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Car and Driver  
2023 Chevrolet Bolt EV Review, Prici...



Car and Driver  
EV Concepts Include S...



Car.USNews - U.S. News & World Report  
How Much Do Electric Cars Cost? | ...



Reuters  
EV pivot ...



The Motley Fool  
The Largest EV Companies in 2023 | The ...



Harvard Gazette - Harvard University  
an EV increases your carbon footprint ...



Subaru  
A Guide to Electric Vehicles | Subaru



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The EV fleets are coming - but are we ...



ET Auto  
Americans would consider EV purchase ...



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Reuters  
Tesla's China-made EV sales fall 17.8 ...



Hyundai USA  
2023 Kona Electric SUV | All-Electric ...



J.D. Power  
How to Maximize EV Range



YES! Magazine  
Electric Trains Everywhere: A Solution ...



Rail Engineer  
Tram Speed Protection - Rail Eng...



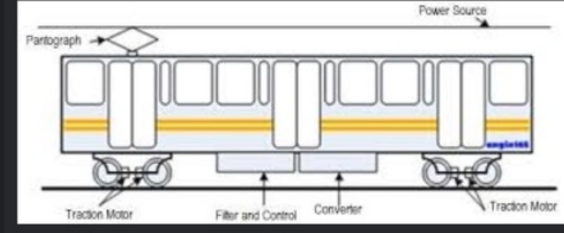
TST Ebike - In stock  
TST@ Surfer 27.5" Step-Thru ...



electrive.com  
six battery-electric trains ...



Dreamstime  
Trolleybus stock photo. Image of b...



ResearchGate  
The main parts of the electric train ...



WIRED  
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M8 electric trains replace diesel ...



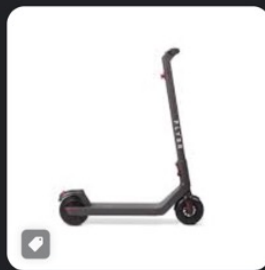
American-Rails.com  
Electric Locomotives In The USA



Inhabitat  
Stadler electric trains are on their ...



WIRED  
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Hungary Today  
Budapest Has World's Busiest Tram Network



Aipas eBike  
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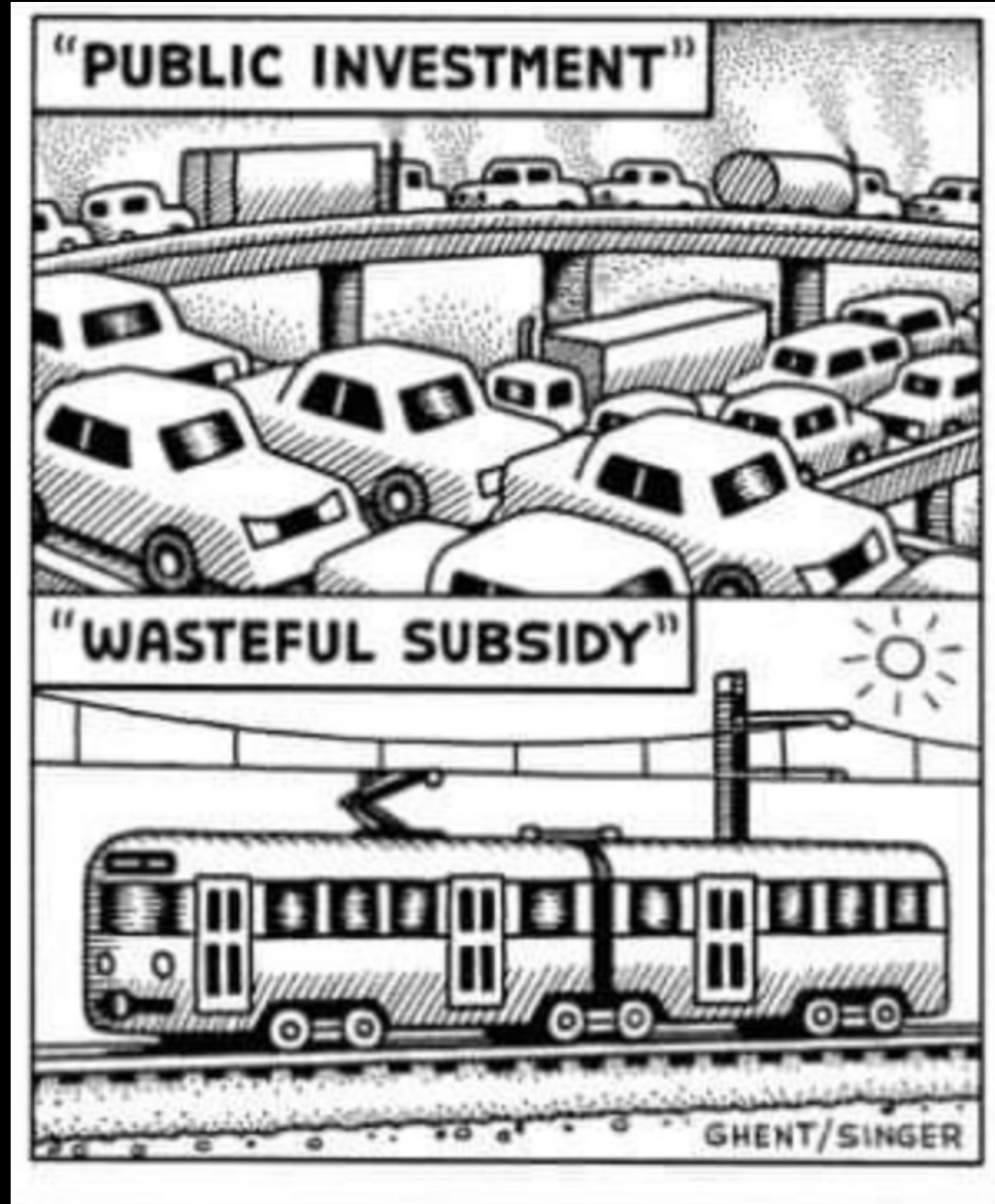
WIRED  
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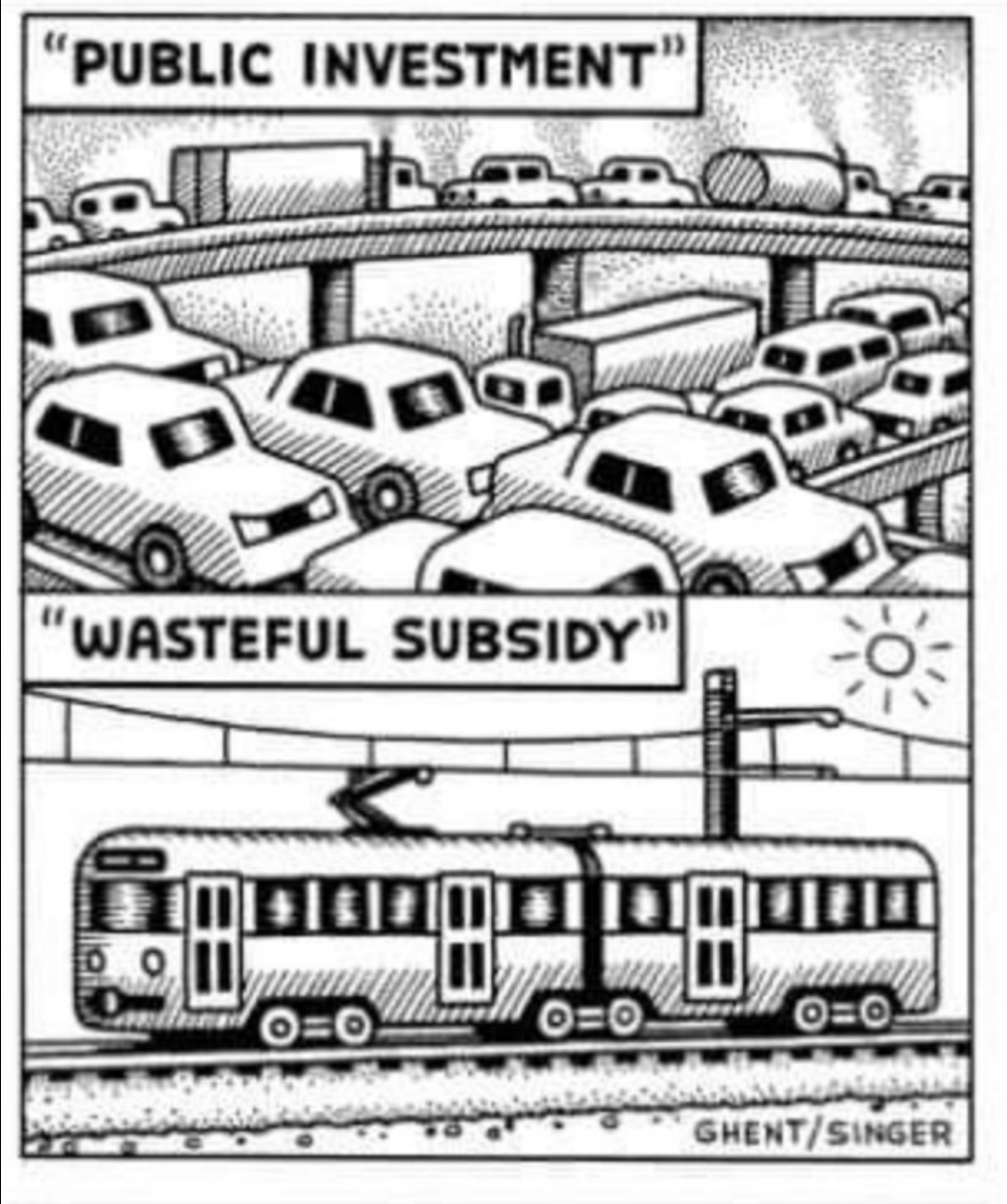
Hungary Today  
Budapest Has World's



Andy Singer



MGM



Andy Singer



Pay no attention to the  
man behind the curtain.

The high-tech sideshow that  
prevents the change we need.

Peter Norton  
norton@virginia.edu  
December 8, 2023



Introduction

**Unkeepable promises**

Futurama 1

**Foolproof highways**

Futurama 2

**Magic highway USA**

Futurama 3

**“Smart” is the new “magic”**

Futurama 4

**Autonorama**

Conclusion

**There's no place like home.**



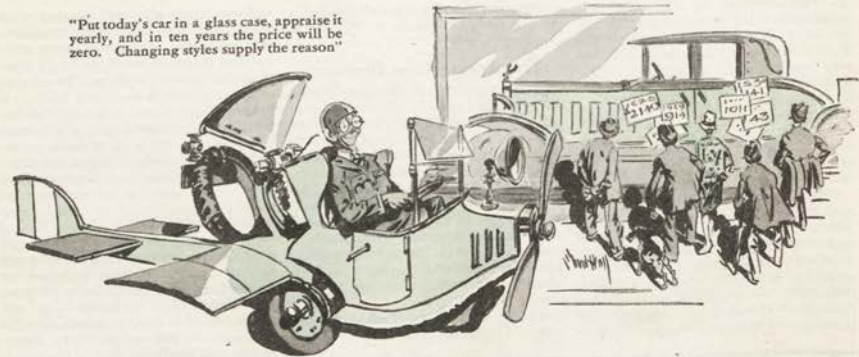
Simon & Schuster







"Put today's car in a glass case, appraise it yearly, and in ten years the price will be zero. Changing styles supply the reason"



## Keep the Consumer Dissatisfied

By CHARLES F. KETTERING

General Director, General Motors Research Laboratories

Cartoons by Stuart Hay

**N**OT LONG ago one of the great bankers of the country said to me:

"The trouble with you fellows is that you are all the time changing automobiles and depreciating old cars, and you are doing it at a time when people have three or four payments to make on the cars they already have.

"Yesterday I got an engraved invitation from one of your companies to see a new model. Out of curiosity I went. I darn near bought one. I didn't because you people wouldn't allow me enough money for my old car."

A few weeks later I was again talking with this banker. He appeared to be greatly disgruntled.

"I bought that new model," he barked. "But it was a rotten shame that I had to accept so much depreciation on my old car. You are the fellow who is to blame. You, with all your changes and refinements, made me dissatisfied with the old model."

He paused, then added, mournfully, "And that old car ran like new."

I told him I thought it was worth what he paid—that is, the difference between the old and the new model—to have his mind changed.

He didn't argue over that but he did say something to the general effect that "the only reason for research is to keep your customers reasonably dissatisfied with what they already have."



"Those ideas are coming from the younger generation"

I might observe, here and now, that he was right.

A few weeks back I was sitting with a group of executives. All were admiring a new model.

"It is absolutely the best automobile that can be made," enthused one. I objected to that statement.

"Let's take this automobile which, you say, is the 'best that can be made' and put it into a glass showcase," I said. "Let's put it in there—seal it so no person can possibly touch it. Just before we seal it in the case let us mark the price in big letters inside the case.

### Depreciates Without Use

"LET us do that and come back here a year from today. After looking at it and appraising it, we will mark a price on the outside of the glass. It will be a price something less than what we think the car is worth today. Probably \$200 less. Then, let's come back once every year for ten years, look through the glass, and

mark a new price. At the end of ten years we won't be able to put down enough ciphers to indicate what we think of the car. That is, of course, eliminating its value as junk.

"In those ten years, no one could possibly have touched the car. There could be no lessened value through handling. The paint would be just as good as new; the crank case just as good; the rear axle just as good; and the motor just

as good as ever.

"What, then, has happened to this car?"

"People's minds will have been changed; improvements will have come in other cars; new styles will have come. What you have here today, a car that you call 'the best that can be made,' will then be useless. So it isn't the best that can be made. It may be the best you have made and, if that is what you meant, I have no quarrel with what you said."

Another prominent banker once said to me:

"You research people are always disrupting things. You cause us more trouble than any other group. I, as a banker, will make a loan to a firm and am apt to discover, in a few days, that you fellows have put this concern out of business. All because your research methods have found different ways for doing things. Perhaps they are better ways, but what of it? The old ways were satisfactory.

This banker was thoughtless.

Prosperity has nothing to do with dol-



*introduction*

**Unkeepable promises**



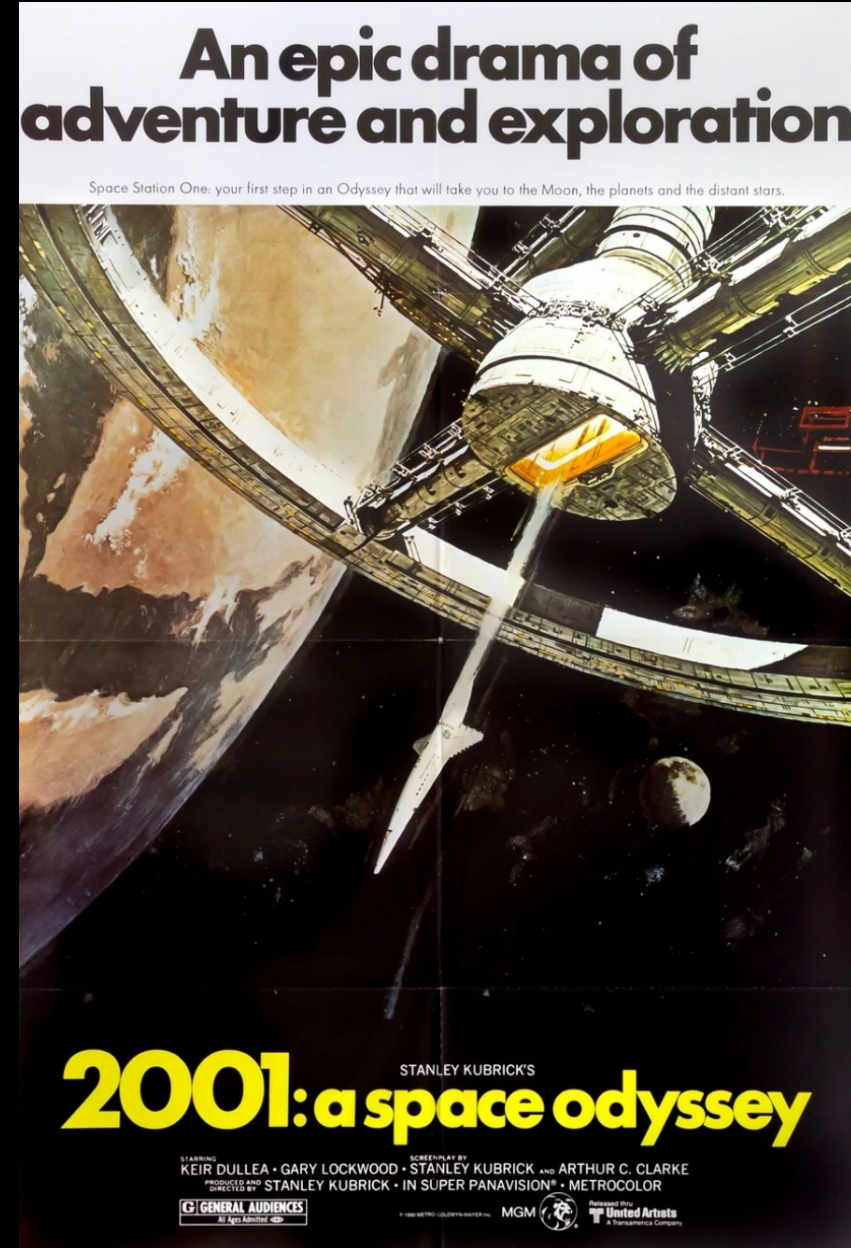
ITU Pictures (1965)

*introduction*

**Unkeepable promises**



ITU Pictures (1965)



Stanley Kubrick Productions / MGM / art: Robert McCall (1968, 1980)



SCIENCE, VOL. 159

19 JANUARY 1968

Any sufficiently advanced technology is indistinguishable from magic.

ARTHUR C. CLARKE



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ZF Domains > Automated Driving

## Automated Driving

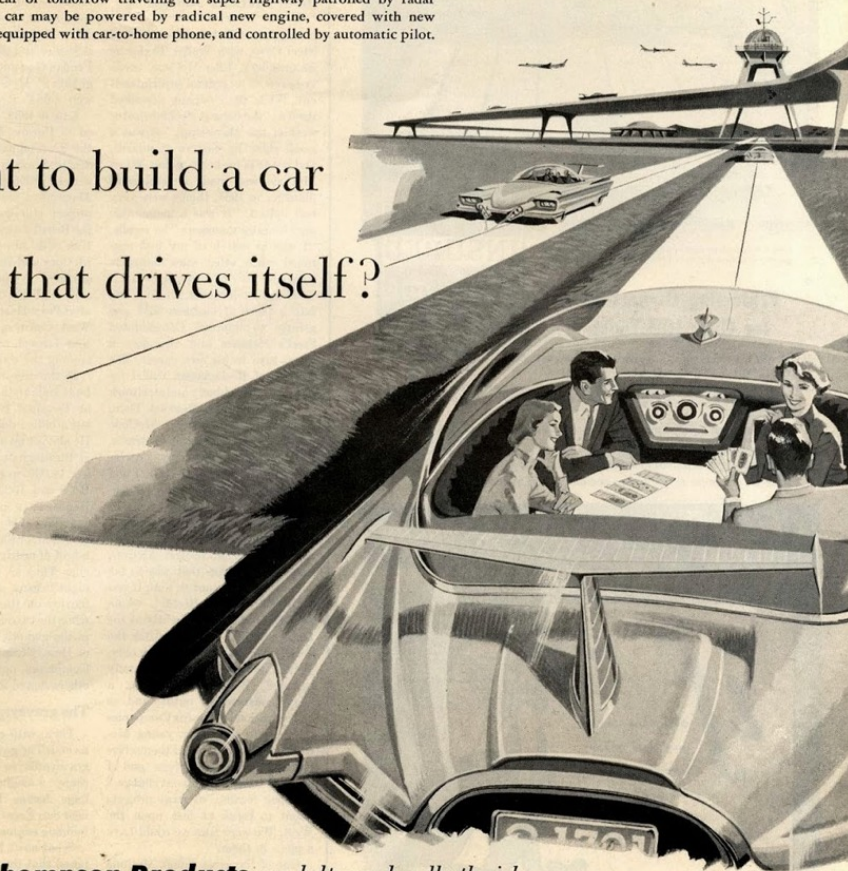


## EFFICIENT MOBILITY: DRIVING US TO DEVELOP INNOVATIVE TECHNOLOGIES

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 of 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](http://www.zf.com)

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.



