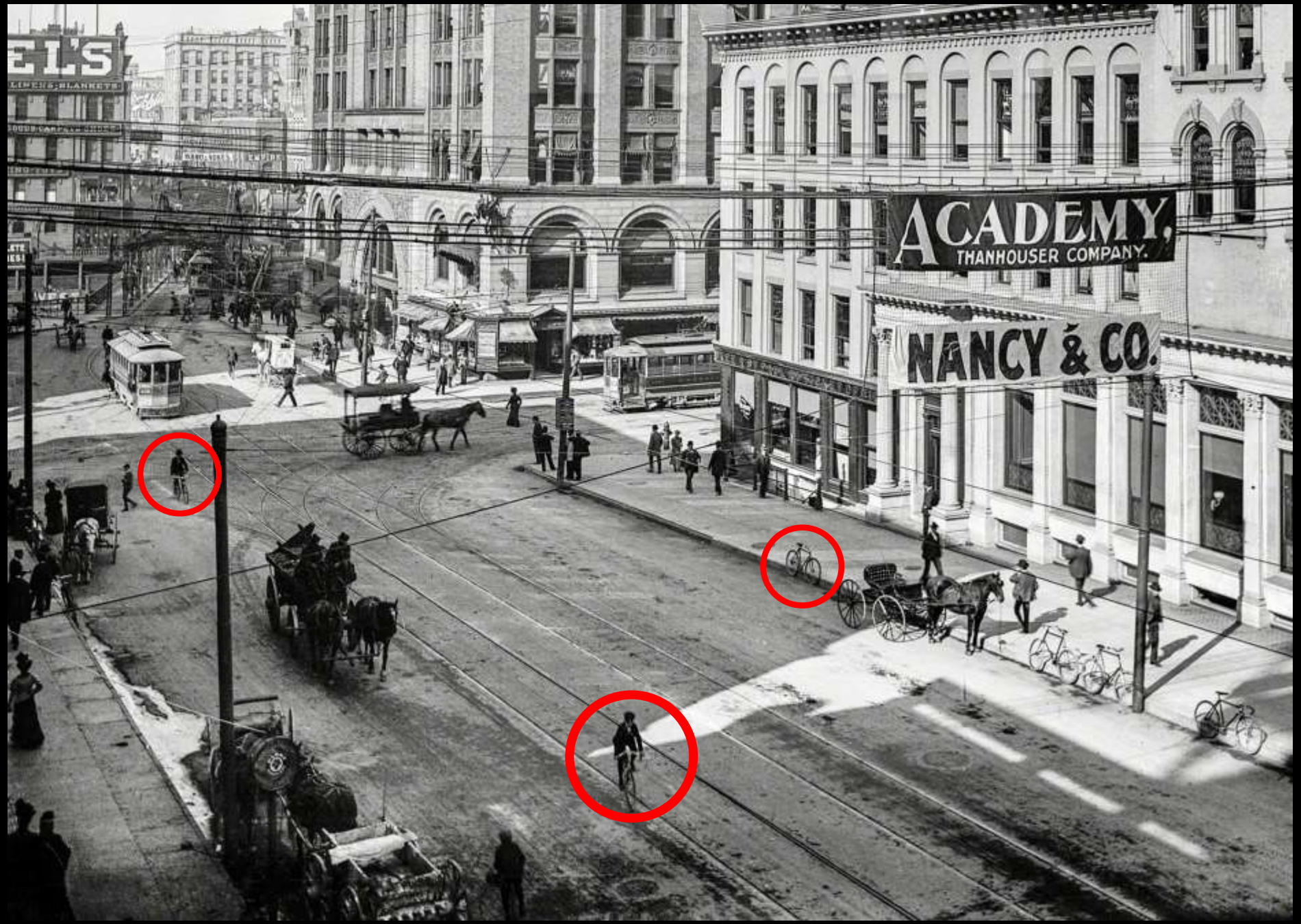
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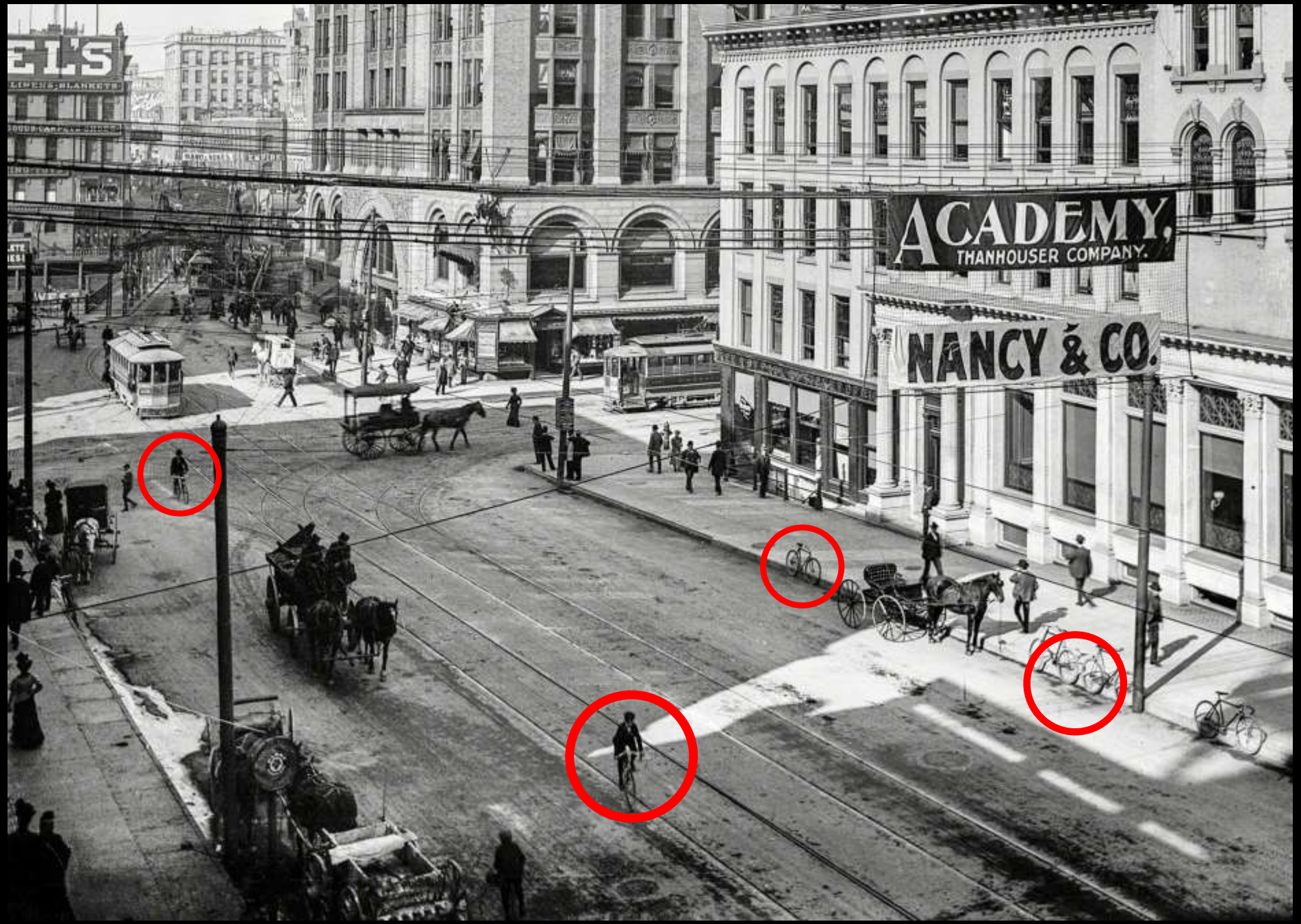
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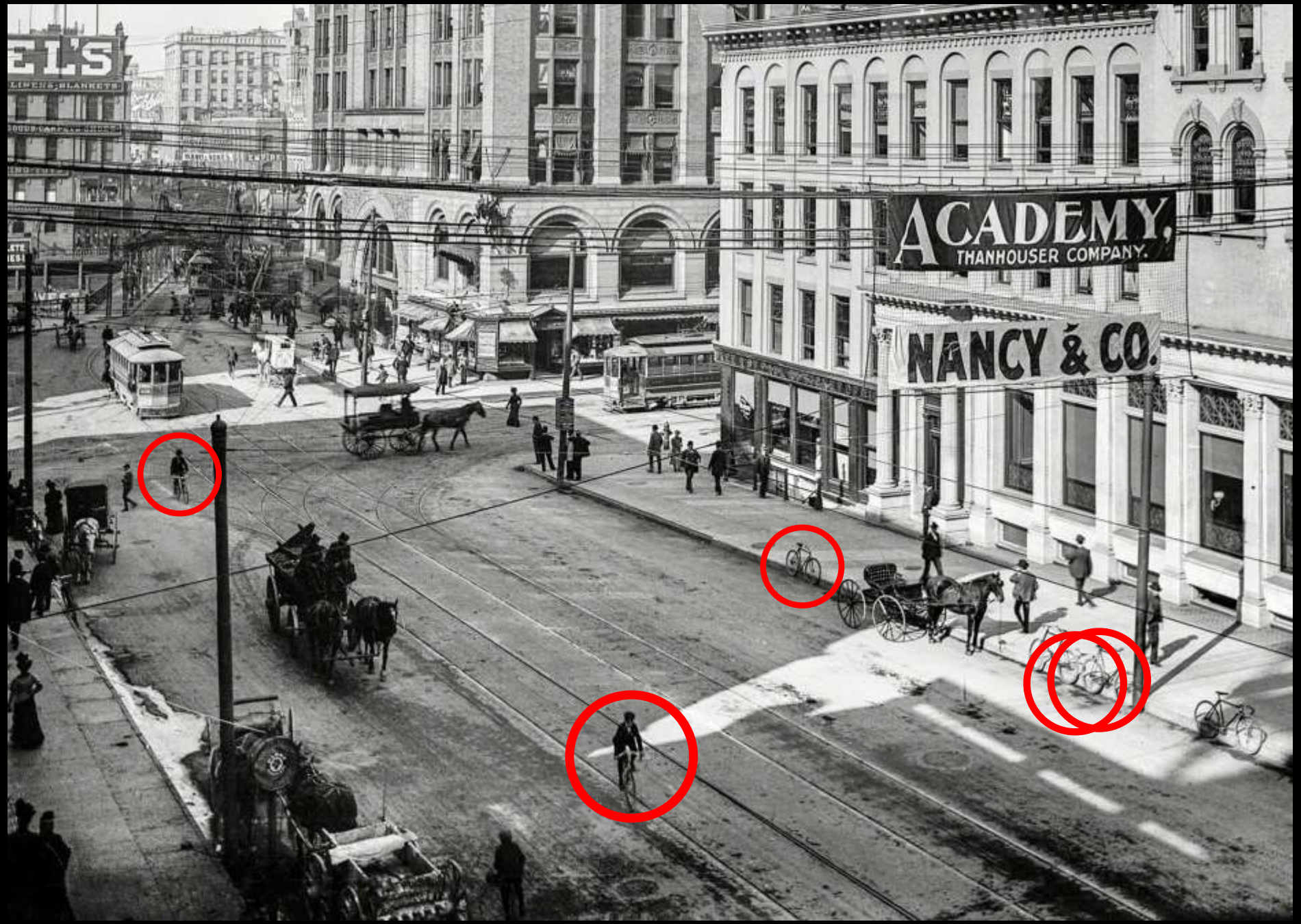
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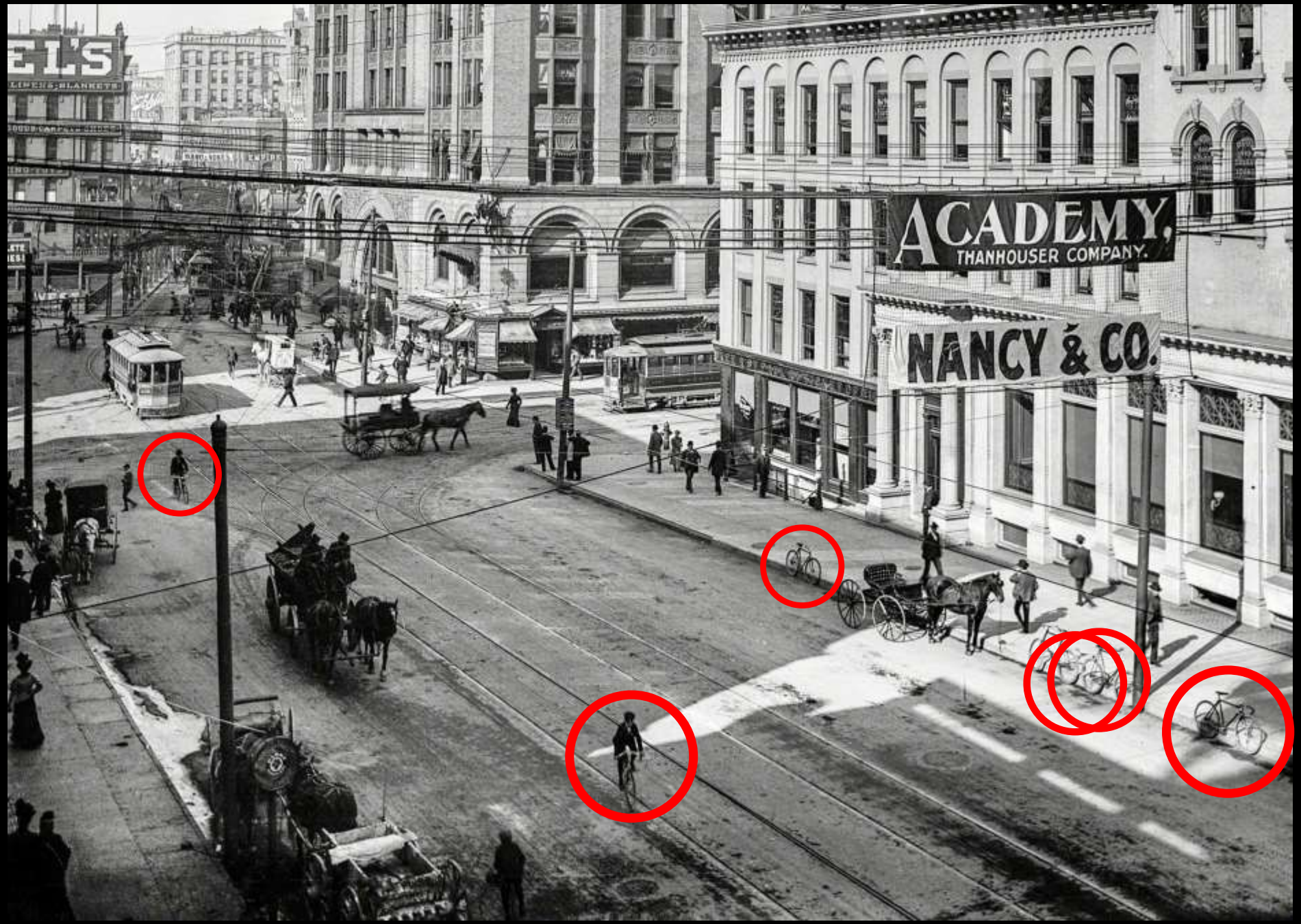
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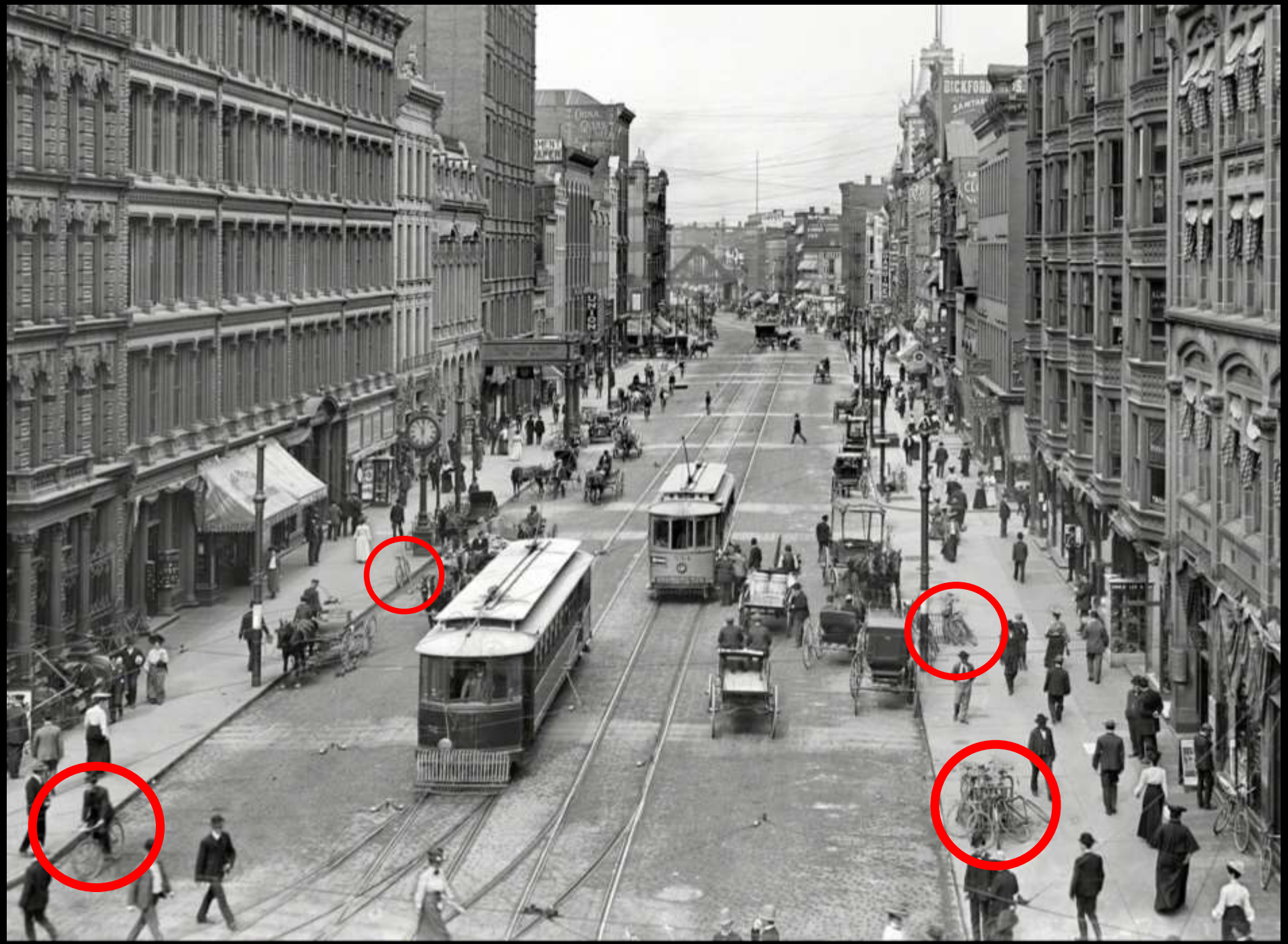

DICKFORD

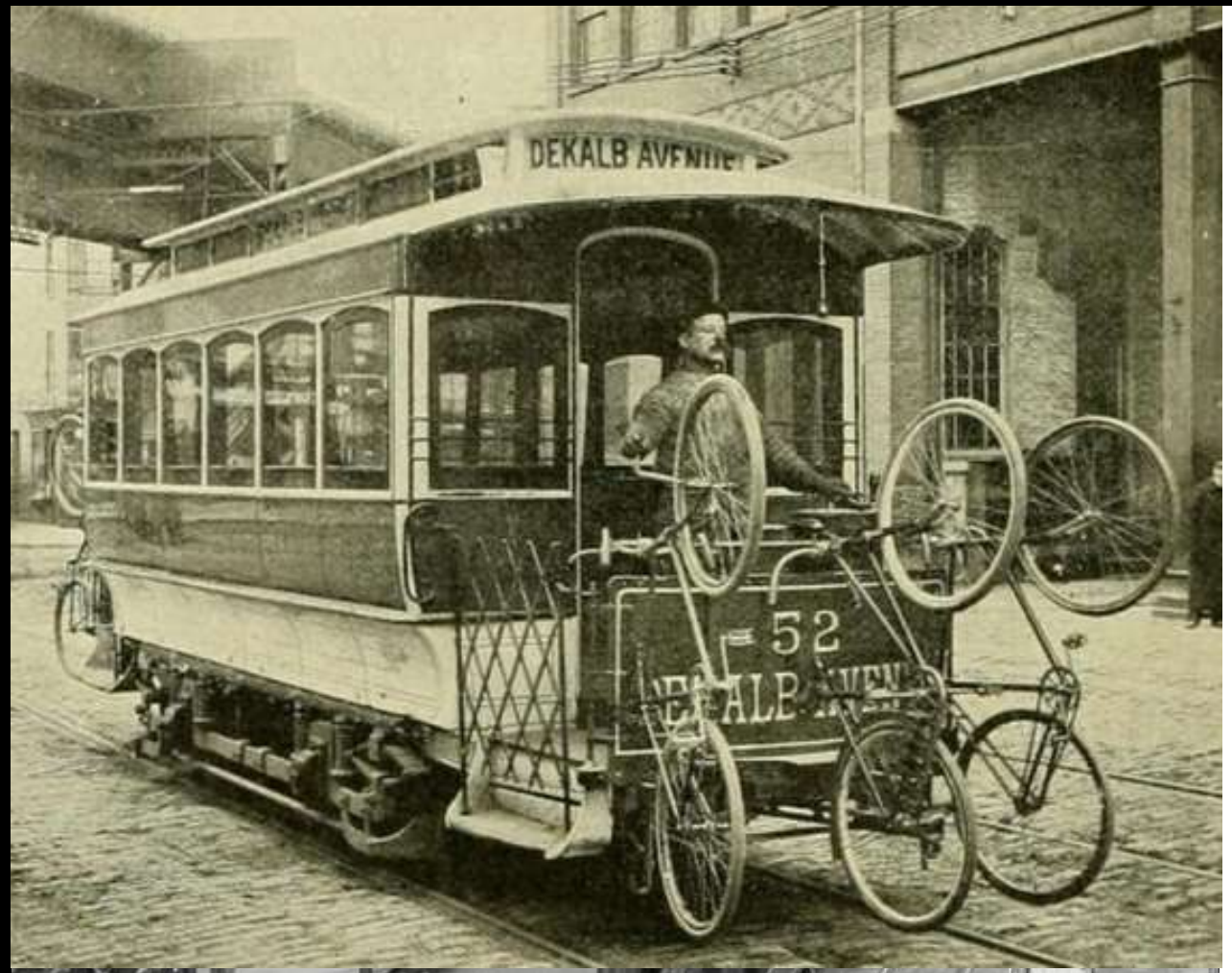
BICYCLE RACKS FOR STREET CARS.

New and Sensible Device for Carrying Wheels on the Rear Dashboards.

Out in Sacramento, Cal., one of the companies which operate trolley lines of street cars has adopted a bicycle rack, which holds two wheels. The rack is attached to the rear dashboard of the car, and the bicycles are carried there at the owners' risk. The charge is five cents for each bicycle in addition to the regular fare.

BICYCLE RACK FOR CARS.

The accommodation is used mostly by those whose wheels have come to grief. The chance of damage from vehicles striking the rear of the car is great, and prevents the general use of the bicycle racks.



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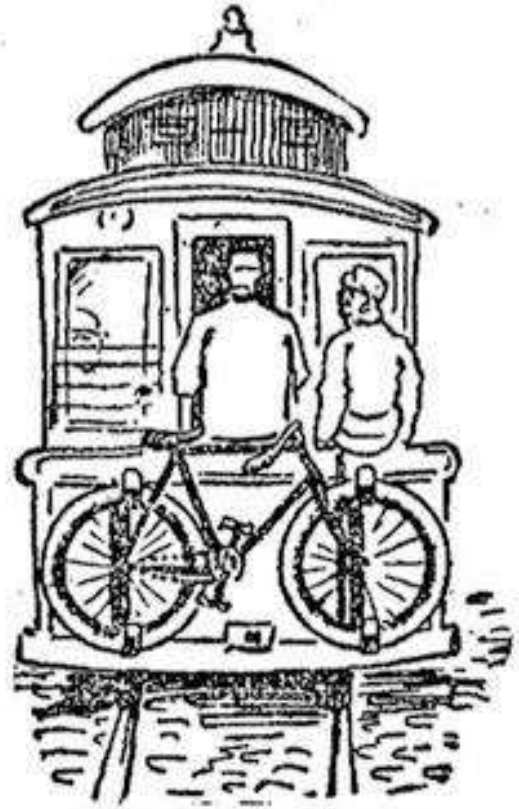

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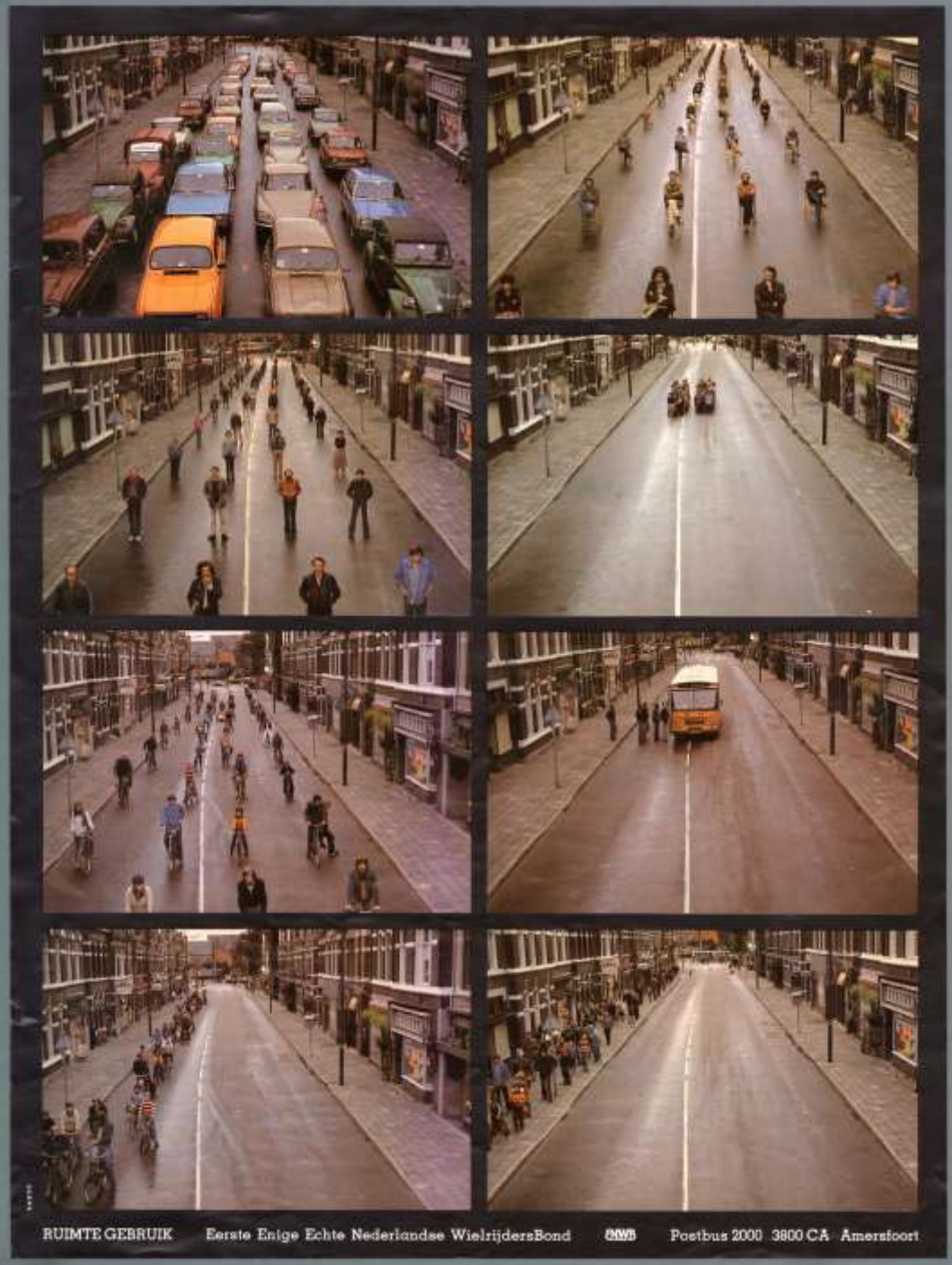

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Mark Wagenbuur / Bicycle Dutch


fietsstraat
auto te gast
fietsstraat
toegestaan

Cycling Professors


SPIEGELGR
MIV 8-11-78 IS DE
SPIEGEL GRACHT
VOOR AUTOVERKEER
GESLOTEN
HEDEN
FIETS-
PAD
REST.

wij willen woonerf!

Hee! Als we auto's wat anders zetten
kan er veel meer dan we dachten
en blijft er meer speelruimte over
we moeten er beslist iets aan doen

ontwerp: Herman Wortel, teksten: Jan Willem Holsbergen, foto's: Sjoerd Holsbergen

Bel voor informatie: Stichting Pressiegroep „Stop de Kindermoord" Keizersgracht 116-2 Amsterdam, tel. 020-259251
Stichting Ruimte, postbus 20732 Rotterdam tel. 010-131441

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Voorrang voor kinderen

Een raadseltje: het aantal auto's is van 1972 tot 1992 gegroeid van twee miljoen naar zes miljoen (verdriedubbeld dus). Maar het aantal kinderen dat door een auto doodgereden is, is in diezelfde tijd omlaag gegaan van 450 (in 1972) tot 93 (in 1992). Rara, hoe kan dat: méér auto's en toch minder dode kinderen in het verkeer?

KORTENKLEIN

Dat kan, zegt de organisatie *Stop de Kindermoord*, omdat de kinderen zich hebben aangepast aan het verkeer. En dat betekent dat kinderen die in een drukke straat wonen waar veel auto's rijden en ook veel auto's geparkeerd staan, gewoon niet meer op straat gaan spelen. Ze blijven binnen. Als ze het willen, bij voorbeeld omdat ze met de Lego willen spelen. Maar ook als ze het niet willen en eigenlijk liever wel naar buiten zouden gaan.
De organisatie *Stop de Kindermoord* vindt dat niet goed. Ze zijn natuurlijk wel blij dat er niet meer zoveel kinderen worden doodgereden. Maar ze zijn niet blij met de manier waarop dat gekomen is, namelijk dat de kinderen gewoon bang zijn om op straat te spelen of alleen maar naar buiten mogen als een volwassene meegaat.
De straat is toch van iedereen? Kinderen moeten gewoon buiten kunnen spelen, vindt die organisatie (en wie eigenlijk niet?). En als dat nu niet zo goed kan, dan moeten de auto's zich maar aanpassen. En niet de kinderen.
Daarom heeft de organisatie vandaag iets georganiseerd om de mensen te laten weten hoe druk de straat is en hoe vervelend dat is voor kinderen. In Amsterdam gaan 450 kinderen (dus net zoveel als in het raadseltje) uit het hele land de straat verven. Niet met een tekening, maar met letters. De letters van de nieuwe naam van de organisatie 'Stop de Kindermoord'.
Veel mensen dachten namelijk bij die naam aan iets anders dan aan kinderen die doodgereden worden door een auto. Ze dachten bij voorbeeld aan abortus, waarbij ook kinderen gedood worden. Dus die naam was eigenlijk niet zo duidelijk. En de nieuwe naam moet wel duidelijk zijn: 'Kinderen Voorrang'.
Kinderen moeten voorrang krijgen. Tenminste, in hun woonwijken. Want op de snelweg gelden natuurlijk weer andere regels. En om kinderen voorrang te geven, is het heus niet nodig dat alle auto's wegblijven. Maar wel dat ze zachtjes rijden. Nu mogen auto's 50 km/uur rijden in de bebouwde kom (dat is, zeg maar, binnen het dorp of binnen de stad). De organisatie-met-de-nieuwe-naam wil dat dat 30 km/uur wordt. Want: hoe zachter de auto's rijden, hoe beter de bestuurders kunnen zien of er kinderen op straat oversteken én hoe sneller ze ook kunnen remmen. De organisatie 'Kinderen Voorrang' gaat dat daarom vandaag aan de regering vragen.
Maar er moet nog meer gebeuren. De organisatie vindt ook dat de straten zo verbouwd moeten worden dat auto's gewoon niet meer hard kunnen rijden. Dus veel bochten, verkeersdrempels en paaltjes maken, dát helpt pas goed. En misschien weet jij nog wel meer trucjes. Dat gaat 'Kinderen Voorrang' vandaag óók aan de regering vragen. Maar die regering moet dan wel in de wet vastleggen dat het móet, vindt de organisatie. Want anders doet het ene dorp het wel en het andere weer niet. En kinderen moeten juist overál lekker rustig kunnen spelen.

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Heineken
dit jaar in 't verkeer:
150 doden
per maand
bedankt Blije Rijders


IN
MEMORY
OF
256
PERSONS
KILLED BY
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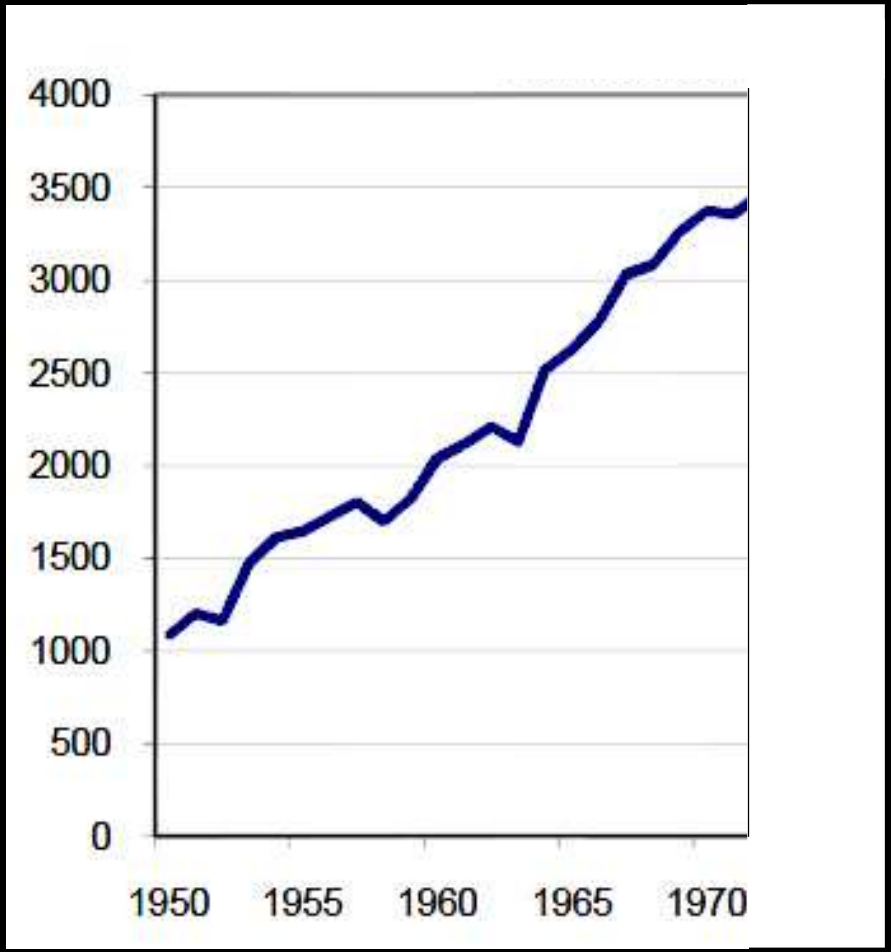

Total traffic fatalities in the Netherlands, 1950-1970

Statistics Netherlands, via Bicycle Dutch. Total population, 1950: 10 million; 2010: 16.5 million.

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traffic deaths per 100,000 persons:

the Netherlands
3.4 (2013)

USA
11.5 (2017)

Statistics Netherlands, via Bicycle Dutch. Total population, 1950: 10 million; 2010: 16.5 million.

2

Data don’t drive.


Big Data Driven Mobility to Tackle
Electric Vehicle Charging Management
Yanyan Xu
HuMNet Lab@MIT


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CON CAR 2017 EXPO
3:30 Panel Discussion:
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Representatives:
Keynote: Andreas Mai, EVP Market Development & Innovation, Keolis, USA
Panel Host: Lutz Heuser, Urban Software Institute GmbH, Germany
Panel Discussion :
Manuel Chaufrein, Managing Director, Vipair, Paris
Christoph Gebele, Managing Director, Geospin GmbH, Germany
David Beeton, Founder and MD, Urban Foresight Limited., UK
Christiane Arnscheidt, Managing Director, Clevershuttle
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Jens Landvogt, Senior Biz Dev. Manager Automotive, HERE
Maxim Nohroudi, Co-Founder & CEO, ally
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Connected Cars Lay Groundwork for Data-Driven Future

The automotive industry is poised for a shift in business models

The applications that are enabled through the data connected cars open up lucrative new data-driven business models for both automotive companies and third party developers and services.

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What is The Real Impact of Connected Cars?

Today, few companies are prepared to take advantage of the value which connected vehicles are bringing across many industries. Beyond gimmicky in-car hotspots and vehicles that can order pizza for you, the trove of value that can be derived from cars becoming not only our autonomous chauffeurs, but also the eyes and ears constantly mapping, monitoring, and communicating with our surroundings in real-time cannot be overstated.

Usual headlines around autonomous cars and connectivity features all center around the same business models and product offerings that have existed since the car's inception – new button here, nicer styling there, along with a few new tech bells and whistles that make great marketing fodder. Under the hood, so to speak, connected cars are generating terabytes of data from their users and surroundings all the time, much of which could be leveraged by third party systems and developers to provide real-time road weather alerts, communicate with other forms of connecting transportation, and decrease overall traffic congestion through real-time routing and infrastructure communication.

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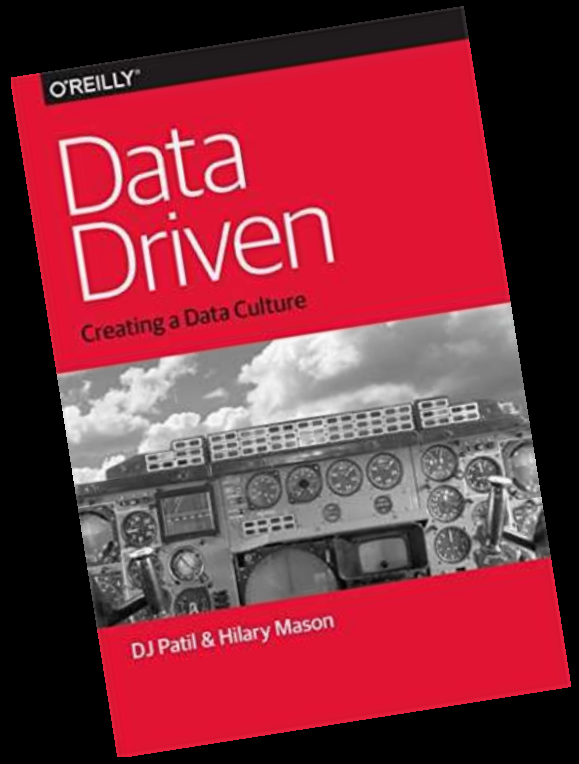
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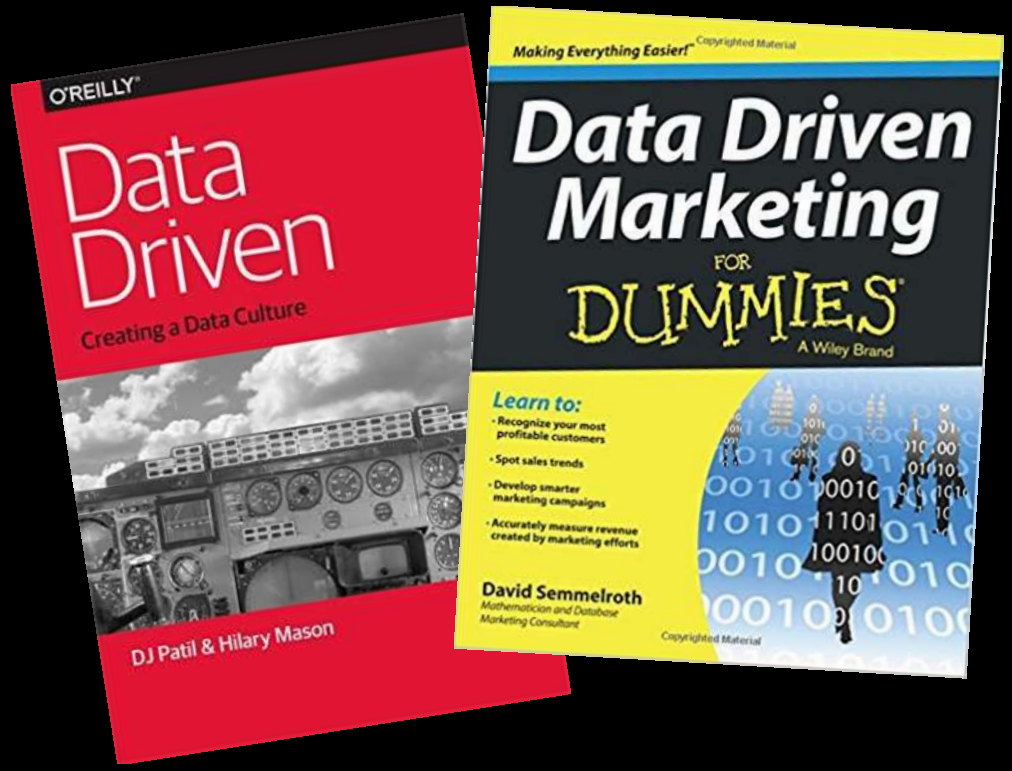
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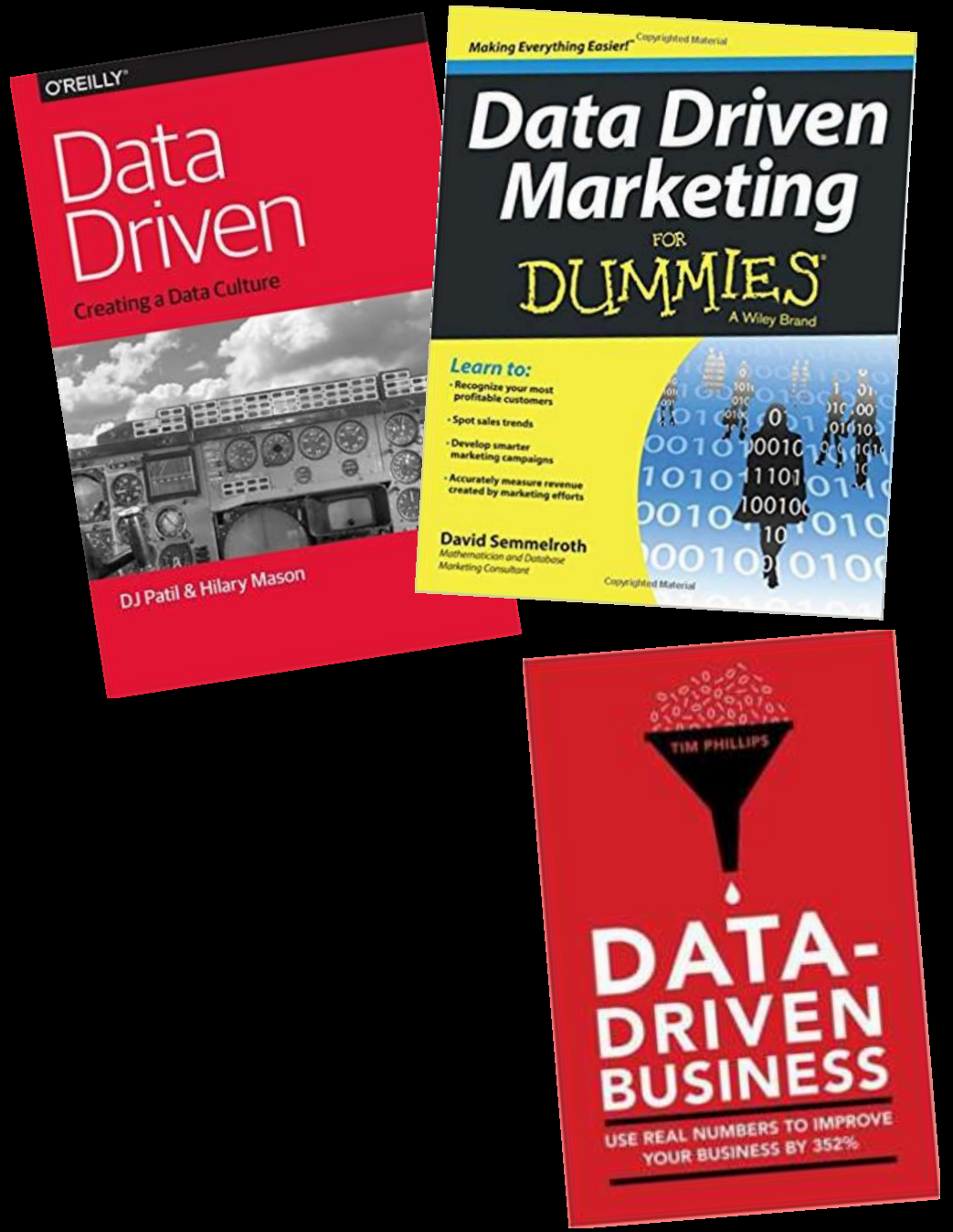
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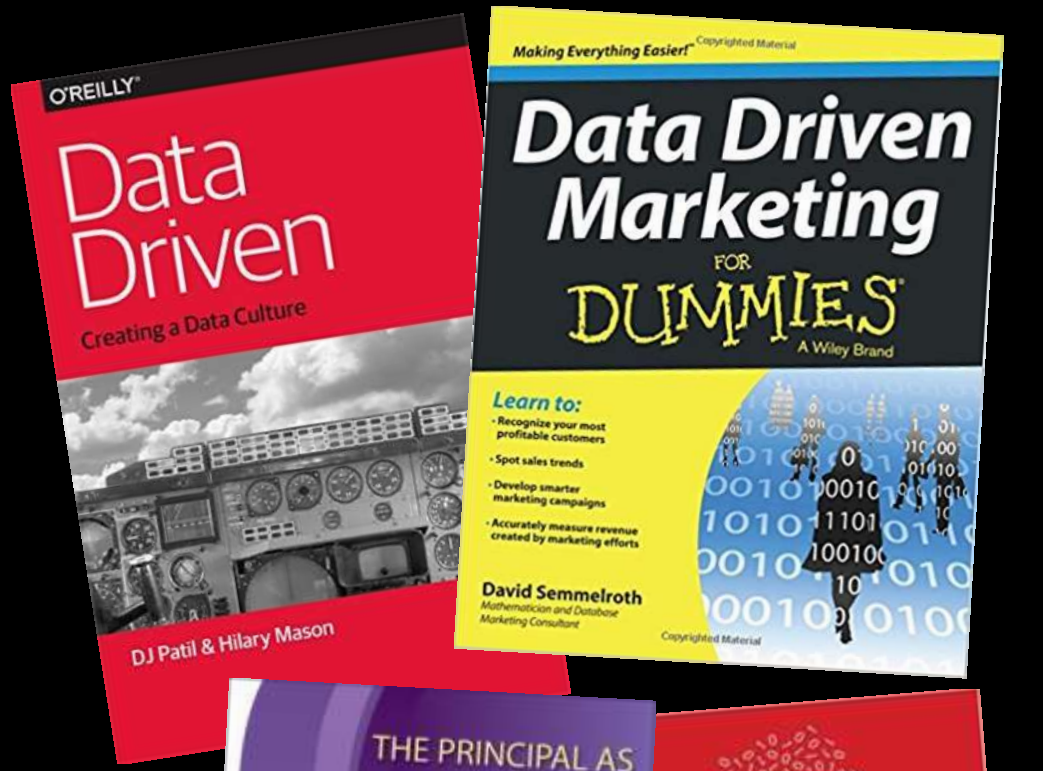
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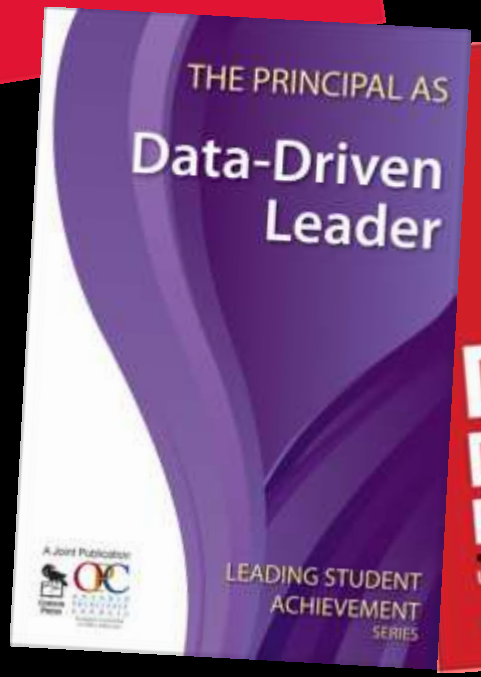
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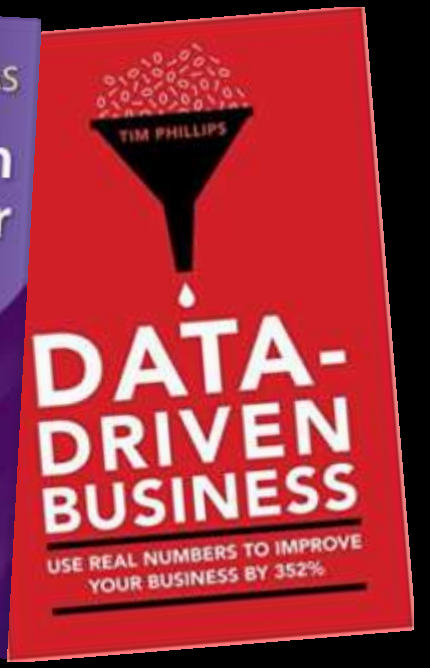
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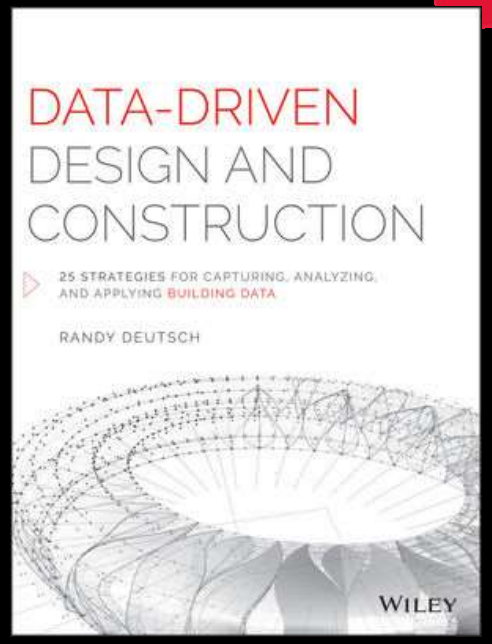
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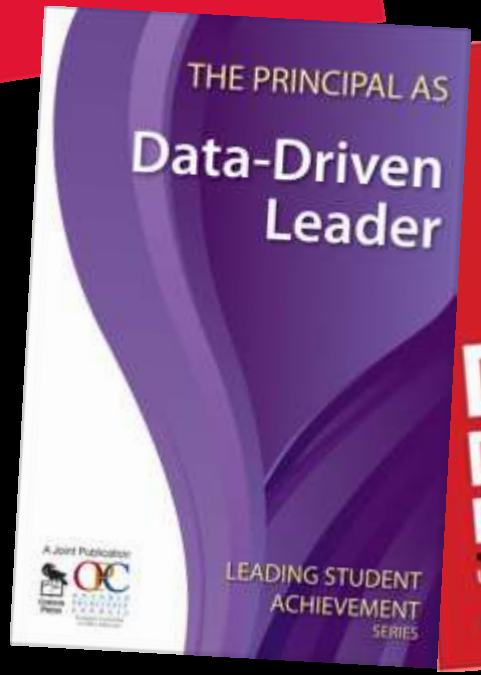
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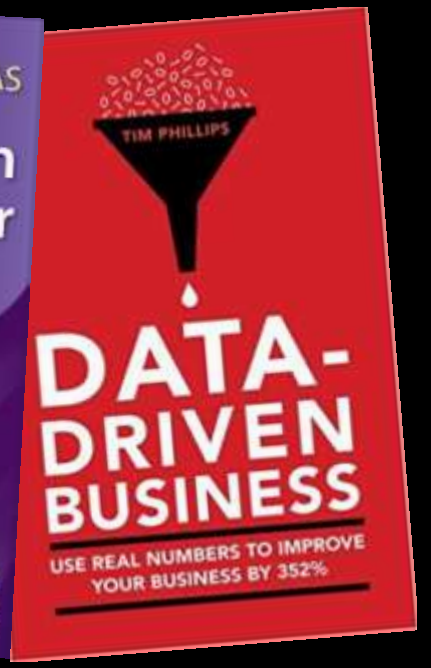
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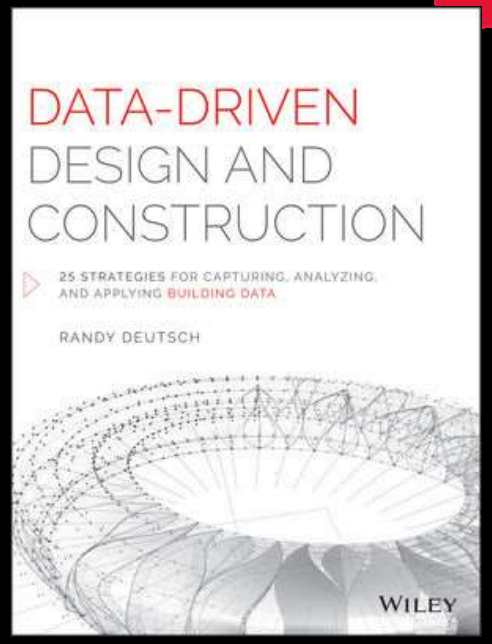
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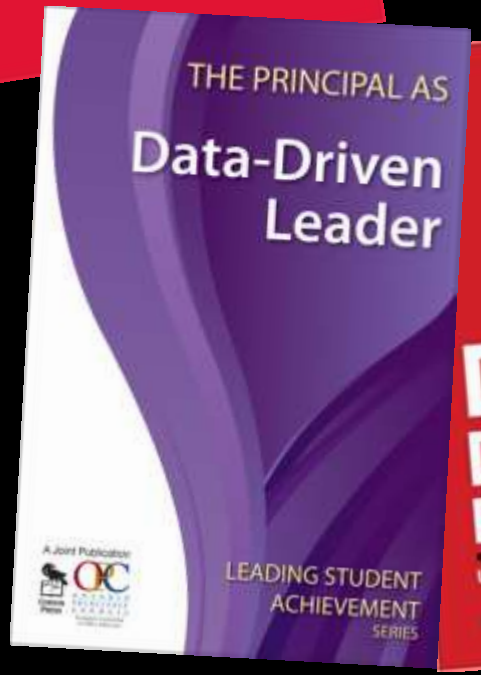
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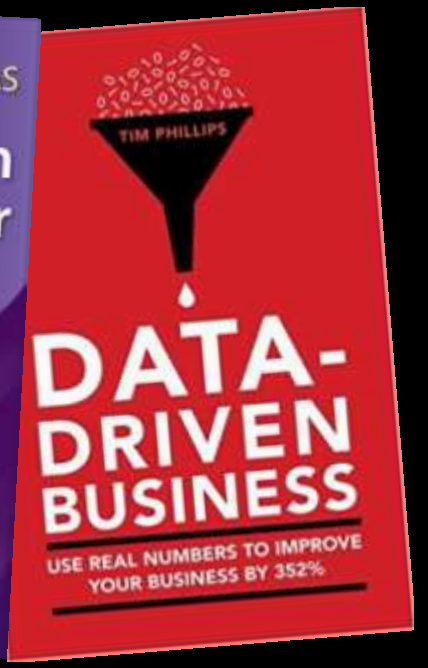
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Report No. UT-15.05
DATA-DRIVEN FREEWAY PERFORMANCE EVALUATION FRAMEWORK FOR PROJECT PRIORITIZATION AND DECISION MAKING
Prepared For:
Utah Department of Transportation
Research Division
Submitted By:
University of Utah
Department of Civil and Environmental Engineering
Authored By:
Xiaoyue Cathy Liu
Zhuo Chen
UDOT
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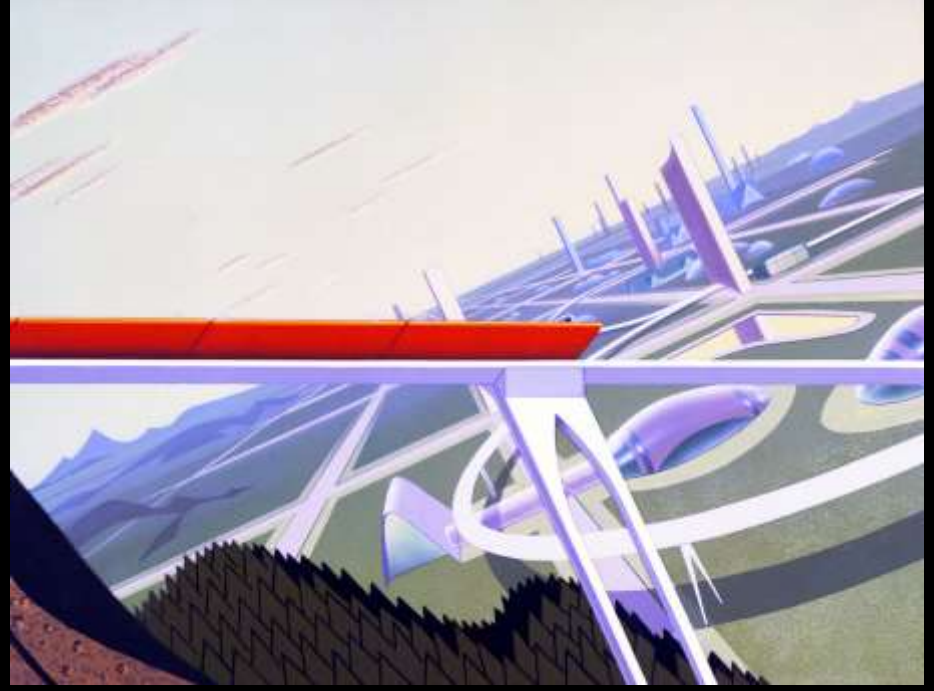


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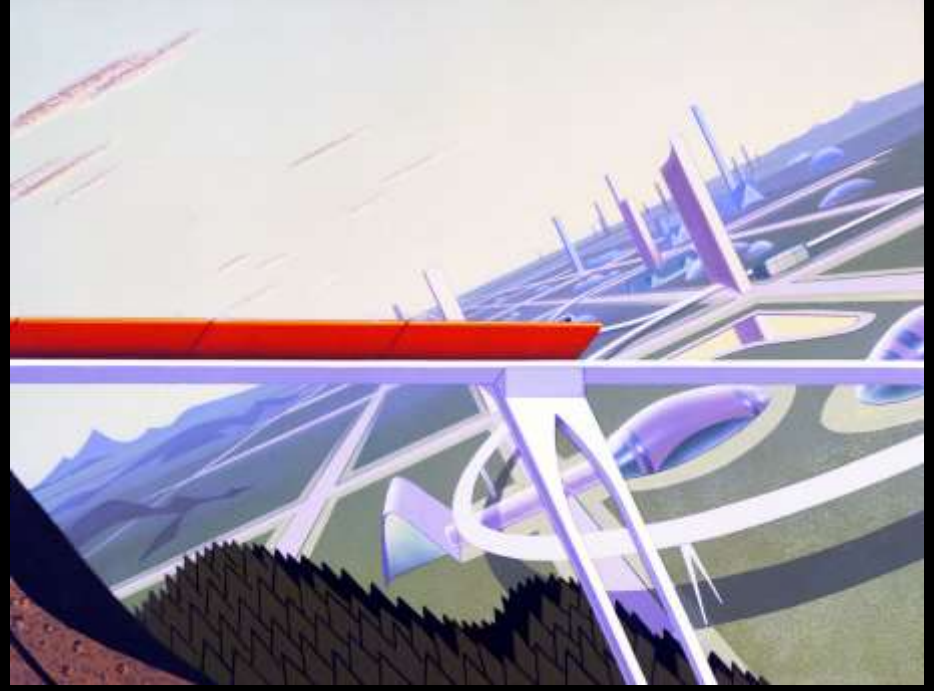


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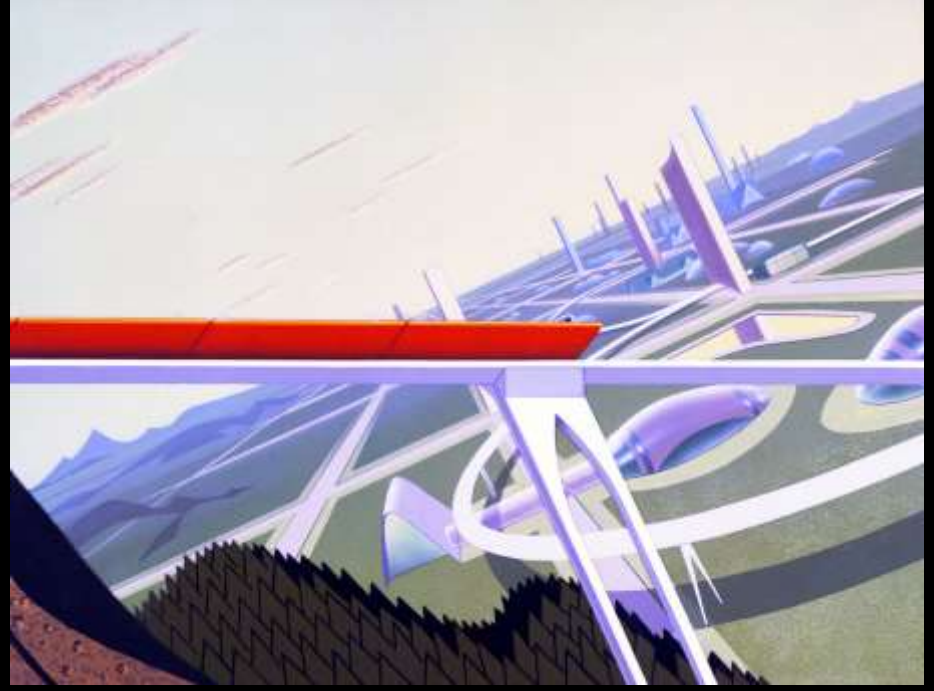
THE Jetsons

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MAGIC
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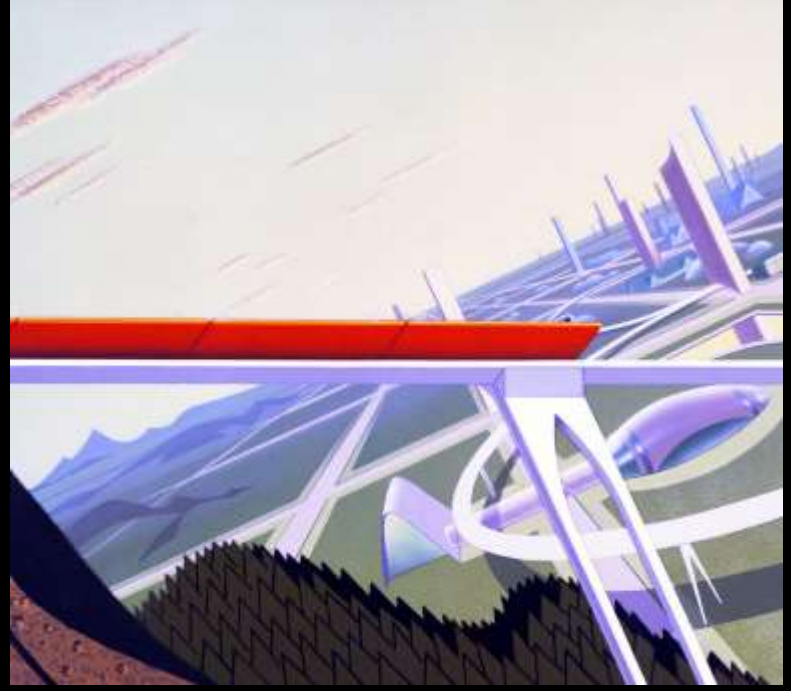


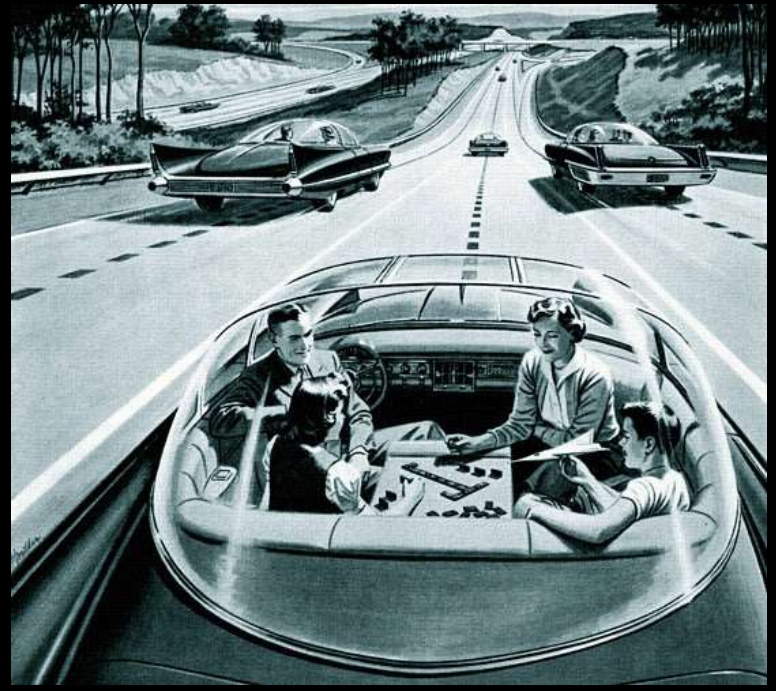
IN this age of flying saucers and 600-mph aircraft, automatic pilots are accepted as being very commonplace . . . for airplanes. But why not automatic pilots for autos?