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## Automated Driving



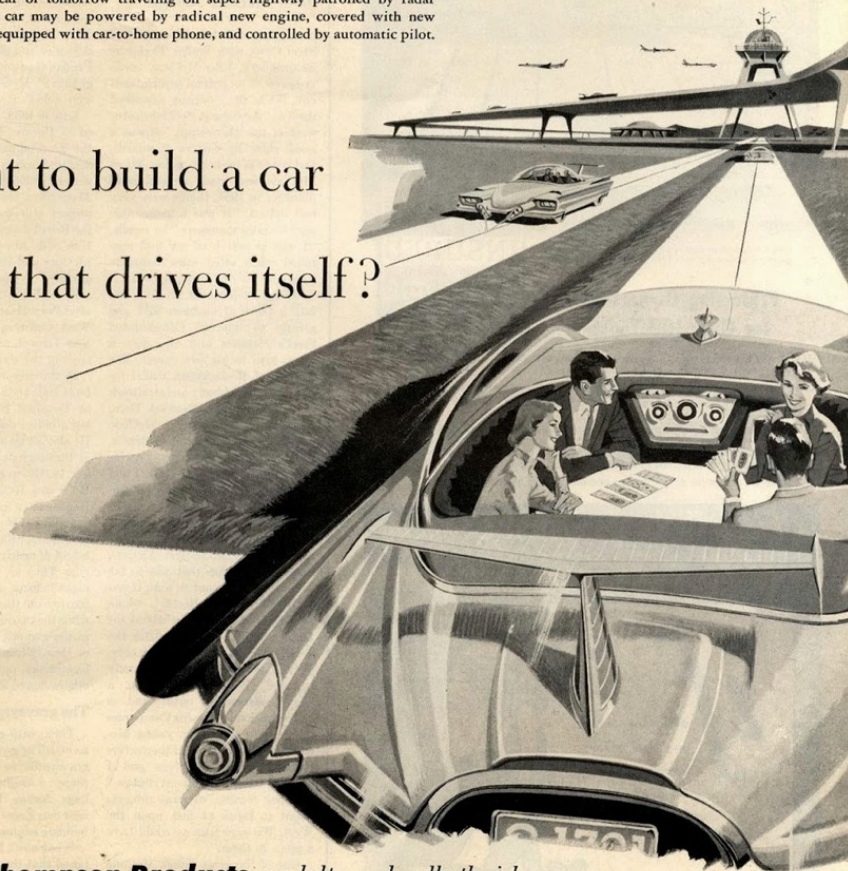
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UC Berkeley / California Path Program, 1997

Peter Norton

# AUTONORAMA

THE  
ILLUSORY PROMISE  
OF  
HIGH-TECH DRIVING



UC Berkeley / California Path Program, 1997

**Table Intro.1.** Since 1940, technofuturistic visions of crash-free, congestion-free driving have emerged roughly every 25 years (author). Each invokes new technology to gain new credibility.

technofuturistic vision	era	transformative technology
Futurama 1	circa 1940	<i>engineering:</i> highway engineering, steel-reinforced concrete, vacuum tube electronics
Futurama 2	circa 1965	<i>electronics:</i> solid-state, transistorized electronic systems; jet-age and space-age hardware
Futurama 3	circa 1990	<i>(advanced) technology:</i> “smart” systems, microprocessors, digital computers
Futurama 4 (Autonorama)	circa 2015	<i>(data-driven) autonomy:</i> “next-generation” technology, “disruptive innovation,” sensors, machine learning, wireless network connectivity

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Peter Norton

# AUTONORAMA

THE  
ILLUSORY PROMISE  
OF  
HIGH-TECH DRIVING

## 1

*Futurama 1***Foolproof highways**

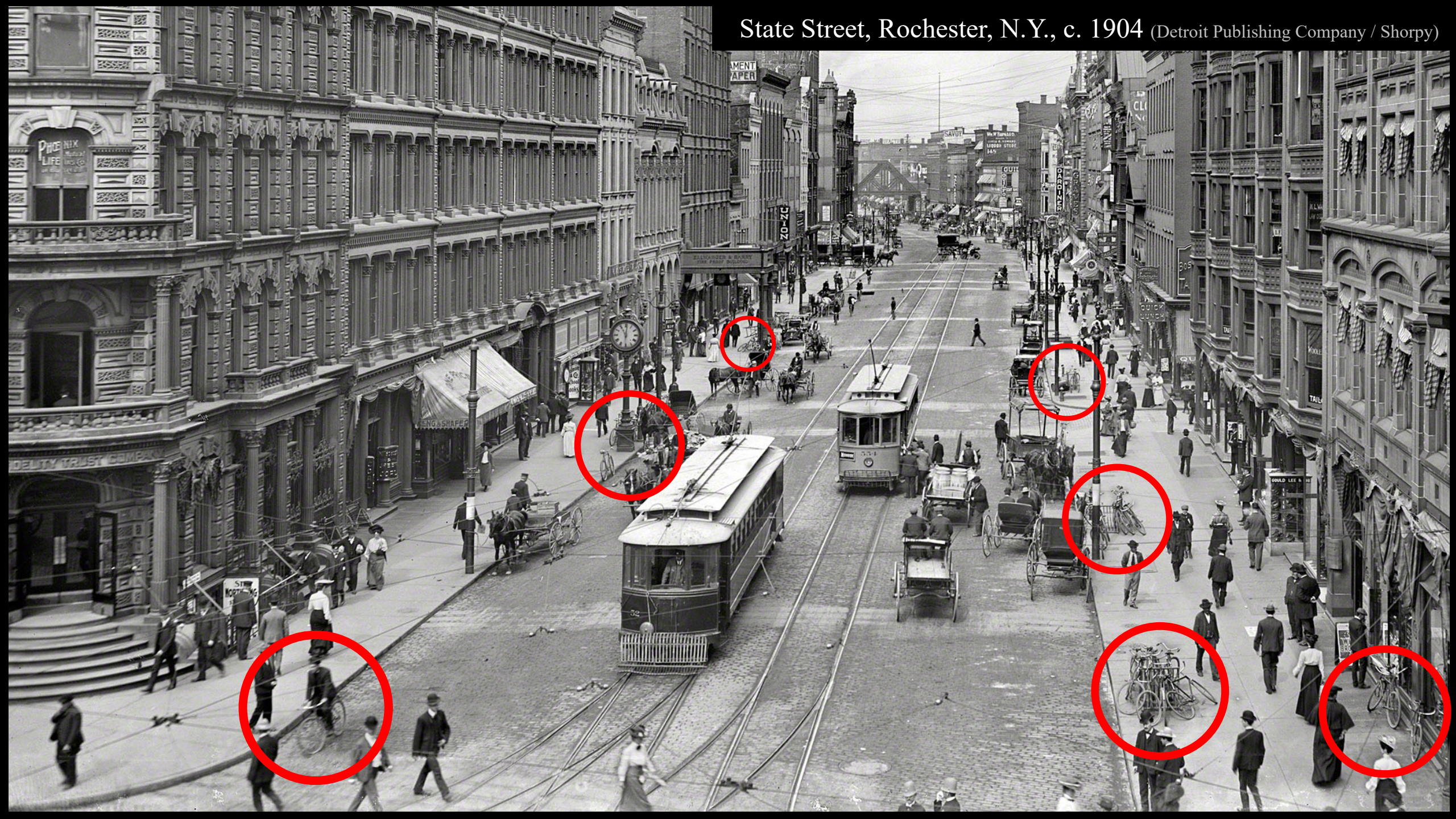
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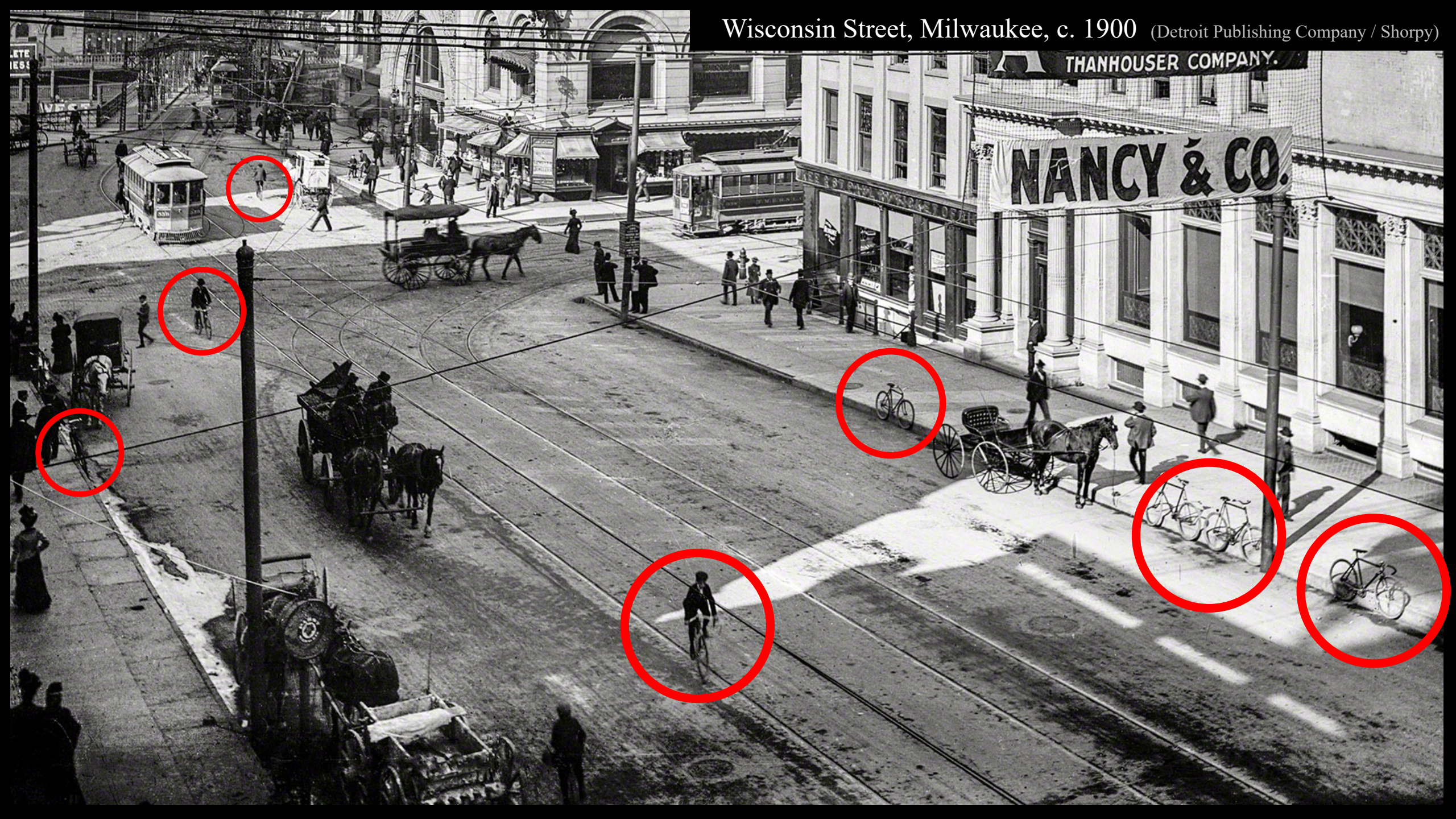
State Street, Rochester, N.Y., c. 1904 (Detroit Publishing Company / Shorpy)



State Street, Rochester, N.Y., c. 1904 (Detroit Publishing Company / Shorpy)



Wisconsin Street, Milwaukee, c. 1900 (Detroit Publishing Company / Shorpy)





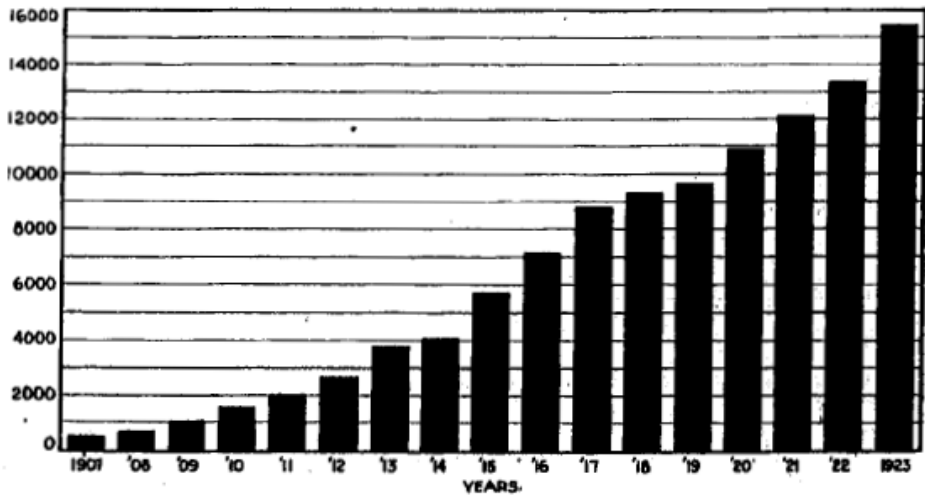
Woodward Ave., Detroit, c. 1917 (Detroit Publishing Company / Shorpy)





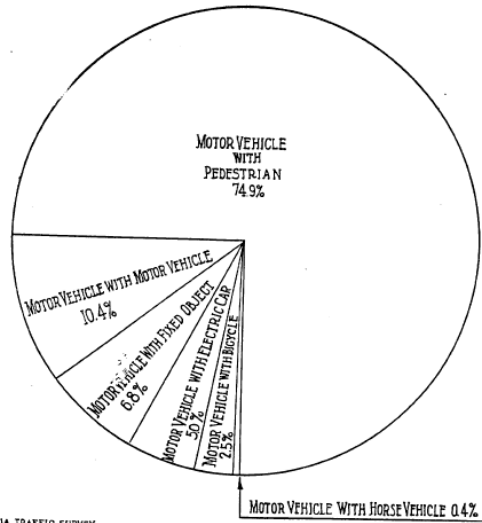
Michigan Ave at  
Woodward Ave, Detroit,  
c. 1920 / *Detroit News*

### GROWTH IN NUMBER OF AUTOMOBILE FATALITIES IN THE UNITED STATES



*Journal of American Insurance, Nov. 1924 / NSC*

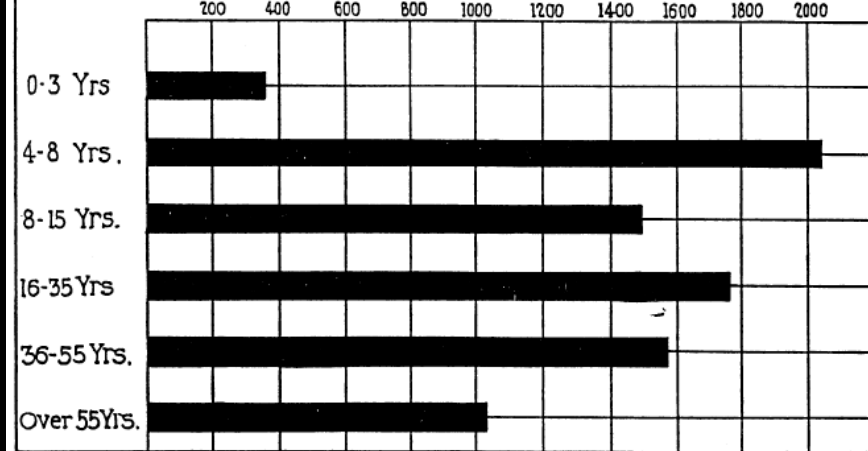
### DEATHS DUE TO MOTOR VEHICLES CITY OF PHILADELPHIA YEAR 1928



PHILADELPHIA TRAFFIC SURVEY  
PREPARED UNDER THE DIRECTION OF  
MITTEN MANAGEMENT INC.,  
PHILADELPHIA, PA.

Compiled from Phila. Police Dept. Records

### VEHICULAR ACCIDENTS BY AGE GROUPS OF PEDESTRIANS CITY OF PHILADELPHIA YEAR 1928 Number of Accidents



PHILADELPHIA TRAFFIC SURVEY  
PREPARED UNDER THE DIRECTION OF  
MITTEN MANAGEMENT INC.  
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Compiled from Phila. Police Dept. Records

# NATION ROUSED AGAINST MOTOR KILLINGS

## Secretary Hoover's Conference Will Suggest Many Ways to Check The Alarming Increase of Automobile Fatalities.—Studying Huge Problem

**T**HE need for vigorous nation-wide action to promote street and highway safety has prompted Secretary Hoover to call a conference of representatives of the various agencies interested in checking the steady increase in vehicular accidents. The conference will be held in Washington on Dec. 19. It will treat the subject from seven angles, including statistics, traffic control, construction and engineering, city planning and zoning, insurance, education and the motor vehicle and public relations.

**T**HE horrors of war appear to be less appalling than the horrors of peace. The automobile looms up as a far more destructive piece of mechanism than the machine gun. The reckless motorist deals more death than the artilleryman. The man in the street seems less safe than the man in the trench.

Fifty thousand of our men were killed in action or died of wounds in the nineteen months of this country's participation in the World War. This is at the rate of 2,600 fatalities a month—a modest average when compared with the startling toll of 7,000 lives destroyed monthly by accidents in the United States.

The greatest single lethal factor is the automobile. It left a shambles in its wake as it coursed through 1923. It accounted for 16,432 victims. According to the tragic auto mishaps recorded in the first nine months of this year there will be an increase of more than 2,000 for 1924. At the beginning of October approximately 14,000 motor deaths had already been reported.

A conference called by Secretary Hoover for next month will concentrate its deliberations upon street and highway accidents. A Committee on Statistics was appointed by Mr. Hoover to supply the conferees with a clearly defined picture of the public accident situation. This committee is placing particular emphasis upon the annual report of the United States Census Bureau on mortality statistics, which revealed that 22,621 persons died in vehicular mishaps in 1923, an increase of almost 3,500 over 1922.

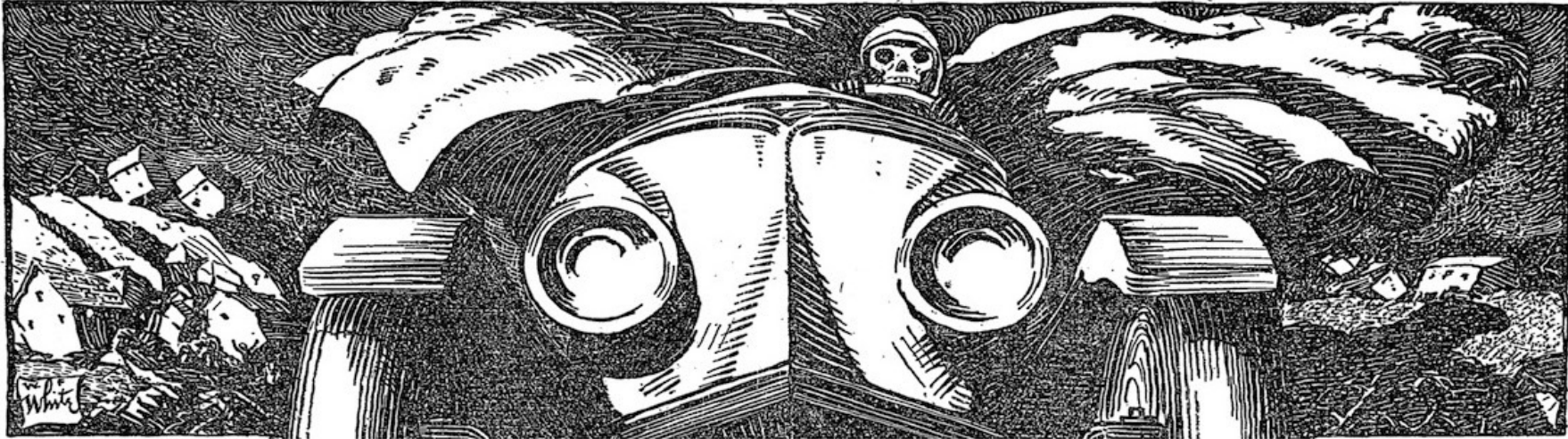
While the number killed in automobile accidents last year was given as 16,432, the motor car was also concerned in other highway fatalities. The Census Bureau charges each accident to the

roads becomes insignificant by comparison with those caused by automobiles.

The huge economic loss caused by street and highway accidents is set forth in a preliminary report prepared by the Committee on Statistics appointed by Secretary Hoover. On this subject the report says in part:

"The economic loss due to these approximately 700,000 accidents in which personal injuries occur can probably never be known. Several estimates have been made. The most conservative is based upon the usual liability of \$5,000 per life and average of \$175 for each personal injury.

"These two items, applied to 22,600 fatalities and 678,000 non-fatal injuries, respectively, give an approximate total of \$232,000,000. Add to this an average



lic streets and roads. Assuredly, that would be a privileged class who would steer such monsters. In reality, the automobile drivers are a privileged class right now.

"Under present conditions there is a deadly competition between pedestrian and motorist for the use of those strips of territory we call streets, a conflict deadly to the wayfarer, with the victory to the motorist.

"Frankly, it is largely a matter of viewpoint, this motor problem, and the same individual if viewed from behind the wheel. As both must use the highway and as two bodies cannot occupy the same space at once, when the twain meet, as they so often do, what is the solution?

"Manifestly, the alerter cannot go on. The mangling and crushing cannot continue. Human life is for relief. The troubled mother who sends her little child off to school or out to play, the faltering aged person who tremulously attempts a crossing must have some surcease of their anxiety. Conversely, the conscientious operator who, with tense nerves sees the fool dart out into his very path from some unexpected direction is entitled to some regard.

"As it stands, the motorist has won his contest for the use of the streets over the foot passengers, despite the present efforts of police, courts and motor vehicle authorities to regulate him and his kind. The motorist has inspired fear and the sort of respect that brute force inspires.

"If we have failed adequately to regulate motorists shall we succeed any better in attempts to regulate pedestrians? It is well enough to condemn the 'jay-walker,' if by that term we mean the reckless individual who is bent on getting there, whether on or off a cross-walk, without looking or governing his movements. But if we mean the average and the under-average in intelligence and alertness of our population who do not use the best judgment because they cannot and who, exasperated by the never heeding, never ending train of automobiles that oftentimes roll ceaselessly toward them, eating up the highway so fast as to upset all calculations of time and space, try to thread their way through, if they are to cross at all, then I disagree emphatically.