If an inventor should offer the motorist an automatic pilot for his car, consider the tremendous safety value of such a device. The human element would be eliminated from driving. Our highways would become virtually crashproof.

Here is a system based on magnetic detection—(similar to that used to locate land mines in World War II) and radar, since it would be impractical to use radio beams as a means of directional control as with aircraft.

A ribbon of metallic material approximately 12 inches wide is located in the center of each highway lane and would have been incorporated in the highway concrete as it was poured.

The automatic pilot needs the following equipment: two magnetic detection units, a radar unit and an engine governor. This unit would work in conjunction with the car's power steering and automatic transmission. The detection units would be mounted under the nose of the vehicle, one on each side of a horizontal line running lengthwise through the body. The narrow-beam parabolic reflector of the radar antenna, su-



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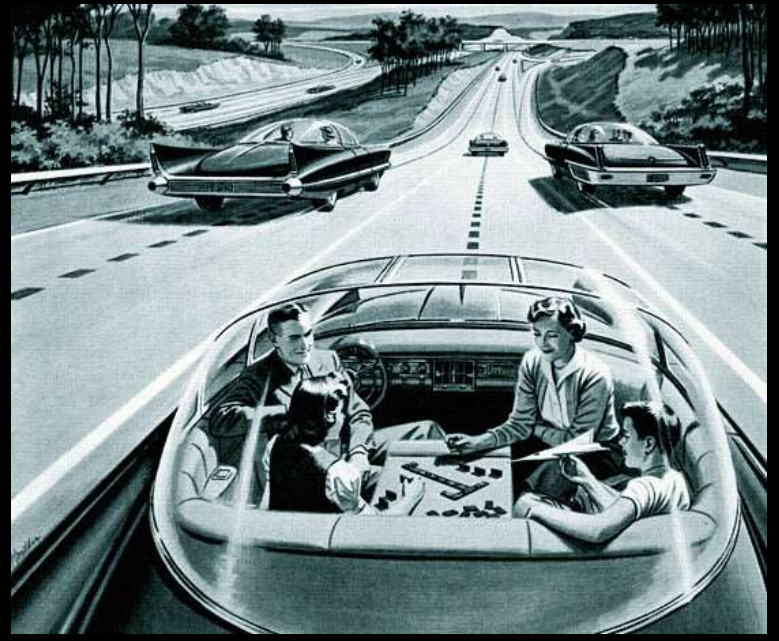

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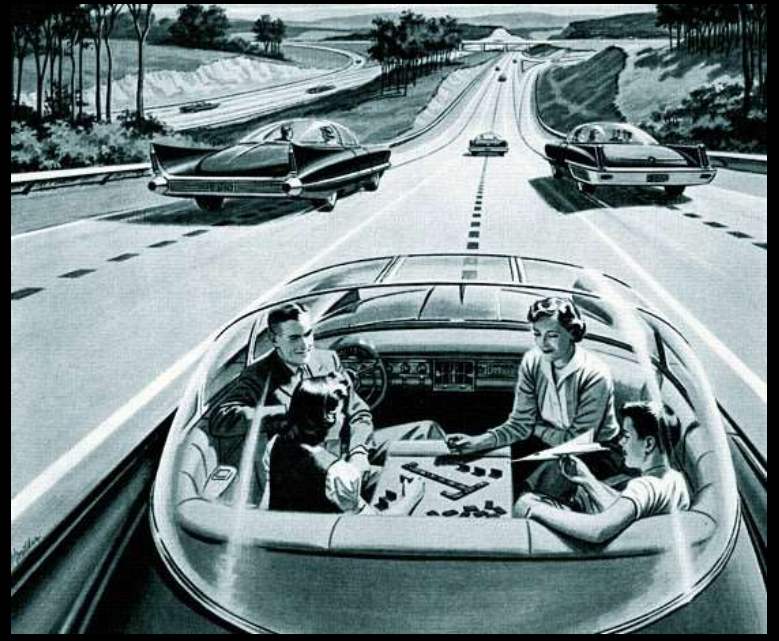

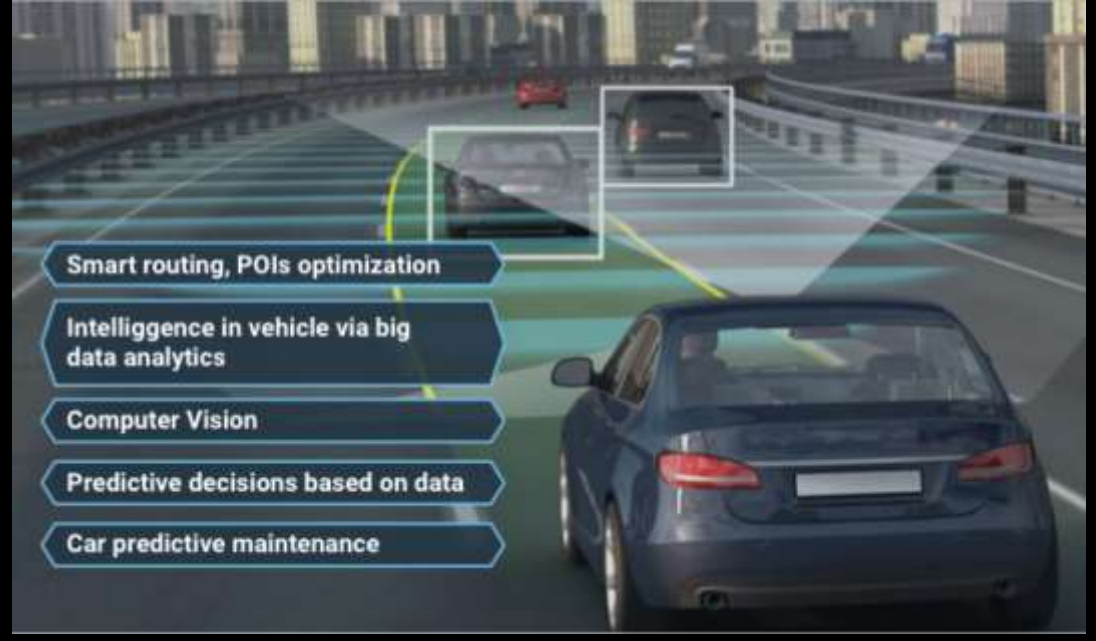
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Computer Vision
Predictive decisions based on data
Car predictive maintenance


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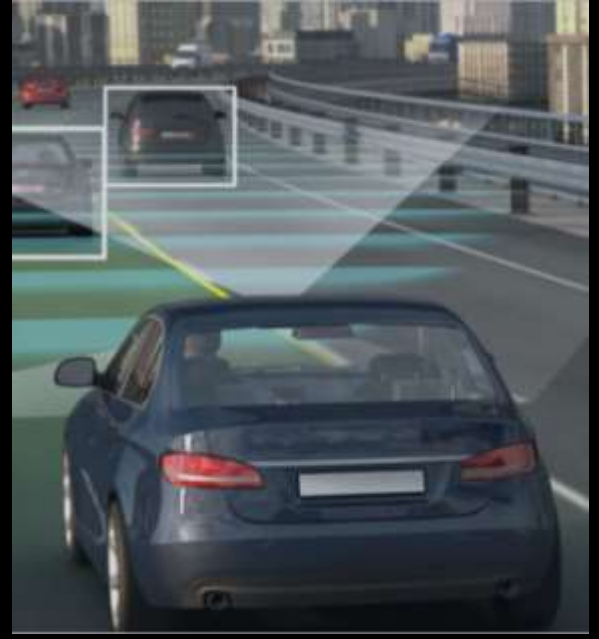


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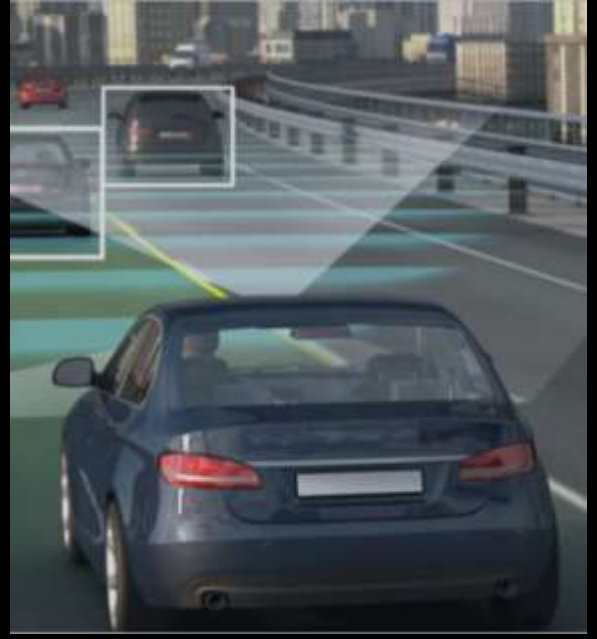

Self-steering car of tomorrow traveling on super highway patrolled by radar towers. Future car may be powered by radical new engine, covered with new wonder metal, equipped with car-to-home phone, and controlled by automatic pilot.

Want to build a car that drives itself?

Thompson Products *can help you handle the job*

SOME DAY—and it may come surprisingly soon—a car-maker will introduce a radically advanced new automobile, and cash in on the giant market of tomorrow. Thompson Products can help design and build important components for such a car *today*.

Right now Thompson can aid in creating self-steering devices, advanced new chassis and engines, uses for new wonder metals, and many other revolutionary features.

For years Thompson has been a leader in the development of steering systems . . . in improvement of automotive and aircraft engines, of chassis and airframes . . . and has pioneered in high-temperature, corrosion-resistant metallurgy.

No matter what kind of product you want to make, chances are Thompson can help you—thanks to its vast experience which includes design and production of hydraulic, pneumatic and electronic components, assemblies and systems . . . and a great variety of processes, from high-precision forging to impact extrusion and every kind of quality machining.

If you have a new product in mind, why not call for specific information on how Thompson can help you build it?

You can count on

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as a partner in solving the design and production problems of an advancing technology

General Offices, Cleveland 17, Ohio

From Thompson's 21 research centers and 25 manufacturing plants come, each year, important new advances in mechanics, electronics, hydraulics, pneumatics, aerodynamics, thermodynamics and nucleonics.

1958

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1964

December 1964

HOW RCA TRANSISTORS

Will Run Your "Electronic" Car of Tomorrow

Slide behind the wheel of this dreamboat. Push the electronic control button. Then sit back and let transistors take over.

Automatically, transistors and semiconductor rectifiers will help...accelerate...brake...steer...detect obstacles . . . guard against "tailgating" . . . guide you safely along the electronic lanes of super highways . . . signal on-coming traffic as you approach intersections . . . even tell you when the road is icy.

As darkness falls, these devices will turn on your lights and courtesy headlight beams. When it rains, they will close your windows, start your windshield wipers and adjust their speed to conditions. They will even blow your horn automatically when necessary! Miraculous? Hardly.

Already, transistors and semiconductor rectifiers can open and close your garage door. Transistor car radios are commonplace. Alternators, using transistors and semiconductor rectifiers are replacing conventional generators—to keep batteries charged, even at idling speeds. Transistor ignition systems are helping to improve engine performance.

The impact of transistors and semiconductor rectifiers in automotive technology is another dramatic illustration of how RCA solid-state advances are helping to meet the broad demands of industry, business, science, and national defense.

RCA Transistors and Semiconductor Rectifiers

These wonder-working devices, shown actual size, are serving electronics everywhere — from computers to satellites.

RCA ELECTRONIC COMPONENTS AND DEVICES

The Most Trusted Name in Electronics

. . . and the world's most broadly based electronics company

Self-steering car of tomorrow traveling on super highway patrolled by radar towers. Future car may be powered by radical new engine, covered with new wonder metal, equipped with car-to-home phone, and controlled by automatic pilot.

Want to build a car that drives itself?

Thompson Products *can help you handle the job*

SOME DAY—and it may come surprisingly soon—a car-maker will introduce a radically advanced new automobile, and cash in on the giant market of tomorrow. Thompson Products can help design and build important components for such a car *today*.

Right now Thompson can aid in creating self-steering devices, advanced new chassis and engines, uses for new wonder metals, and many other revolutionary features.

For years Thompson has been a leader in the development of steering systems . . . in improvement of automotive and aircraft engines, of chassis and airframes . . . and has pioneered in high-temperature, corrosion-resistant metallurgy.

No matter what kind of product you want to make, chances are Thompson can help you—thanks to its vast experience which includes design and production of hydraulic, pneumatic and electronic components, assemblies and systems . . . and a great variety of processes, from high-precision forging to impact extrusion and every kind of quality machining.

If you have a new product in mind, why not call for specific information on how Thompson can help you build it?

You can count on

Thompson Products

as a partner in solving the design and production problems of an advancing technology

General Offices, Cleveland 17, Ohio

From Thompson's 21 research centers and 25 manufacturing plants come, each year, important new advances in mechanics, electronics, hydraulics, pneumatics, aerodynamics, thermodynamics and nucleonics.

195

1958

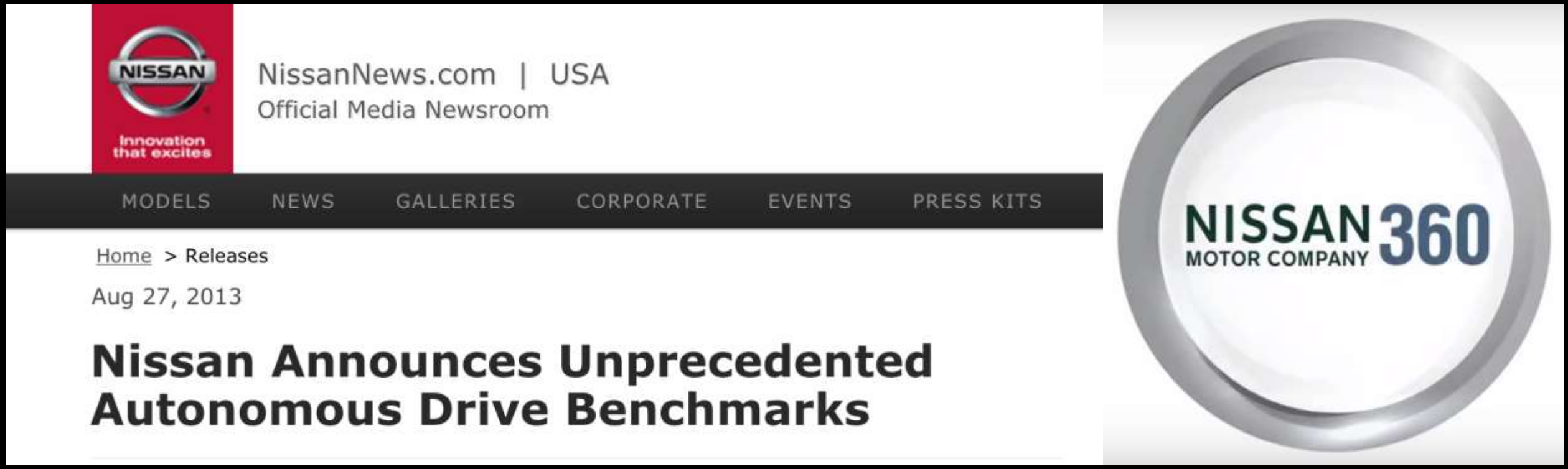
2019

see. think. act.

Home Magazine Technologies Careers Company Press

EFFICIENT MOBILITY: DRIVING US TO DEVELOP INNOVATIVE TECHNOLOGIES

People are in motion, on the way to their destinations. Different means of transportation link the places where we live and study, our workplaces, recreational facilities and travel destinations. The need to conserve resources, reduce noise and emissions and increase safety and comfort are not only key requirements for contemporary mobility but opportunities for sustainable innovation. As one the world's leading technology companies in drive and suspension technology, we are part of and are also driving this development. We're a reliable partner to our customers, employees and to society in general, with the goal of developing innovative and efficient products that improve quality of life and help shape the future. **www.zf.com**

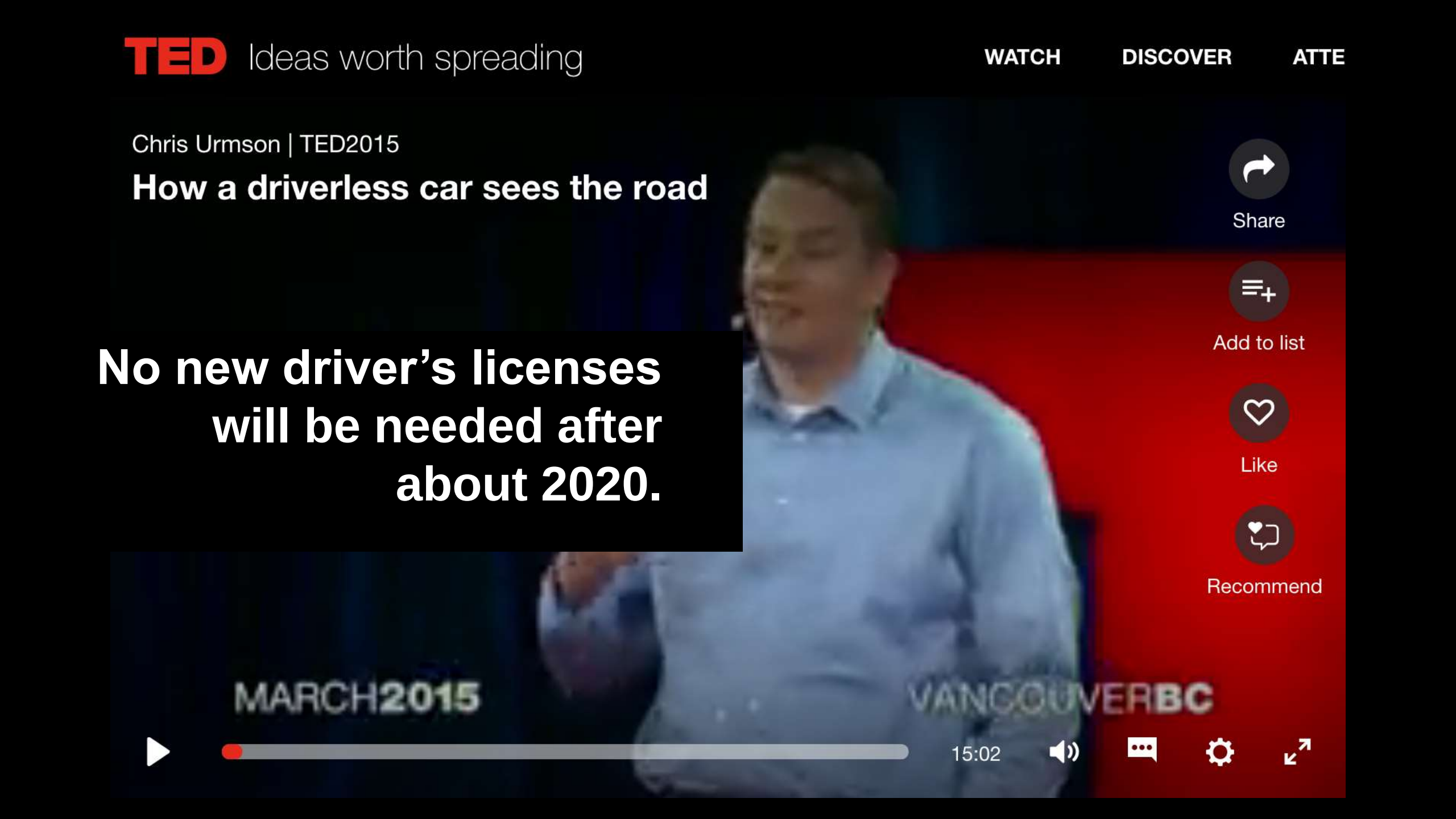


"Nissan today announced that the company will be ready with multiple commercially viable Autonomous Drive vehicles by 2020."

— Nissan press release, 2013

Chris Urmson | TED2015

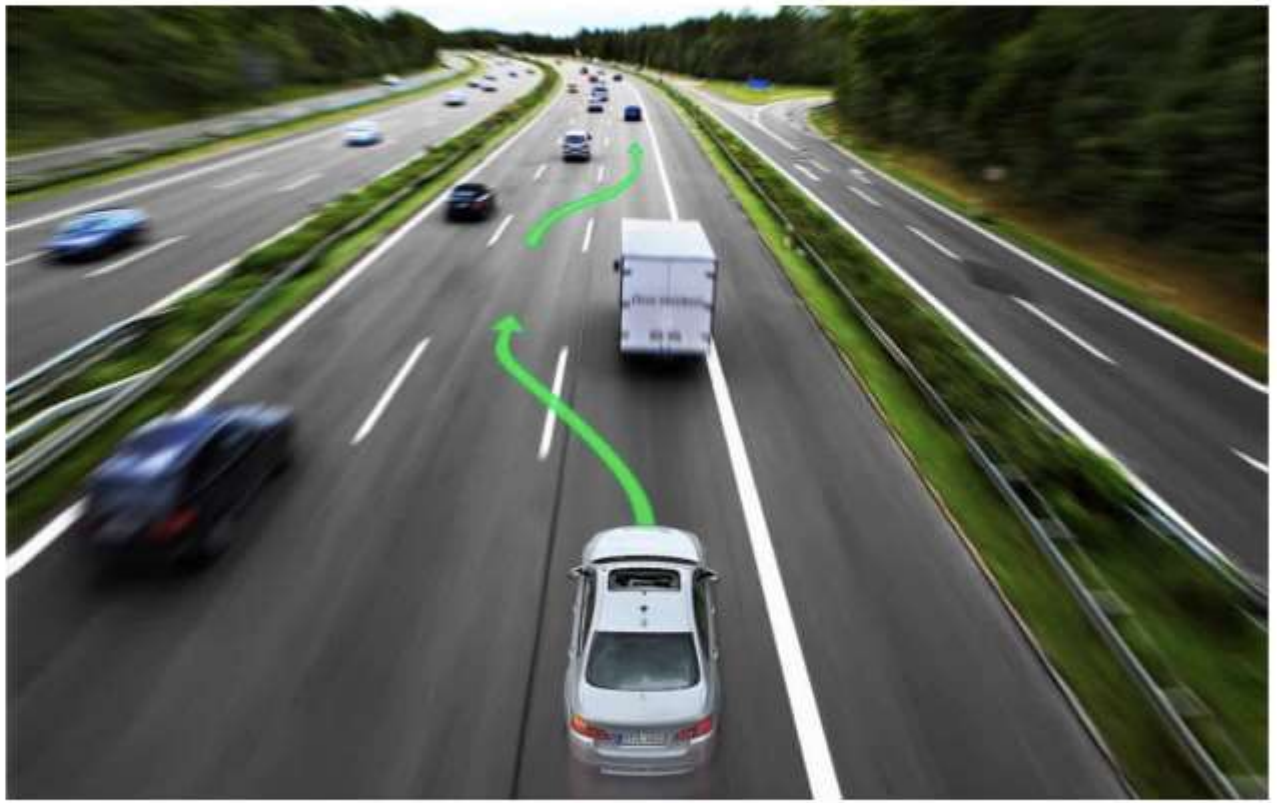
How a driverless car sees the road


TED Ideas worth spreading
WATCH
DISCOVER
ATTE
Chris Urmson | TED2015
How a driverless car sees the road
Share
Add to list
Like
Recommend
No new driver's licenses will be needed after about 2020.
MARCH2015
VANCOUVERBC
15:02

The Observer
Technology

Self-driving cars: from 2020 you will become a permanent backseat driver

Driverless cars will revolutionise motoring, claim the manufacturers. But is the greatest danger that they will be too safe?



▲ A BMW 'highly automated' prototype on the German autobahn. Photograph: PR

In the BMW museum at the company's solidly futuristic headquarters, next to the old Olympic stadium site in Munich, you can view a century

Tim Adams

@TimAdamsWrites

Sun 13 Sep 2015
05.05 EDT

531 375

The Guardian

Sunday
13 September 2015

AUTOWEEK

THE ULTIMATE SELF-DRIVING MACHINES WILL TAKE OVER IN 2021

'Automated ridesharing solutions' are coming as well

JULY 7, 2016

2021. That's the year that ~~Skynet~~ fully autonomous cars will take to the streets, sporting the blue and white roundel. To bring about this utopian future, BMW has partnered up with Intel and the autonomous hardware and software specialist Mobileye.

March 16, 2017 01:00 AM

BMW says self-driving car to be Level 5 capable by 2021

Georgina Prodhan

BMW's iNext model due in 2021 will use self-driving technologies showcased in the Vision Next 100 concept.

BERLIN -- BMW is on track to deliver a fully self-driving car by 2021, the company's senior vice president for autonomous driving, Elmar Frickenstein, said.

"We are on the way to deliver a car in 2021 with Level 3, 4 and 5," Frickenstein told a panel discussion in Berlin on Thursday, explaining the vehicle will have


FUTURAMA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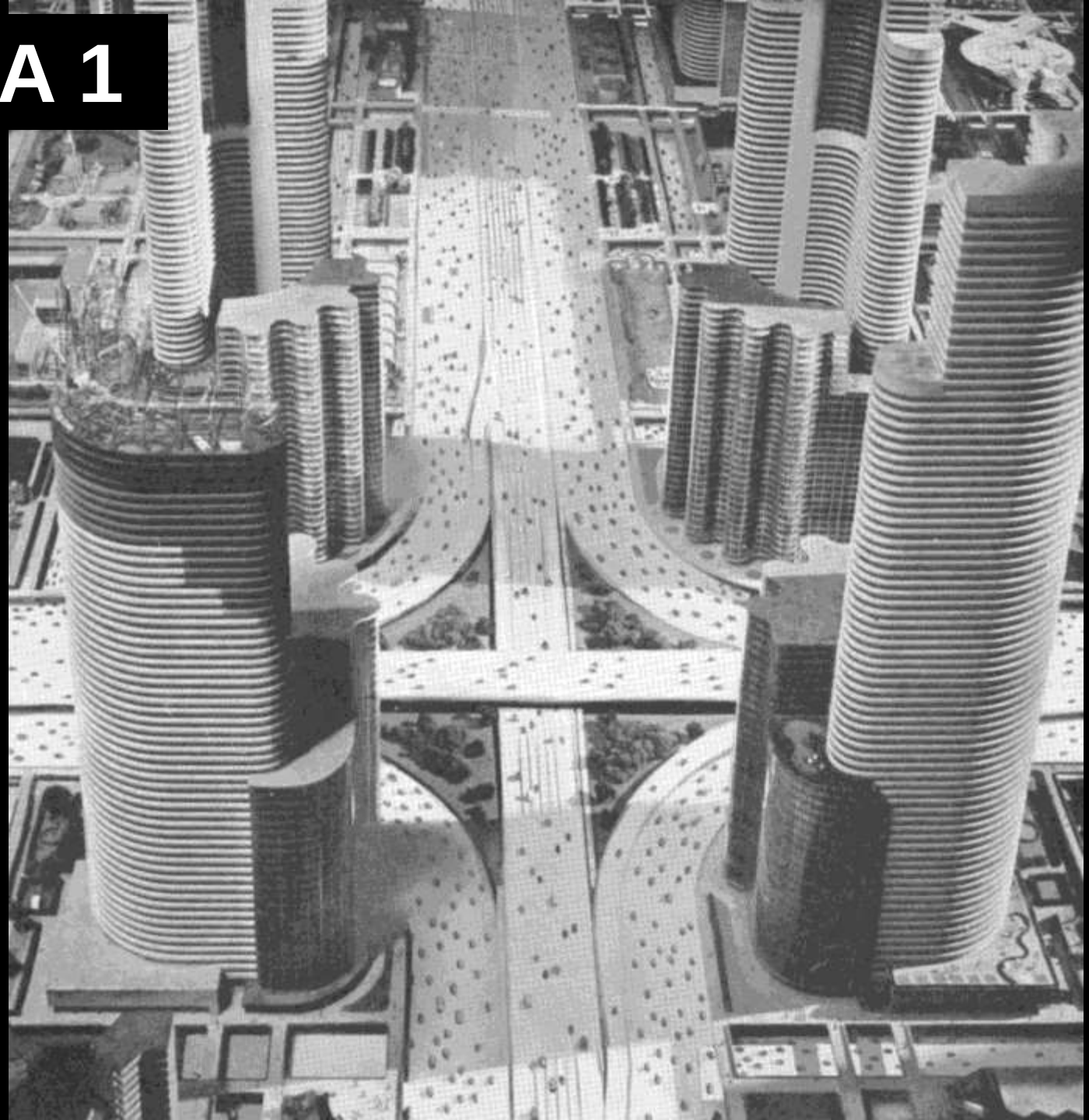
FUTURAMA 1



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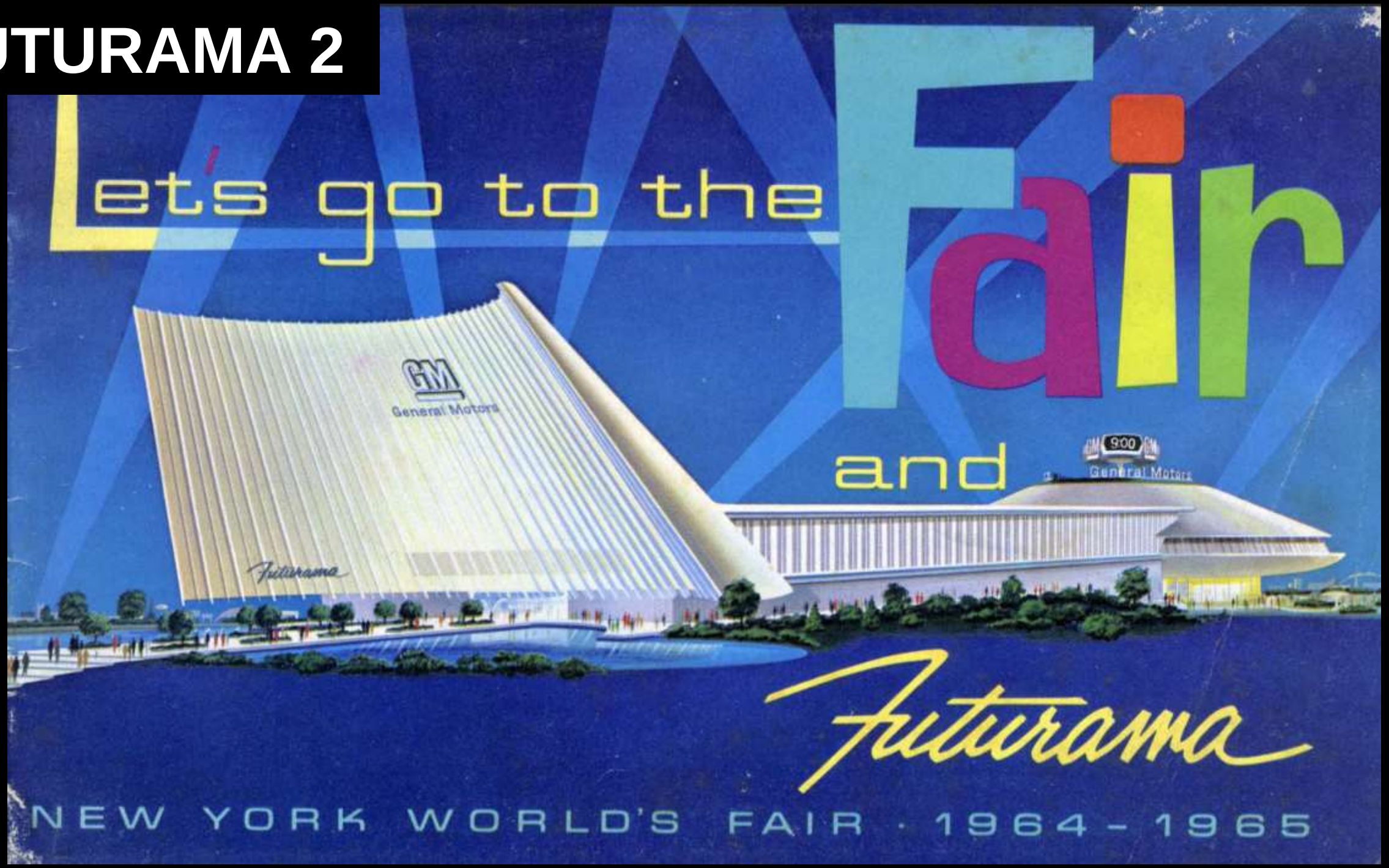
Let's go to the Fair
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General Motors
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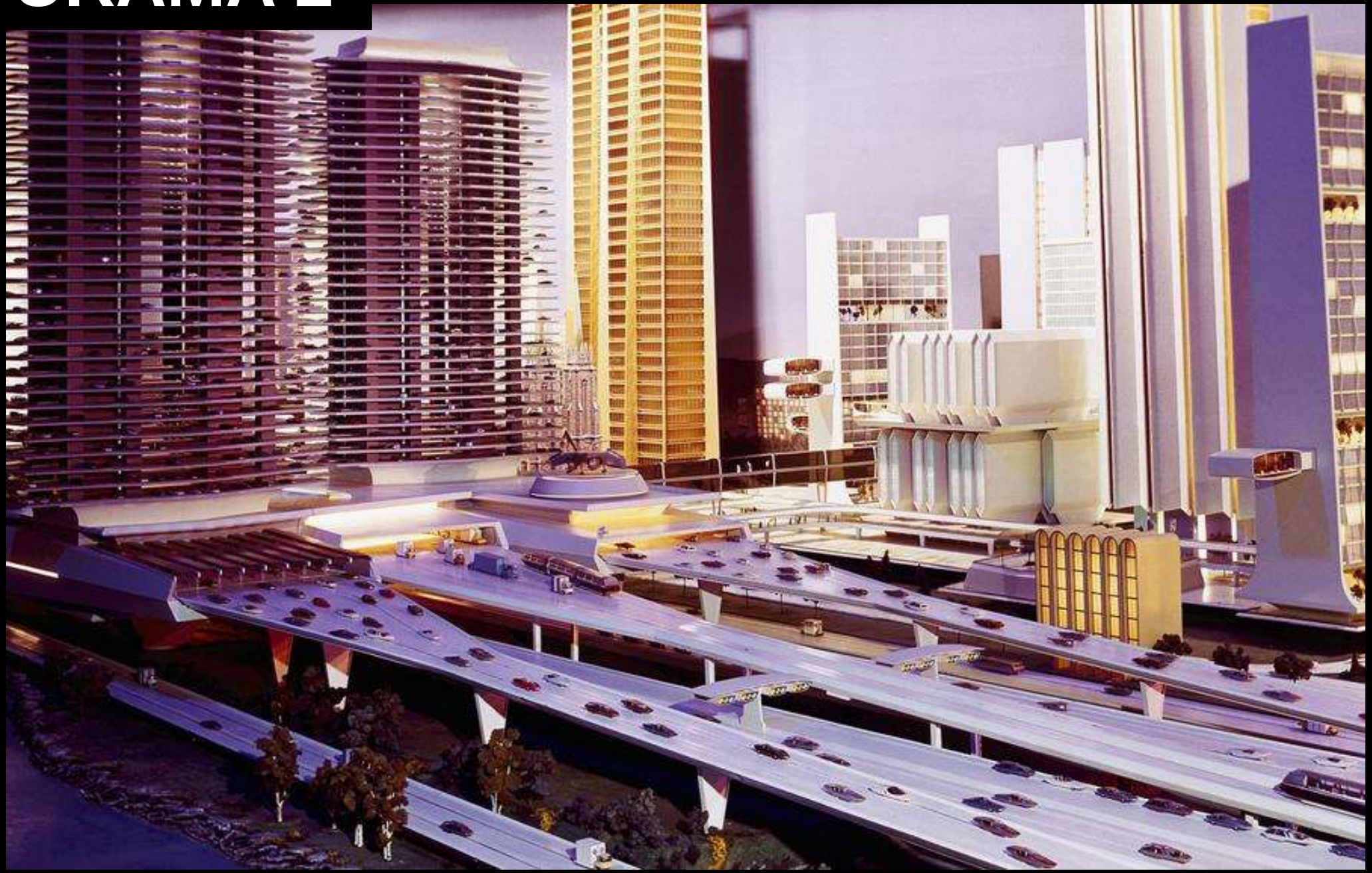
Futurama
NEW YORK WORLD'S FAIR · 1964 - 1965

FUTURAMA 2



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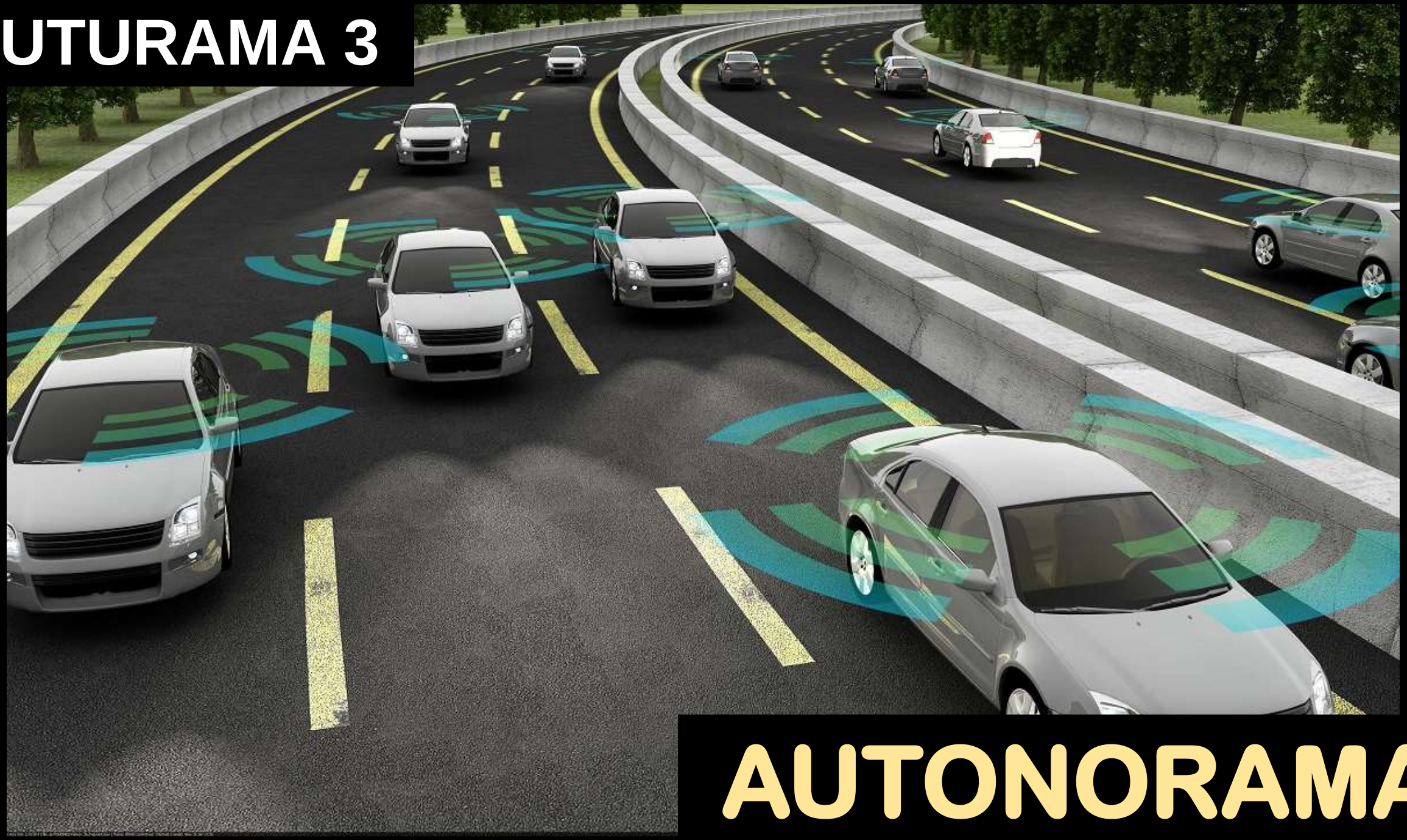

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AUTONORAMA

GENERAL MOTORS

Zero Crashes.

2017 Sustainability Report

Zero Emissions.

Zero Congestion.

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2017 Sustainability Report

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Zero Congestion.

TO OUR STAKEHOLDERS

General Motors Chairman and CEO Mary Barra

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Autonomous, electric, shared and connected vehicles will fuel this transformation. Each is leading-edge on its own. Combined, they will provide customers with safer, better and more sustainable vehicles.

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Vehicles That Drive Themselves

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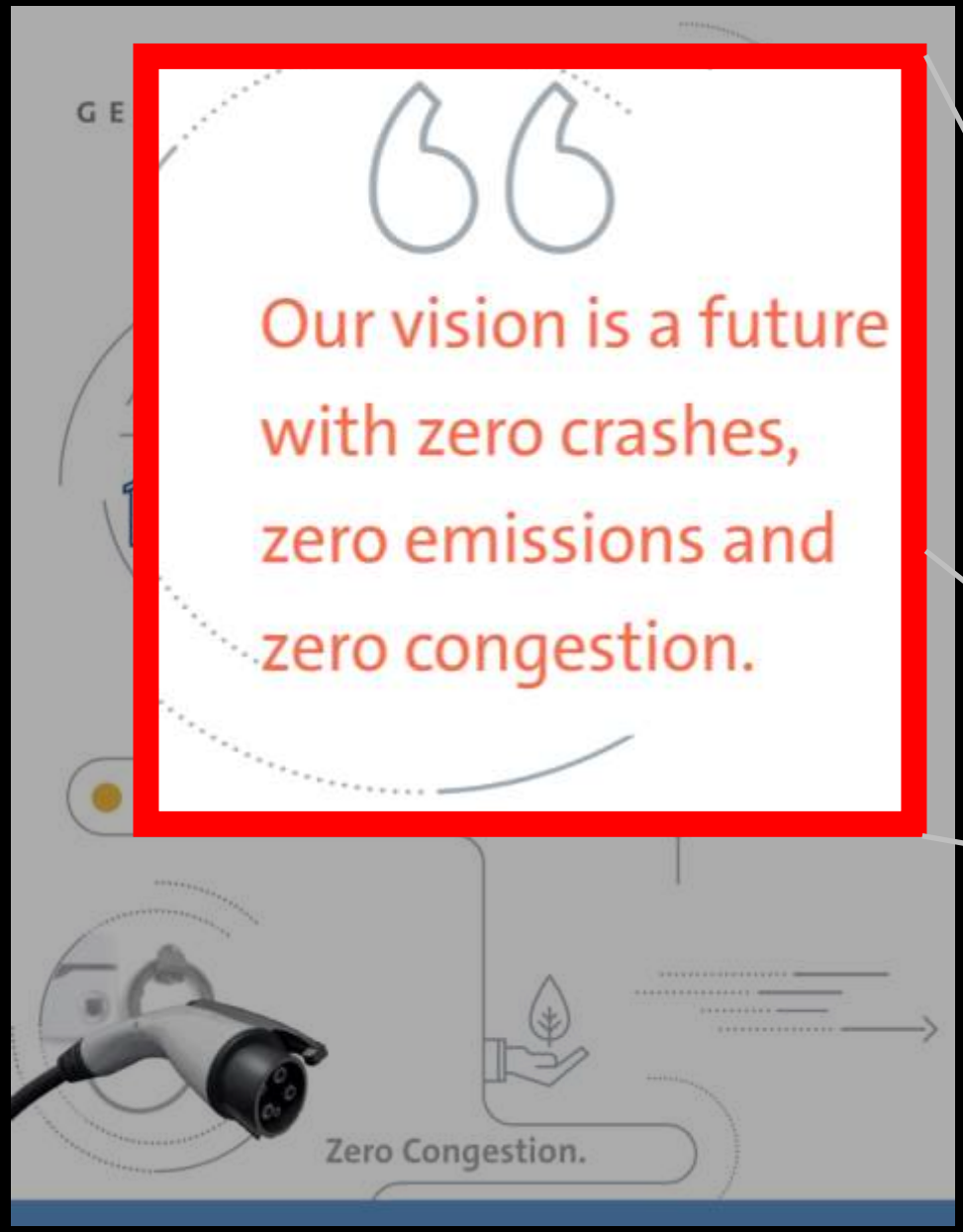

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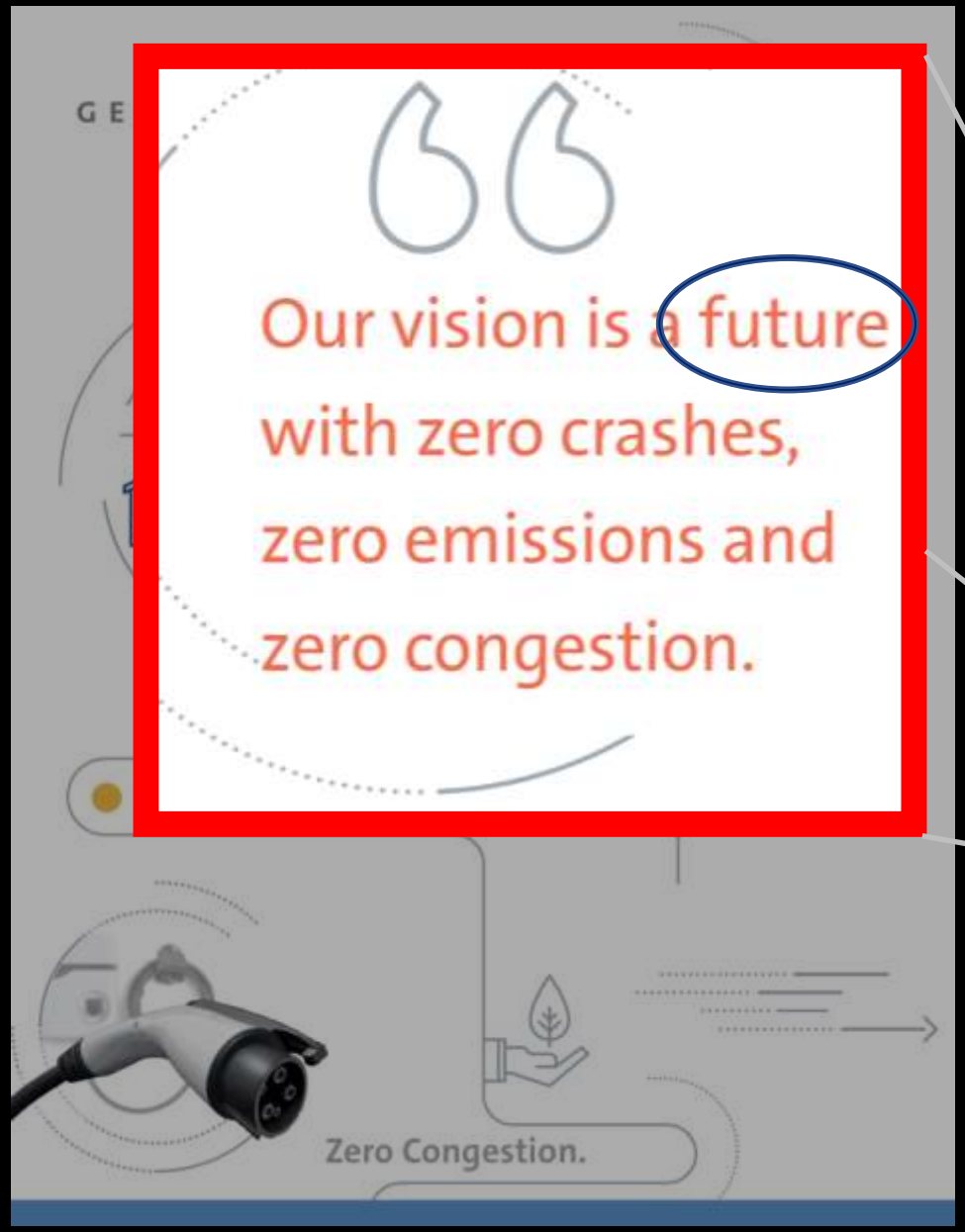

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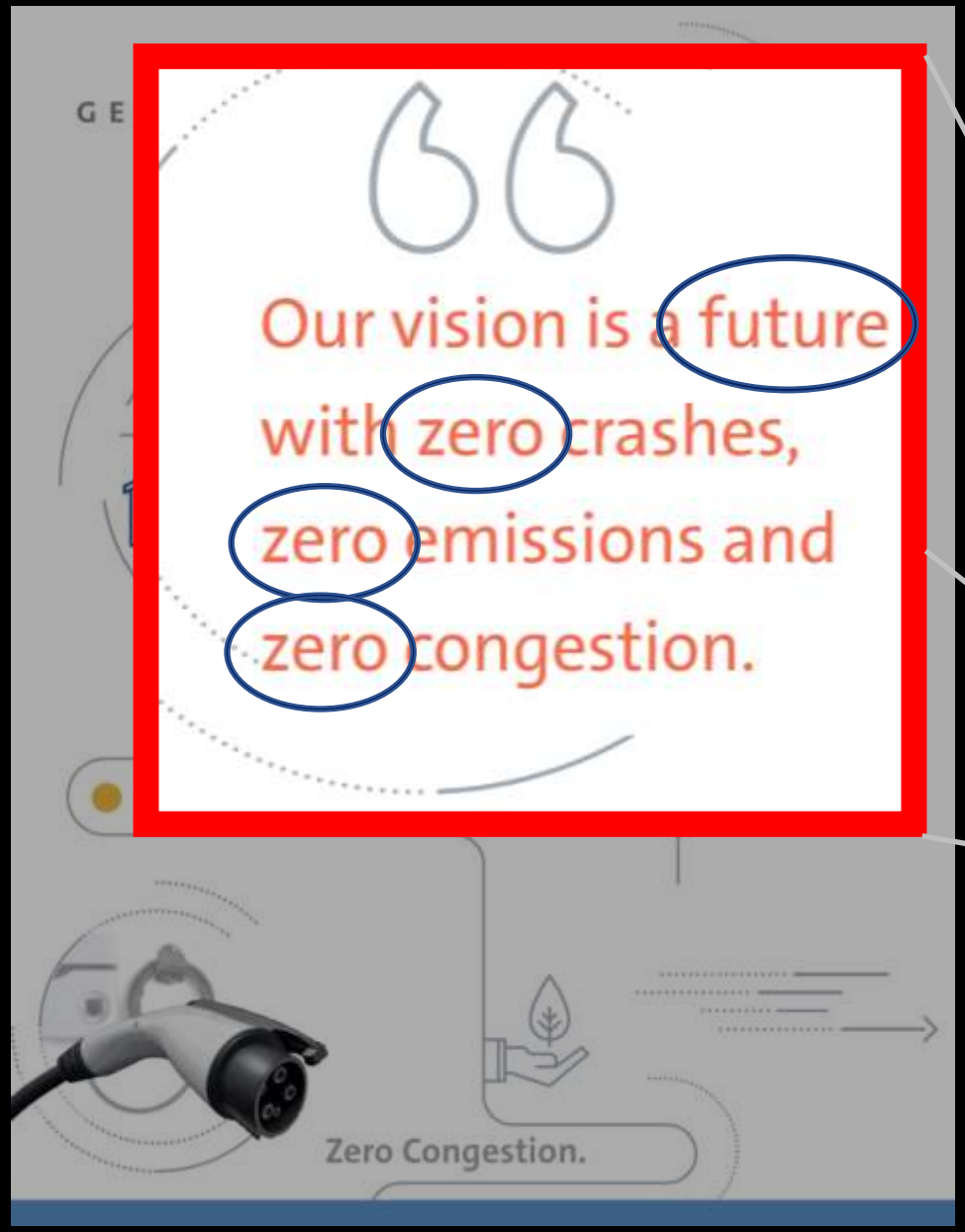

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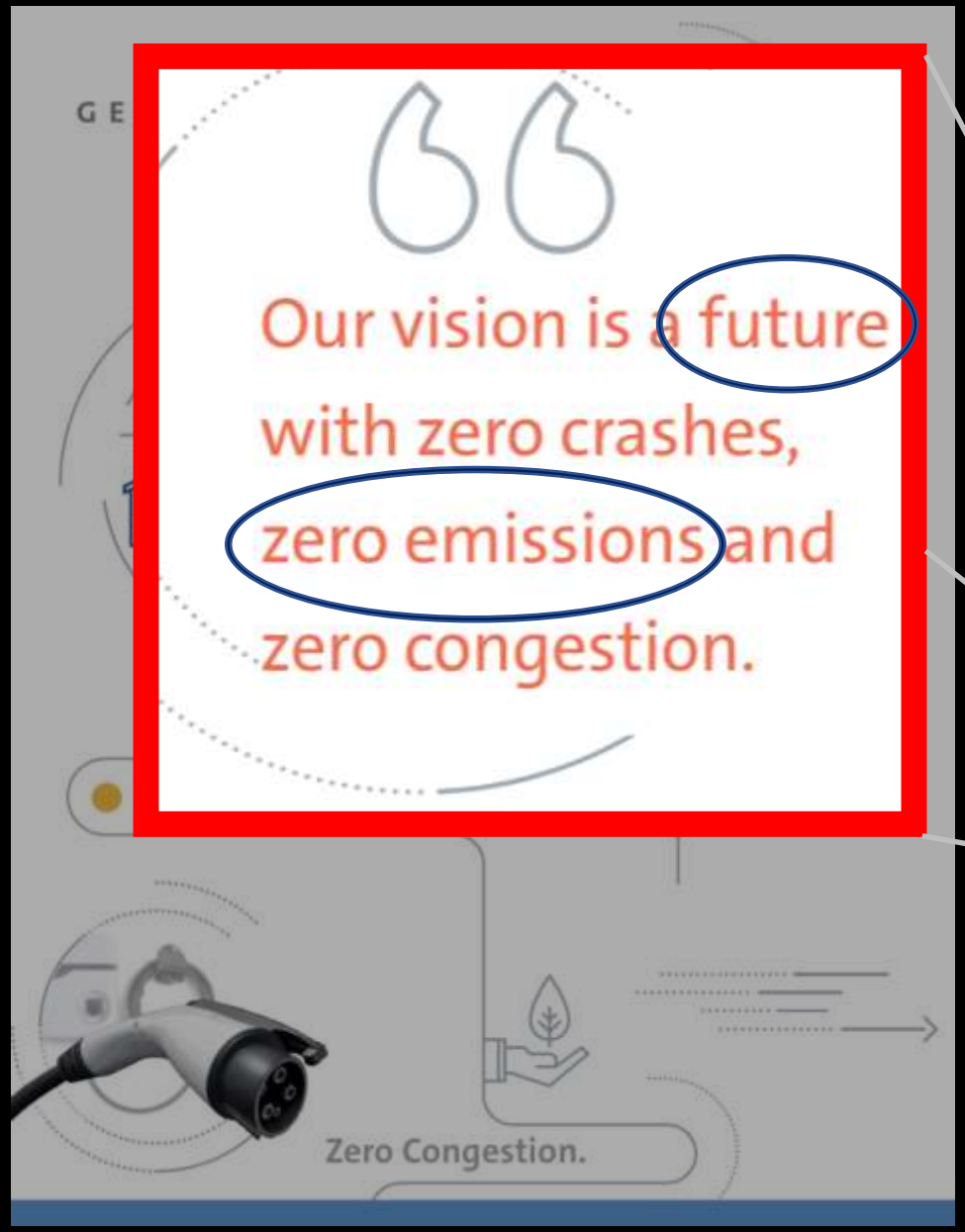

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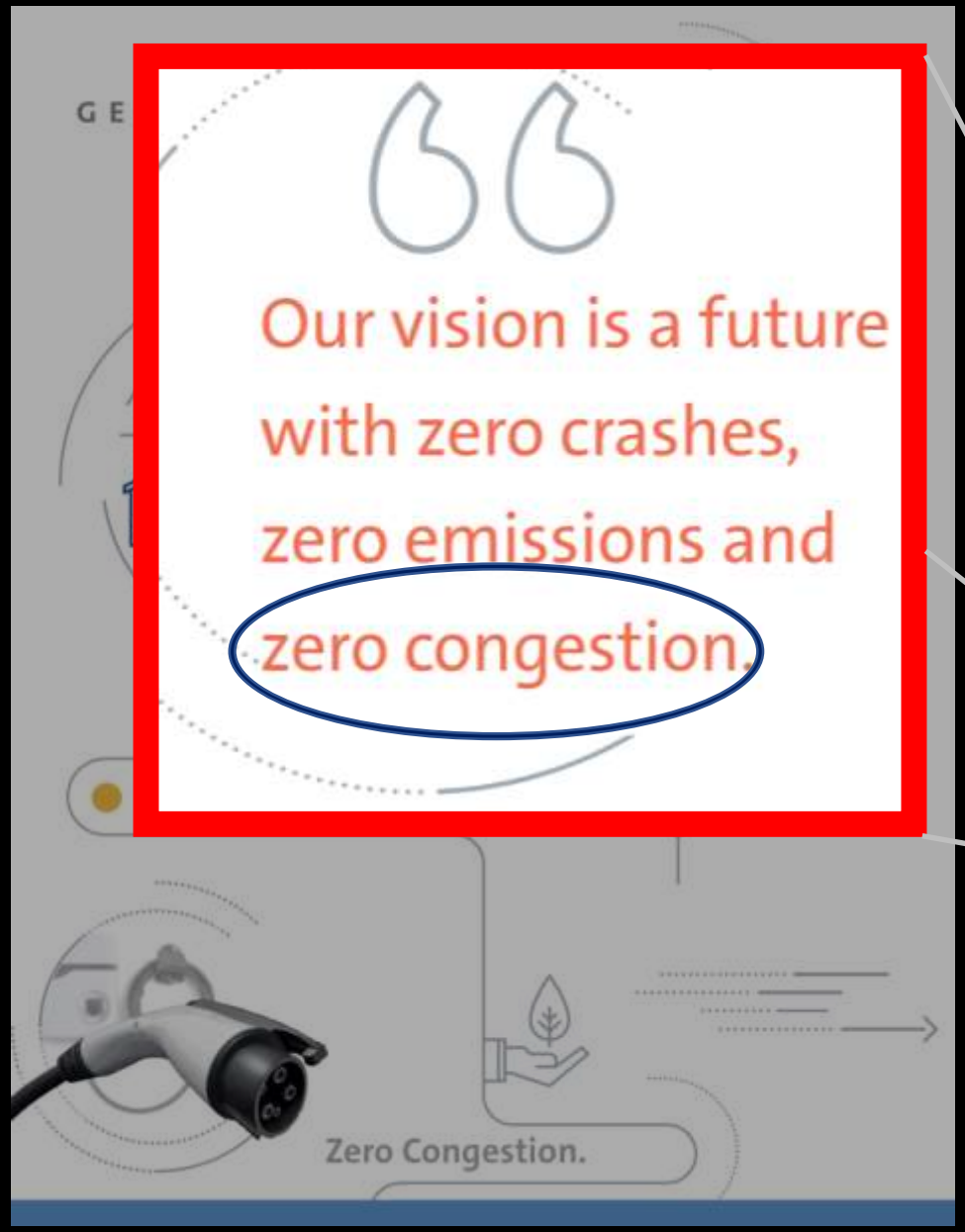

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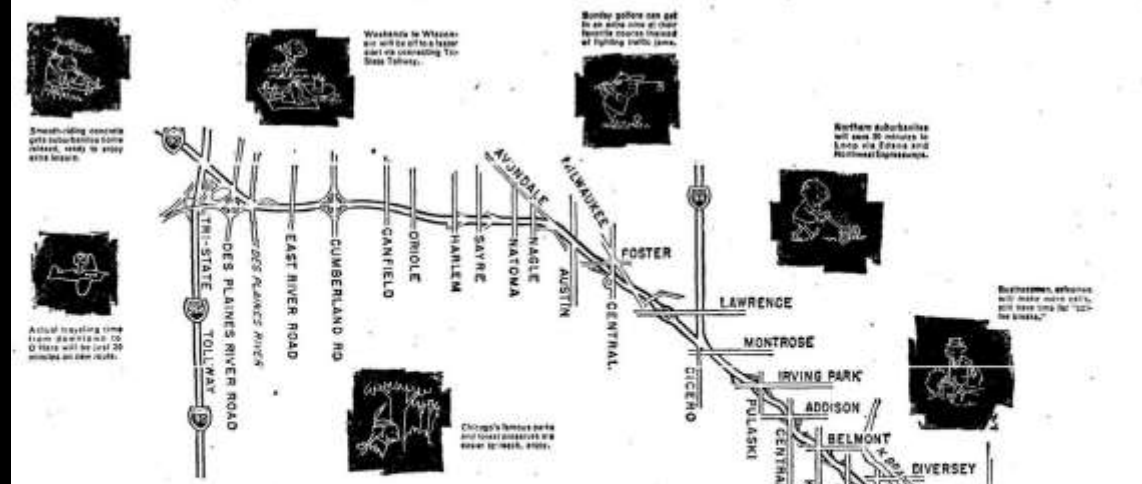
Cure for Congestion

DAVISON LIMITED HIGHWAY, DETROIT. Built by the Board of Wayne County (Michigan) Road Commissioners, this limited highway provides nonstop highway travel for 1½ miles through a solidly built-up neighborhood in the Detroit area. Concrete bridges carry cross traffic over the expressway. Entrance to the expressway is permitted only at each end. One-way concrete service drives for local traffic are provided on both sides of the concrete highway. At the center of the project, provision is made for bus stops and passenger interchange with the upper level.

Portland Cement Association (1948)



Now open for traffic all the way!

Northwest Expressway of modern concrete will save Chicago area drivers 40,000 hours each day!

Driving time from the Loop to O'Hare Field will be more than cut in half on Chicago's newest expressway. Free from traffic jams, drivers all along the Northwest route will have millions of extra hours a year for their own pleasure. Look for time savings—and look, too, for easier driving, new comfort and far greater safety.

There's good reason why the preferred pavement for roads like this is *modern concrete*. For one thing, the smooth, level ride it gives—and keeps on giving! Concrete starts out strong, gets stronger year by year! Summer heat can't soften it, so no ruts and ridges. Winter can't rough it up, either, thanks to built-in protection from freezing and ice-melting salts.

Next time you're driving on Northwest Expressway, give a nod of thanks to your city, county, state and federal officials who made it possible. You go *1st class* on concrete!

Northwest Expressway leading into Northwest Tollway at O'Hare Field. Smooth-riding highways of modern concrete now speed travelers from the international airport to all parts of Chicagoland.

Interchange of Edens and Northwest Expressways. On modern concrete highways like these, upkeep costs stay low. And the 50 year life engineers can design into concrete and figure across real tax savings!

Congress Expressway. Vital Chicago traffic arteries, Congress and Northwest Expressways efficiently and safely move more than 540,000 people per day.