**As to Regulating Jaywalkers.**

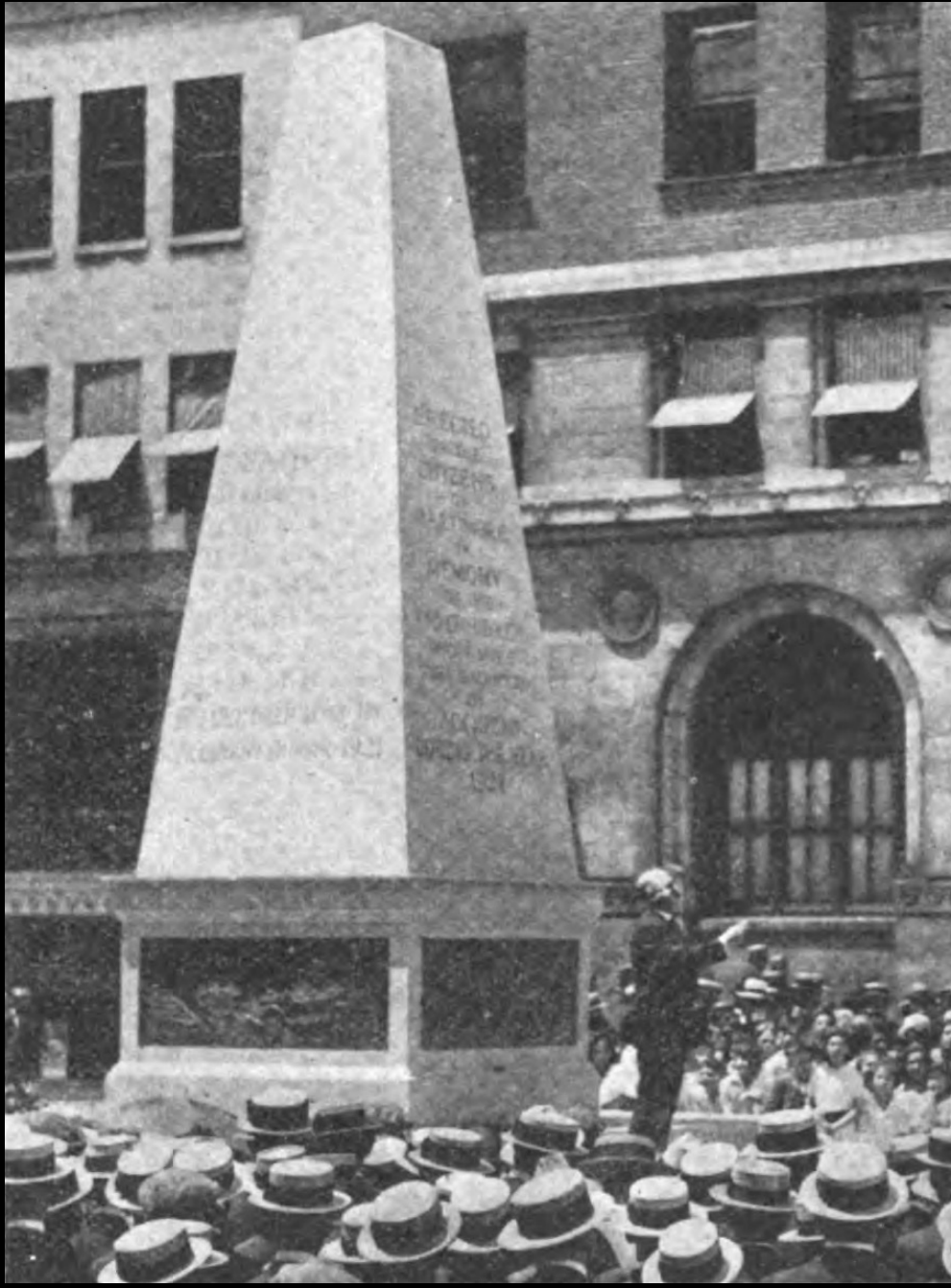
"Any regulating of the pedestrian is to be done with caution. His constitu-

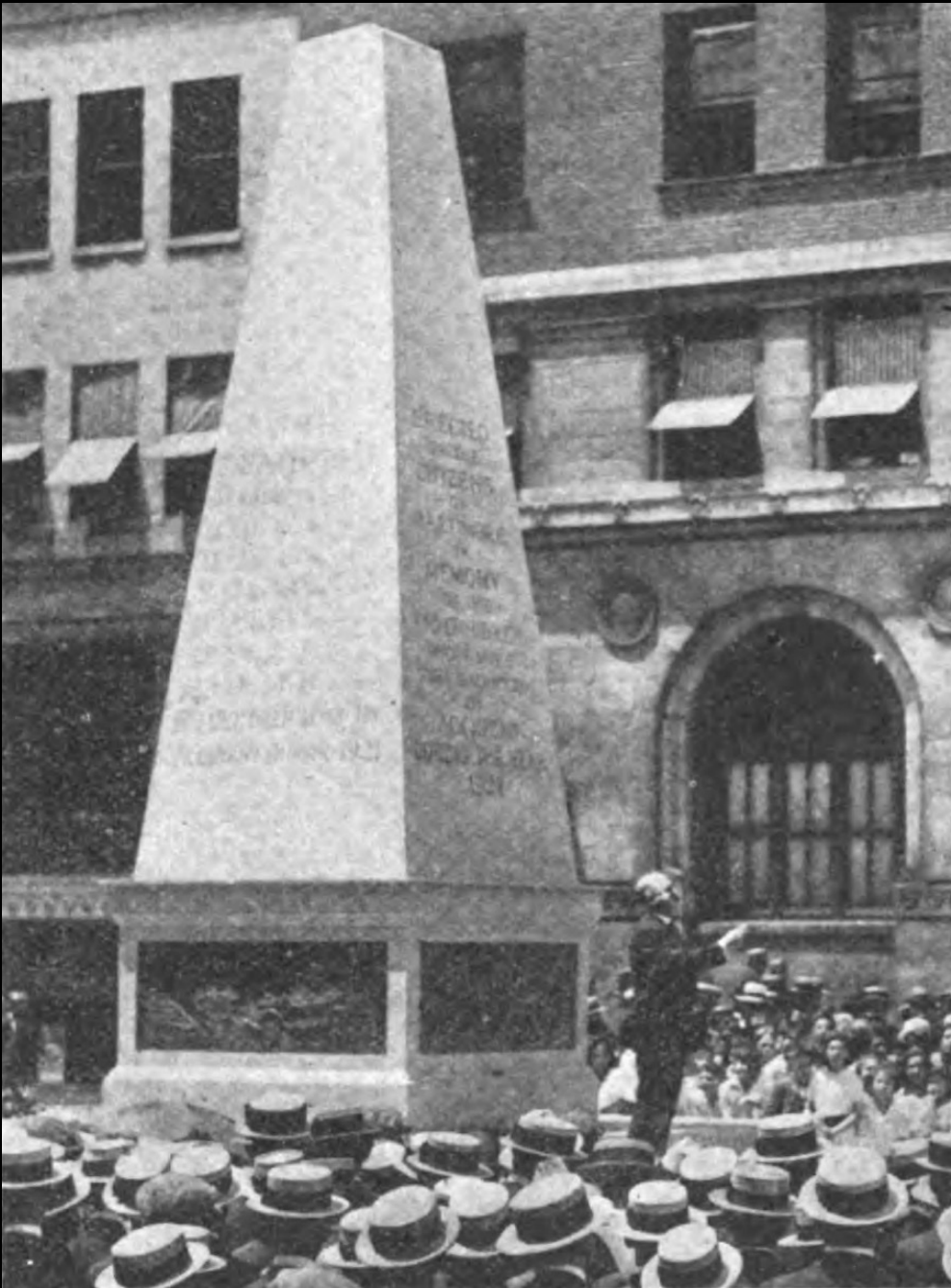
asserting them in the actual use of the highway in the presence of superior force in the shape of the omnipresent motor car?

"It is usually only when in court at the post-mortem of an accident or of his own bodily post-mortem from such accident that the pedestrian is, so to speak, allowed to enjoy his legal rights! Most of us prefer not to fall victims as the price of such recourse.

"Some time ago General O'Ryan was quoted as saying that 'most of us are still addicted to habits on the street which were suitable to the life of a generation ago when all vehicles were horse drawn. The modern street calls for an entirely new set of habits and for a kind of alertness and precaution

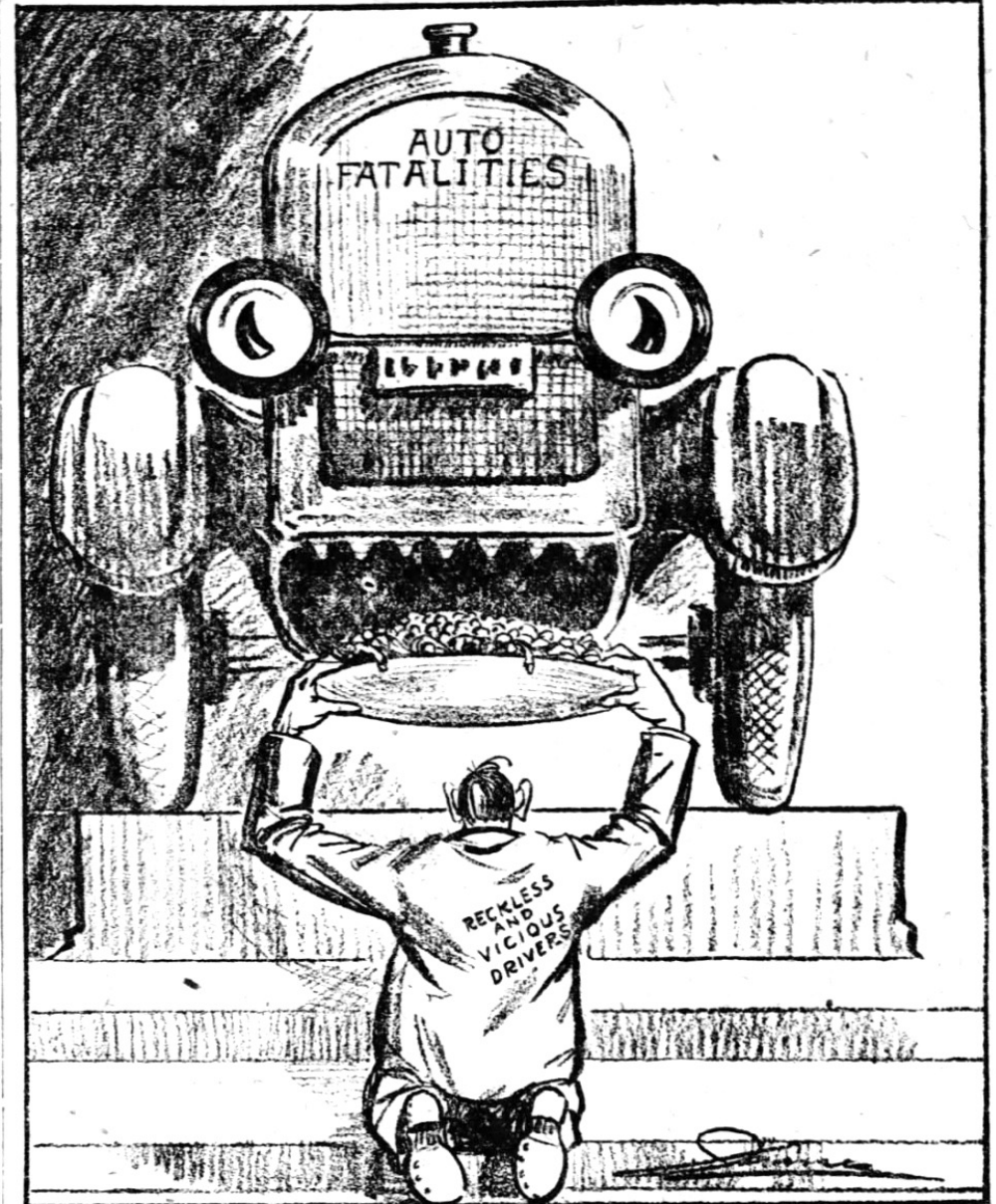
*National Safety News, Aug. 1923*





Sacrifices to the Modern Moloch

By James



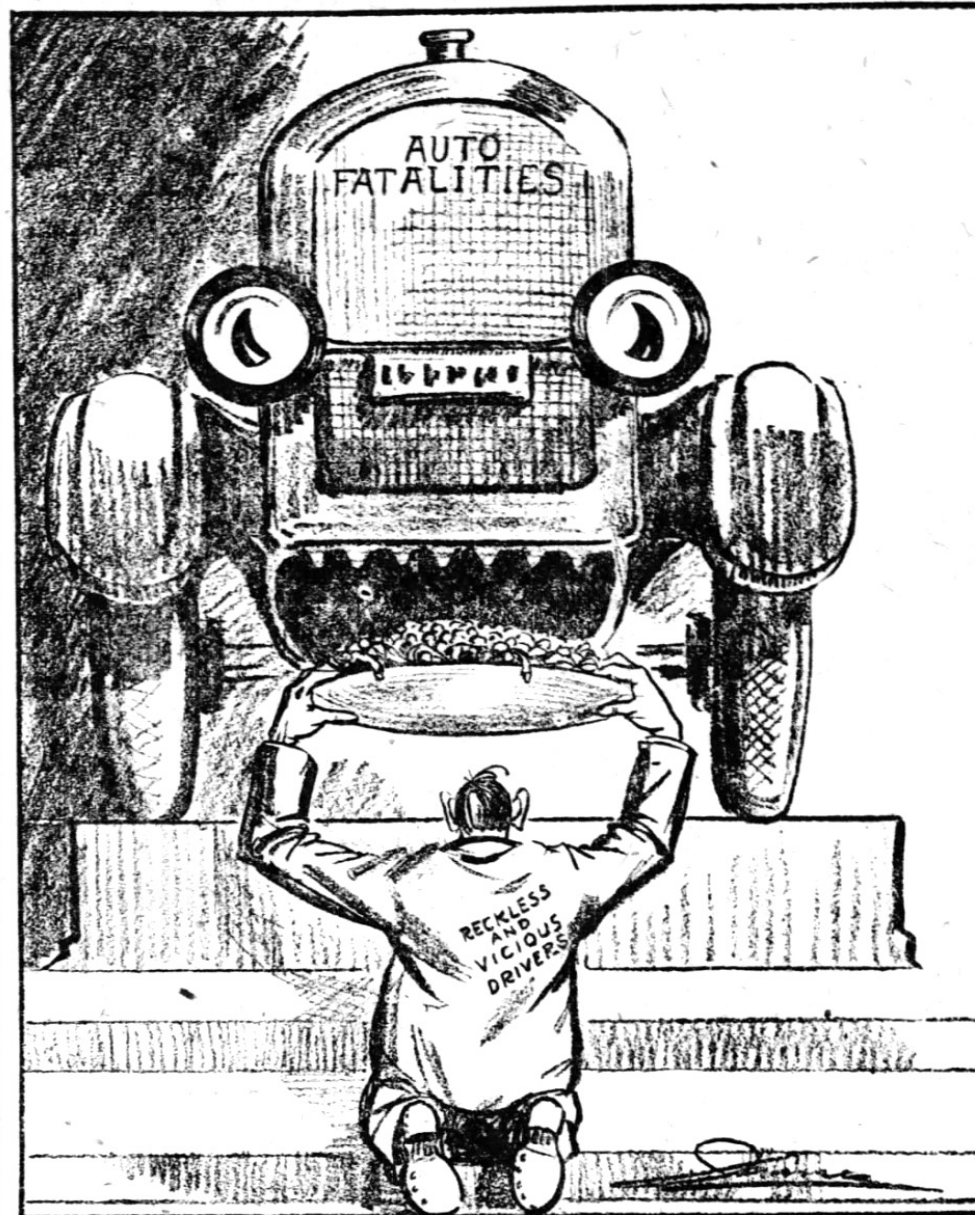
# **SPEED DEMONS**



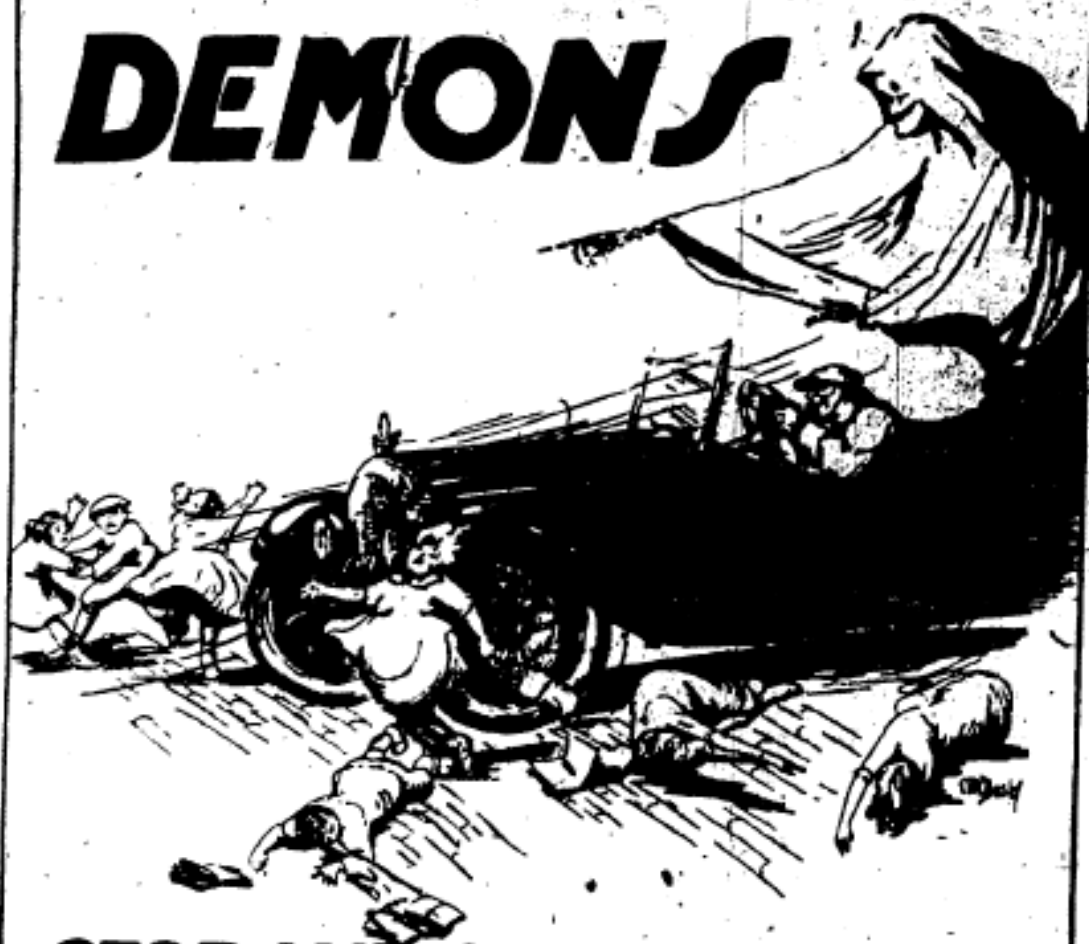
**STOP, AND CONSIDER OUR  
FUTURE GENERATION!**

Sacrifices to the Modern Moloch

By James



# ***SPEED DEMONS***



**STOP, AND CONSIDER OUR  
FUTURE GENERATION!**

# ***SPEED***



*— a menace  
to life and limb*  
**STOP IT!**



**VOTE "YES"**

**On the Ordinance to Curb Speeding**

*Which Shall* A Limit of 25 Miles Per Hour and SAFETY  
*It Be---* or

No Limit and the Lurking Danger  
of DEATH!

**SPAND**



*— a menace  
to life and limb*  
**STOP IT!**

# THE GREAT WALL of CHINA AGAINST PROGRESS



China is the most  
Backward of All Nations

Would YOU  
Build A Wall Around  
CINCINNATI  
AND RETARD YOUR CITY'S  
PROGRESS?

Defeat the Motor Governor Ordinance

It Will NOT Curb Reckless Driving!

These Organizations  
Are Opposed  
To This Ordinance

- Academy of Medicine
- American Business Club
- Business Men's Club
- Central Labor Council
- Cincinnati Automobile Club
- Cincinnati Automobile Dealers' Association
- Cincinnati Automotive Trade Association
- Chadwell Chamber of Commerce
- Cincinnati Motor Club
- Cincinnati Retail Merchants' Association
- Cincinnati Team and Motor Truck Drivers' Association
- Cincinnati Association
- Fairview Civic League
- Federated Civic Association
- Industrial Association
- Merchants and Manufacturers' Association of Cincinnati
- Sewall Street Business Men's Association

These are the things that will happen if the use of the so-called Motor Governor is made compulsory:

- 1—Accidents will increase.
  - (a) Because the motorist is deprived of full control of his machine.
  - (b) Because the careless motorist will be given a false sense of security thru being privileged to drive at the rate of 25 miles an hour.
  - (c) Because traffic congestion would be increased, thereby endangering pedestrians.
- 2—The loss of business in Cincinnati will be enormous, for the ordinance builds a wall around the city excluding every motor car from entering unless equipped with a governor. It will isolate the city and make Cincinnati the last of national cities.
- Insurance experts believe that accidents will increase if the ordinance should pass. And, therefore, are anticipating an increase in rates.
- 3—While the Police Department already equipped, are deterring their time in the enormous task of calling and inspecting these devices on 20,000 automobiles, the city will be wide open to the criminal elements.
- 4—The enforcement of the ordinance will cost the taxpayers approximately \$250,000 a year.

- 4—If the governor should get out of order—and this is liable to happen every time an automobile goes over a bump—the driver will be sent to jail without the benefit of a trial—a violation of the fundamental principles of American justice.
- 5—The manufacturers of motor governors will get wealthy overnight. Automobile owners will be compelled to pay them between \$12 and \$25 for each device—a matter of over \$125,000. THIS CITY WILL NOT GET ONE CENT OF THIS MONEY.
- 6—Even if the ordinance is repealed, the reckless driver would still be with us—AND CARELESS DRIVING IS THE CAUSE OF MOST ACCIDENTS. The Motor Governor Ordinance will not offset or cure these facts. That the largest number of accidents occur when the auto is traveling at a speed of less than 20 miles an hour. (The Governor Ordinance permits 25 miles.) That it is easy for anyone with slight mechanical knowledge to tamper with the device between inspection periods. Automobile governors are not new. If they were successful, every automobile would carry a governor as part of its standard equipment today. They are easily got out of order—worthless on hills—dangerous in emergencies and absolutely unnecessary.