FOR HIGHWAYS WITH A SOLID FUTURE
MODERN Concrete

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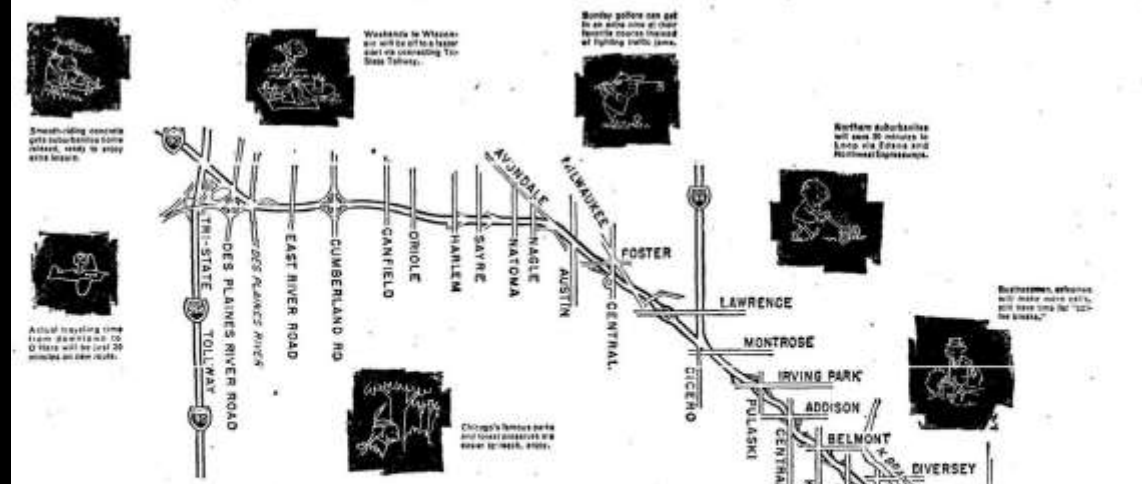
111 West Washington Street, Chicago 3, Illinois

A national organization to improve and extend the uses of concrete



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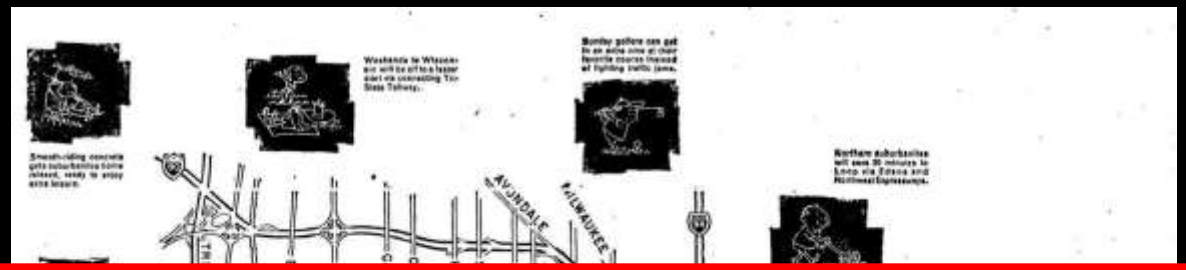

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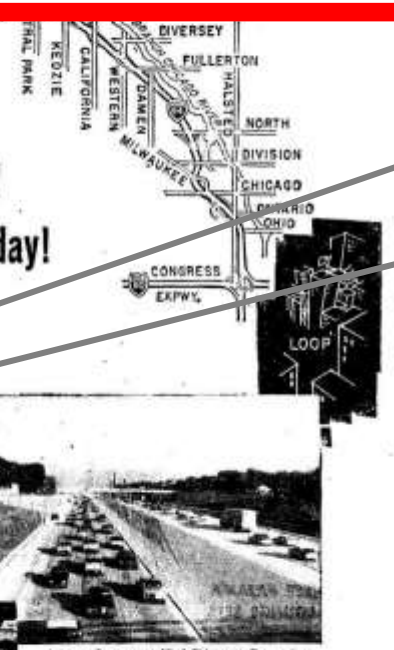

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Easy go.
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LIMIT
45
SPEED
LIMIT
45

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16,900,000
$ 418,000,000
Rank 23: I90 Between I55 and W Pershing Rd
1,300,000
$ 31,000,000
Annual Total Delay (Hrs)
$ Annual Lost Value of Time (US $)
National Rank
Daily Total Delay (Hrs)
2,001 - 3,000
3,001 - 4,500
4,501 - 6,000
6,001 - 7,500
7,501 - 11,800
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Chicago
Melrose Park
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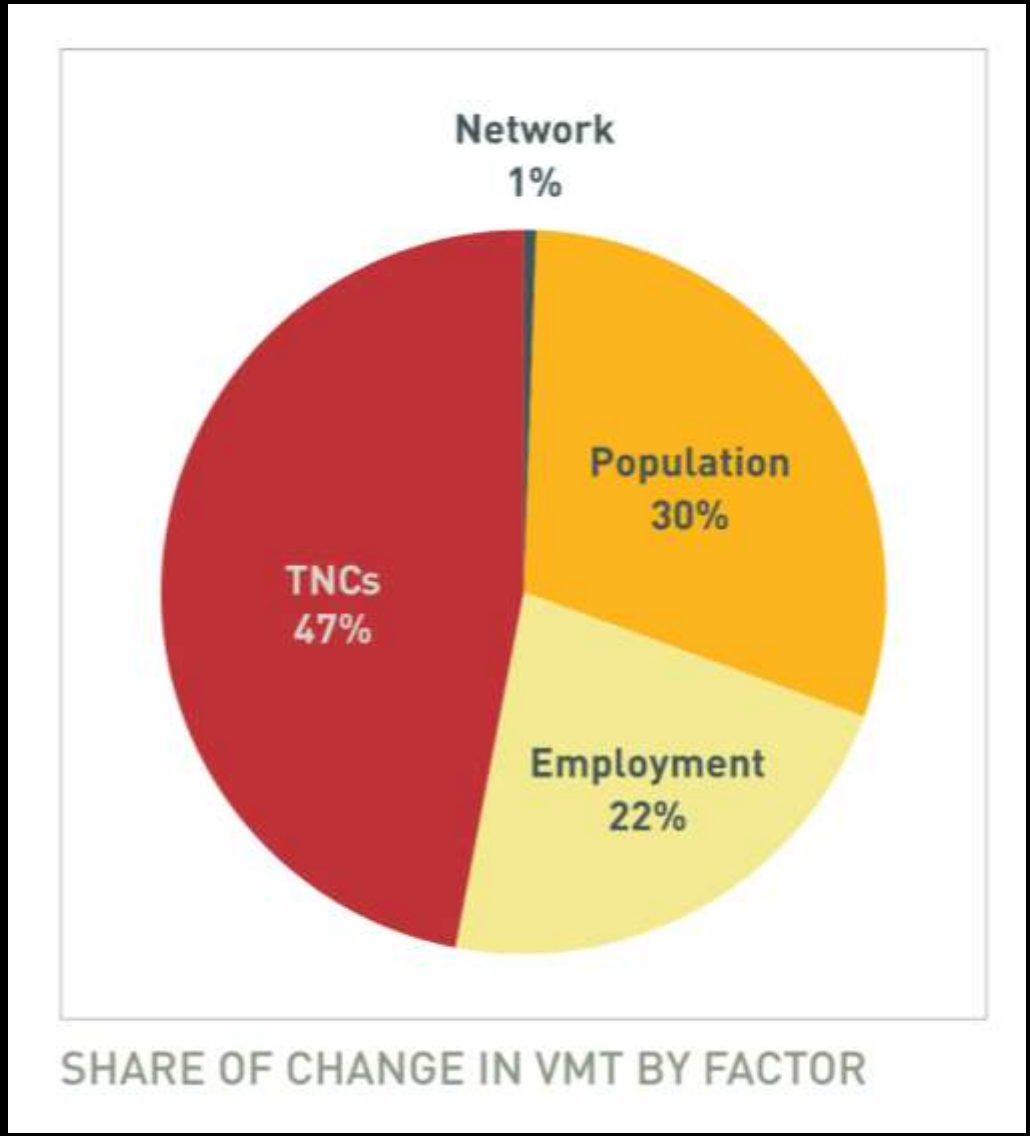
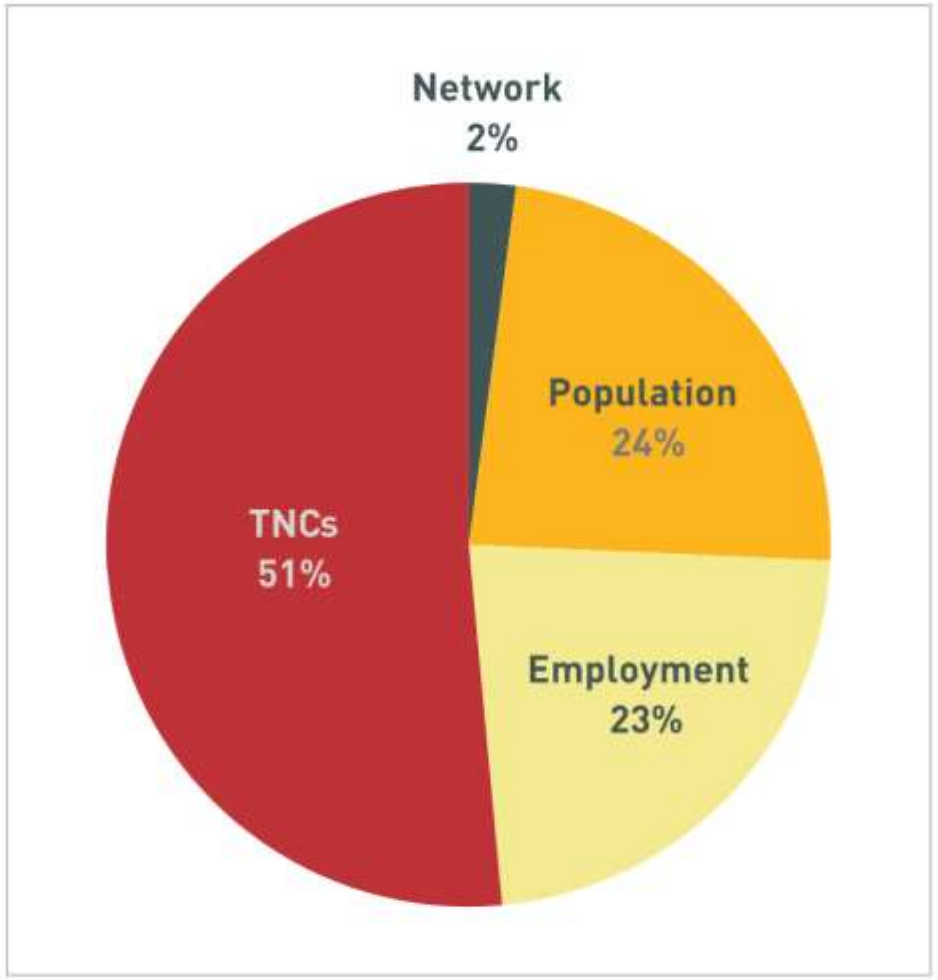


SHARE OF CHANGE IN VMT BY FACTOR



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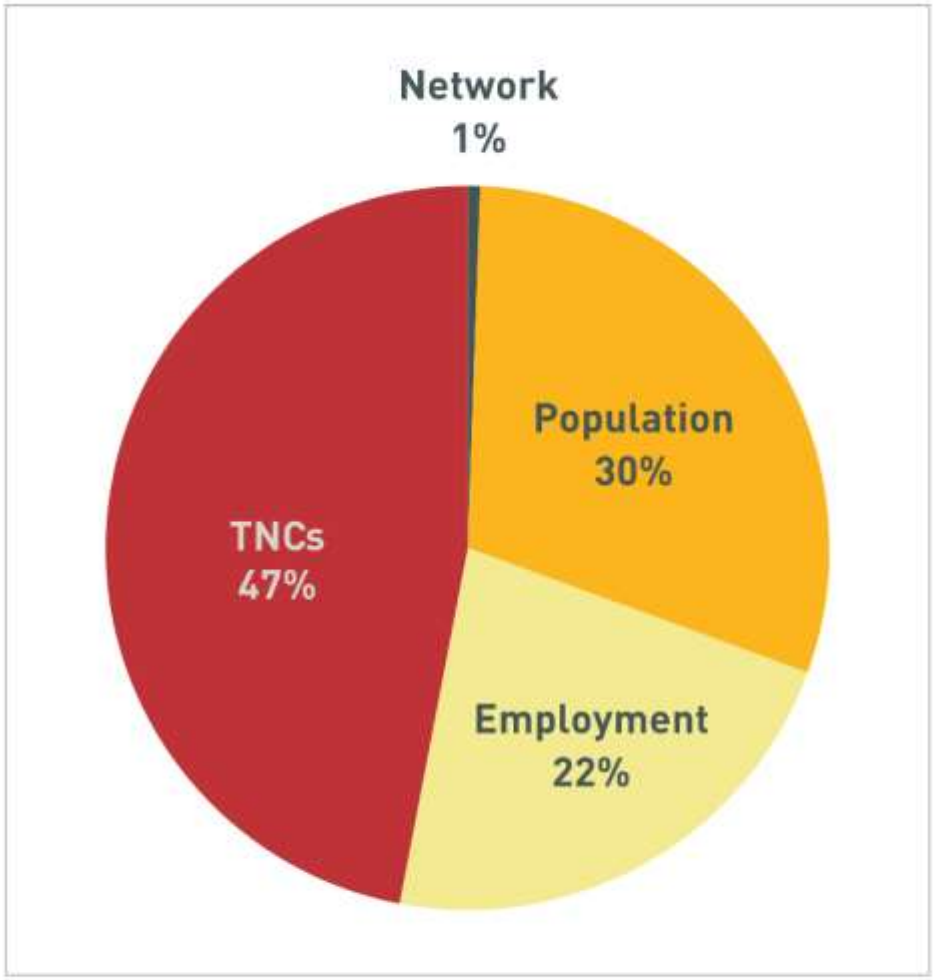

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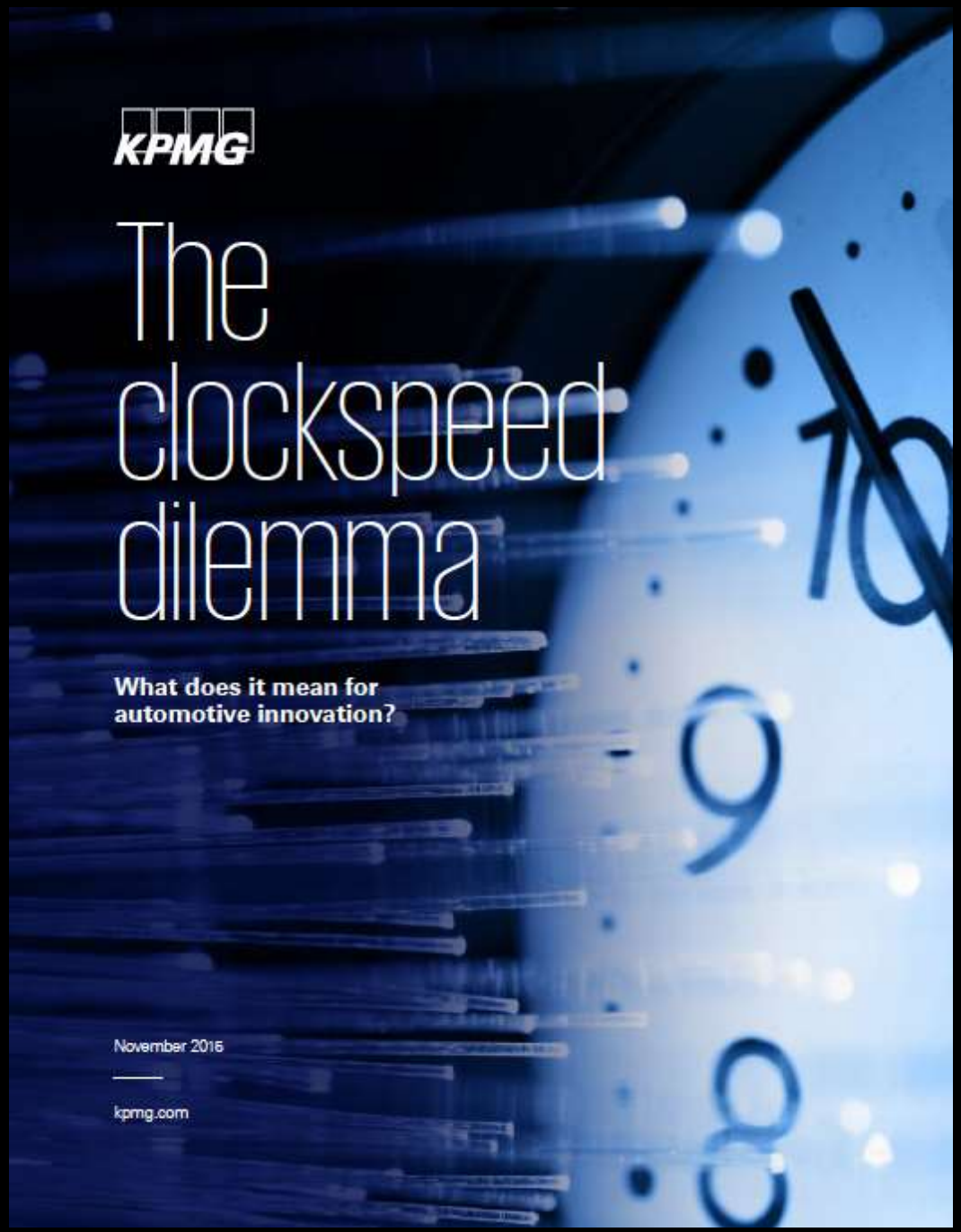
Unionville Elementary Car Rider dropoff attempt with 2 lanes

Darin Givens / ATL Urbanist


KPMG
The clockspeed dilemma
What does it mean for automotive innovation?
November 2016
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Personal miles will soar.

Younger and older age groups are making small changes in their mobility decisions that will drive big changes in personal miles traveled. Our models project as much as an additional trillion or more by 2050.

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A trillion-mile surge

These changes in consumer behavior seem modest, but small changes in personal travel choices can have a big impact in the future… and personal miles traveled (PMT) will soar!

One thing is for sure.

Those additional personal miles traveled offer a golden opportunity for the auto industry.

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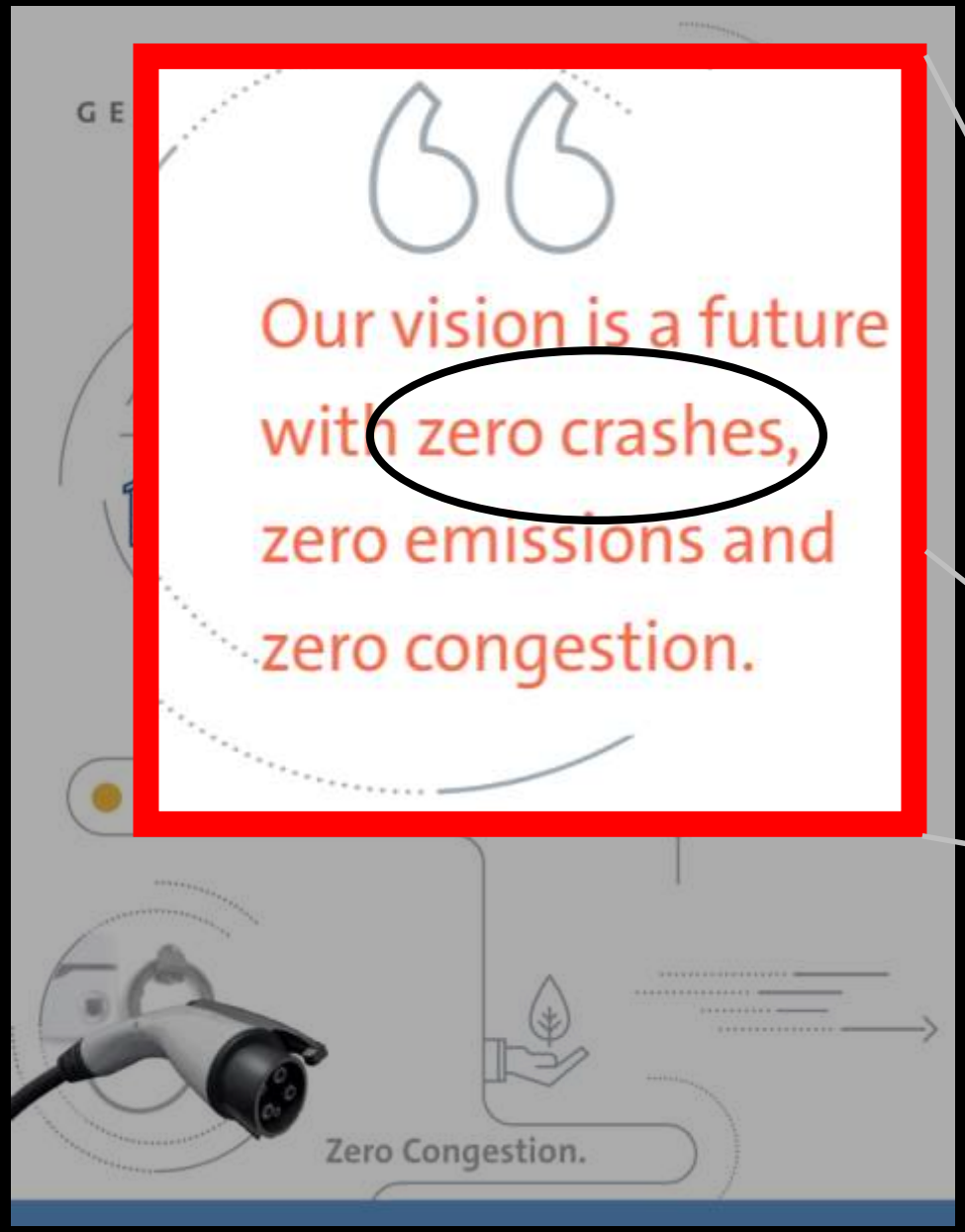


TO OUR STAKEHOLDERS

Our vision is a future with zero crashes, zero emissions and zero congestion.

For more than a century, automobiles have driven our society and economy, giving us unprecedented mobility and transforming the way we work and live.

Today, we are in the midst of another revolution as groundbreaking technologies and evolving customer lifestyles transform our vehicles and how we use them.

At General Motors, our vision of a future with zero crashes, zero emissions and zero congestion addresses the challenges associated with the freedom of mobility. This bold, ambitious vision has the potential each year to save 1.25 million lives by eliminating human error, the root of more than 90 percent of crashes; eliminate over 2 billion tons of carbon dioxide; and give commuters back the week of time they spend in traffic.

Autonomous, electric, shared and connected vehicles will fuel this transformation. Each is leading-edge on its own. Combined, they will provide customers with safer, better and more sustainable vehicles.

Our journey to this future is underway. We have the right team, the right technology, the right partners and the global manufacturing scale to bring these innovative solutions to more customers, more quickly. And our strategy to transform GM into the world's most valued automotive company includes several major initiatives to lead this revolution.

Vehicles That Drive Themselves

Self-driving vehicles will reinvent our society, not only by reducing crashes and saving lives, but also by unlocking the power of mobility for those unable to drive.

General Motors is the only company with a fully integrated solution to produce self-driving vehicles at scale. With our 2017 acquisition of LiDAR developer Strobe, we now have every capability—from simulation and mapping software to safety validation and autonomous vehicle (AV)-specific vehicle design—under one roof. And we've moved quickly, developing three generations of self-driving vehicle technology in just 14 months.

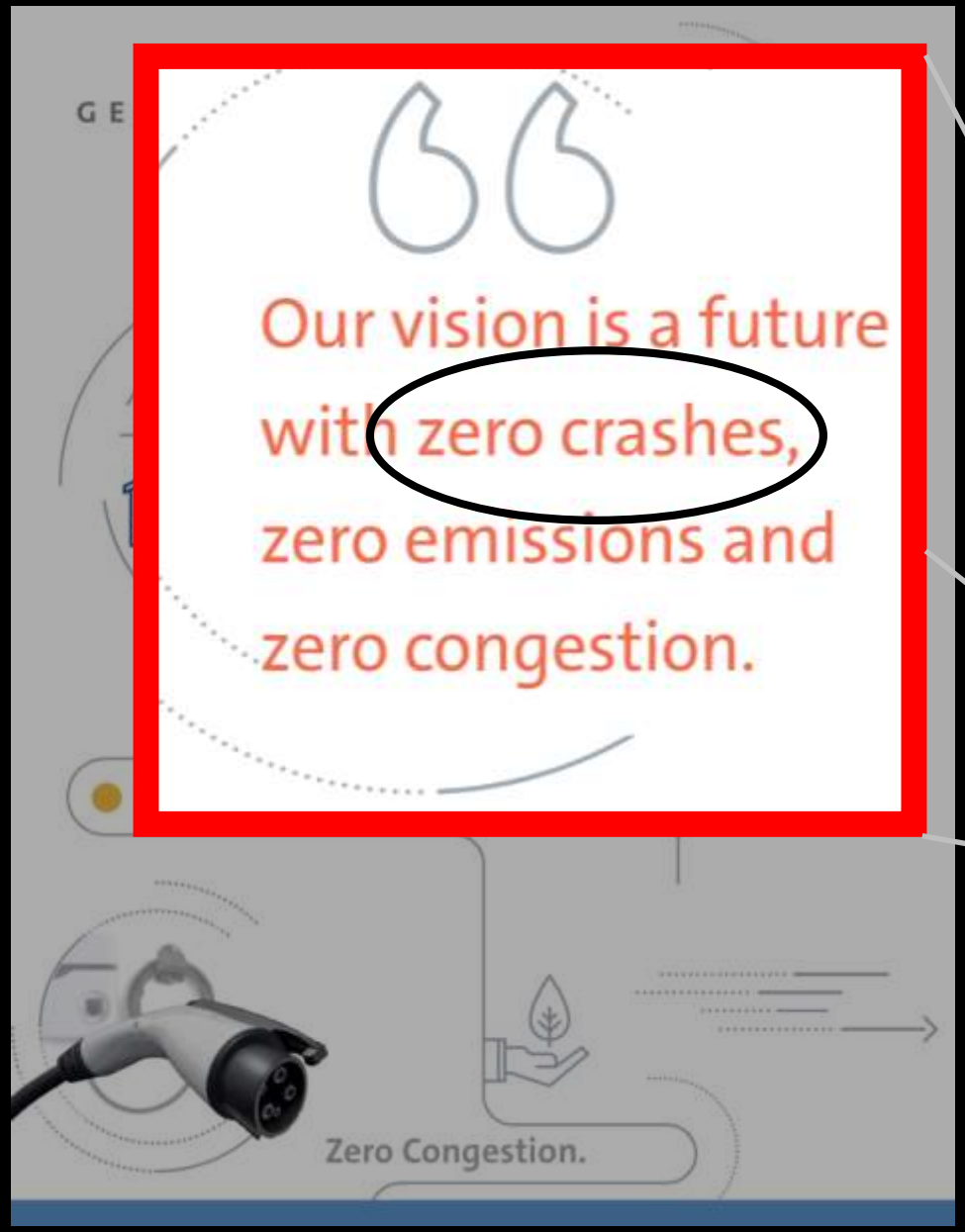
After more than a year of building test vehicles, we are shifting to build production versions at our Orion Assembly plant in Michigan. The Cruise AV, which is part of our plans to commercialize in a dense urban area in 2019, will be the first production-ready vehicle built from the ground up to operate safely without a driver, steering wheel, pedals or manual controls. It represents a significant milestone on our path to deploying self-driving vehicles next year.

In preparation, we filed a Safety Report and Safety Petition with the U.S. Department of Transportation in January 2018 to enable us to safely deploy our Cruise AV zero-emission, self-driving vehicle.

Last month, we further strengthened our plans to commercialize AV technology at large scale through a landmark deal with the SoftBank Vision Fund, the world's largest tech and ridesharing investor. SoftBank is investing $2.25 billion and General Motors is investing $1.1 billion in GM Cruise, a new, majority-owned subsidiary. With SoftBank as a partner, we gain a tech leader that shares our vision, believes in our long-term business model and appreciates our integrated approach to AV development. It also strengthens our ability to attract high-tech talent, which is vital to our success.

5

public relations beats research



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THE FOOL-PROOF HIGHWAY OF THE FUTURE

by Dr. MILLER McCLINTOCK, Director
The Erskine Bureau for Street Traffic Research
Harvard University

ARE fool-proof highways possible?

This question, often the subject of debate when highway engineers or safety directors gather, has but one answer. It is simply "yes."

Highway safety has become one of our most important national and local problems. It is deplorable but, nevertheless, true that our most efficient mechanical servant, the motor car, is the cause of a yearly death roll of thirty-three thousand men, women and children and that it causes annually serious personal injury to more than one million citizens. This is a matter of concern to every man interested in the automobile industry as well to to every-

accidents were made impossible by guards and protectors placed over dangerous machinery in such a manner that an accident became an impossibility.

The railways, too, have pointed the way for highway safety. Despite highly trained personnel and refined equipment the country was, for several decades, repeatedly shocked by ghastly train wrecks. Railroad safety was made a reality only when grade separations, block signals, interlocking switches and train control devices made wrecks practically impossible.

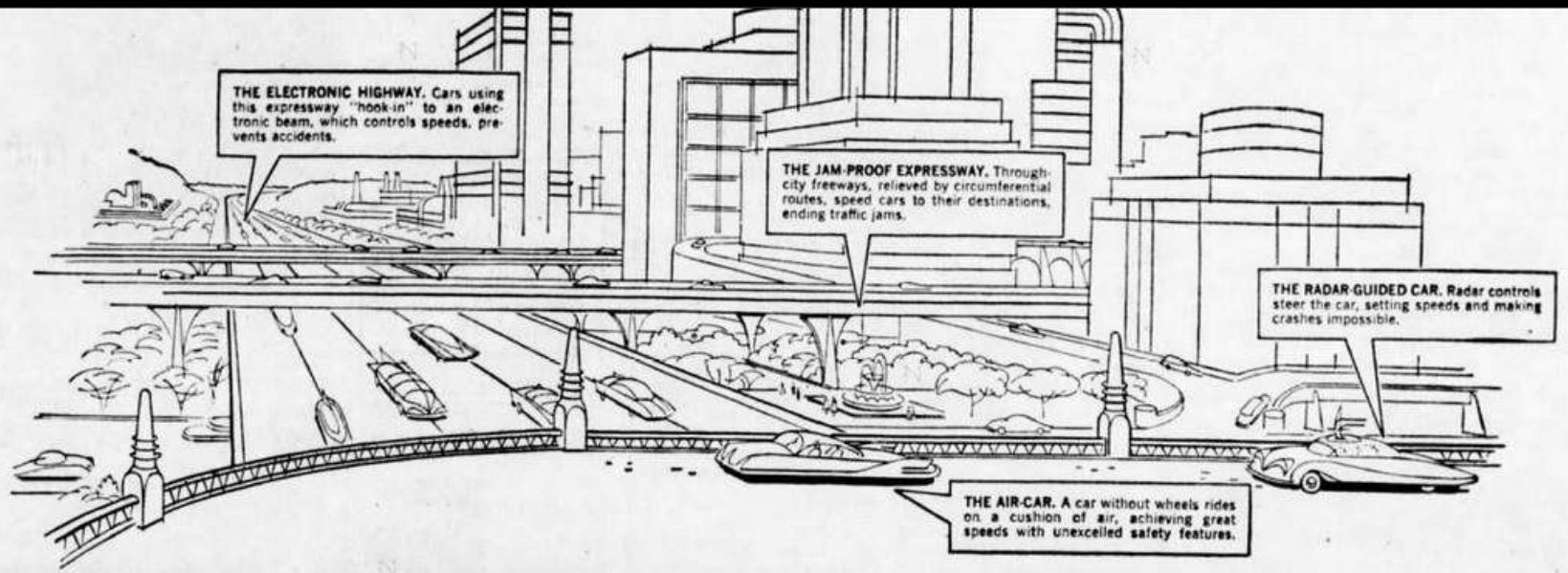
The same accomplishment can be had for street and highway safety. Fool-proof highways are possible. They have been made a definite pos-

cars and pedestrians. There are no pedestrians on limited ways and, hence, no pedestrians can be killed on such a structure. The next great cause of fatalities is the collision of vehicles at intersection. This type of accident can never happen on a limited way because there are no intersections. Left-hand turns and other irregular movements in the roadway are another source of fatal accidents. This cause is practically eliminated by the limited way. In fact, about the only accidents that can take place on one of these structures is a rear-end collision.

A limited way may be constructed right to the heart of any city, thus affording not only a fool-proof right of way for automobile operation but,

In 1933 nine hundred people were killed in the City of Chicago in traffic accidents. An examination of the cause of each of these accidents reveals that only seventeen of them would have been possible if all traffic had been moving on limited ways.

98.1%



SCIENCE PROMISES A FUTURE FREE OF TRAFFIC ACCIDENTS

The Effects of Automobile Safety Regulation

Sam Peltzman

University of Chicago

Technological studies imply that annual highway deaths would be 20 percent greater without legally mandated installation of various safety devices on automobiles. However, this literature ignores offsetting effects of nonregulatory demand for safety and driver response to the devices. This article indicates that these offsets are virtually complete, so that regulation has not decreased highway deaths. Time-series (but not cross-section) data imply some saving of auto occupants' lives at the expense of more pedestrian deaths and more nonfatal accidents, a pattern consistent with optimal driver response to regulation.

The attempt to improve automobile safety by regulation of product design is perhaps the trademark of the contemporary "consumerist" movement. The gross and net benefits of this regulation have already been acclaimed.[1] This paper will first review some of the evidence supporting the acclamations and then proceed to an independent evaluation of the effects of auto safety regulation. The main conclusion is that safety regulation has had no effect on the highway death toll. There is some evidence that regulation may have increased the share of this toll borne by pedestrians and increased the total number of accidents.

I. Background

Motor vehicle deaths have long been among the 10 leading causes of death, and they usually comprise between a third and a half of all

I am indebted to Paul Evans for diligent research assistance and to Isaac Ehrlich for helpful comments. The support of the Walgreen Foundation for the Study of American Institutions is gratefully acknowledged.

[1] See, e.g., any recent *Annual Report* of the National Highway Traffic Safety Administration and the summary of benefit-cost comparisons in U.S. Office of Science and Technology (1972).

[*Journal of Political Economy*, 1975, vol. 83, no. 4]

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Self-Driving Cars Moving into the Industry's Driver's Seat

New IHS Automotive study forecasts nearly 12 million yearly self-driving cars sales and almost 54 million in use on global highways by 2035

Thursday, January 2, 2014 10:44 am EST

Self-driving cars (SDC) that include driver control are expected to hit highways around the globe before 2025 and self-driving "only" cars are anticipated around 2030, according to an emerging technologies study on Autonomous Cars from IHS Automotive, driven by Polk.

In the study, "*Emerging Technologies: Autonomous Cars—Not If, But When,*" IHS Automotive forecasts total worldwide sales of self-driving cars will grow from nearly 230 thousand in 2025 to 11.8 million in 2035 – 7 million SDCs with both driver control and autonomous control and 4.8 million that have only autonomous control. In all, there should be nearly 54 million self-driving cars in use globally by 2035.

"Accident rates will plunge to near zero for SDCs, although other cars will crash into SDCs, but as the market share of SDCs on the highway grows, overall accident rates will decline steadily"

The study anticipates that nearly all of the vehicles in use are likely to be self-driving cars or self-driving commercial vehicles sometime after 2050.

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THE WALL STREET JOURNAL.

Human Drivers Are Headed For History's Exit Ramp, Study Says

By Jonathan Welsh

Jan 2, 2014 4:00 pm ET

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By David Undercoffler

JANUARY 2, 2014

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Video appears Tesla driver asleep at the wheel on freeway

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#tesla #models #model3

Hack Your Tesla To Go Hands Free Full Autonomous Self Driving on the Highway!

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See Motorists Play, Read and Relax In Self-Driving Cars As Second Tesla Crashes

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In conclusion, I fear I have wandered from the subject of our discussion, and do not feel I have done justice to it. I hope, however, to have said enough to make you feel that the traumatic disorders of remembering are worthy of consideration.

REFERENCES

1. FERRIER, D. (1878). *The Localisation of Cerebral Disease* (London).
2. RUSSELL, W. R. and NATHAN, P. W. (1946). *Brain*, **69**, 280.
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(*Manuscript received 7th October*, 1947.)

THE BREAKDOWN OF VIGILANCE DURING PROLONGED VISUAL SEARCH[1]

BY

N. H. MACKWORTH

(*From the Medical Research Council Applied Psychology Research Unit, Cambridge*)

I

INTRODUCTION

1. *The General Problem.* The deterioration in human performance resulting from adverse working conditions has naturally been one of the most widely studied of all psychological problems. Amongst other possibilities, the stress arising from an unusual environment may be due either to physico-chemical abnormalities in the surroundings or to an undue prolongation of the task itself. This paper is concerned with the latter form of stress, as it has been found to occur in one particular type of visual situation; a later publication will more fully discuss the implications of these and other visual and auditory experiments (Mackworth, 1948).

The relevant literature on the deterioration in perceptual efficiency resulting from prolonged work makes depressing reading; not only is it scanty, but it is also rather contradictory. For example, in 1890, William James could confidently define the nature of attention—but nearly 50 years later both Woodworth (1938) and Bills (1934) were dubious about the whole concept of attention, the latter maintaining that the term had lost its meaning from an identification with the conscious results of the process rather than with the process itself. Head (1926) used the term vigilance to describe both a physiological and a psychological readiness to react, and the present writer also believes that vigilance is a useful word to adopt, particularly in describing a psychological readiness to perceive and respond, a process which, unlike attention, need not necessarily be consciously experienced.

[1] This paper has been based on one given to the first meeting of the Experimental Psychology Group.

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News Release

December 22, 2016

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"Arizona welcomes Uber self-driving cars with open arms and wide open roads. While California puts the brakes on innovation and change with more bureaucracy and more regulation, Arizona is paving the way for new technology and new businesses. In 2015, I signed an executive order supporting the testing and operation of self-driving cars in Arizona with an emphasis on innovation, economic growth, and most importantly, public safety. This is about economic development, but it's also about changing the

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PRELIMINARY REPORT

HIGHWAY

HWY18MH010

The information in this report is preliminary and will be supplemented or corrected during the course of the investigation.

About 9:58 p.m., on Sunday, March 18, 2018, an Uber Technologies, Inc. test vehicle, based on a modified 2017 Volvo XC90 and operating with a self-driving system in computer control mode, struck a pedestrian on northbound Mill Avenue, in Tempe, Maricopa County, Arizona. The Uber test vehicle was occupied by one vehicle operator, a 44-year-old female. No passengers were in the vehicle.

In the area of the crash, northbound Mill Avenue consists of two left-turn lanes, two through lanes, and one bike lane. The crash occurred before the formation of a right-turn lane. Roadway lighting was present. The posted speed limit was 45 mph.

The crash occurred as the pedestrian, a 49-year-old female, walked a bicycle east across Mill Avenue. The Uber test vehicle was traveling in the right through lane when its right front side struck the pedestrian (see figure 1). As a result of the crash, the pedestrian died. The vehicle operator was not injured.

In this area, northbound Mill Avenue is separated from southbound Mill Avenue by a center median containing trees, shrubs, and brick landscaping in the shape of an X. Four signs at the edges of the brick median, facing toward the roadway, warn pedestrians to use the crosswalk. The nearest crosswalk is at the intersection of Mill Avenue and Curry Road, about 360 feet north of where the crash occurred.

Figure 1. (Left) Location of the crash on northbound Mill Avenue, showing the paths of the pedestrian in orange and of the Uber test vehicle in green. (Right) Postcrash view of the Uber test vehicle, showing damage to the right front side.

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Yavapai County Attorney
255 East Gurley Street
Prescott, AZ 86301
ycao@yavapai.us

SHEILA POLK
Yavapai County Attorney

March 4, 2019

Hon. Bill Montgomery
Maricopa County Attorney
301 W. Jefferson Street
Phoenix, AZ 85003

Re: Rafael Vasquez / Uber Corporation, Tempe Police Department #2018-32694

Dear Mr. Montgomery:

This Office accepted this matter on a conflict basis due to a prior working relationship between the Maricopa County Attorney's Office (MCAO) and Uber. We agreed to accept the case and review the matter for a charging decision only.

After a very thorough review of all the evidence presented, this Office has determined that there is no basis for criminal liability for the Uber corporation arising from this matter. Because this determination eliminates the basis for the MCAO conflict, we are returning the matter to MCAO for further review for criminal charges.

Based on the entire investigation, this Office has concluded that the collision video, as it displays, likely does not accurately depict the events that occurred. We therefore recommend that the matter be furthered to the Tempe Police Department to obtain additional evidence. Specifically, we believe that an expert analysis of the video is needed. The purpose of the expert analysis is to closely match what (and when) the person sitting in the driver's seat of the vehicle would or should have seen that night given the vehicle's speed, lighting conditions, and other relevant factors.

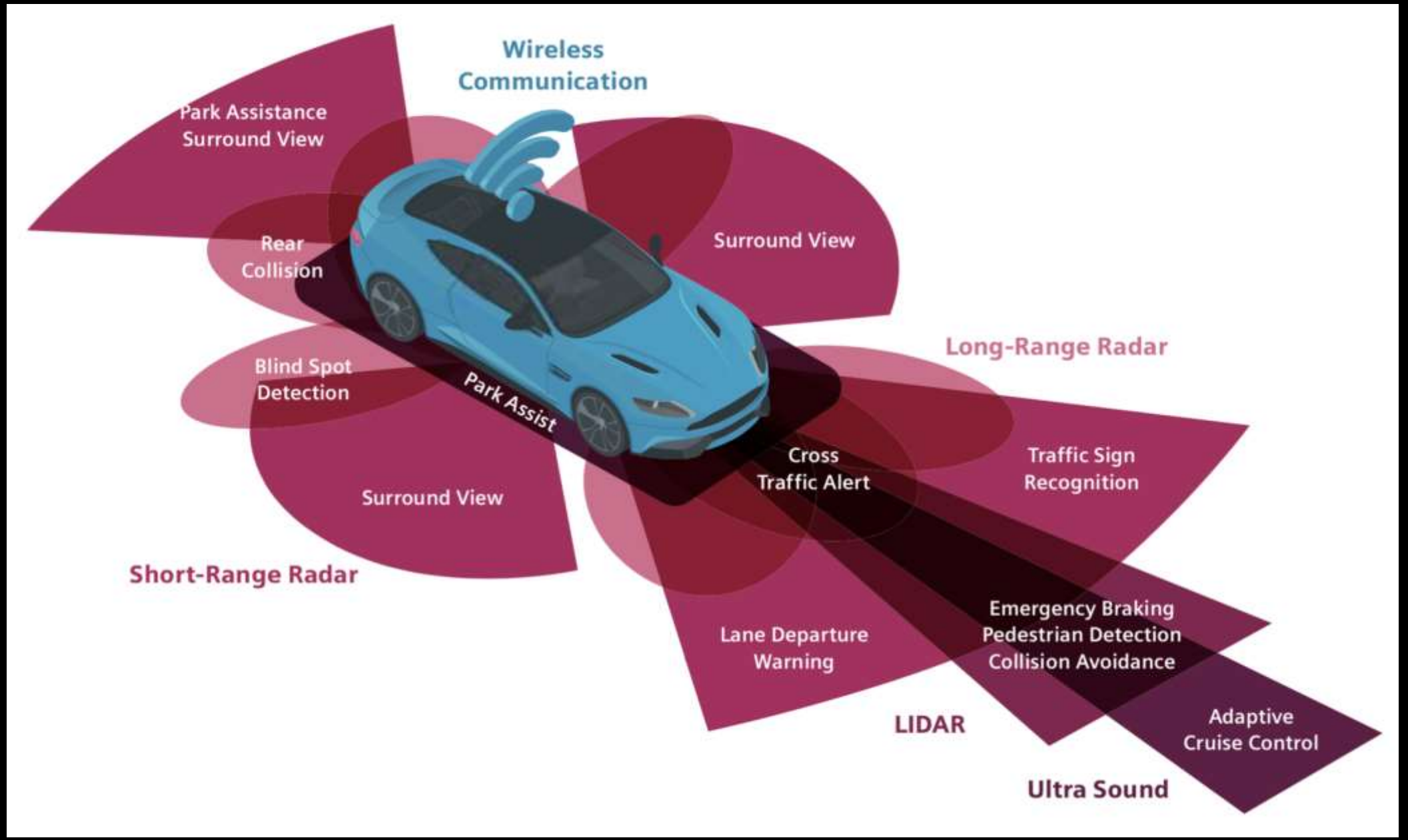
This will end this Office's official involvement in this matter. It has been our pleasure to be of assistance in this matter and to work with the outstanding professionals at the Tempe Police Department. If you or your staff need any additional questions answered, please do not hesitate to contact us.

Very truly yours,

[redacted]

Sheila Sullivan Polk
Yavapai County Attorney

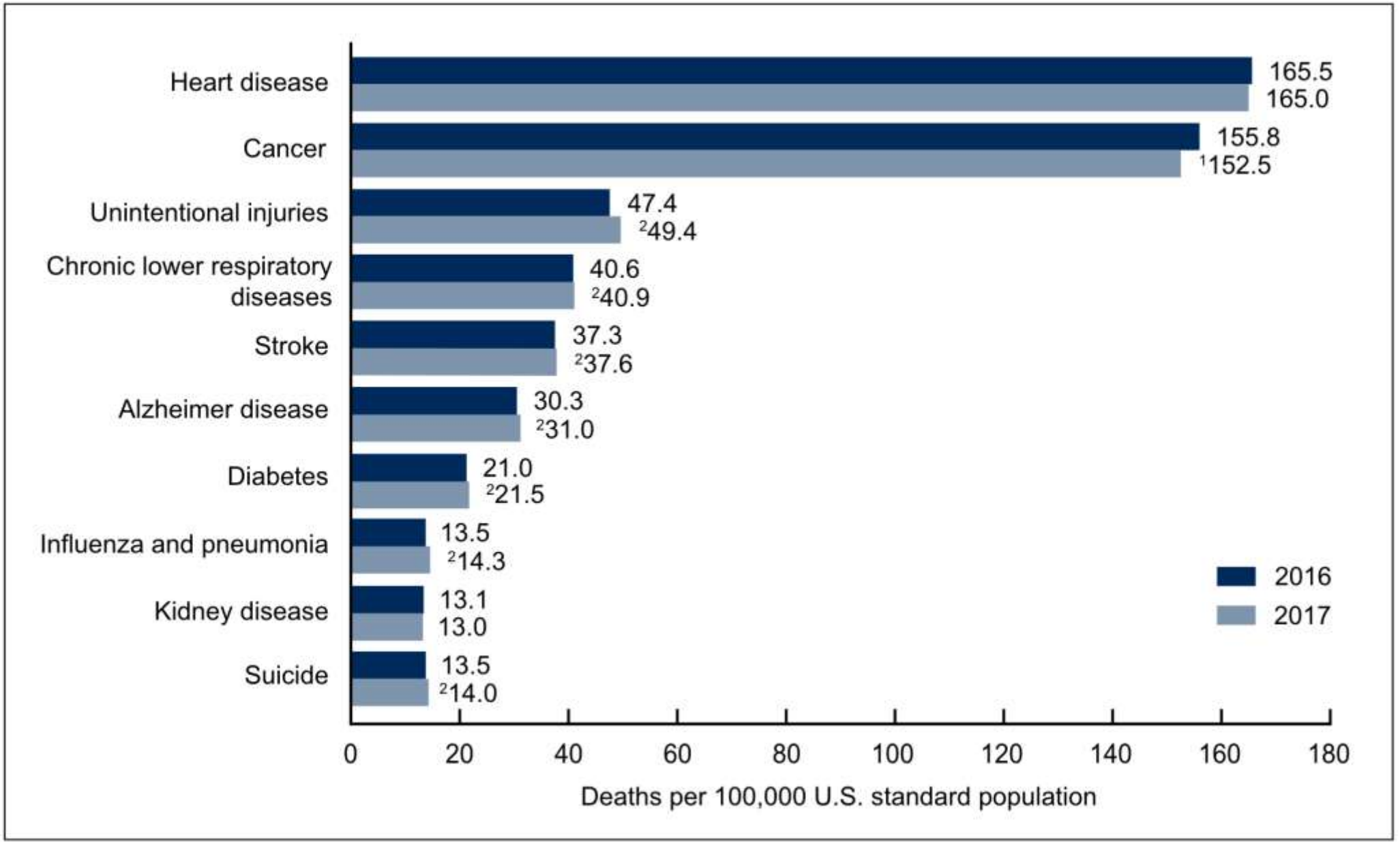
Criminal Division (928) 771-3344
Civil Division (928) 771-3338
Bad Check Program (928) 771-3490


Wireless
Communication
Park Assistance
Surround View
Rear
Collision
Surround View
Long-Range Radar
Blind Spot
Detection
Park Assist
Cross
Traffic Alert
Traffic Sign
Recognition
Surround View
Short-Range Radar
Lane Departure
Warning
Emergency Braking
Pedestrian Detection
Collision Avoidance
LIDAR
Adaptive
Cruise Control
Ultra Sound

6

isolating safety

Figure 4. Age-adjusted death rates for the 10 leading causes of death: United States, 2016 and 2017



National Center for Health Statistics

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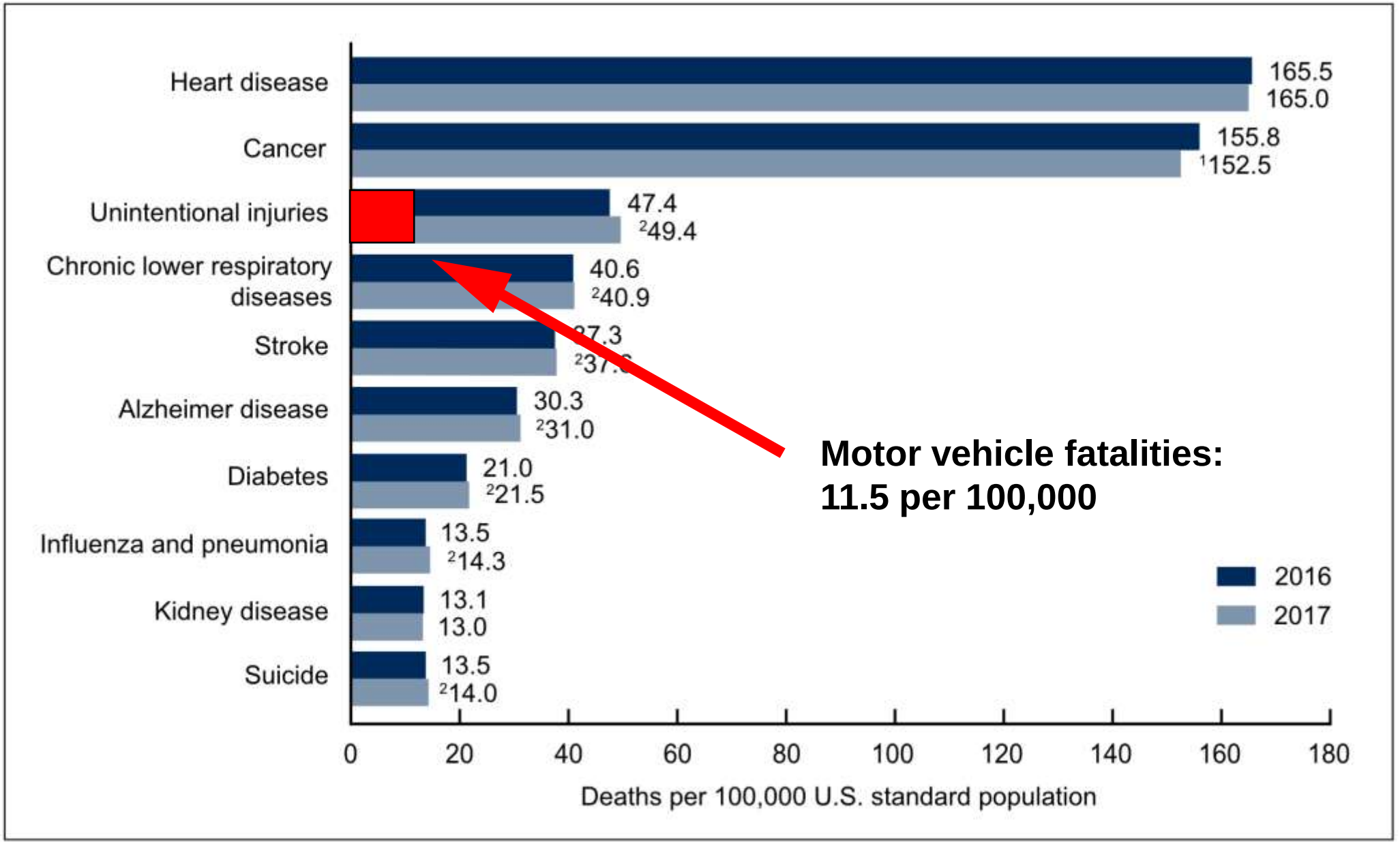

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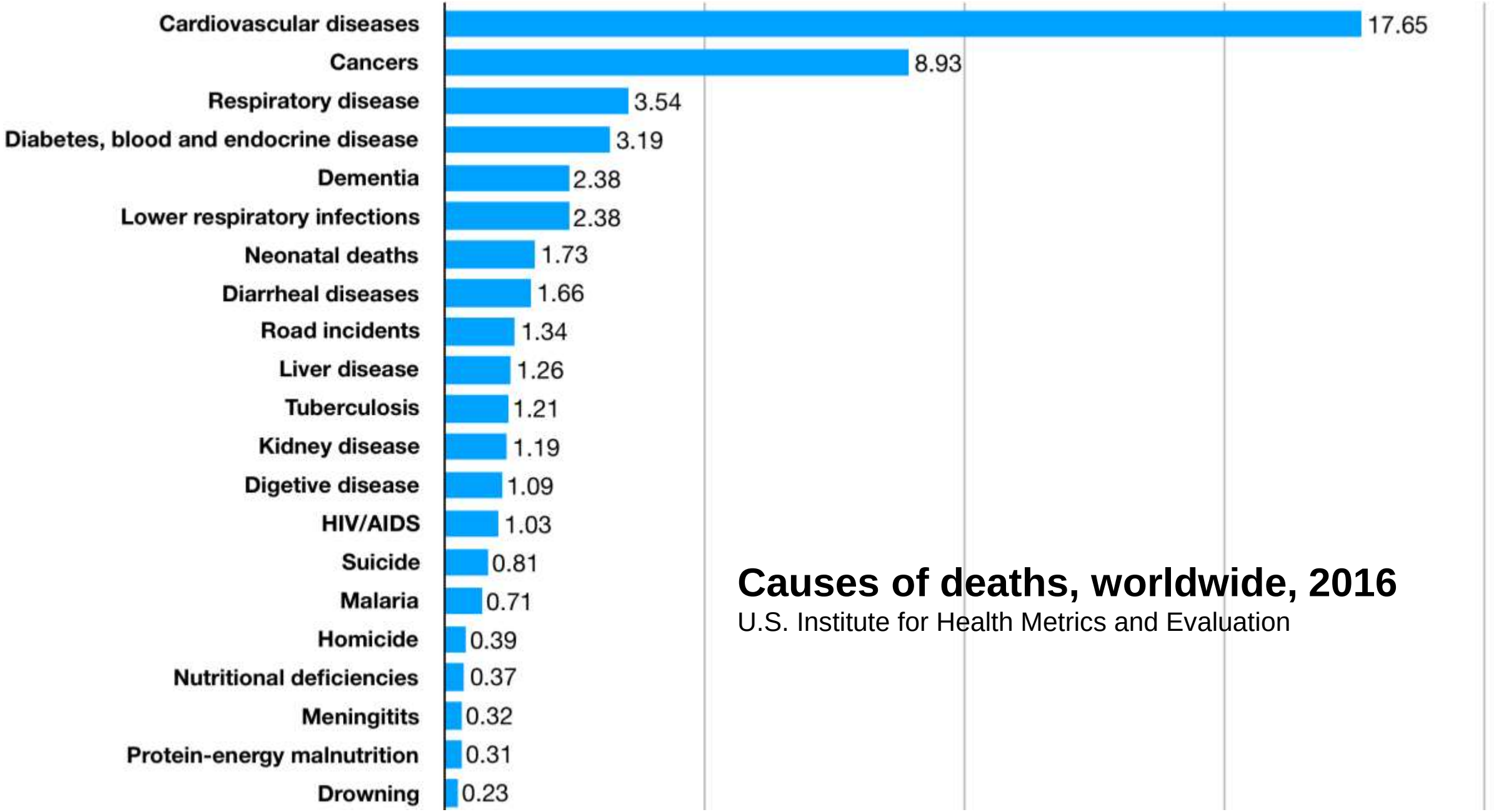
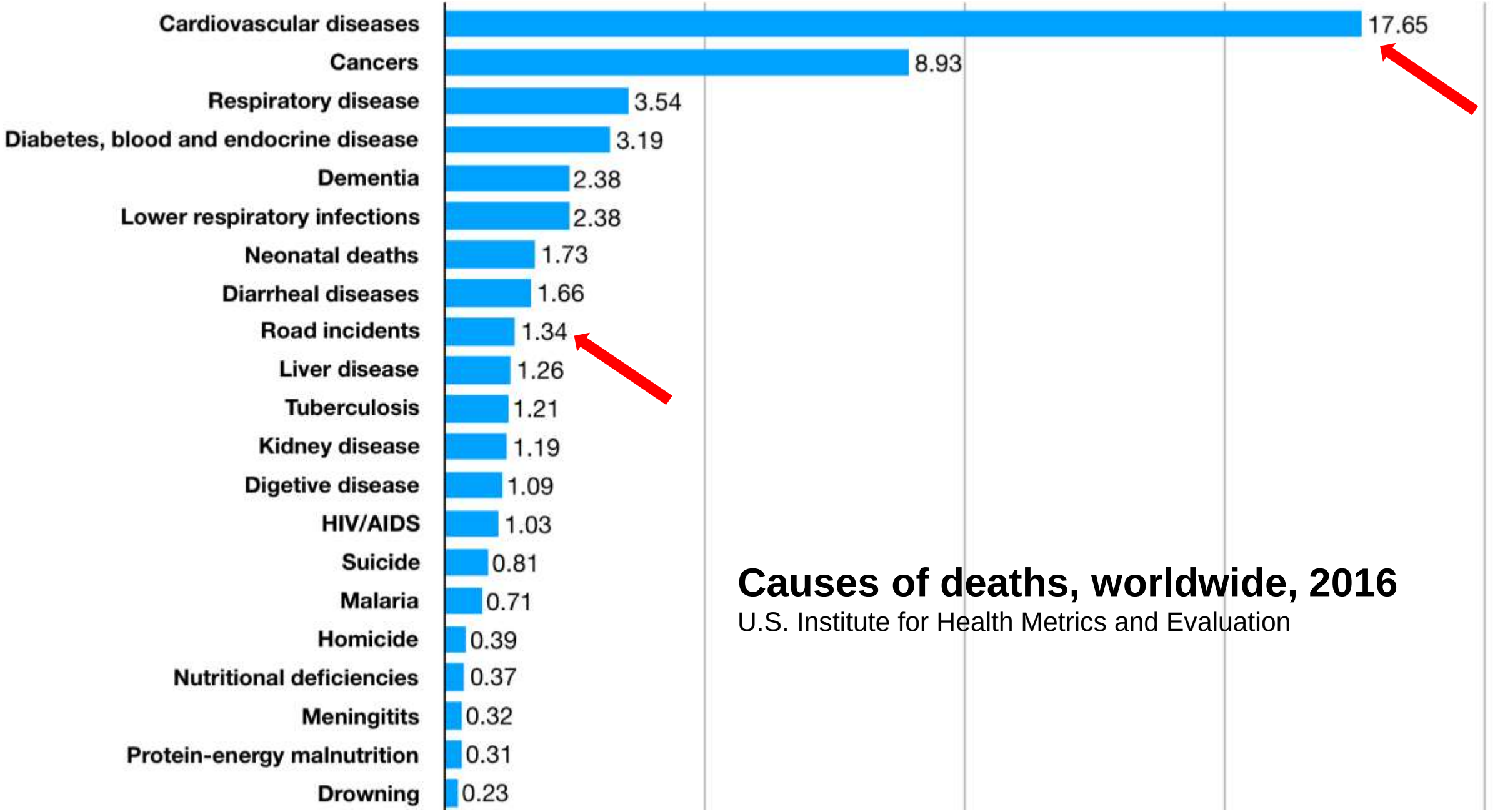


Causes of deaths, worldwide, 2016

U.S. Institute for Health Metrics and Evaluation



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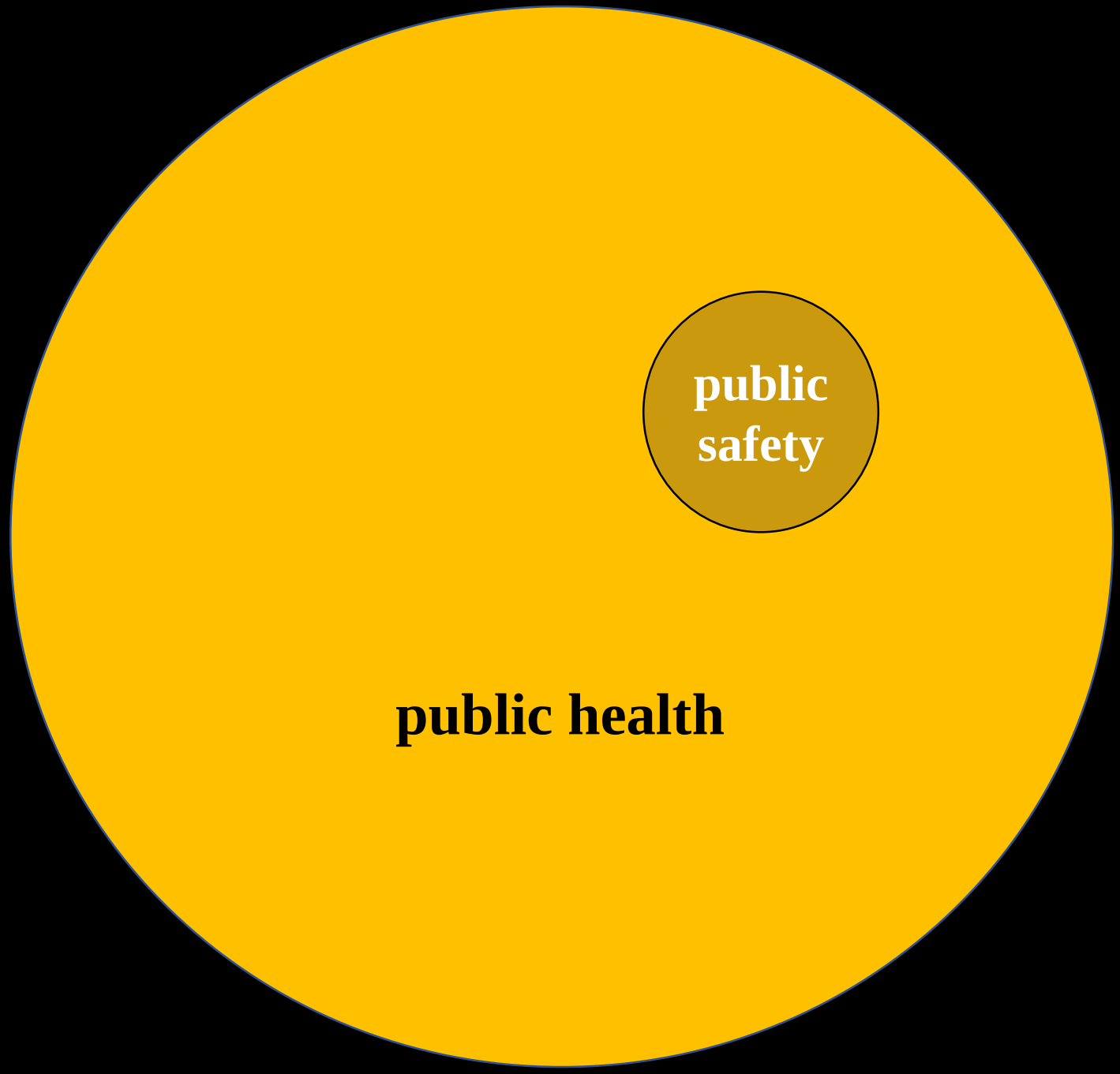
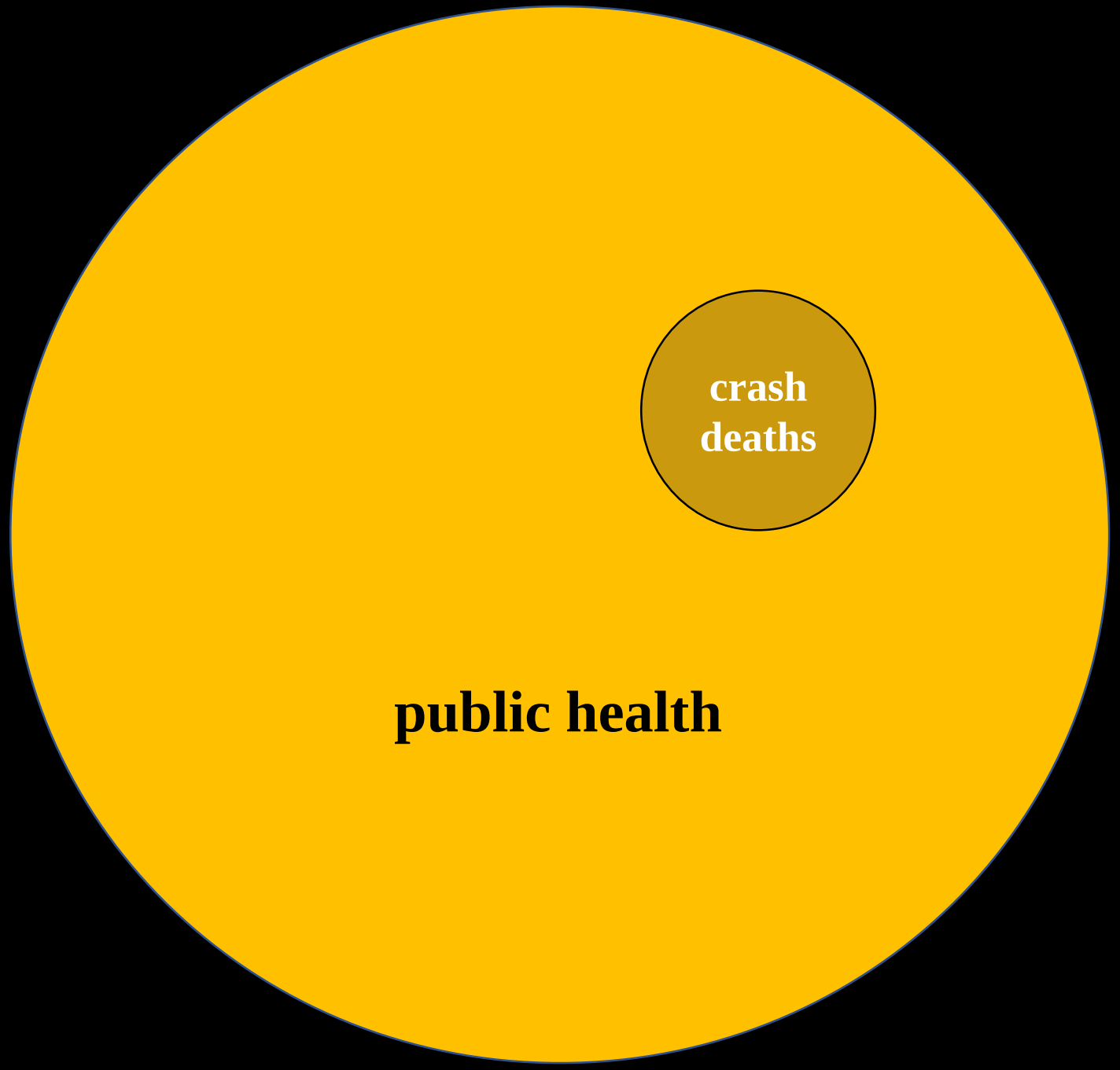
public safety


public
safety
public health


crash
deaths
public health


crash deaths
premature death associated with sedentary living


crash deaths
premature death associated with sedentary living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premature death associated with sedentary living

MIT Technology Review

View from the Marketplace

Self-driving cars take the wheel

Advanced technologies come together to get autonomous vehicles driving safely and efficiently.

by MIT Technology Review Insights February 15, 2019

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Autonomous vehicles are here, and they're here to stay. While their use and acceptance are not yet widespread, that day is coming. Most of the major automotive manufacturers are actively exploring autonomous-vehicle programs and conducting extensive on-road testing.