Present Laws Are Adequate.

The laws and ordinances we have now are adequate to curb not only speeding, but what is more important—careless, reckless driving. The cure for speeding and careless driving is strict enforcement of these present laws and ordinances. Defeat the ordinance by voting "NO!"

Do Not Help To Build a Chinese Wall Around Cincinnati  
Let's Make It Unanimous and—

# VOTE NO

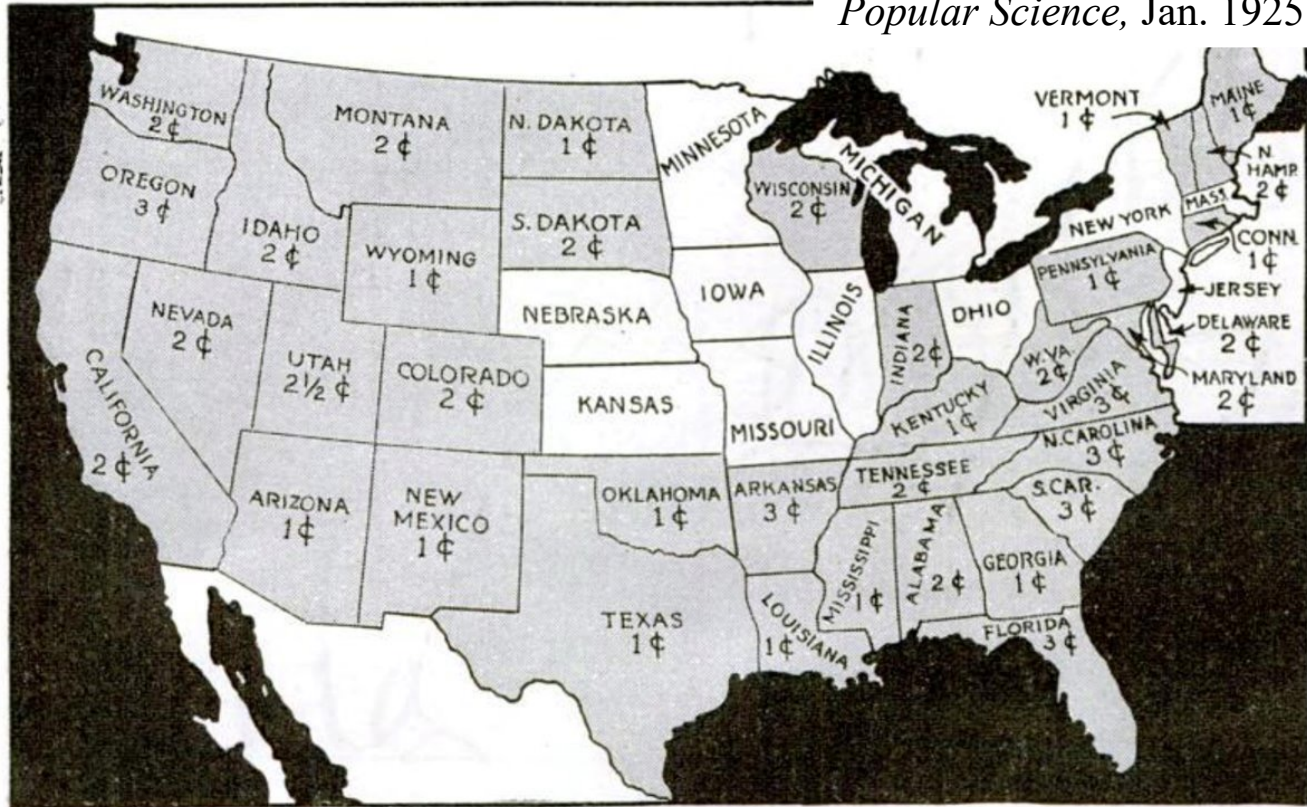


## VOTE "YES"

On the Ordinance to Curb Speeding

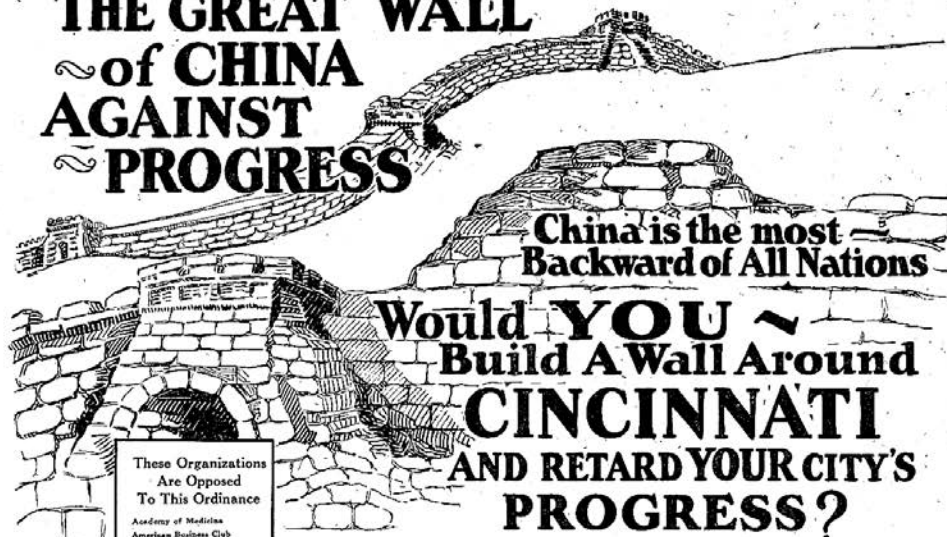
Which Shall A Limit of 25 Miles Per Hour and SAFETY  
It Be--- or ---

No Limit and the Lurking Danger of DEATH!



Shaded portions show the 36 states that have gasoline taxes, and the rate in each case

# THE GREAT WALL of CHINA AGAINST PROGRESS



China is the most  
Backward of All Nations

Would YOU  
Build A Wall Around  
**CINCINNATI**  
AND RETARD YOUR CITY'S  
PROGRESS?

Defeat the Motor Governor Ordinance

It Will NOT Curb Reckless Driving!

These Organizations  
Are Opposed  
To This Ordinance

- Academy of Medicine
- American Business Club
- Business Men's Club
- Central Labor Council
- Cincinnati Automobile Club
- Cincinnati Automobile Dealers' Association
- Cincinnati Automotive Trade Association
- Cincinnati Chamber of Commerce
- Cincinnati Motor Club
- Cincinnati Retail Merchants' Association
- Cincinnati Team and Motor Truck Owners' Association
- Cincinnati Association
- Fairview Civic League
- Federated Civic Association
- Industrial Association
- Merchants and Manufacturers' Association of Cincinnati
- Sewanh Street Business Men's Association

These are the things that will happen if the use of the so-called Motor Governor is made compulsory:

- 1—Accidents will increase.
  - (a) Because the motorist is deprived of full control of his machine, (b) because the careless motorist will be given a false sense of security thru being privileged to drive at the rate of 25 miles an hour, (c) because traffic congestion would be increased, thereby endangering pedestrians.
  - (d) The loss of business to Cincinnati will be enormous, for the ordinance builds a wall around the city excluding every motor car from entering unless equipped with a governor. It will isolate the city and make Cincinnati the last of national cities.
- Insurance experts believe that accidents will increase if the ordinance should pass. And, therefore, are contemplating an increase in rates.
- 2—While the Police Department already equipped, are deterring their time to the enormous task of calling and impounding these devices on 20,000 automobiles, the city will be wide open to the criminal elements.
  - 3—The enforcement of the ordinance will cost the taxpayers approximately \$280,000 a year.

- 4—If the governor should get out of order—and this is liable to happen every time an automobile goes over a bump—the driver will be sent to jail without the benefit of a trial—a violation of the fundamental principles of American justice.
  - 5—The manufacturers of motor governors will get wealthy overnight. Automobile owners will be compelled to pay them between \$12 and \$25 for each device—a matter of over \$1,250,000. THE CITY WILL NOT GET ONE CENT OF THIS MONEY.
  - 6—Even if the ordinance is defeated, the reckless driver would still be with us—AND CARELESS DRIVING IS THE CAUSE OF MOST ACCIDENTS.
- The Motor Governor Ordinance will not offset or cure these facts. The largest number of accidents occur when the auto is traveling at a speed of less than 30 miles an hour. (The Governor Ordinance permits 25 miles.)
- That it is easy for anyone with slight mechanical knowledge to tamper with the device however, inspection periods.
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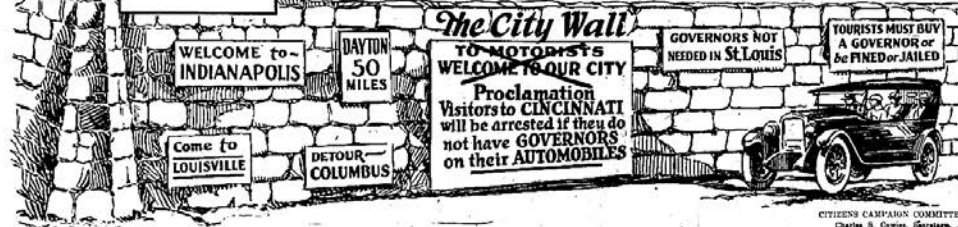
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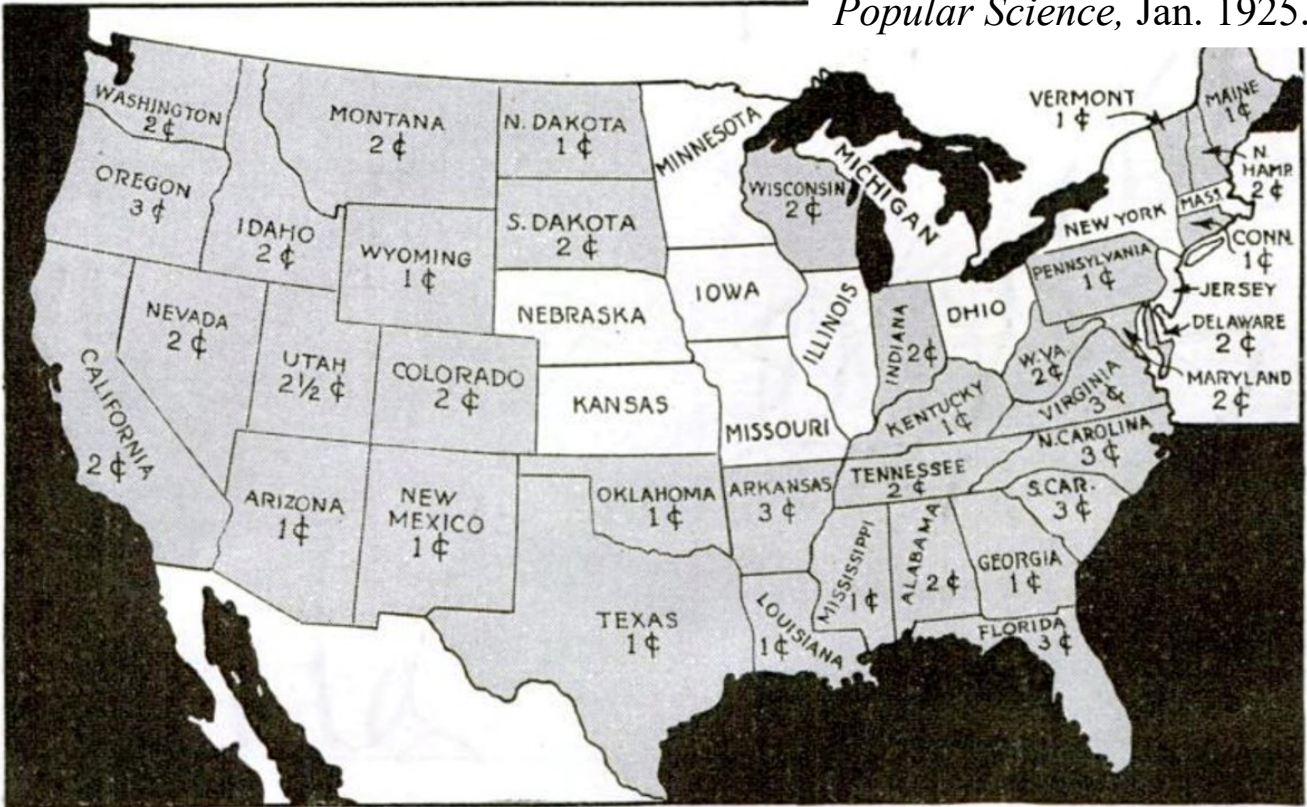
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Shaded portions show the 36 states that have gasoline taxes, and the rate in each case



# WIDEN YOUR ROADS WITH CONCRETE

**RELIEVE CONGESTION  
SPEED TRAFFIC  
INCREASE SAFETY**

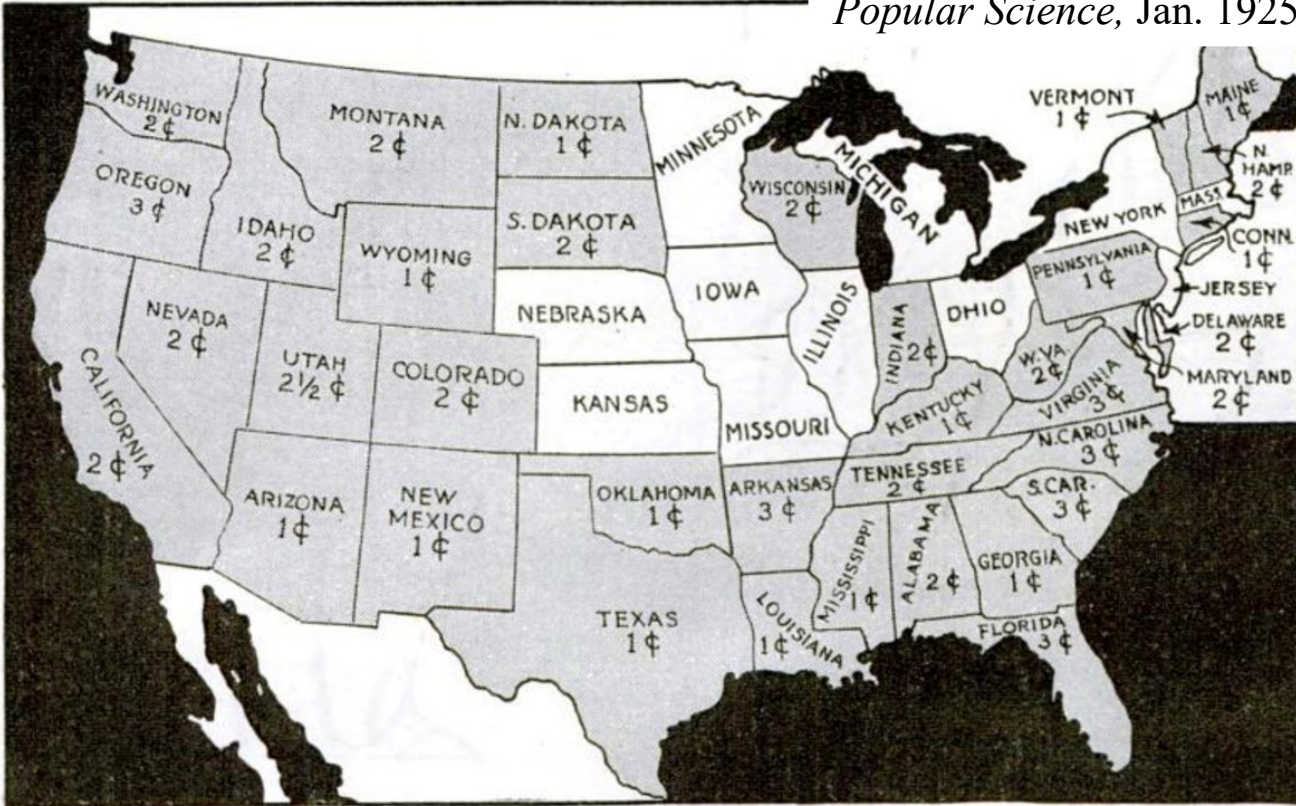
**N**O community today can afford narrow, congested roads and streets.

Today's swollen traffic clamors for "elbow room." The practical answer is to widen crowded roadways with concrete. Restores normal speeds. Eliminates congestion. Provides ample room for passing. Saves countless hours. *Increases safety.* And wider roads boost business.

Whether you build new roads or widen old, be sure to demand concrete—the safest and most economical pavement for modern traffic.



**PORTLAND CEMENT ASSOCIATION**  
30 W. Broad St., Columbus, Ohio



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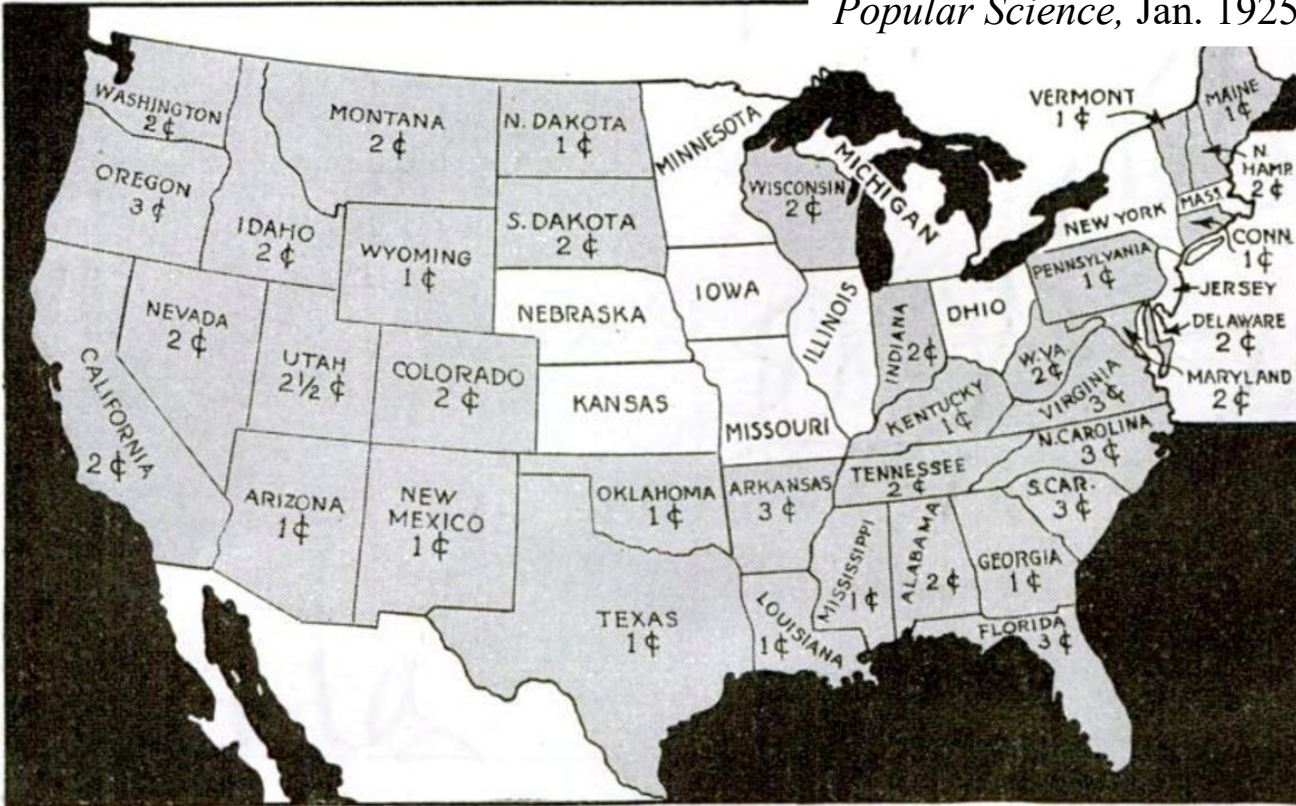
# THE FOOL-PROOF HIGHWAY OF THE FUTURE

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

**A**RE fool-proof highways possible? This question, often the sub-

accidents were made impossible by guards and protectors placed over dangerous machinery in such a man-

cars and pedestrians. There are no pedestrians on limited ways and, hence, no pedestrians can be killed



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*In the City of TOMORROW—*

*you'll loaf along at 50—  
right through town*

"Complete separation of traffic moving at three different speeds within 'the City of Tomorrow' will end today's confusion," predicts Norman Bel Geddes, authority on future trends.

"If you drive 10 blocks or more, you'll use Express Streets allowing speeds up to 50 miles an hour with no stop lights... no intersections... no pedestrians to slow you down.

"For short trips, you'll use one-way Local Streets, made wider by the elevation of sidewalks... elimination of parked cars and loading trucks. You'll walk and cross streets at the second-story level. Loading and parking facilities will be inside buildings..."

**...but TODAY,  
4 miles in 5 are  
Stop and Go**

**Y**OU average 30 stops every day. And one stop can waste enough gasoline to drive you 5 city blocks.

Today's stop and go is the COSTLIEST kind of driving!

While traffic authorities are planning "the City of Tomorrow," Shell engineers have developed a fuel, Super-Shell, to meet today's driving problem. They found a way to rearrange the chemical structure of gasoline...to balance it.

Automotive engineers describe Super-Shell as "motor-digestible," because at all motor speeds it is converted so QUICKLY, so COMPLETELY into power.