Increased safety is the primary benefit. "Right off the bat, the main goal is to reduce the number of accidents," says Jill Sciarappo, senior director of strategy and marketing for autonomous driving at Intel. "Many cars that have collision-avoidance technology today are demonstrating that they are safer than cars that don't."[1]

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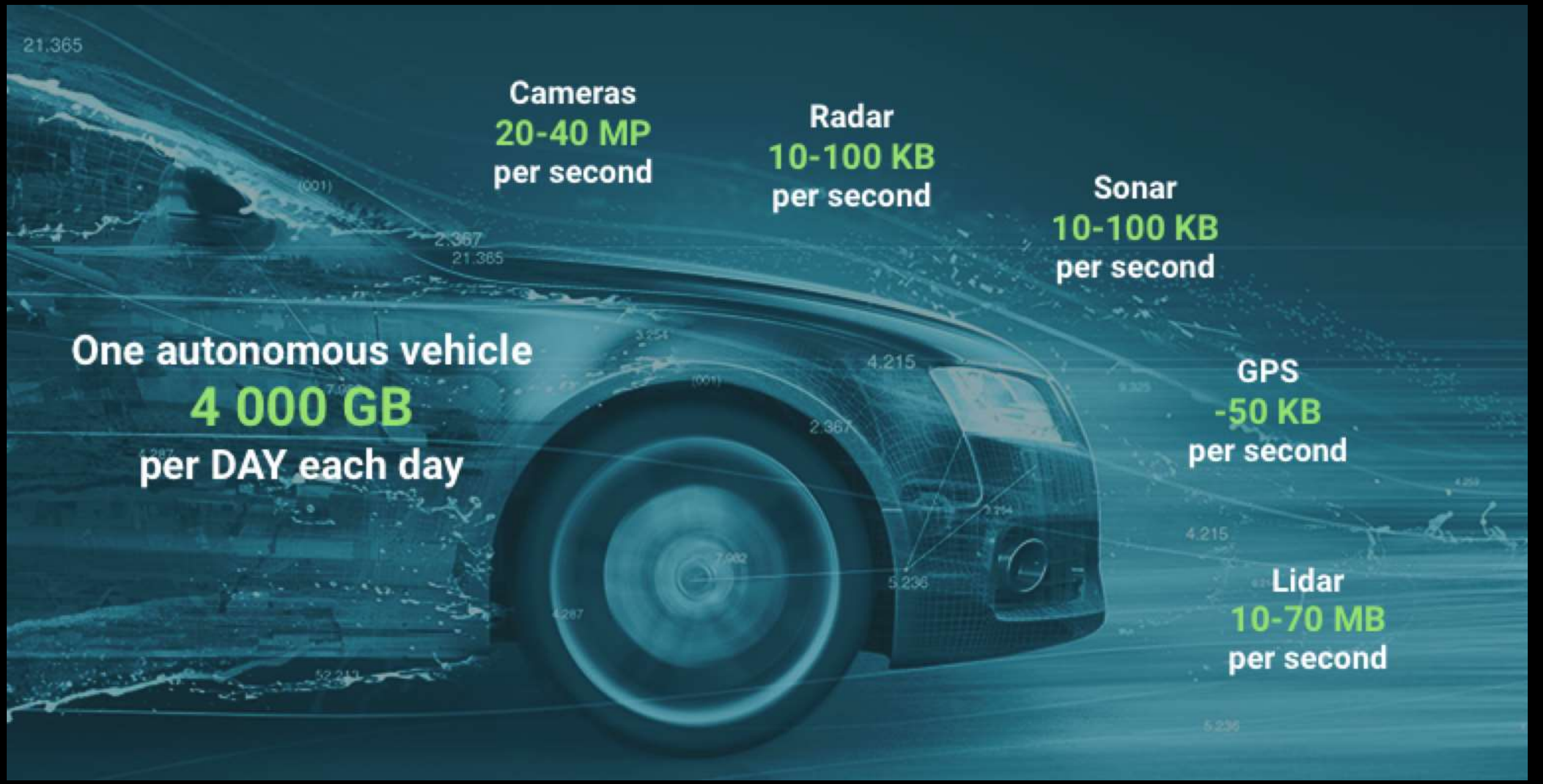
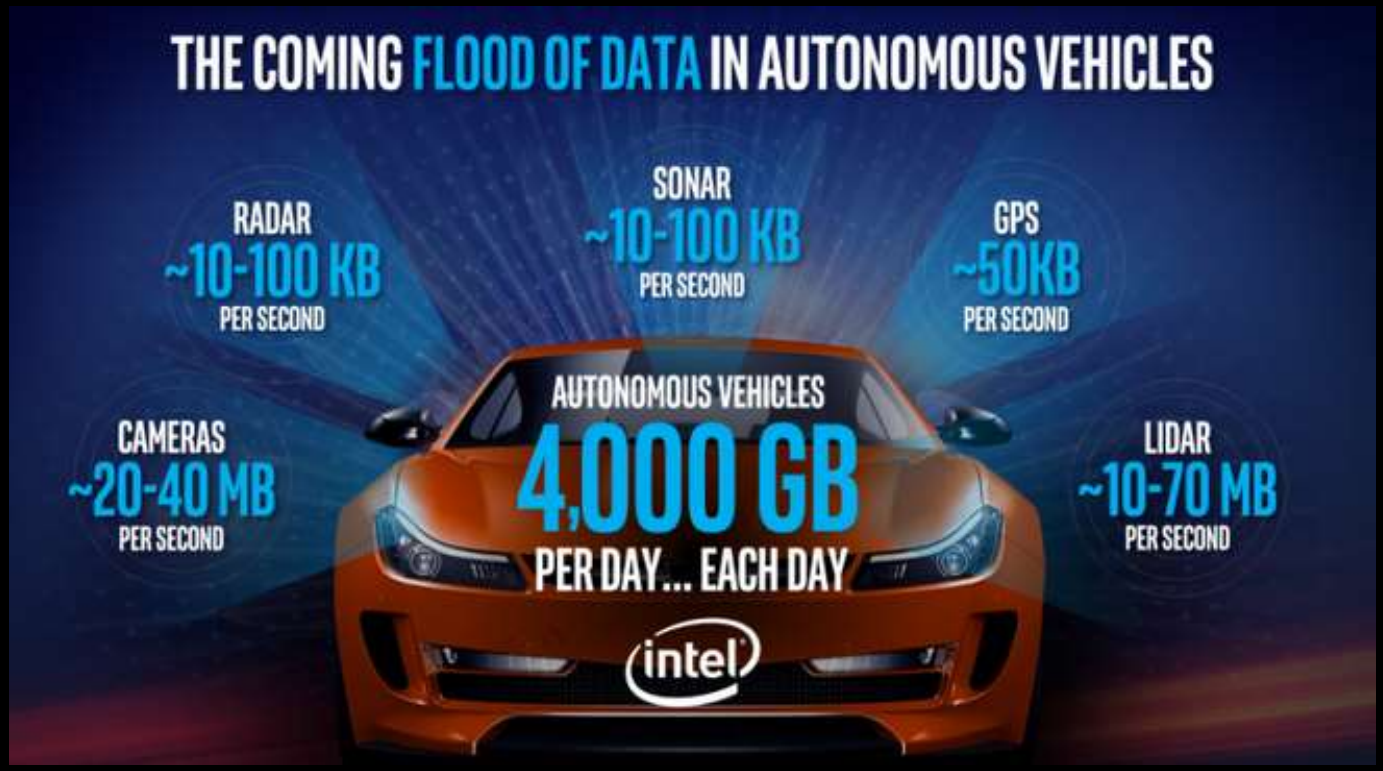
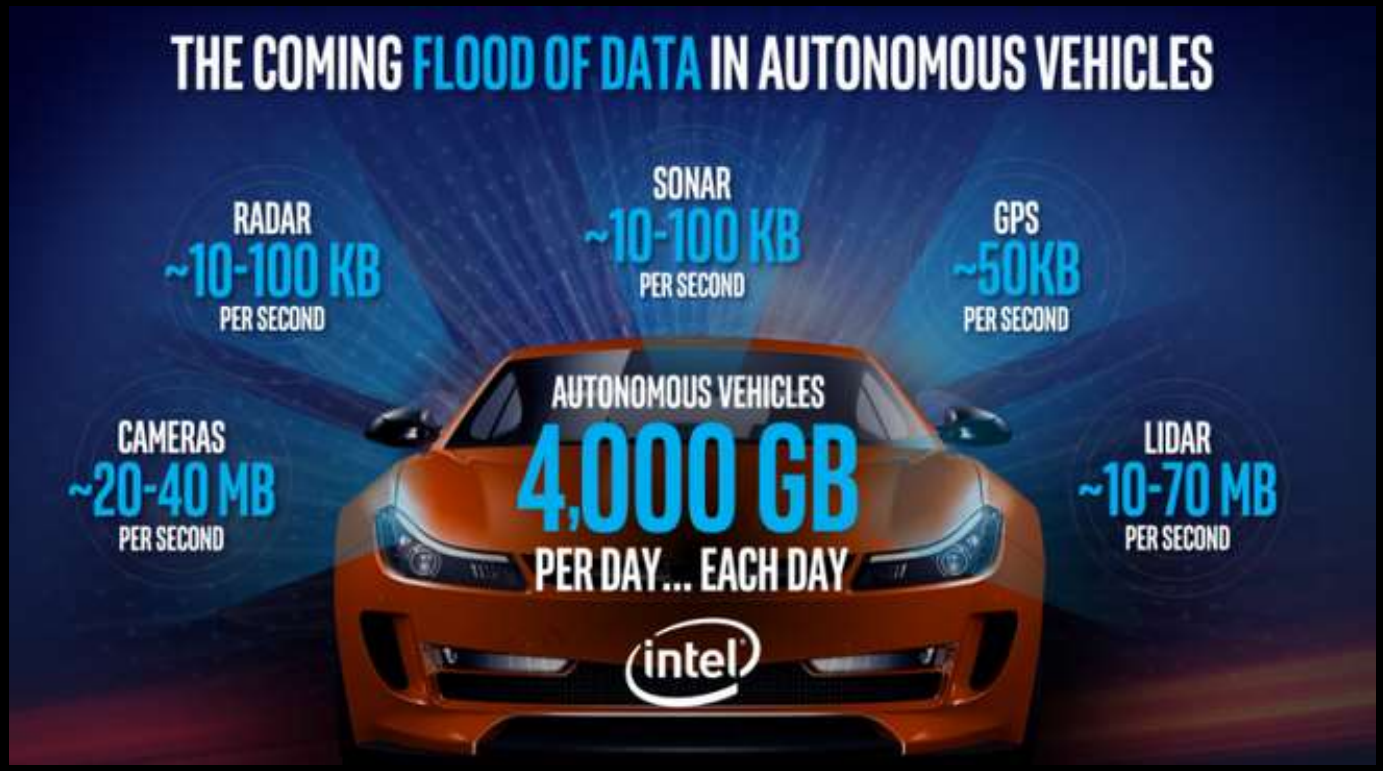

Cameras
20-40 MP
per second
Radar
10-100 KB
per second
Sonar
10-100 KB
per second
One autonomous vehicle
4 000 GB
per DAY each day
GPS
-50 KB
per second
Lidar
10-70 MB
per second


THE COMING FLOOD OF DATA IN AUTONOMOUS VEHICLES
RADAR
~10-100 KB
PER SECOND
SONAR
~10-100 KB
PER SECOND
GPS
~50KB
PER SECOND
CAMERAS
~20-40 MB
PER SECOND
AUTONOMOUS VEHICLES
4,000 GB
PER DAY... EACH DAY
LIDAR
~10-70 MB
PER SECOND
intel



Outside of a vehicle, a typical connected person generates 1 - 1.5 GB/day.

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Editorial

November 15, 2016

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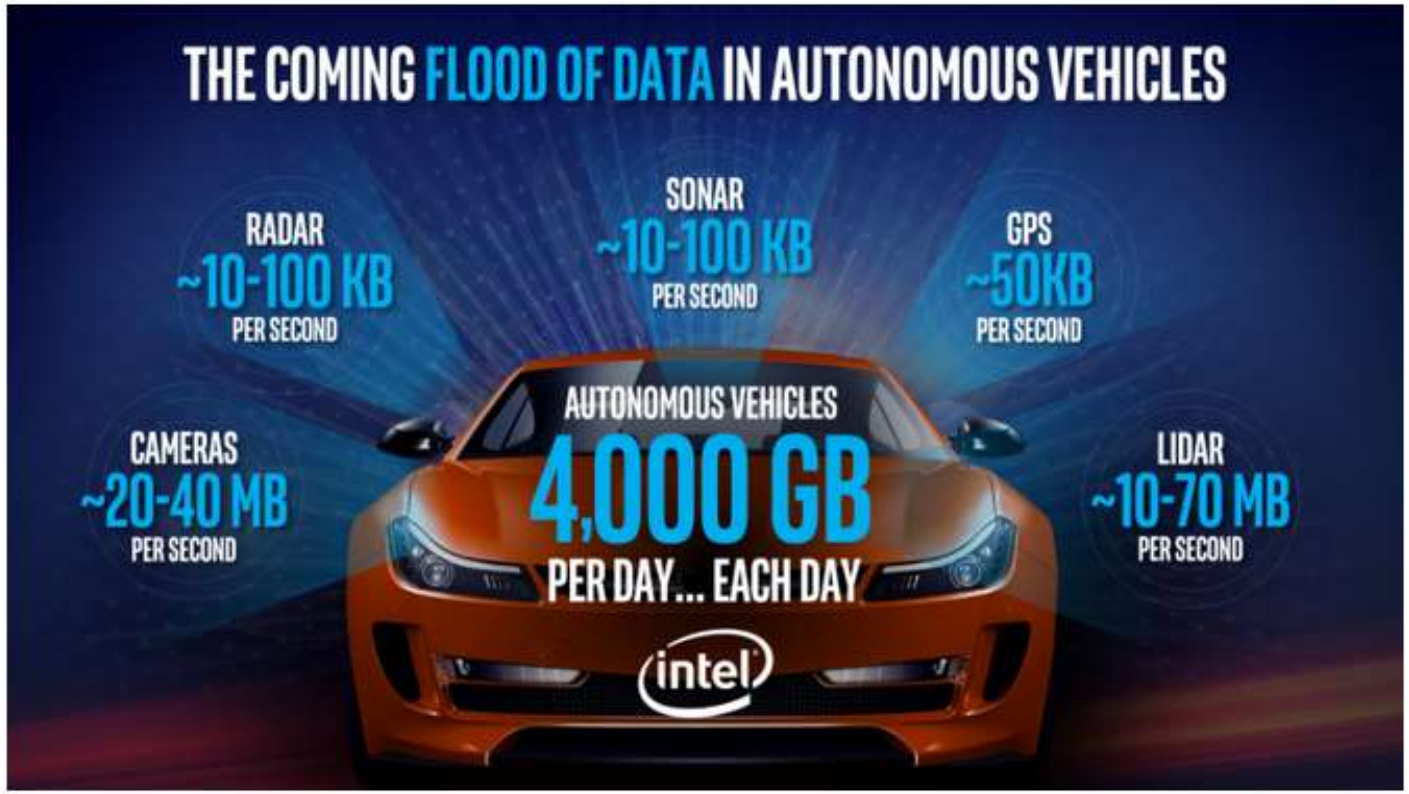

DATA IS THE NEW OIL IN THE FUTURE OF AUTOMATED DRIVING

Brian Krzanich, CEO

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November 15, 2016

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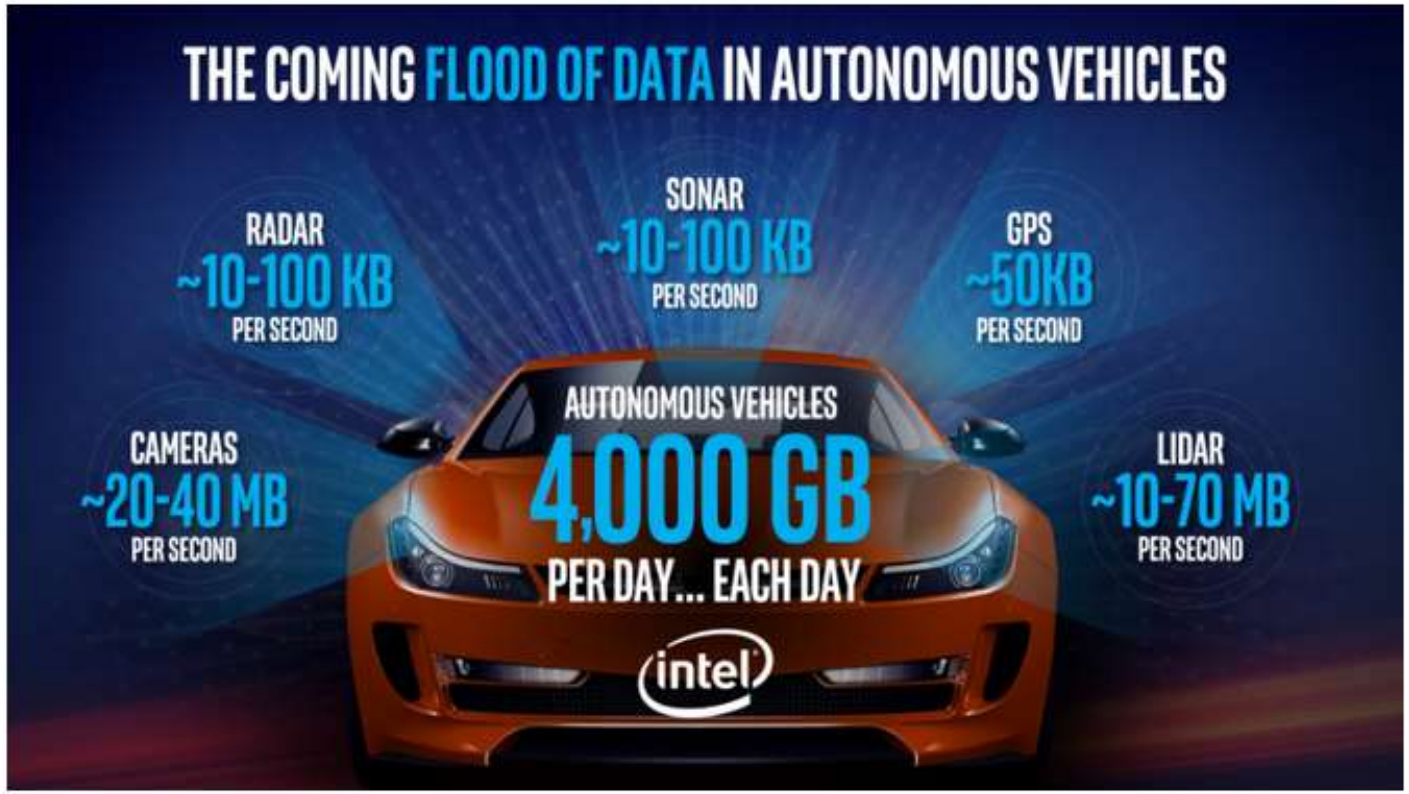

DATA IS THE NEW OIL IN THE FUTURE OF AUTOMATED DRIVING

Brian Krzanich, CEO

The Trillion Sensor Economy is Coming. Are You Ready?

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By 2021, nearly 28 billion IoT devices and networks will be able to communicate with each other across a low-latency infrastructure. According to a report from Research and Markets, we'll have more than 100 billion connected devices, each with a dozen sensors or more, worldwide by 2025. 5G connectivity and AI technology will fuel much of this transformation.

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7

the balance of mobility

If you could travel back in time 150 years to deliver *either* A *or* B to the people of that time, which would have more medical benefit?

A

MRI systems

dialysis machines

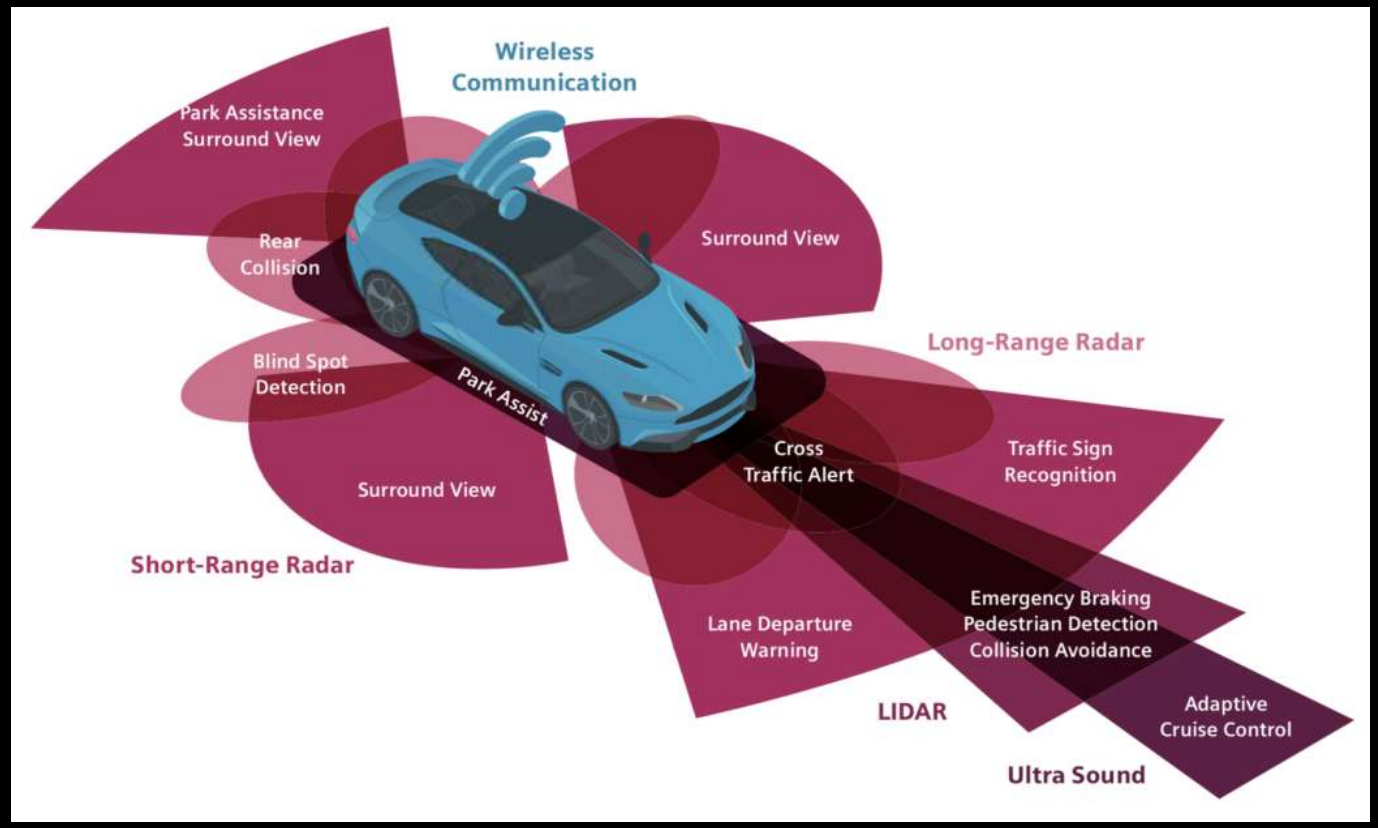
surgical stents

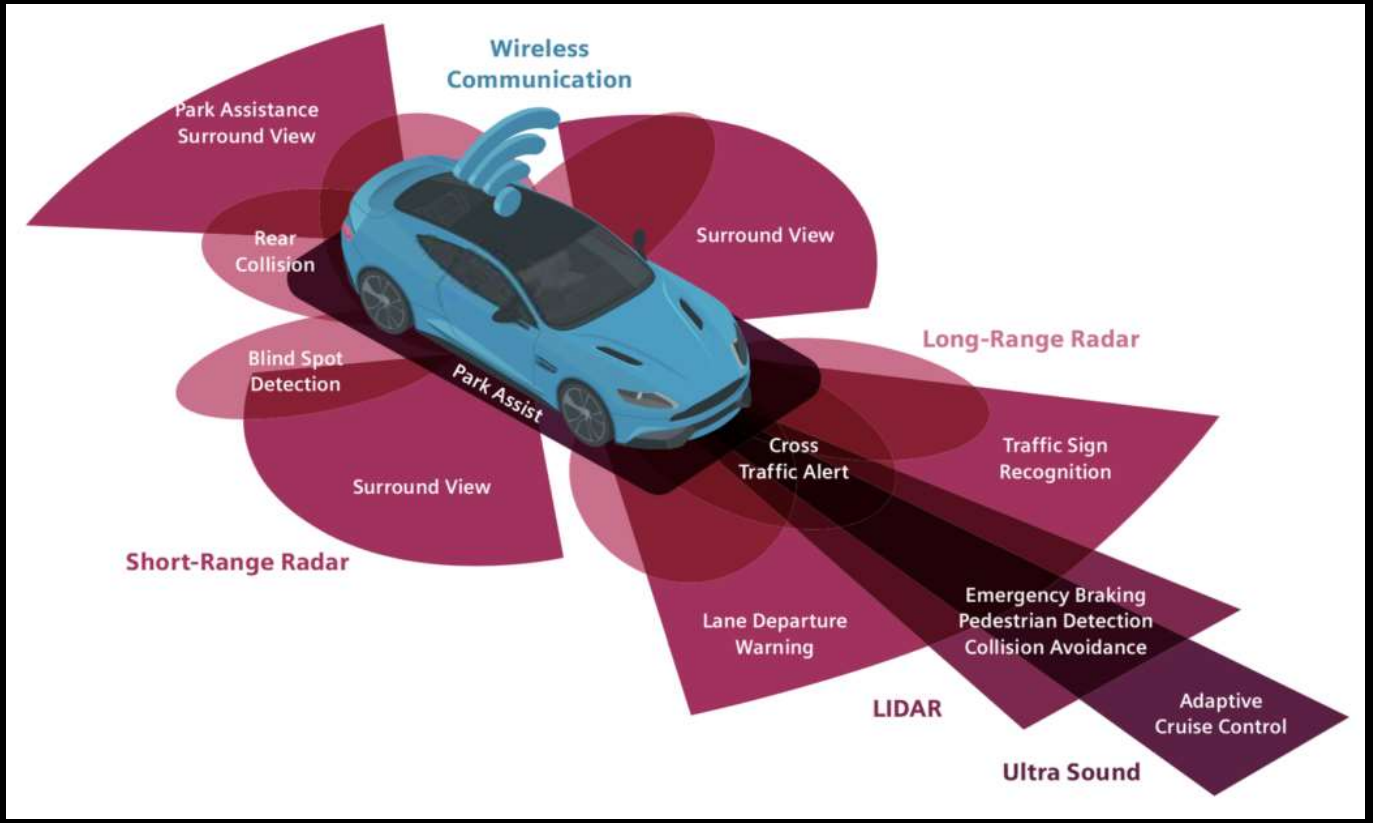
B

sanitation techniques

vaccines

antispetics


Wireless
Communication
Park Assistance
Surround View
Rear
Collision
Surround View
Long-Range Radar
Blind Spot
Detection
Park Assist
Cross
Traffic Alert
Traffic Sign
Recognition
Surround View
Short-Range Radar
Lane Departure
Warning
Emergency Braking
Pedestrian Detection
Collision Avoidance
LIDAR
Adaptive
Cruise Control
Ultra Sound


Wireless Communication
Park Assistance Surround View
Rear Collision
Surround View
Long-Range Radar
Blind Spot Detection
Park Assist
Cross Traffic Alert
Traffic Sign Recognition
Surround View
Short-Range Radar
Lane Departure Warning
Emergency Braking
Pedestrian Detection
Collision Avoidance
LIDAR
Adaptive Cruise Control
Ultra Sound


Throttle provides acceleration
Birds are dockless, using app-based GPS tracking technology
Riders push-off with their feet to get going and to assist the scooter during steep inclines
Speed is capped at 15 mph
Birds are powered by electricity

AUTONOMOUS VEHICLE ECOSYSTEM

We're working with a wide range of partners to make autonomous vehicles a reality. Meet our ecosystem and learn more about how we're moving the world forward together.

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sobi SOCIALBICYCLES
motivate
Zagster
Bandwagon

Traffic Flow

waze
remix
urban engines
INRIX
cisco

Mobile Ticketing

SIEMENS
CUBIC Global. Innovative. Trusted.
moovel
xerox
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Sensors

placemeter
SIGFOX
BreezoMeter Because Breathing Matters
idax DATA SOLUTIONS

Autonomous Vehicle Tech

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cruise GENERAL MOTORS
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Mobility Apps

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moovit

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SIDEWALK LABS
Clear Channel Outdoor
LinkNYC
JCDecaux
OUTFRONT media
Intersection
CIVIQ SMARTSCAPES

Beacons/Proximity

Radius Networks
estimote
Blue Bite
GIMBAL

Self-driving Cars

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THE SMART MOBILITY ECOSYSTEM

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chariot
BRIDJ
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motivate
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urban engines
INRIX
cisco

Mobile Ticketing

SIEMENS
CUBIC Global. Innovative. Trusted.
moovel
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Sensors

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Autonomous Vehicle Tech

MOBILEYE
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Mobility Apps

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CIVIQ

Beacons/Proximity

Radius Networks
estimote
Blue Bite
GIMBAL

Self-driving Cars

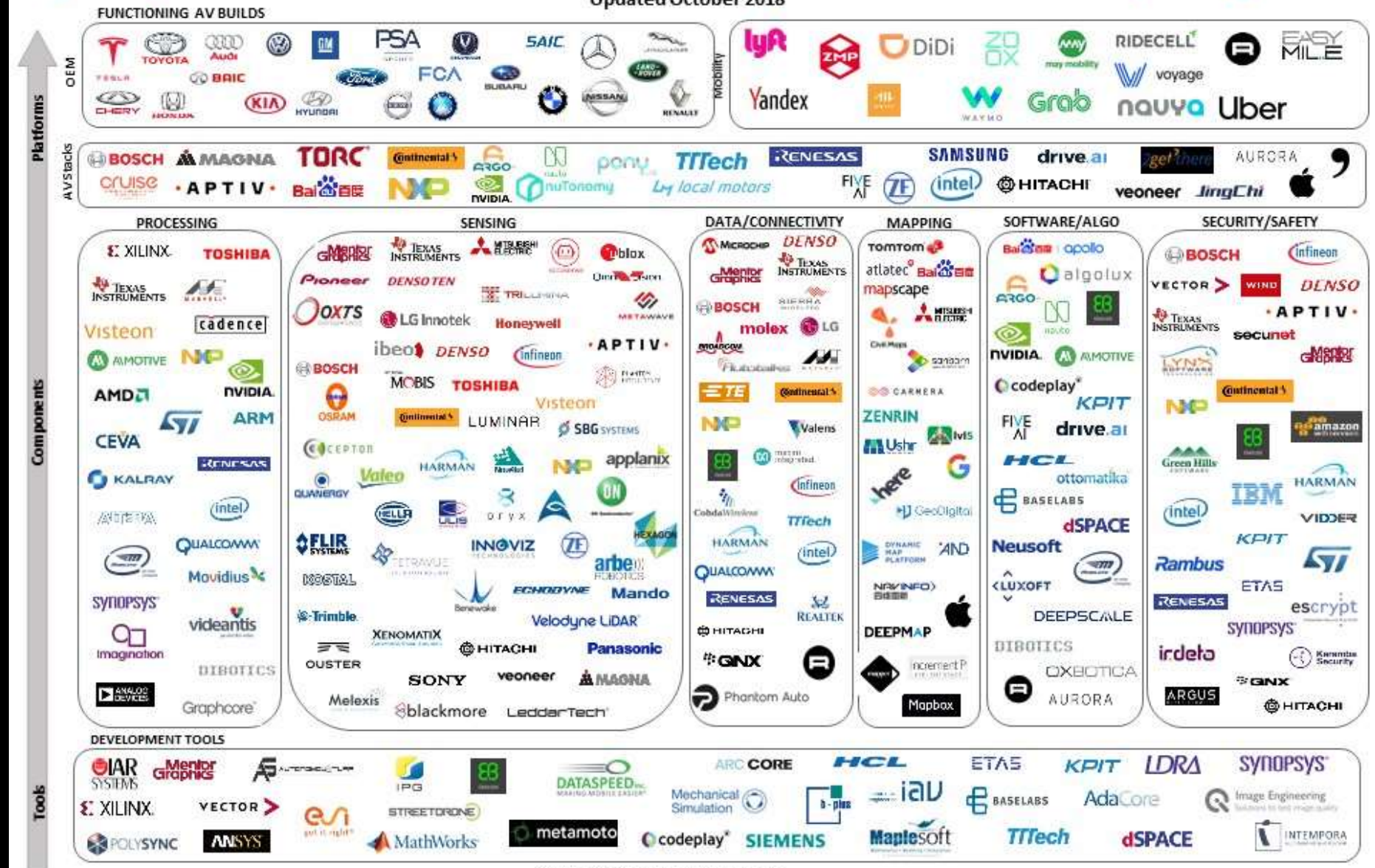
TESLA
lyft
Faraday Future

Mapping

MAPZEN
MapBox
here
CARTODB

Automated Vehicle Technology Ecosystem by VSI Labs

Updated October 2018



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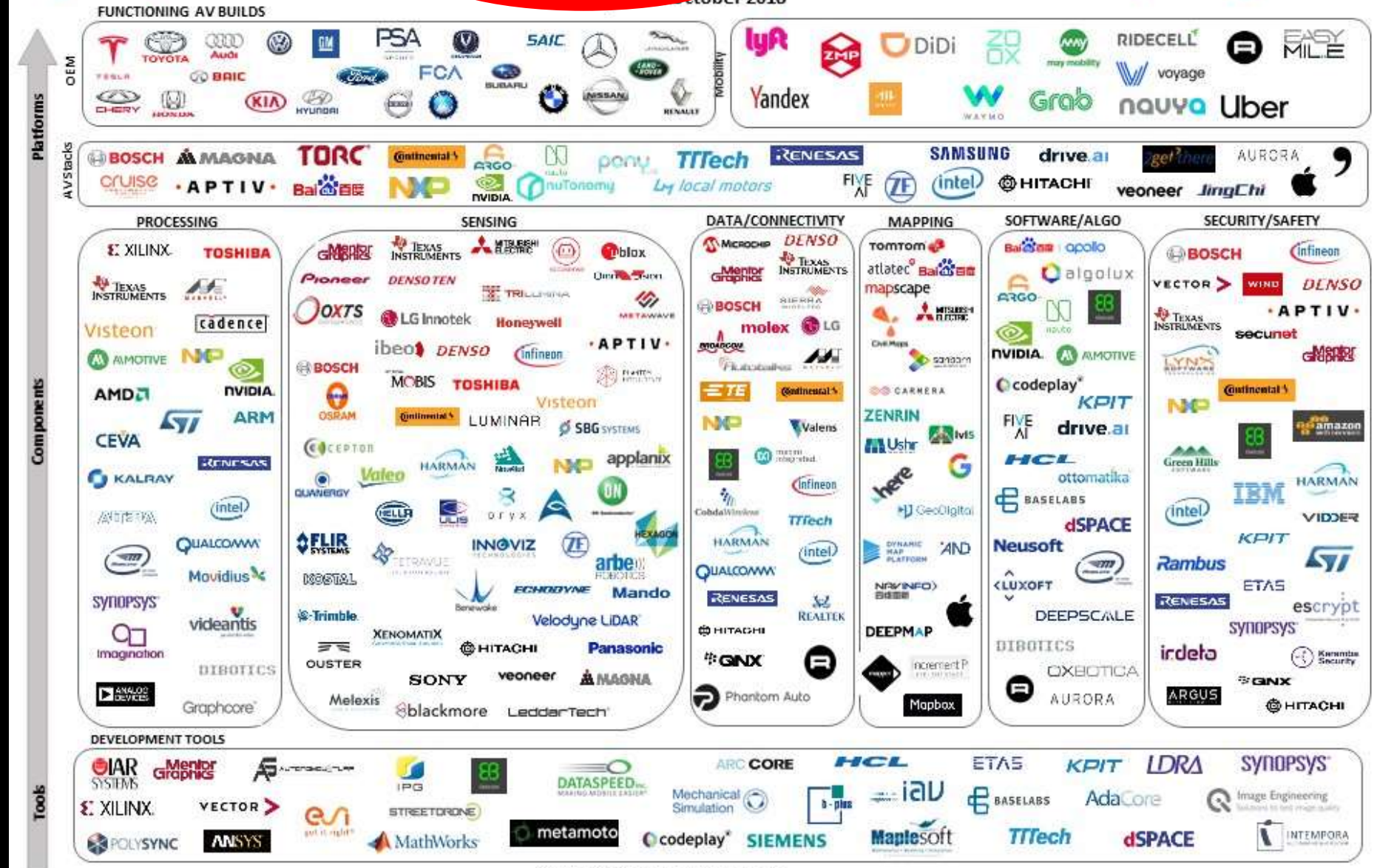

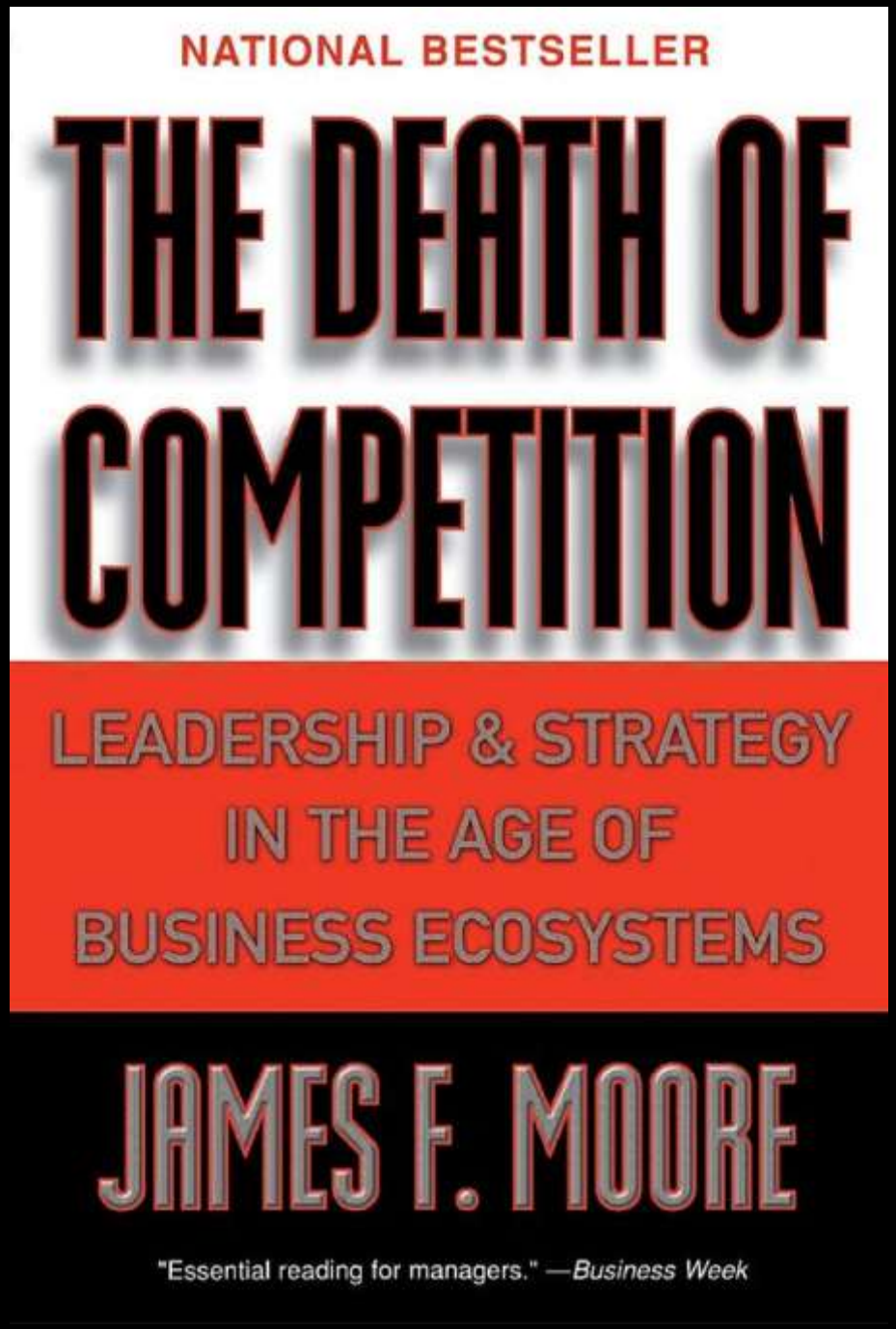
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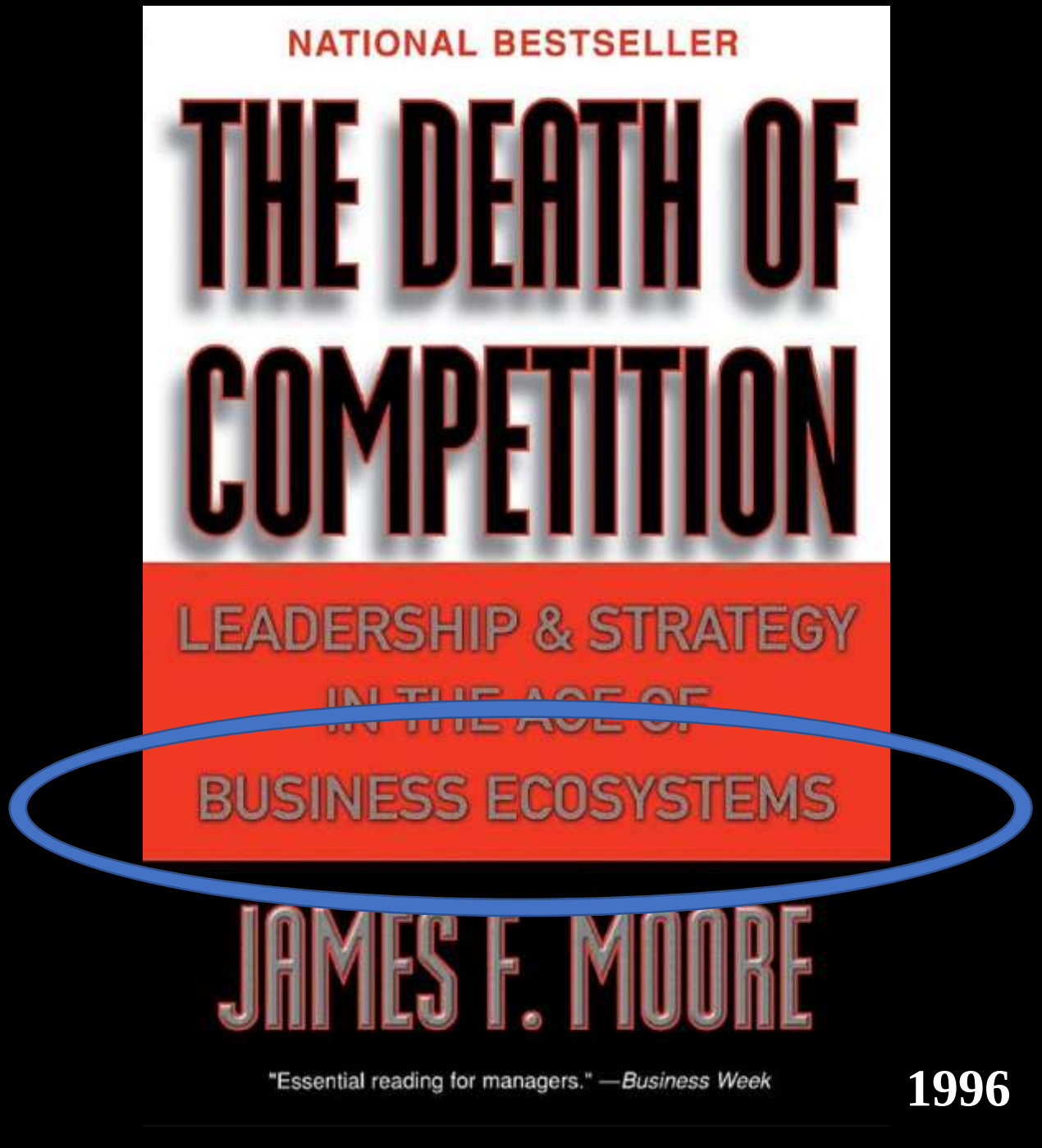
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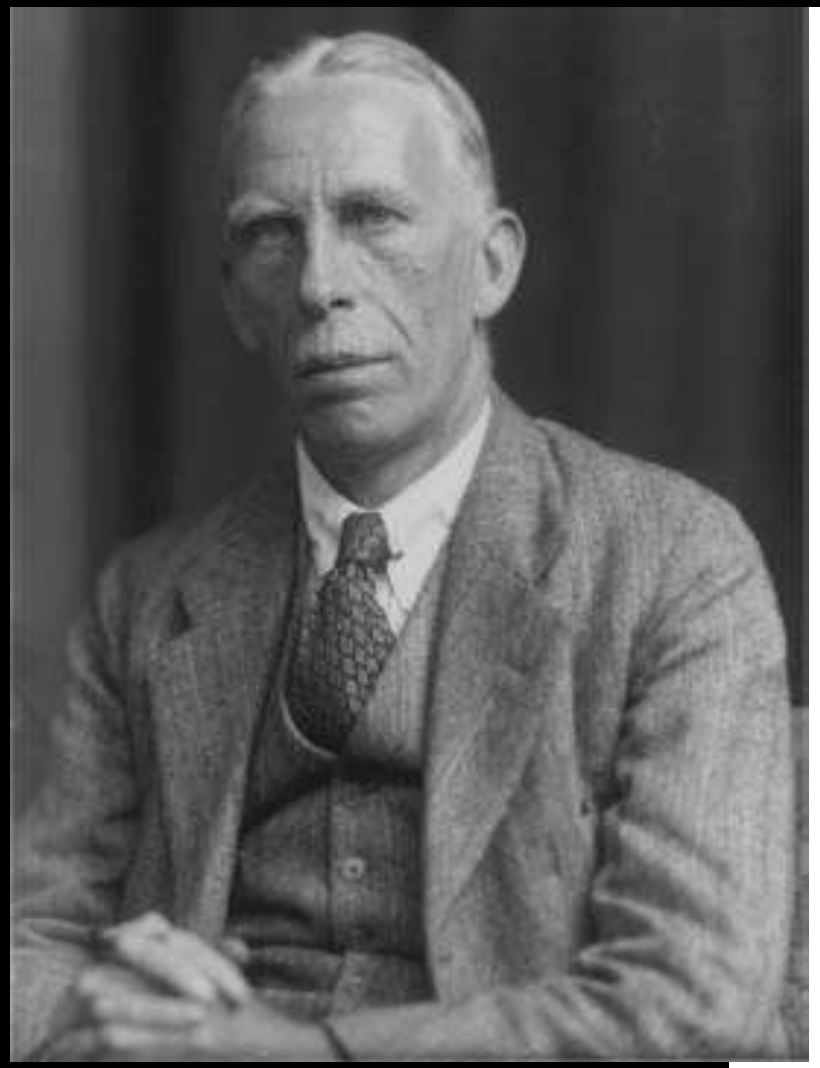

THE USE AND ABUSE OF VEGETATIONAL CONCEPTS AND TERMS

A. G. Tansley

Oxford University, England

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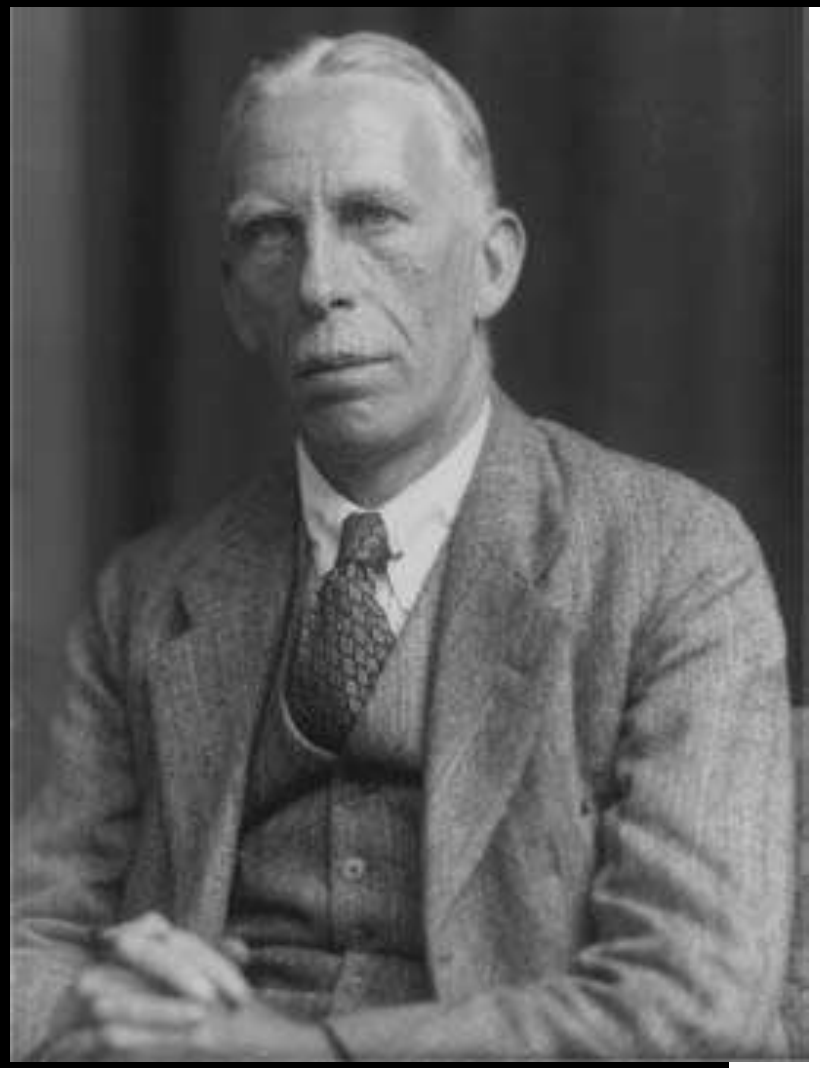
It is now generally admitted by plant ecologists, not only that vegetation is constantly undergoing various kinds of change, but that the increasing habit of concentrating attention on these changes instead of studying plant communities as if they were static entities is leading to a far deeper insight into the nature of vegetation and the parts it plays in the world. A great part of vegetational change is generally known as *succession*, which has become a recognised technical term in ecology, though there still seems to be some



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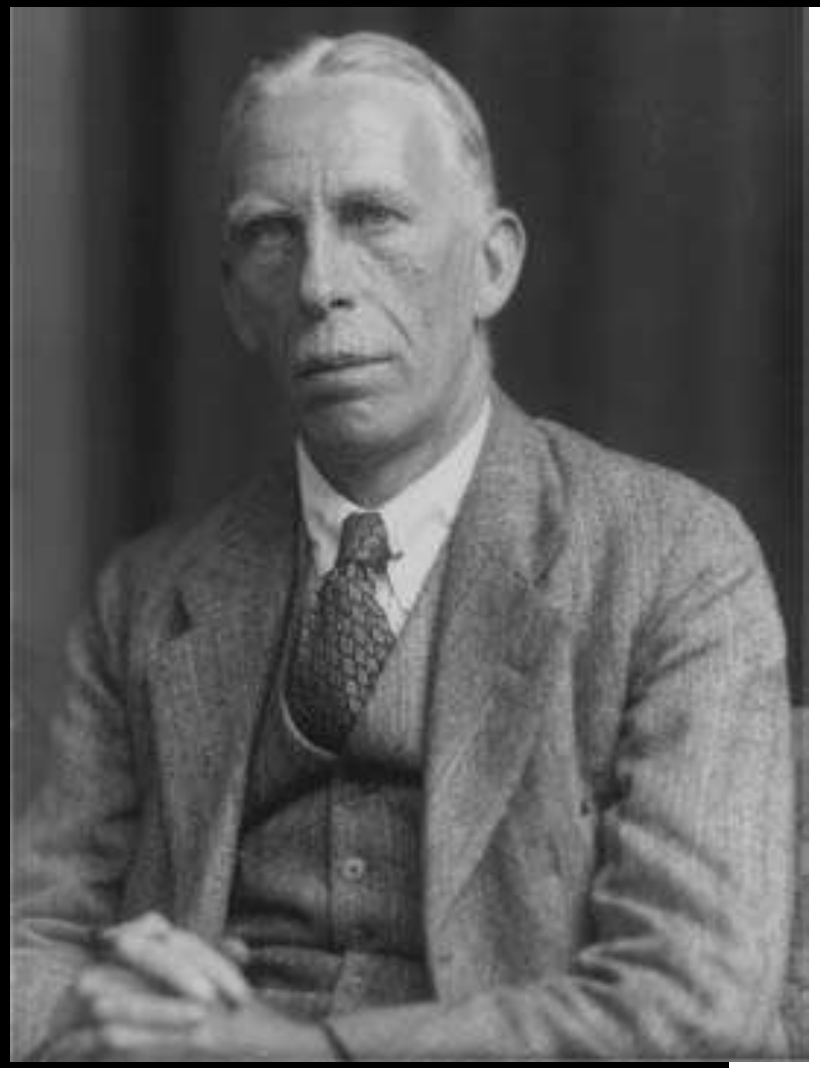

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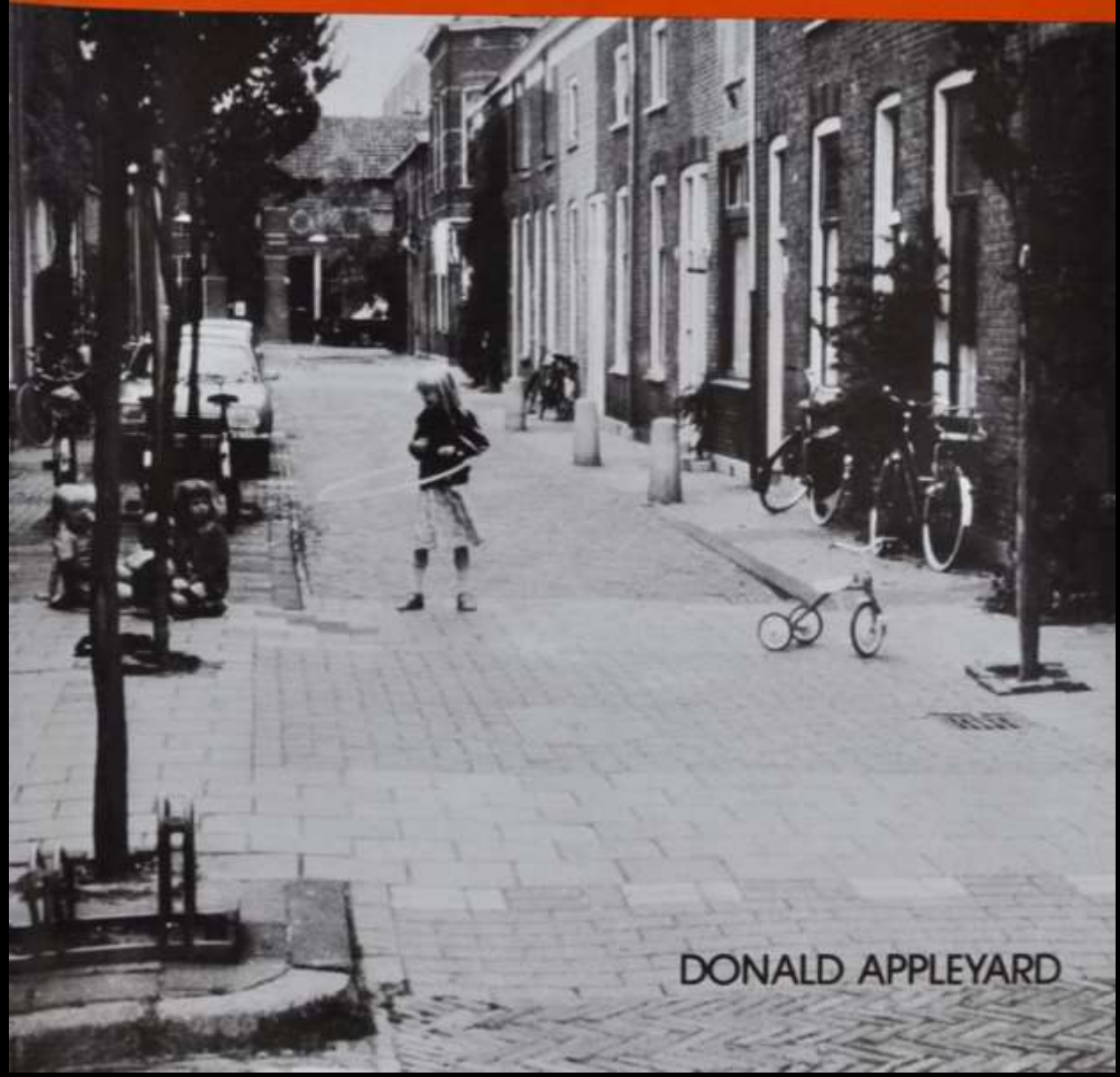
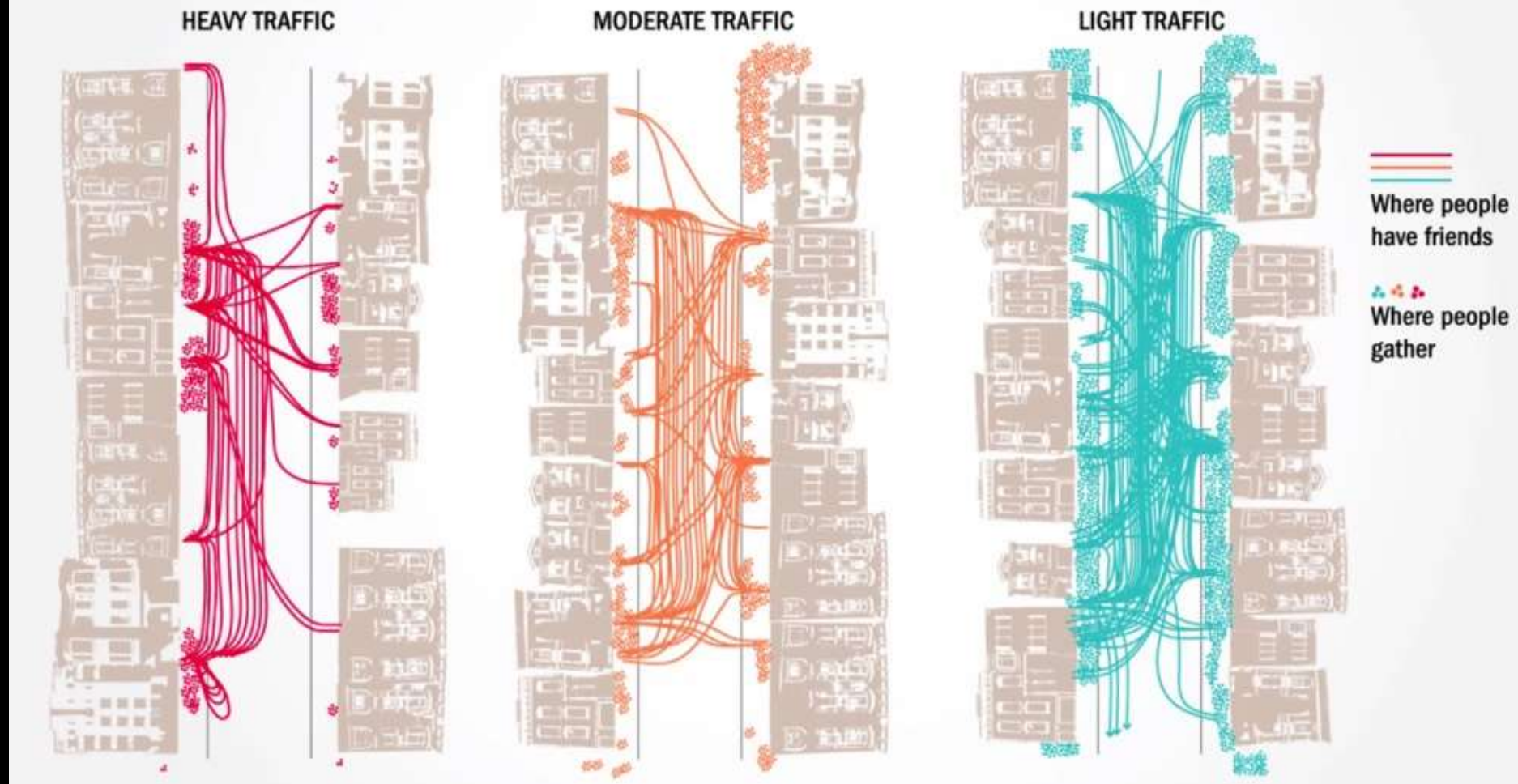
LIVABLE STREETS



DONALD APPLEYARD

Social Interactions on Three Streets - Neighboring and Visiting



THE DEATH AND LIFE OF GREAT AMERICAN CITIES

JANE JACOBS

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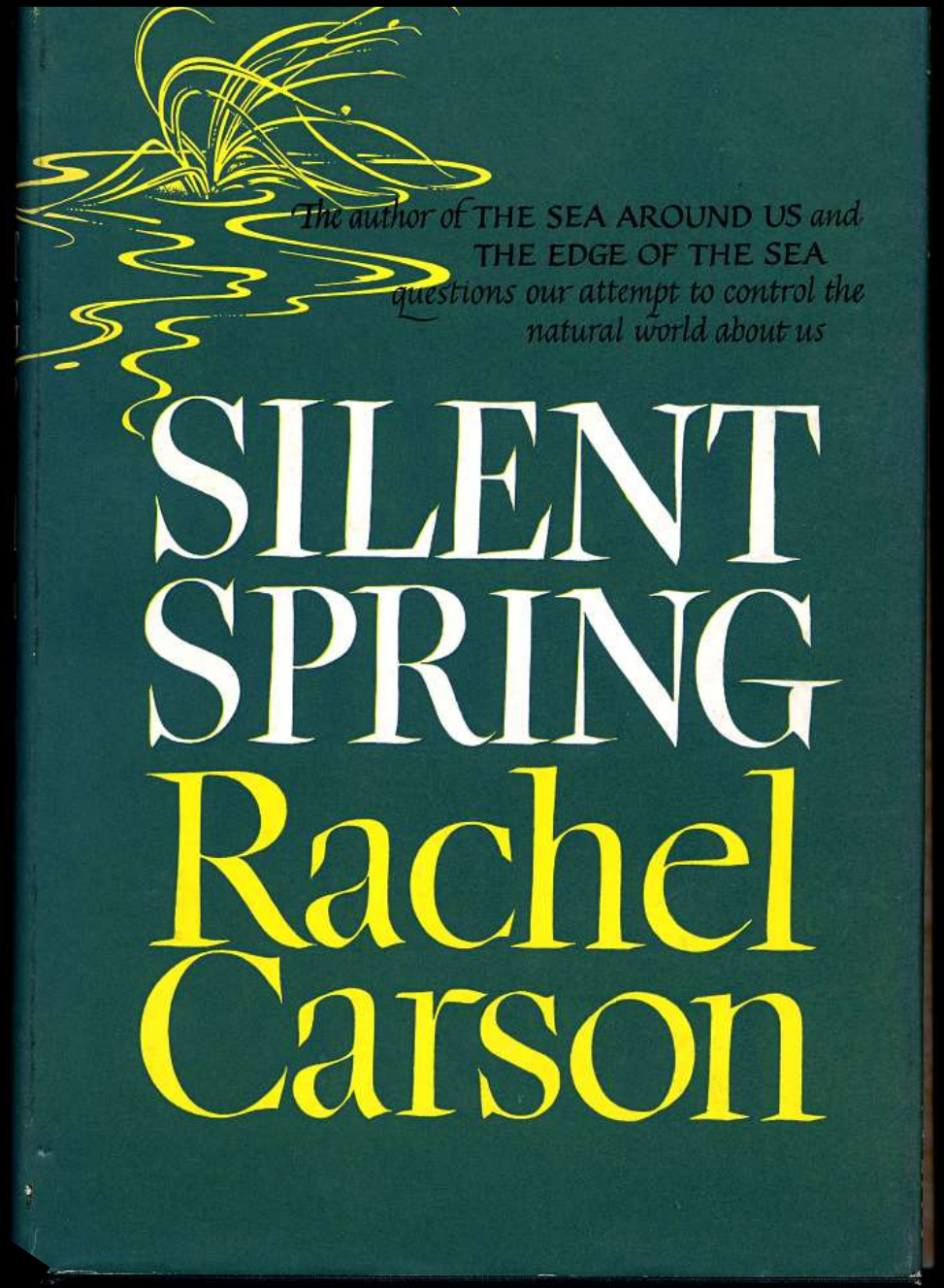
[They impose on the city] the dishonest mask of pretended order, achieved by ignoring or suppressing the real order that is struggling to exist and to be served.

— Jane Jacobs, *The Death and Life of Great American Cities* (1961).


The author of THE SEA AROUND US and
THE EDGE OF THE SEA
questions our attempt to control the
natural world about us
SILENT
SPRING
Rachel
Carson

The chemical war is never won, and all life is caught in its violent crossfire.

— Rachel Carson, *Silent Spring* (1962)

driverless

drive less

autonomous vehicles

autonomous people

more

more is less

less is more


BICKFORD


THE Jetsons


MAGIC
HIGHWAY,
U.S.A.