Your regular use of Super-Shell will save on stop and go. There's a Shell dealer in your neighborhood.

**SUPER-SHELL**



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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.



# WINNING *the* WAR *on* TRAFFIC ACCIDENTS

By Paul G. Hoffman

President The Automotive Safety Foundation

WHILE vast strides have been made toward reducing the rate of highway accidents, this lowered rate must be even further reduced, while more people ride more miles each year. Here is a paradox challenging the automotive industry today.

safest, strongest, most useful motor cars in the world. From the very beginning the pioneer builders and designers of motor vehicles have had the importance of

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*Popular Mechanics*, Oct. 1939

Portland Cement Association, 1948

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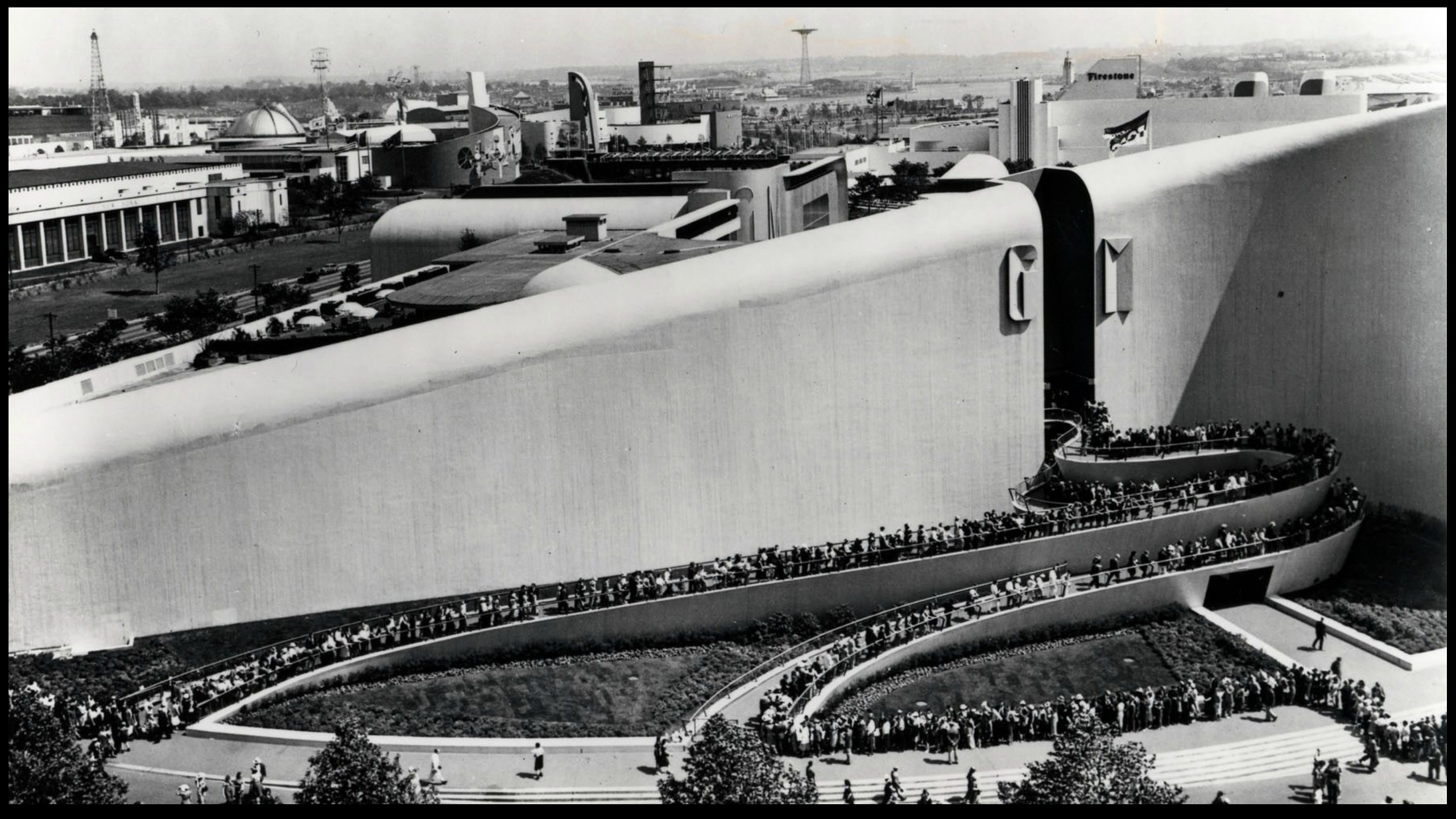
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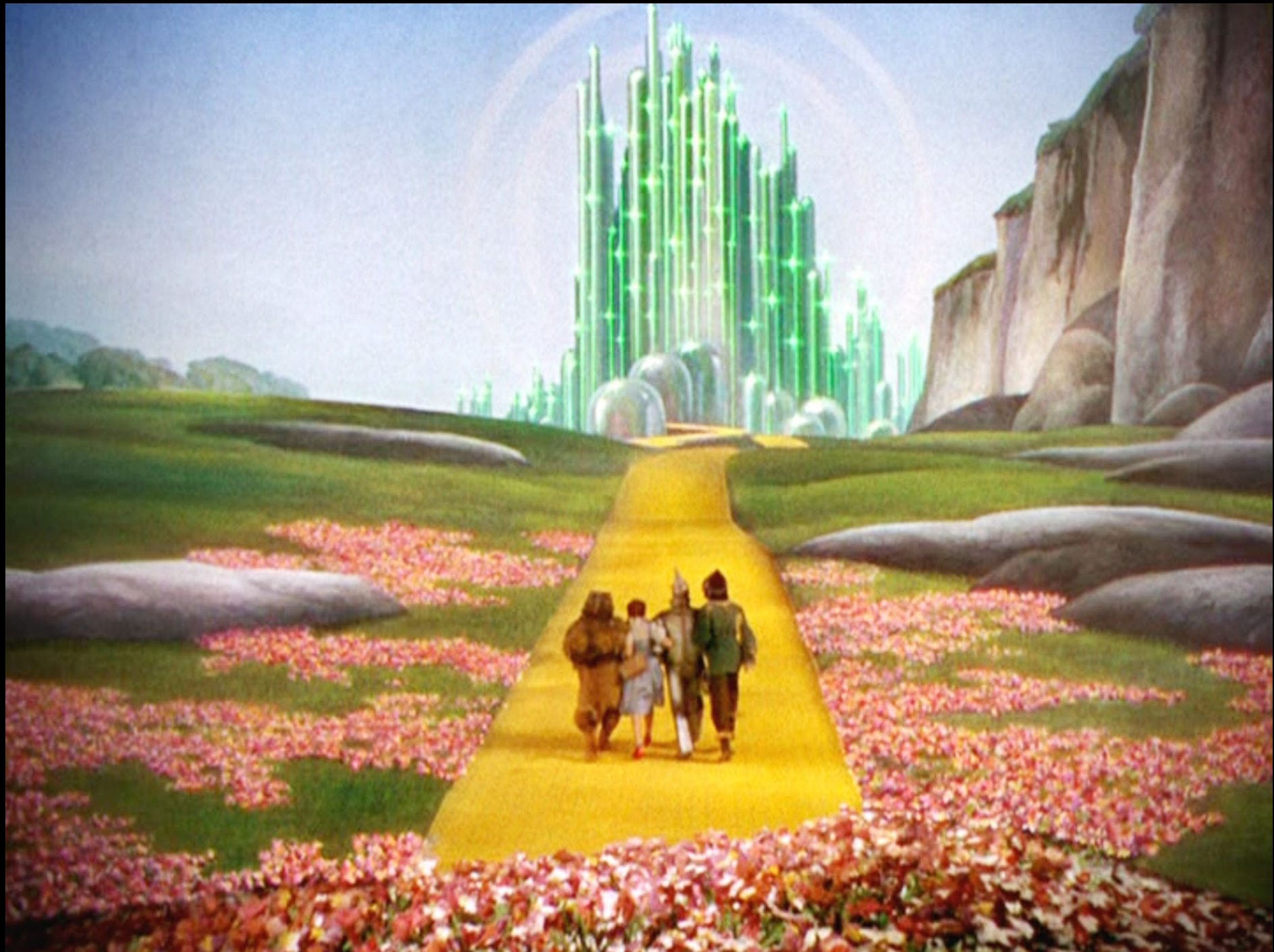
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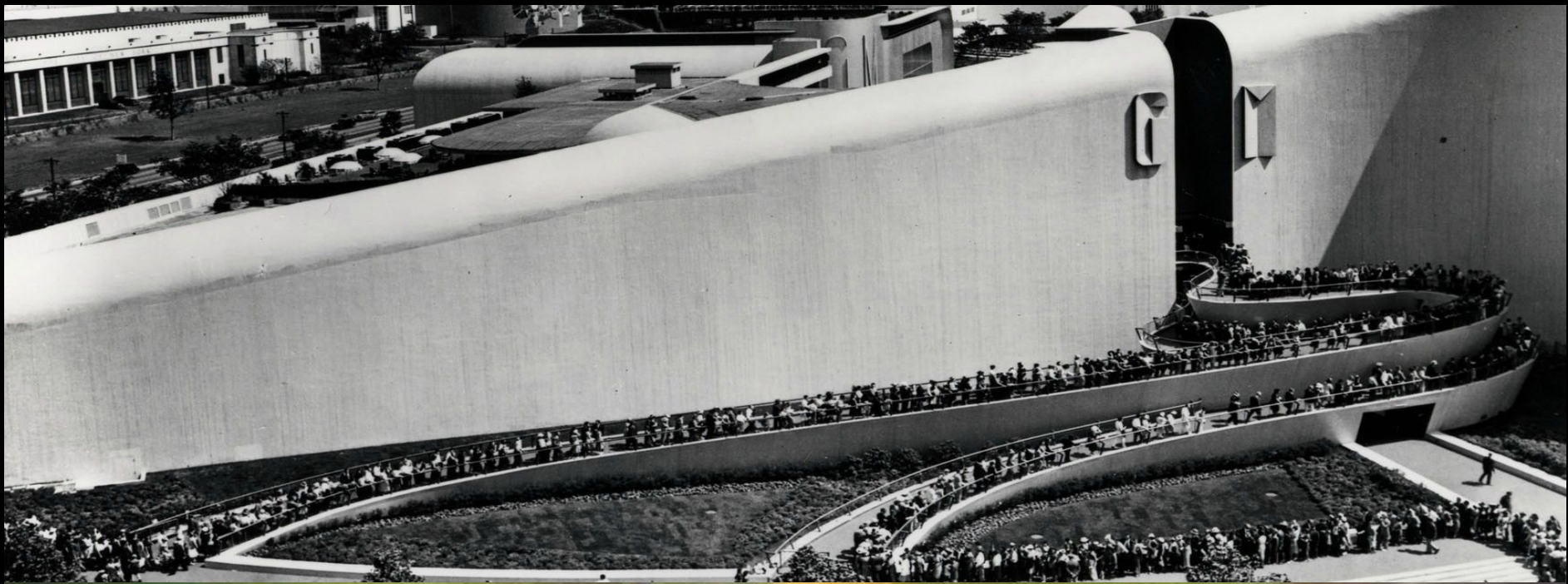


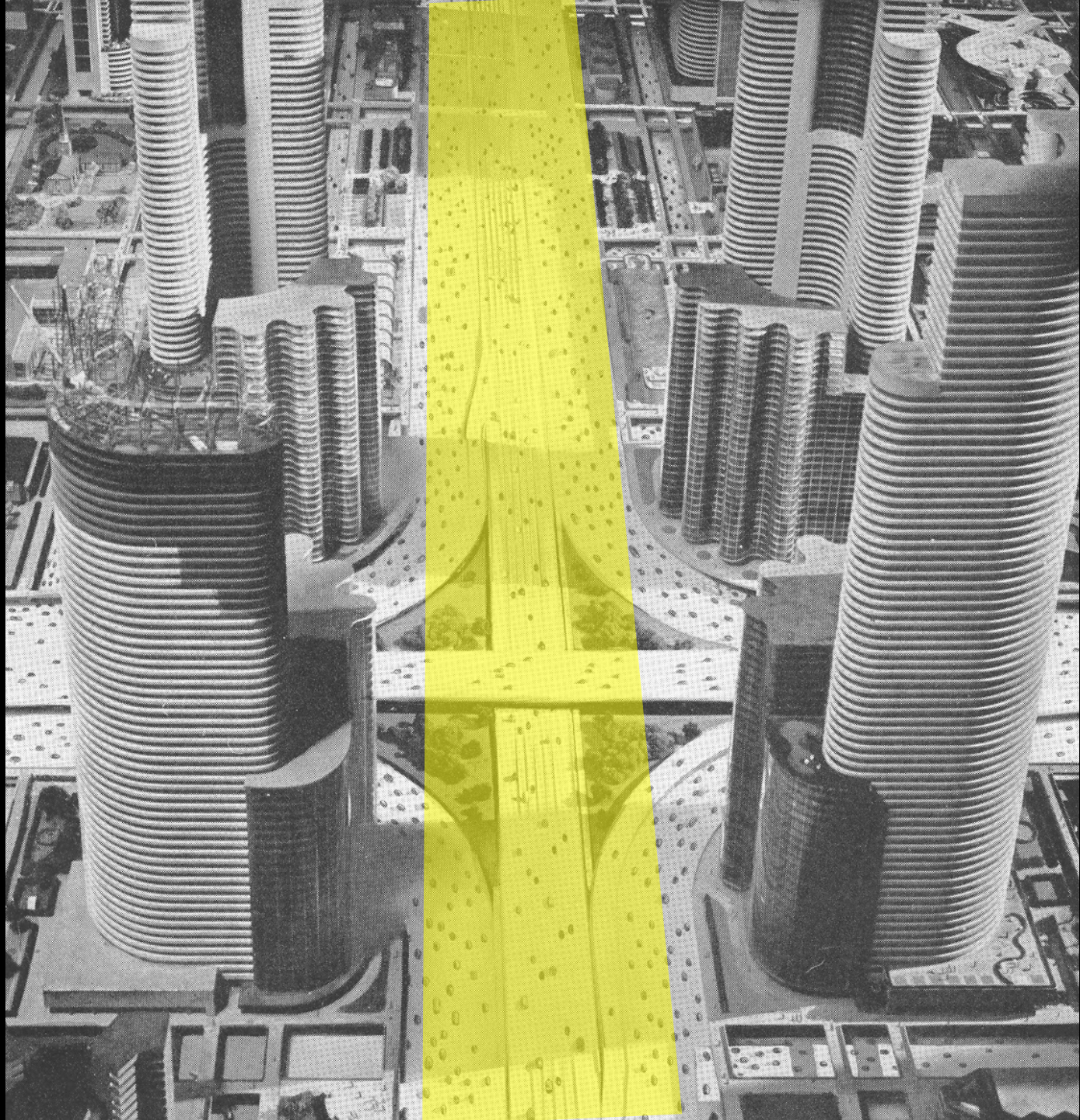
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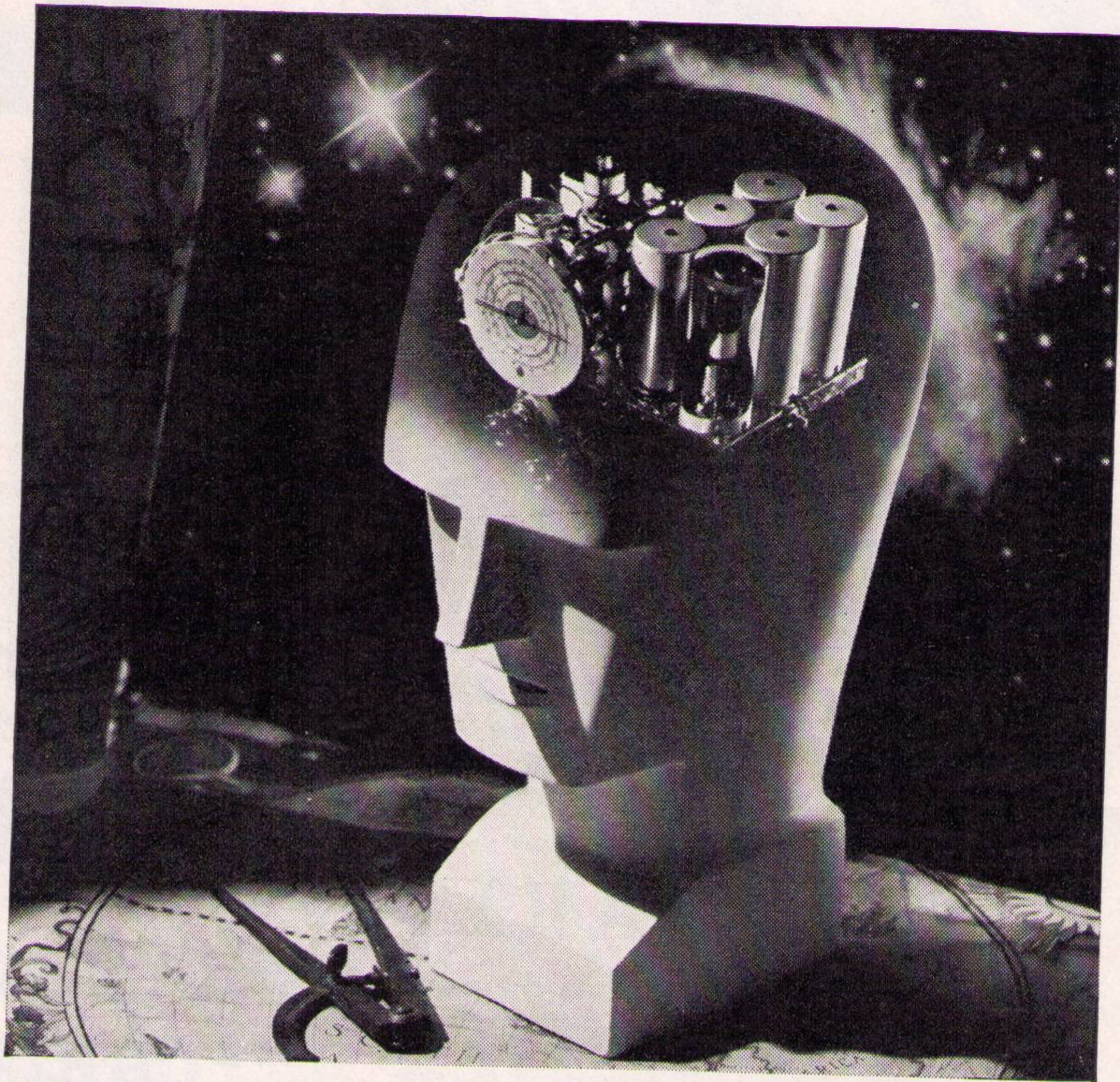
# TO NEW HORIZONS











*Travel tonight on radio's wings of light  
with RCA Victor's "Magic Brain"*

# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

Public Library  
Kansas City, Mo.

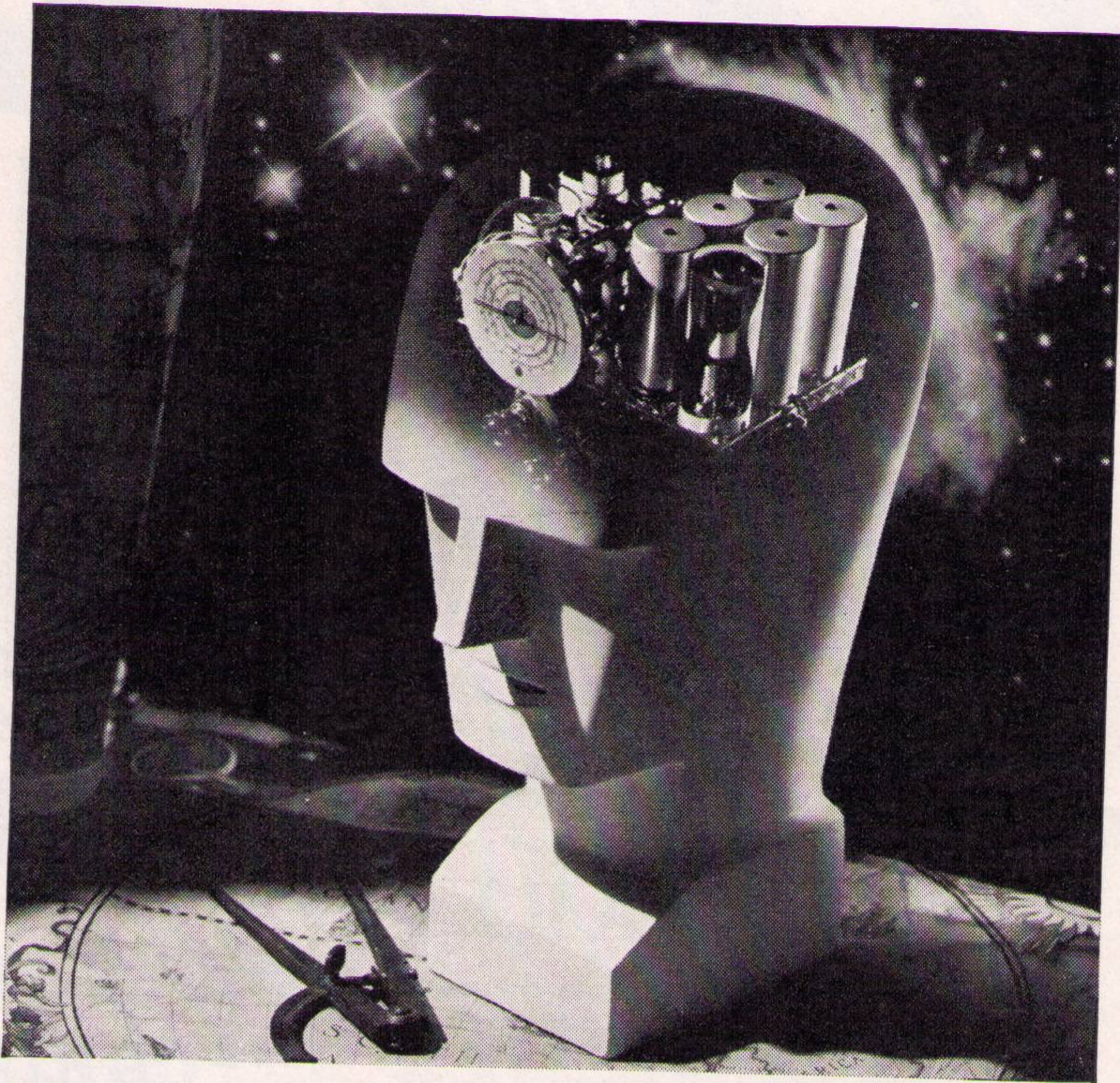


JANUARY

1947

TELEVISION CAMERA TUBES





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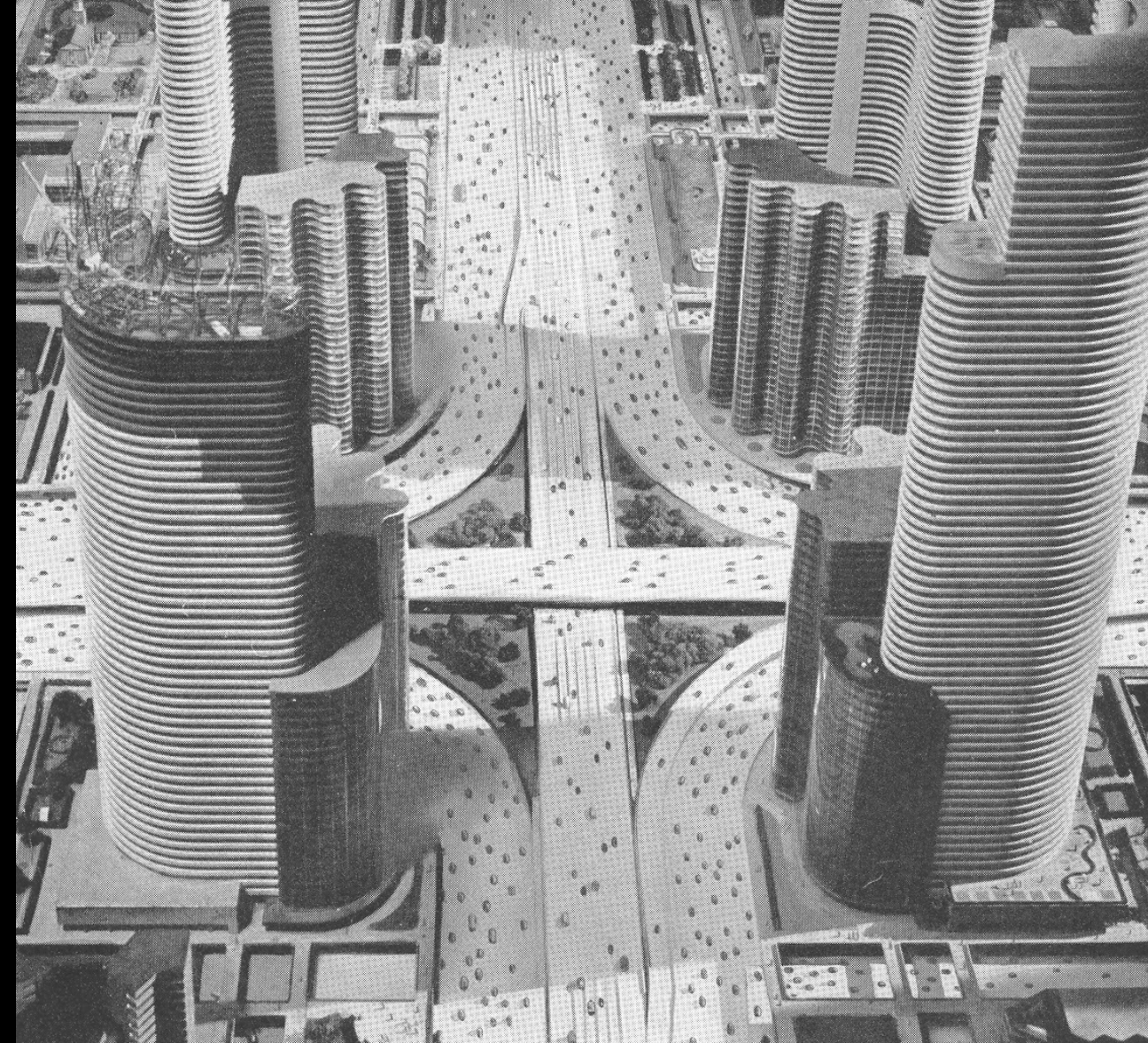


JANUARY

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TELEVISION CAMERA TUBES

# FUTURAMA 1



# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

Public List  
Kansas City, Mo.



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TELEVISION CAMERA TUBES

RCA (1947)

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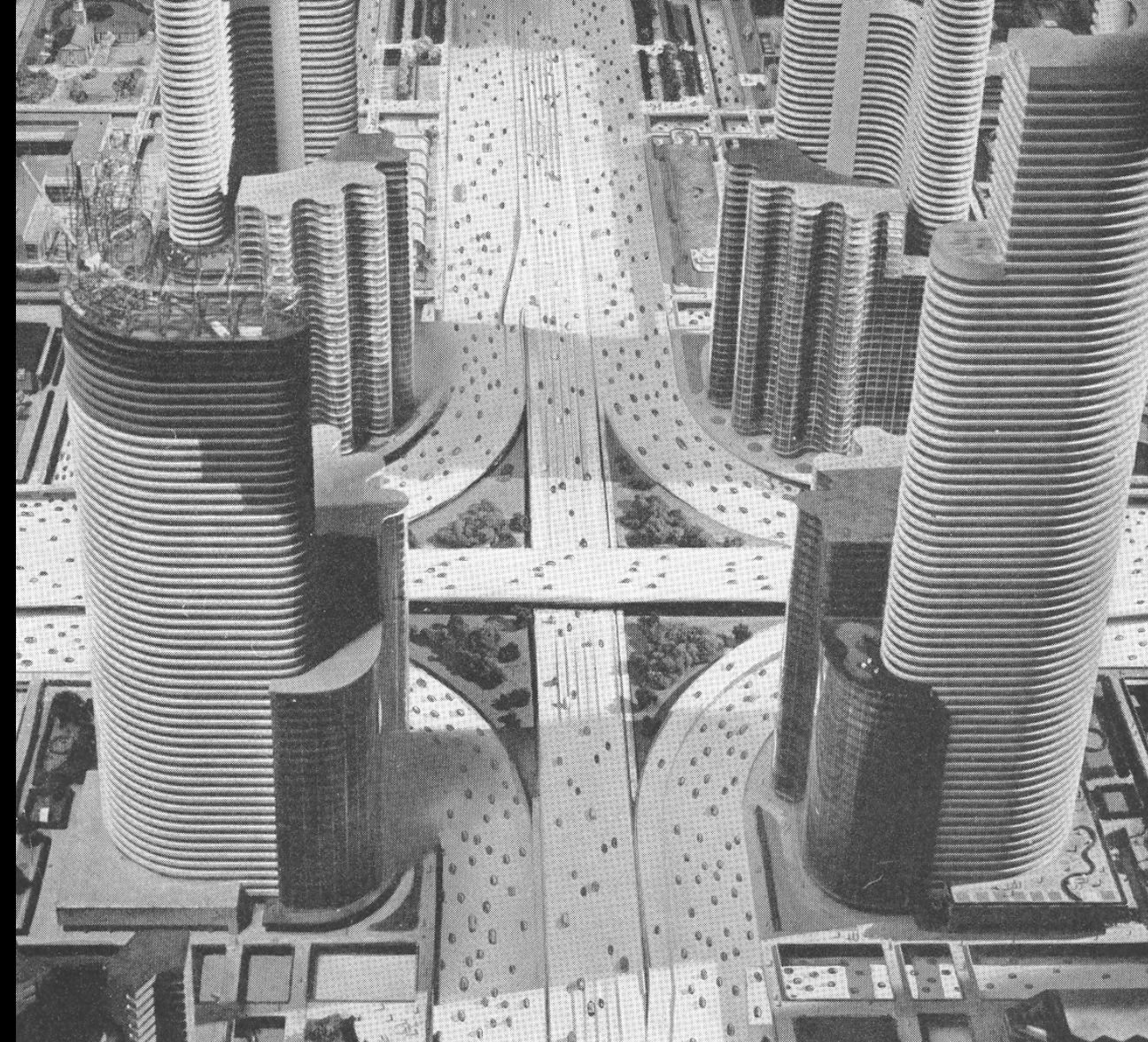


General Motors, 1939



Portland, Oregon, 1962 (*The Oregonian*)

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## *Cure for Congestion*

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Hastings Street, March 19, 1959

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*left:* Hastings Street, March 19, 1959; *right:* Chrysler Freeway, November 29, 1961 (Detroit Historical Society)

# WORLD'S BIGGEST SQUEEZE!

If you drive a car, a truck or a bus—  
You're in the middle of the world's biggest squeeze.



You know what they say . . .  
"The U.S.A.'s a nation on wheels."

No argument there. Fifty million motor vehicles—  
all trying to get somewhere—certainly makes us  
a nation on wheels.

Trouble is—we're trying to roll those vehicles over main  
roads designed for less than *half* the traffic.

So, from coast to coast, you're in the middle of  
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Millions of times a day, the wheels of our vehicles are  
stopped dead. Locked in the greatest traffic jam on earth.  
And as it gets worse instead of better, the toll of deaths,  
injuries and accidents is rocketing to shocking levels.

What's the answer, then? Stop building cars, trucks  
and busses? Naturally not. Unless we want  
to halt all progress.

The answer is adequate highways to keep  
pace with our growth. Highways  
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Main roads that let us move the way we  
want to move—comfortably, at reasonable  
speeds, in safety. Main roads that give us  
a reasonable return on our investment.  
Highways that let us get the most for the  
billions of dollars we put into our cars,  
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We have the world's finest highway  
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road-building industry; and we assess  
motor vehicles the taxes to pay for the  
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If we all get together and plan for *action*—  
for highway *improvement*—for roads  
we can *use*—we'll get them. But it needs  
*everybody* who uses the highways.

And that's just about *all* of us.

It Can Be Done By Making as a National and State Project—Adequate Roads



**THE AMERICAN TRUCKING INDUSTRY**

AMERICAN TRUCKING ASSOCIATIONS, WASHINGTON 6, D. C.



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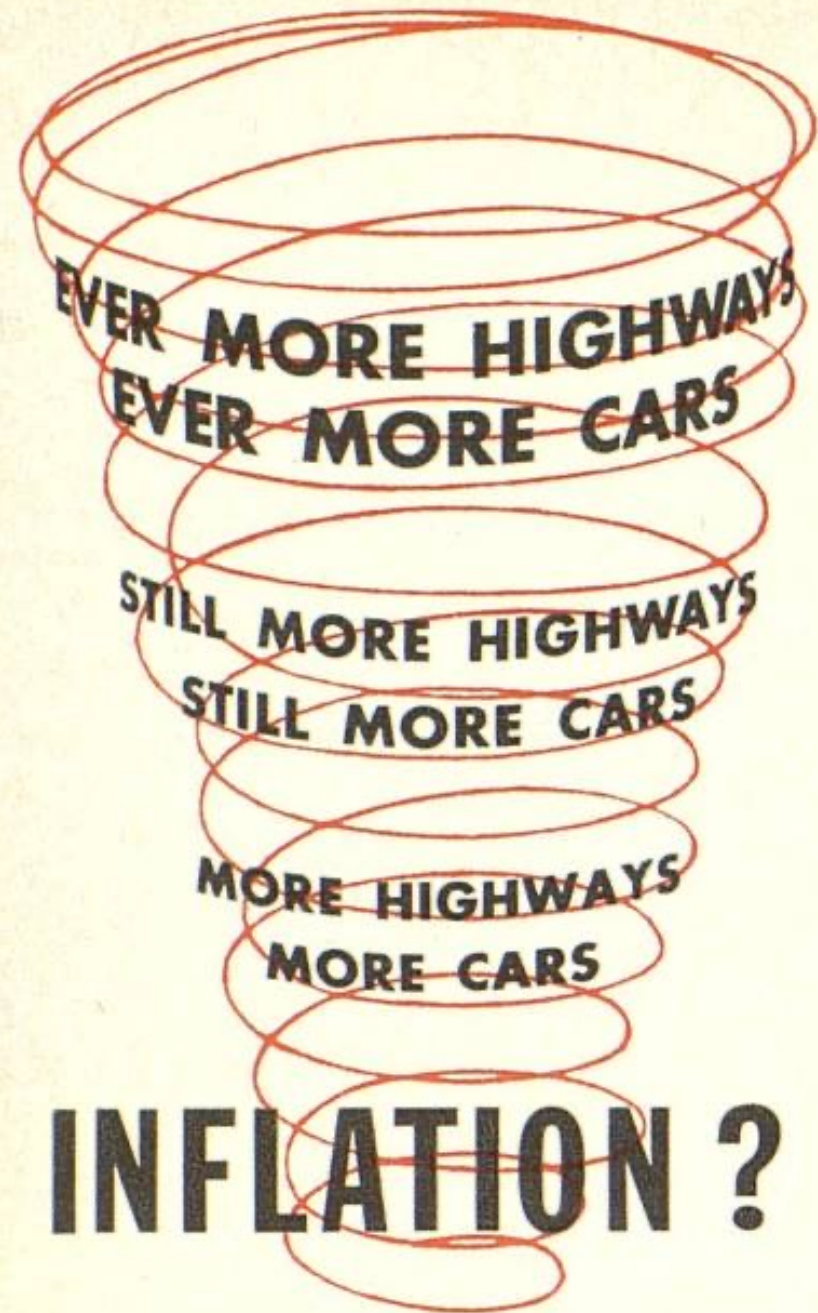
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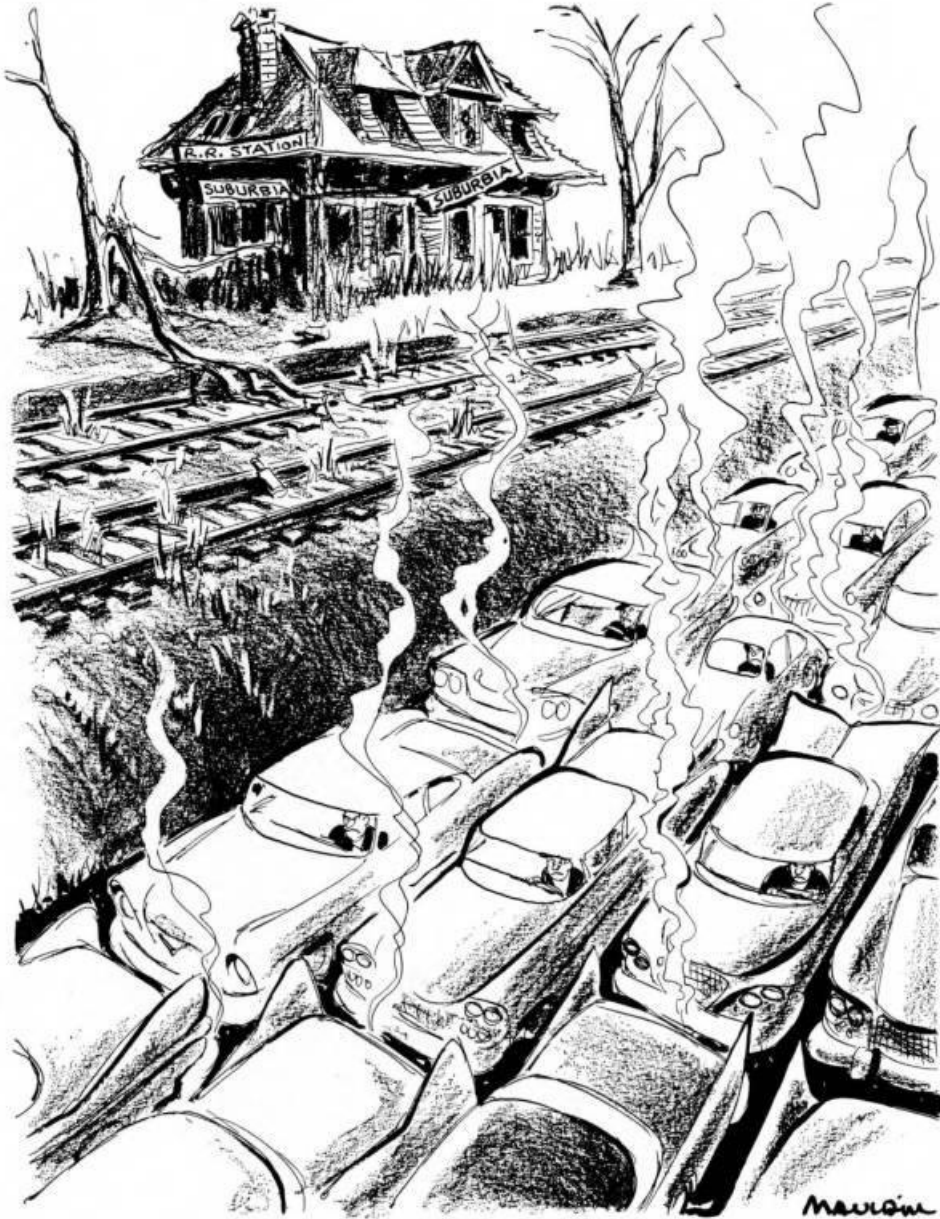


THE **AMERICAN TRUCKING** INDUSTRY

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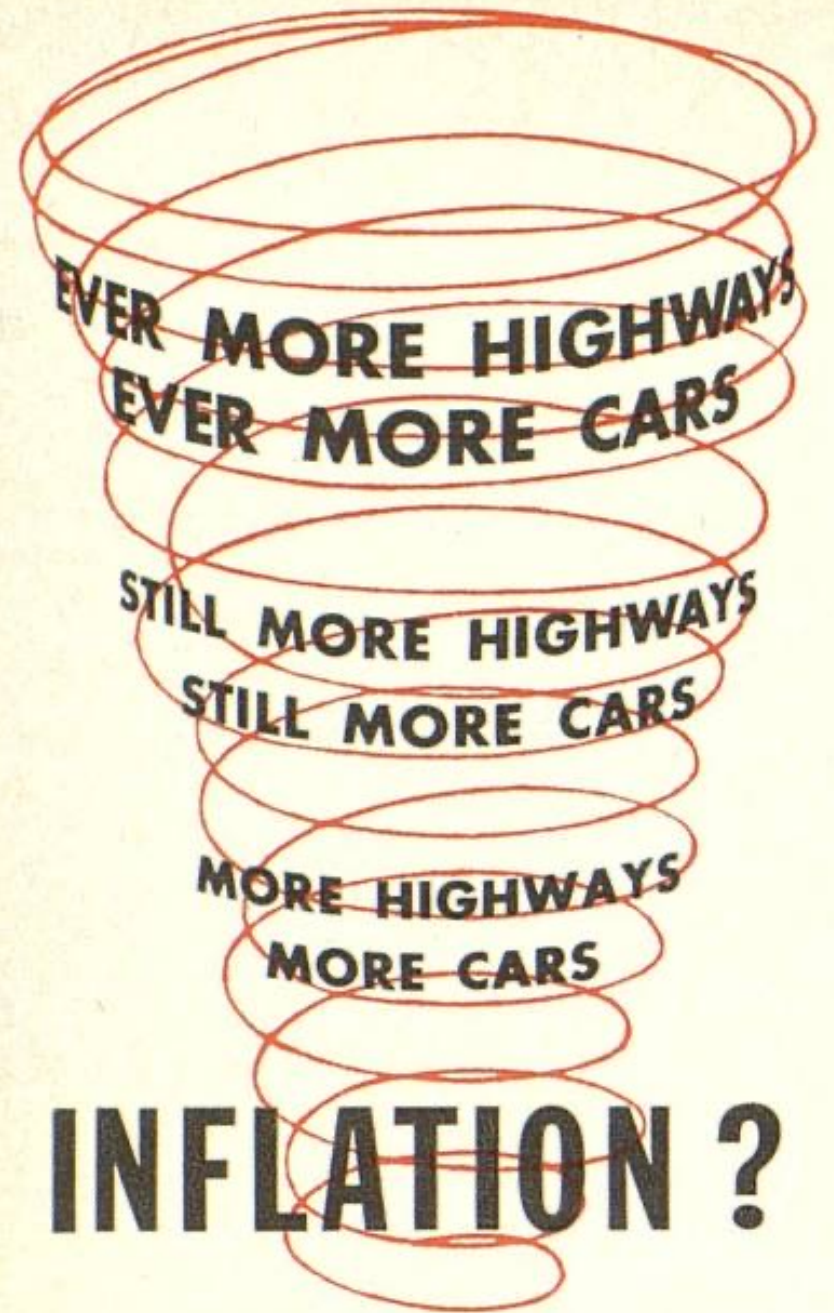


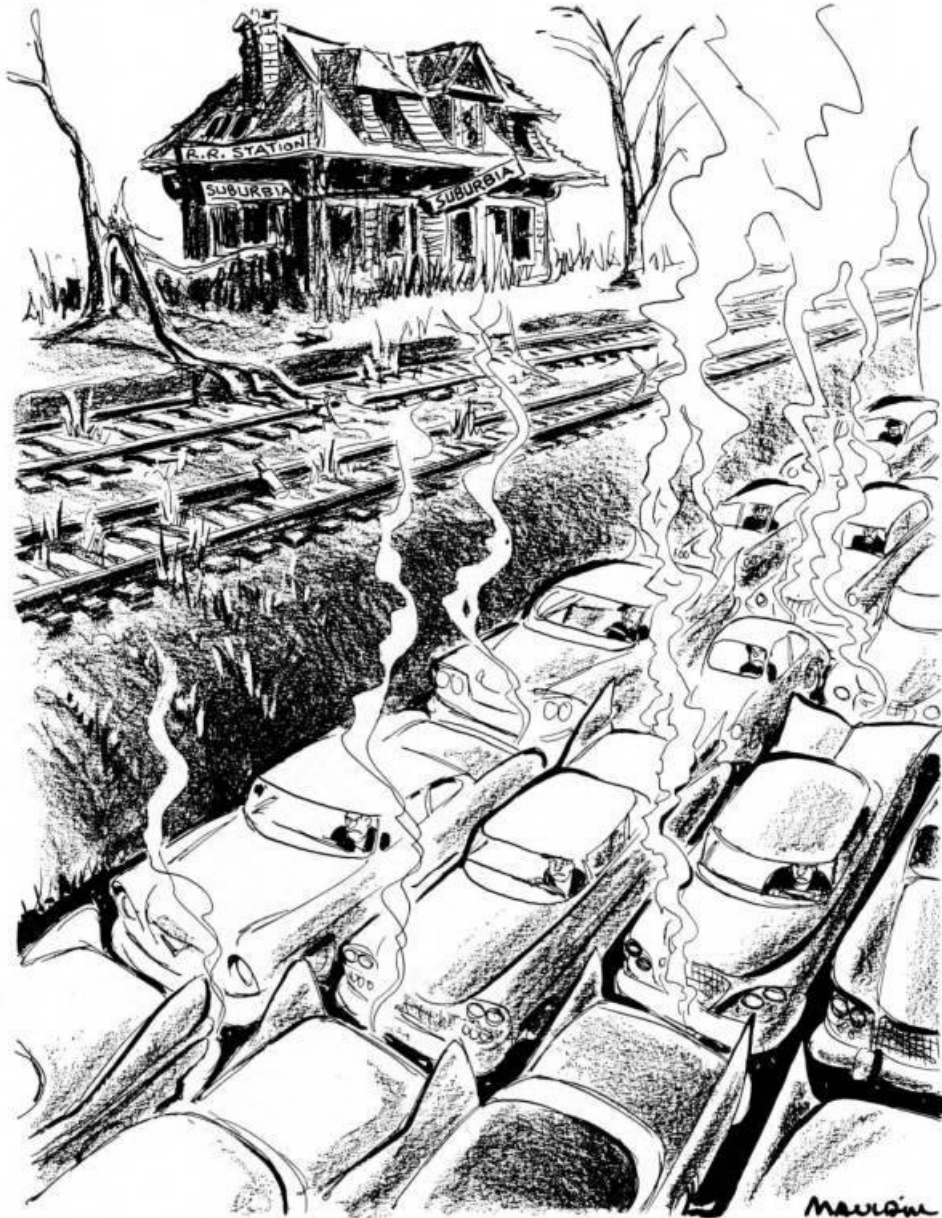


THIS IS PROGRESS?

Mon., Feb. 9, 1959

ST. LOUIS POST-DISPATCH





THIS IS PROGRESS?

Mon., Feb. 9, 1959

ST. LOUIS POST-DISPATCH



THE DEATH  
AND LIFE  
OF GREAT  
AMERICAN  
CITIES

JANE JACOBS



✎ They've put up gleaming stone and glass file cabinet housing which breeds delinquency and crime.

✎ They've built spacious green park areas that are avoided by everyone but bums and hoodlums.

✎ They've condemned and destroyed entire city blocks that are not slums, but attractive places to live.

✎ They've zoned our cities into intolerable patterns of dullness.

Jane Jacobs says this and much more in her explosive new book, *THE DEATH AND LIFE OF GREAT AMERICAN CITIES*. Mrs. Jacobs shows that the city

planners have failed because they have overlooked the realities of urban life, and stripped our cities of the vitality and diversity which make them exciting places to live. She offers concrete, practical alternatives that can save our cities from the blunders of orthodox planners.

Harrison Salisbury of the *New York Times* hails this book as "the most refreshing, stimulating and exciting study of this greatest of our problems of living which I've seen. It fairly crackles with bright honesty and good sense."

William H. Whyte, author of *The Organization Man*, calls it "magnificent. One of the most remarkable books ever written about the city."

## The Death and Life of Great American Cities

By **JANE JACOBS**

\$5.95, now at your bookstore

RANDOM HOUSE



THE DEATH  
AND LIFE  
OF GREAT  
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JANE JACOBS



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✘ They've put up gleaming stone and glass file cabinet housing which breeds delinquency and crime.

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RANDOM HOUSE



*Futurama 2*

**Magic Highway USA**

**Table Intro.1.** Since 1940, technofuturistic visions of crash-free, congestion-free driving have emerged roughly every 25 years (author). Each invokes new technology to gain new credibility.

technofuturistic vision	era	transformative technology
Futurama 1	circa 1940	<i>engineering</i> : highway engineering, steel-reinforced concrete, vacuum tube electronics
Futurama 2	circa 1965	<i>electronics</i> : solid-state, transistorized electronic systems; jet-age and space-age hardware
Futurama 3	circa 1990	<i>(advanced) technology</i> : “smart” systems, microprocessors, digital computers
Futurama 4 (Autonorama)	circa 2015	<i>(data-driven) autonomy</i> : “next-generation” technology, “disruptive innovation,” sensors, machine learning, wireless network connectivity

## *Futurama 2*

# Magic Highway USA



MAGIC  
HIGHWAY,  
*U.S.A.*

*Futurama 2*

Magic Highway USA

SCIENCE, VOL. 159

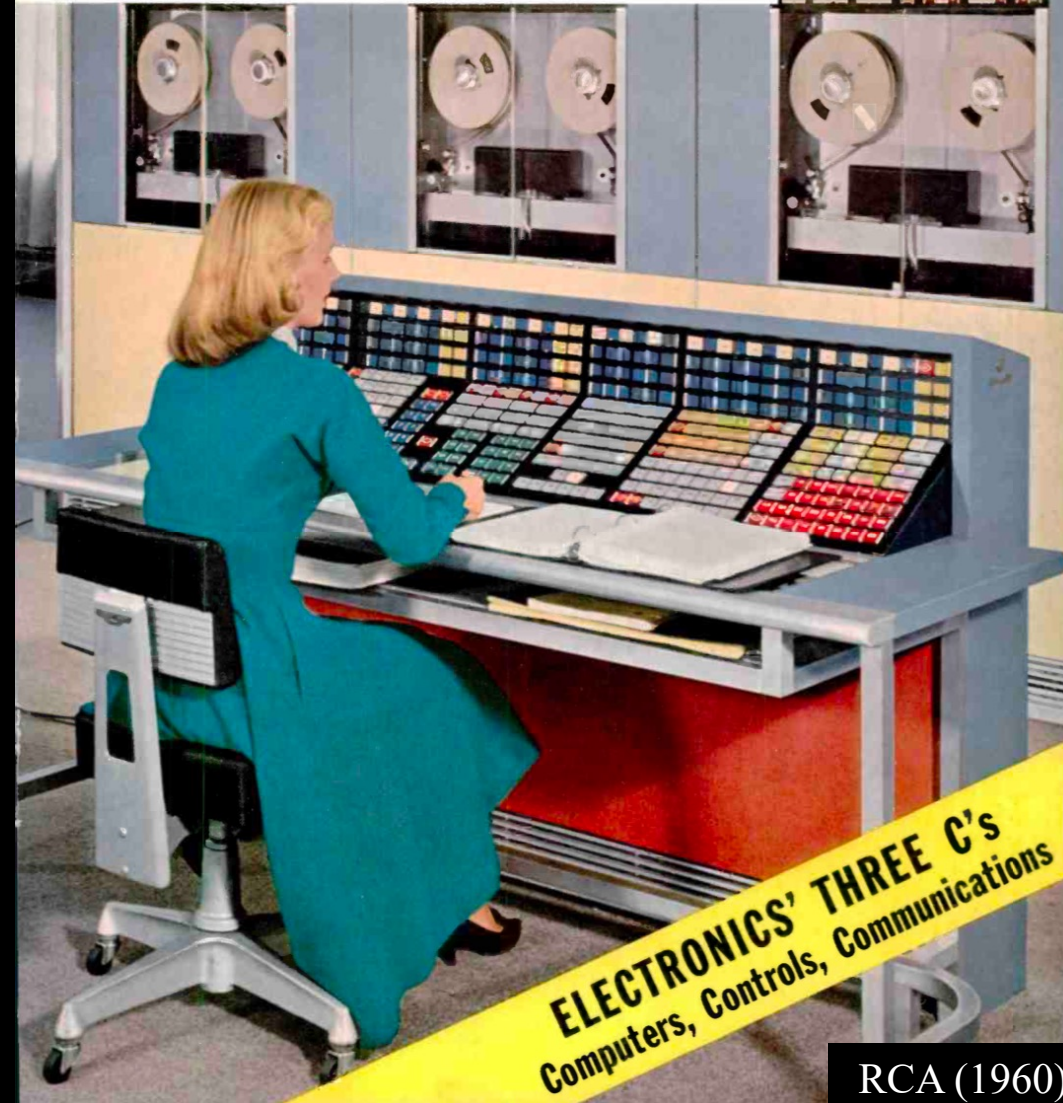
19 JANUARY 1968

Any sufficiently advanced technology is indistinguishable from magic.

ARTHUR C. CLARKE

# MAGIC HIGHWAY, U.S.A.

 **Electronic Age**  
— SPRING / 1960



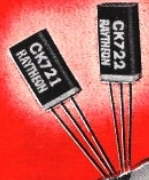
**ELECTRONICS' THREE C's**  
Computers, Controls, Communications

RCA (1960)

# NOW AVAILABLE!

PNP GERMANIUM JUNCTION

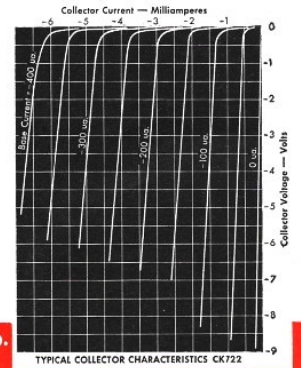
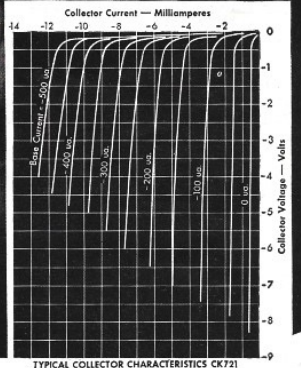
# RAYTHEON TRANSISTORS



**AVERAGE CHARACTERISTICS AT 30° C**

	CK721	CK722
Collector Voltage (volts)	-1.5	-1.5
Collector Current (ma.)	-0.5	-0.5
Base Current* (ua.)	-6	-20
Current Amplification Factor*	40	12
Power Gain* (db)	38	30
Noise Factor* (1,000 cycles) (db)	22	22

\*Grounded Emitter connection



**F**or the first time in history, Germanium Junction Transistors are commercially available. Raytheon Junction Transistors, types CK721 and CK722 can now be obtained for your experimental and developmental use.

Here's another first for Raytheon! Leaders in the development and production of Electron Tubes and Germanium Products, Raytheon now leads the way in production of this important new electronic development.

For price and delivery information of Raytheon Germanium Junction Transistors, write, phone or wire your Raytheon Tube distributor.



**RAYTHEON MANUFACTURING CO.**  
Receiving Tube Division

Excellence in Electronics Newton, Massachusetts • Chicago, Illinois • Atlanta, Georgia • Los Angeles, California

RAYTHEON MAKES ALL THESE RECEIVING AND PICTURE TUBES • RELIABLE SUBMINIATURE AND MINIATURE TUBES • GERMANIUM DIODES AND TRANSISTORS • NUCLEONIC TUBES • MICROWAVE TUBES

Raytheon (1953)



RCA **Electronic Age**  
SPRING / 1960

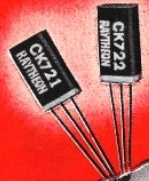
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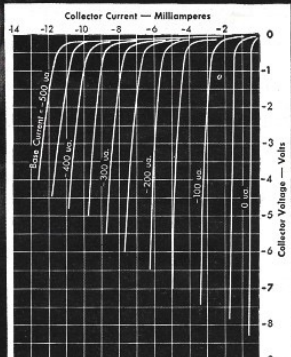
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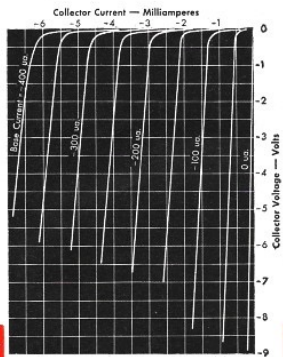
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December 1964

**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.



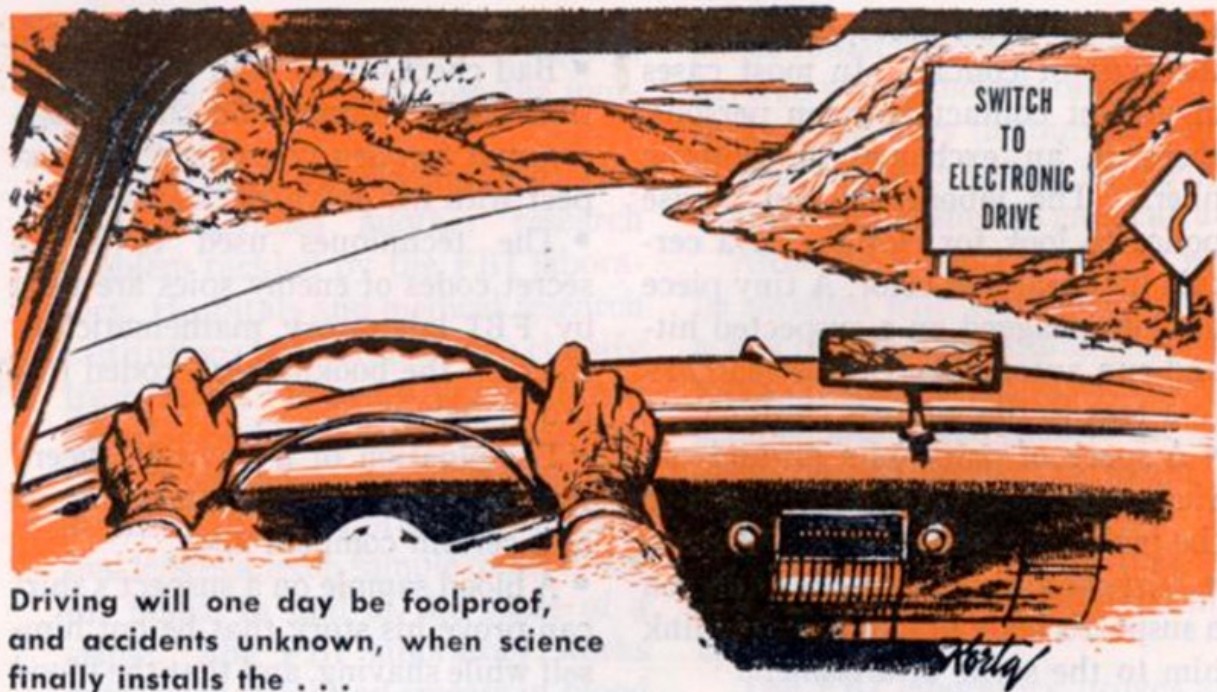
**RCA Transistors and Semiconductor Rectifiers**  
These wonder-working devices, shown actual size, are serving electronics everywhere — from computers to satellites.

RCA ELECTRONIC COMPONENTS AND DEVICES



**The Most Trusted Name in Electronics**

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



Driving will one day be foolproof,  
and accidents unknown, when science  
finally installs the . . .

## Electronic Highway of the Future

*Science Digest, April 1958*



Fortune, Dec. 1964; artist: Arthur Radebaugh

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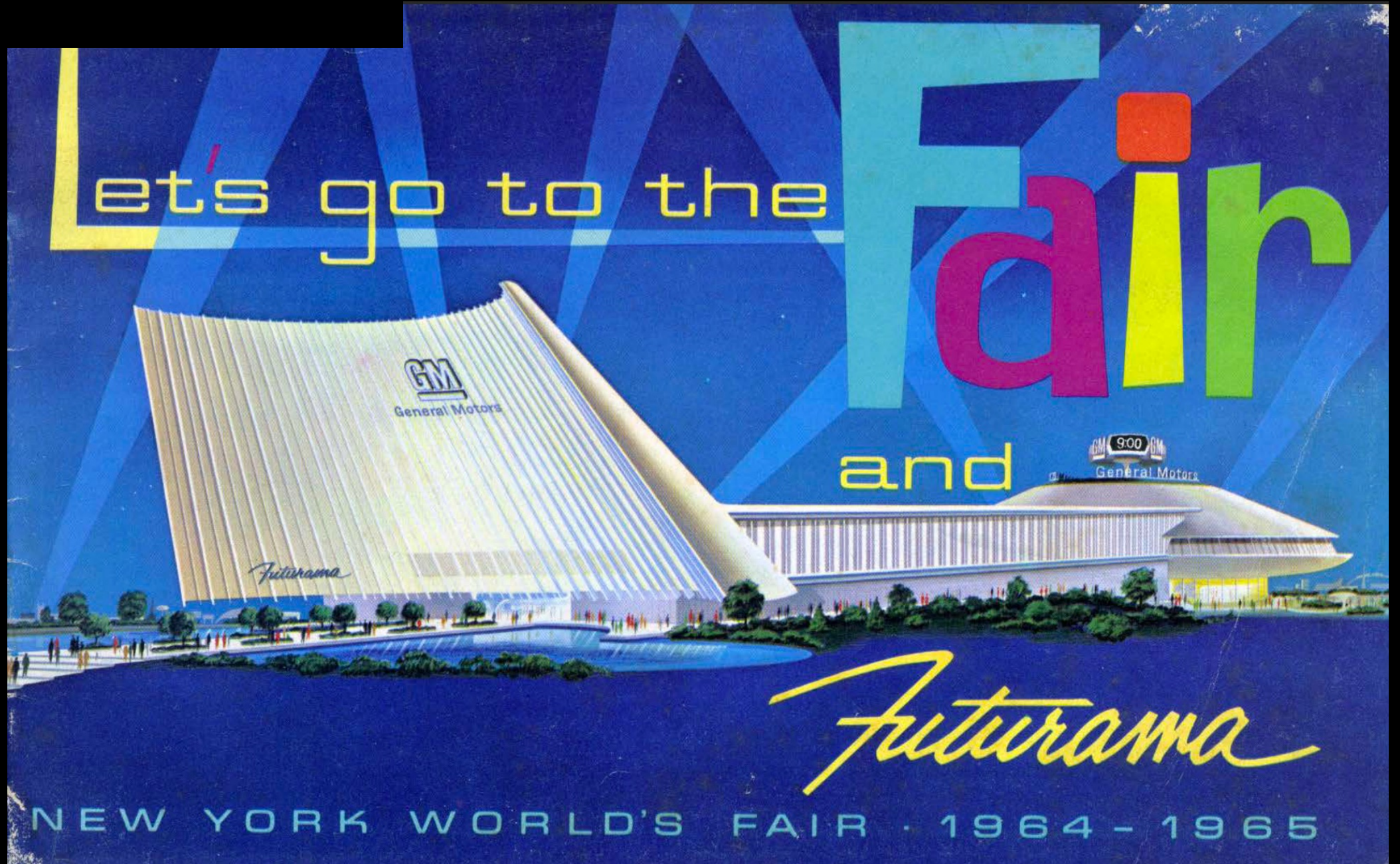
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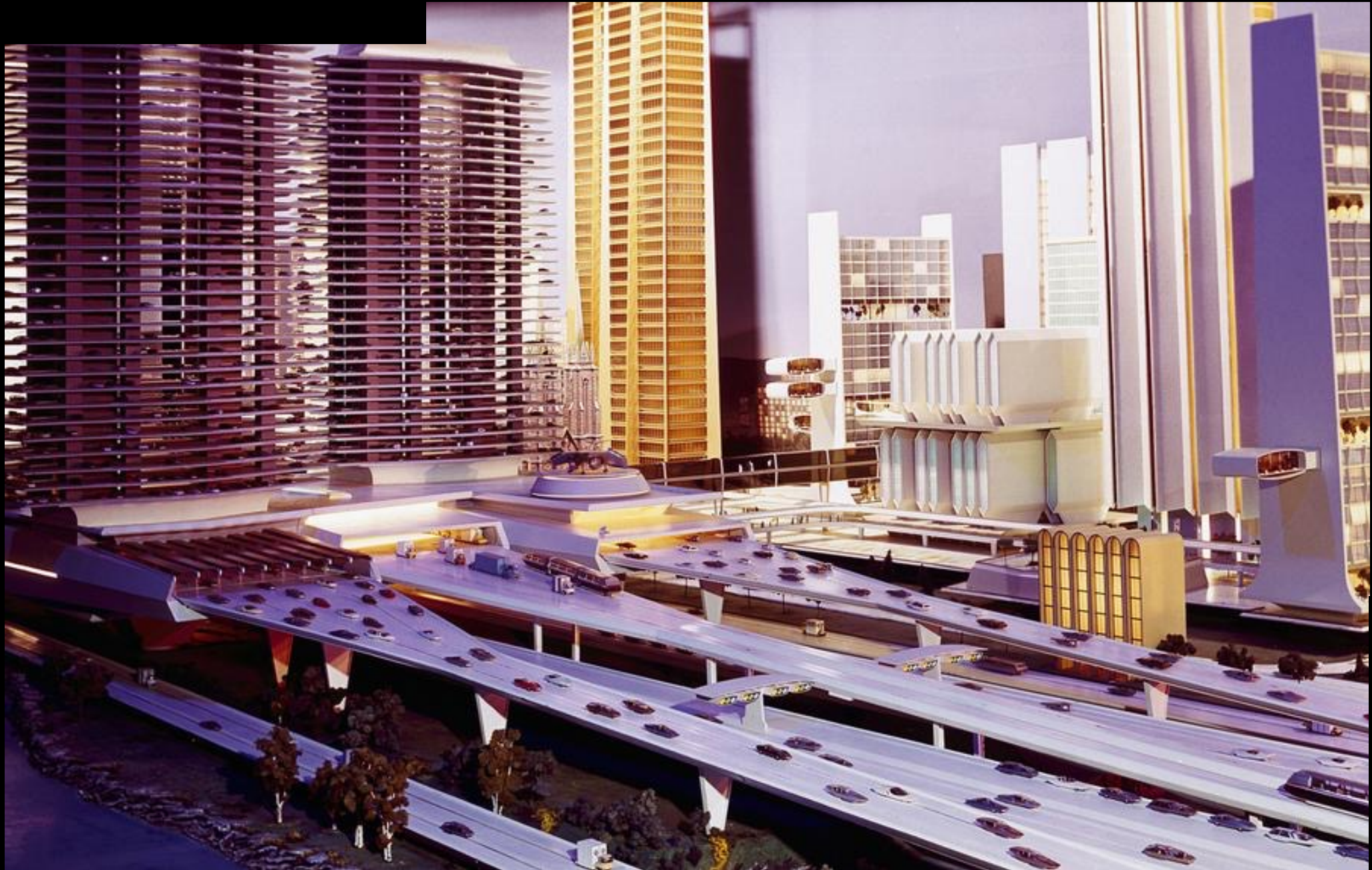
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# FUTURAMA 2



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General Motors, 1964

## The Illusory Demand For Mass Transit

It is time for some close thought to be given to the demand for mass transit, particularly, that *illusory* demand which various hidden persuaders would pass off for real.

Since my comments are directed only to the demand side of the picture, I can safely make some concessions on the supply side, and then pass on. I concede that transit: (1) can carry more people past a point in a given period of time than a freeway *if* the demand is there, (2) can provide high speed, *if* routes are grade-separated, and *if* stops are far enough apart, and *if* travelers live and work within a few minutes of these stops, (3) can provide a comfortable ride, *if* the rider is unencumbered with shopping bags, briefcases, or babies, and (4) can be automated, be beautiful, be glamorous! Suffice to say that, physically, transit can do whatever designers and engineers are commissioned to make it do.

I concede that, at present, the "great" cities need more than a highway system to survive. Such cities include New York, London, and Tokyo—and perhaps many of the larger cities in England and on the European continent, where the American experience of providing modern freeway systems may prove

This article is based on a presentation by the author at the 6th Annual Conference on Traffic Operations and Planning, Tampa, Florida, September 15-17, 1965, sponsored by the Florida Section, ITE and the Electrical & Traffic Lighting Association.

impossible. Such cities do *not* include Skunk Hole, Wyoming; Chester's Crossroads, Maine; or Slippery Rock, Pennsylvania!

I also concede that, at present, our auto-dominant society has many shortcomings. It is incredible that we tolerate 40,000 to 50,000 highway deaths a year; that we accept unsightly and dangerous strip development; that we ignore the killing noise, the noxious fumes, and the wasteful congestion of crowded cities.

These are problems that seek solution. Can it possibly be mass transit?

### Collective Travel

I'm convinced that people, the traveling public, you and I, want individually owned and directed transportation: private, instantly available, always flexible as to route, susceptible to being pampered and shined, a trusted, necessary member of the family. Freudian, bosh!



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Alice Lipscomb,  
Philadelphia, March 22,  
1968. *photo: Jack Tinney,*  
*Philadelphia Evening*  
*Bulletin, 1968 (Temple*  
*University Libraries).*

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LATE CITY EDITION

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VOL. CXIX... No. 40,997

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NEW YORK, THURSDAY, APRIL 23, 1970

10 CENTS

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With Reds Near, Phnompenh Is Gloomy Over Limited Response to Aid Pleas

CIVIL AVIATION CURBED

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By HENRY KAMM  
Special to The New York Times

PNOMPENH, Cambodia, April 22—An atmosphere of heightening national emergency is overtaking Cambodia.

It is due to evidence that the Cambodian Army is unable to turn back the Vietnamese Communist forces, which at one point are within 15 miles of the capital, and to the limited response to Premier Lon Nol's appeal to all nations for arms aid. The military authorities closed the Phnompenh airport this evening to all civilian traffic. According to military sources, it is to remain closed until tomorrow in connection with an important military operation. The operation is presumably intended to dislodge the North Vietnamese and Vietcong forces from the district capital of Saang, about 15 miles south of here.

An Appeal to Newsmen

The discouragement over the failure of such countries as the United States and France, on which Cambodia had counted for important aid, reached a point this evening where the official military spokesman, Major Armstrong, appealed to foreign newsmen at his briefing to awaken world public opinion to Cambodia's pressing need for arms, ammunition and other

### CAMBODIA TO GET RIFLES FROM U.S.

Washington Agrees to Send a Few Thousand Weapons Captured in Vietnam

By WILLIAM BEECHER  
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WASHINGTON, April 22—The Nixon Administration has agreed to supply several thousand rifles to the beleaguered Government of Cambodia. Administration officials disclosed today. The weapons would be automatic rifles of Soviet de-



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Long Army Can Hold Out  
With the Arms It Has**

By HENRY KAMM  
Special to The New York Times

PNOMPENH, Cambodia, April 22—An atmosphere of heightening national emergency is overtaking Cambodia.

It is due to evidence that the Cambodian Army is unable to turn back the Vietnamese Communist forces, which at one point are within 15 miles of the capital, and to the limited response to Premier Lon Nol's appeal to all nations for arms aid.

The military authorities closed the Phnompenh airport this evening to all civilian traffic. According to military sources, it is to remain closed until tomorrow in connection with an important military operation. The operation is presumably intended to dislodge the North Vietnamese and Vietcong forces from the district capital of Saang, about 15 miles south of here.

**An Appeal to Newsmen**

The discouragement over the failure of such countries as the United States and France, on which Cambodia had counted for important aid, reached a point this evening where the official military spokesman, Major Amrong, appealed to foreign newsmen at his briefing to awaken world public opinion to Cambodia's pressing need for arms, ammunition and other equipment. Major Amrong declined to say how long the army could hold out with the ammunition it had.

High officials have been making the same appeal for days in private talks with journalists. Key Cambodian officials consider the United States their principal hope.

**Sources Report No Reply**  
Highly placed sources reported that there had been no reply yet from President Nixon to an urgent appeal from Gen-

### CAMBODIA TO GET RIFLES FROM U.S.

**Washington Agrees to Send  
a Few Thousand Weapons  
Captured in Vietnam**

By WILLIAM BEECHER  
Special to The New York Times

WASHINGTON, April 22—The Nixon Administration has agreed to supply several thousand rifles to the beleaguered Government of Cambodia, Administration officials disclosed today. The weapons would be automatic rifles of Soviet de-

small  
is  
beautiful  
a study of economics  
as if people mattered

EF Schumacher

*Futurama 3*

“Smart” is the  
new “magic.”

**small  
is  
beautiful**

**a study of economics  
as if people mattered**

**EF Schumacher**

# Futurama 3

## “Smart” is the new “magic.”

**Table Intro.1.** Since 1940, technofuturistic visions of crash-free, congestion-free driving have emerged roughly every 25 years (author). Each invokes new technology to gain new credibility.

technofuturistic vision	era	transformative technology
Futurama 1	circa 1940	<i>engineering</i> : highway engineering, steel-reinforced concrete, vacuum tube electronics
Futurama 2	circa 1965	<i>electronics</i> : solid-state, transistorized electronic systems; jet-age and space-age hardware
Futurama 3	circa 1990	<i>(advanced) technology</i> : “smart” systems, microprocessors, digital computers
Futurama 4 (Autonorama)	circa 2015	<i>(data-driven) autonomy</i> : “next-generation” technology, “disruptive innovation,” sensors, machine learning, wireless network connectivity

# Introducing Macintosh. For the rest of us.

In the older days, before 1984,  
not very many people used computers  
for a very good reason.



Not very many people knew how.  
And not very many people wanted  
to learn.

After all, in those days, it meant  
leaving to your stomach good enough  
computer seminars, falling asleep over  
computer manuals, and trying, week  
after week, to remember commands so

complicated you'd have to be a computer  
to understand them.

Then, in a particularly bright day  
in Cupertino, California, some  
particularly bright engineers  
had a particularly bright idea:  
your computers are so smart,  
we didn't make you have  
to teach computers about  
people, instead of teaching people about  
computers!

So it was that these very engineers  
worked long days and late nights and  
a few legal holidays, making the  
minutes of us all about people. How they  
make mistakes and change their minds  
how they refer to the lockers and use  
old phone numbers. How they labor for  
their livelihood, and decide in their  
spare time.

For the first time in recorded  
computer history, hardware engineers

actually talked to software engineers  
in real-time, face-to-face, and both  
were united by a common goal: to build  
the most powerful, most portable, most  
flexible, most versatile computer ever  
made—easy to use!

And when the engineers were  
fully finished, they introduced us to  
a personal computer so powerful,  
so easy to use, that people

already knew how.

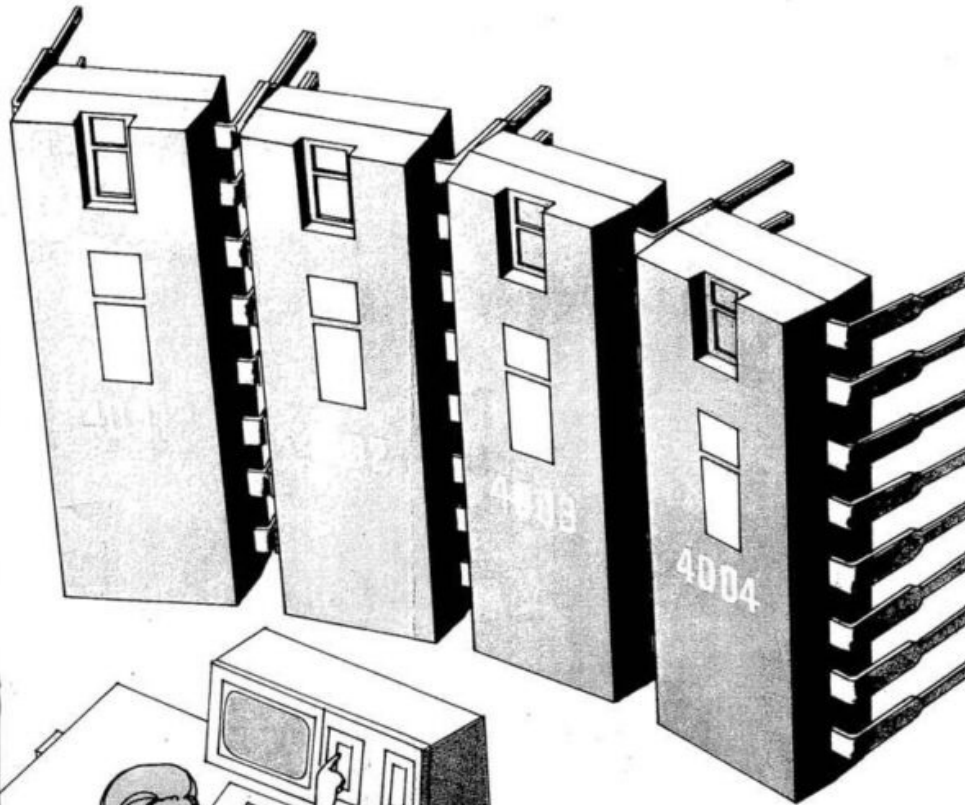
They didn't call it the Q1700, or  
the Zephrus 5000.

They called it Macintosh!

And now you'll like to introduce  
it to you.



# Announcing a new era of integrated electronics



## A micro- programmable computer on a chip!

Intel introduces an integrated CPU complete with a 4-bit parallel adder, sixteen 4-bit registers, an accumulator and a push-down stack on one chip. It's one of a family of four new ICs which comprise the MCS-4 micro computer system—the first system to bring you the power and flexibility of a dedicated general-purpose computer at low cost in as few as two dual in-line packages.

MCS-4 systems provide complete computing and control functions for test systems, data terminals, billing machines, measuring systems, numeric control systems and process control systems.

The heart of any MCS-4 system is a Type 4004 CPU, which includes a powerful set of 45 instructions. Adding one or more Type 4001 ROMs for program storage and data tables gives you a fully functioning micro-programmed computer. To this you may add Type 4002 RAMs for read-write memory and Type 4003 registers to expand the output ports.

Using no circuitry other than ICs from this family of four, you can create a system with 4096 8-bit bytes of ROM storage and 5120 bits of RAM storage. When you require rapid turn-around or need only a few systems, Intel's erasable and re-programmable ROM, Type 1701, may be substituted for the Type 4001 mask-programmed ROM.

MCS-4 systems interface easily with switches, key-boards, displays, teletypewriters, printers, readers, A-D converters and other popular peripherals.

The MCS-4 family is now in stock at Intel's Santa Clara headquarters and at our marketing headquarters in Europe and Japan. In the U.S., contact your local Intel representative for technical information and literature. In Europe, contact Intel at Avenue Louise 216, B 1050 Bruxelles, Belgium. Phone 492003. In Japan, contact Intel Japan, Inc., Parkside Flat Bldg. No. 4-2-2, Sendagaya, Shibuya-Ku, Tokyo 151. Phone 03-403-4747.

Intel Corporation now produces micro computers, memory devices and memory systems at 3065 Bowers Avenue, Santa Clara, Calif. 95051. Phone (408) 246-7501.

**intel<sup>®</sup>  
delivers.**

## Invention That Shaped the Gulf War: the Laser-Guided Bomb

With a simple kit,  
inaccurate devices  
became tank-killers.

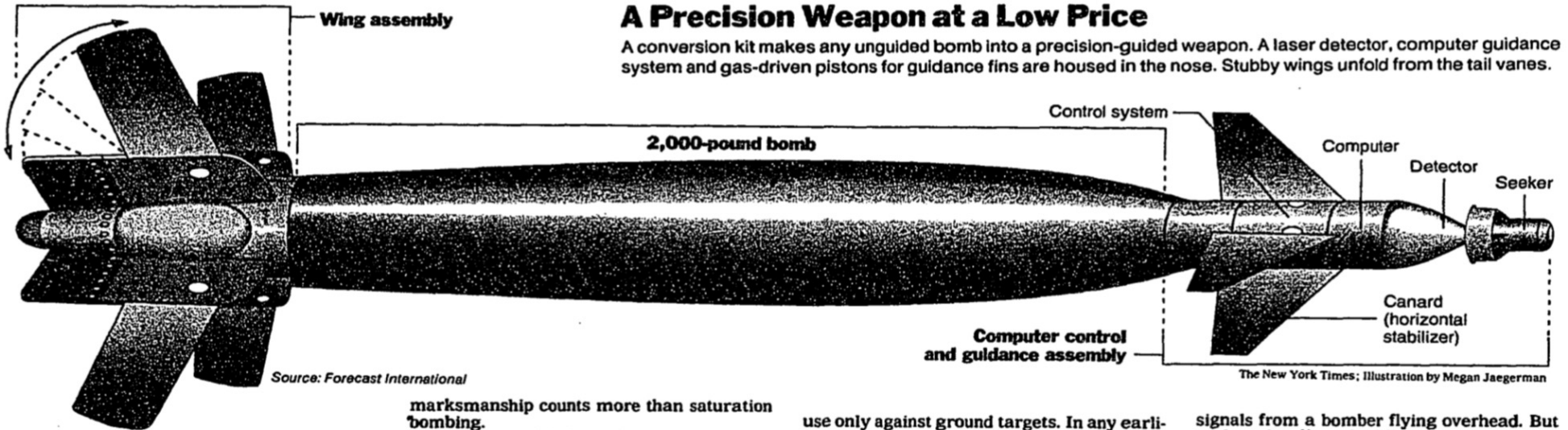
By MALCOLM W. BROWNE

**F**OR the first time in history, precision-guided bombs and missiles have played a decisive role in war, paving the way for the invasion of Kuwait and Iraq. With their help, the United States and its allies critically weakened the fourth-largest army in the world while suffering surprisingly light casualties during the month of the air war.

Having established absolute air supremacy from the outset of the war, the allies have been able to hammer Iraq's command centers, supply lines, bunkers, tanks and troops almost at will. Precision weapons like laser-guided bombs have greatly enhanced the effectiveness of the attacks.

Even small, armored targets like tanks and personnel carriers, previously almost impossible to destroy with bombs, have now fallen victim to the new bombs' accuracy. The same accuracy has substantially reduced the accidental damage that would otherwise have befallen civilian buildings.

An allied military spokesman reported last



week that of the many thousands of precision-guided bombs and missiles launched at Iraqi military targets, fewer than one-tenth of 1 percent had gone astray and fallen in civilian areas.

Mass attacks using precision-guided weapons against small, precisely defined targets seem to herald a new era in warfare, in which

marksmanship counts more than saturation bombing.

The new abilities of precision-guided bombs were sharply underscored by a recent incident. One week ago, an American military spokesman disclosed that an F-111 bomber returning from an assault on Iraqi tanks had destroyed an enemy helicopter in flight. Lacking guns or missiles, the bomber pilot had attacked with the only weapon at his disposal, a laser-guided bomb intended for

use only against ground targets. In any earlier war, a bomb attack against a swiftly moving target would have been virtually hopeless, but this time the bomb flew unerringly to its mark, blowing the helicopter to fragments.

Efforts to develop precision-guided bombs are at least as old as World War II, when Germany experimented with the Fritz-X, a gliding bomb directed to its target by radio

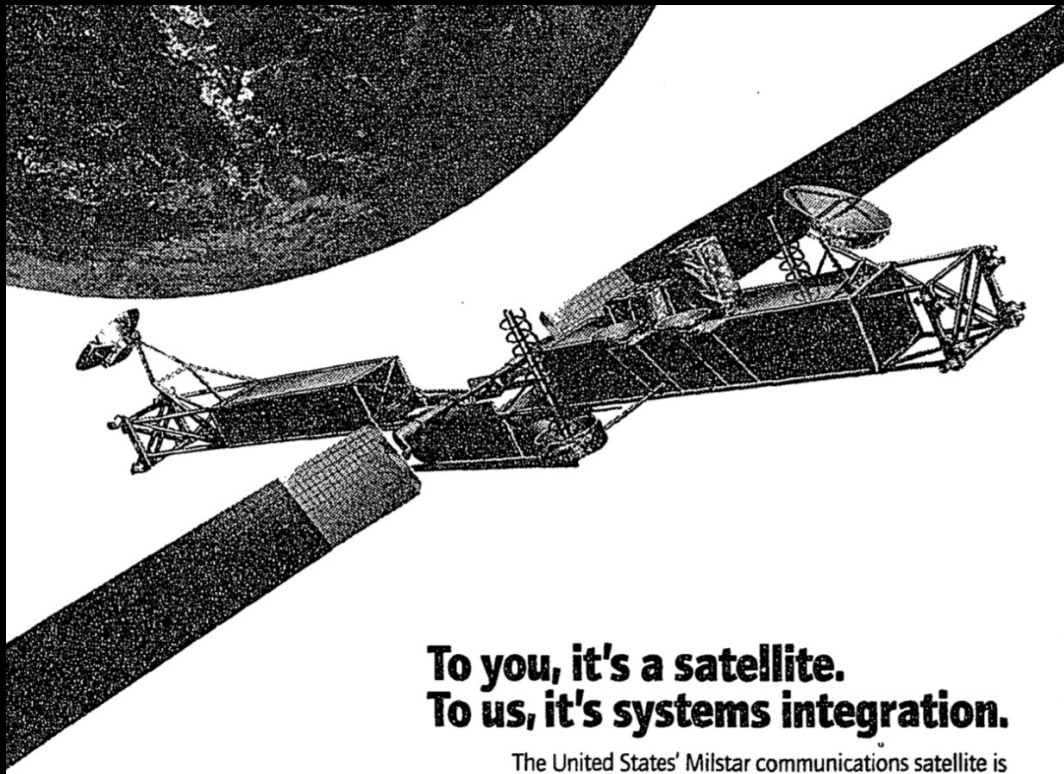
signals from a bomber flying overhead. But such early efforts had little practical effect on warfare. When the first precision-guided bombs appeared in Vietnam nearly two decades ago, many missed even the stationary targets at which they were aimed.

Even as recently as the American raid on Libya in 1986, many precision bombs and weapons appear to have missed their targets,

Continued on Page C8



C-Span, Jan. 30, 1991



## To you, it's a satellite. To us, it's systems integration.

The United States' Milstar communications satellite is Lockheed's newest systems integration success. It will soon join the Navy's Fleet Ballistic Missile System, the Hubble Space Telescope, the F-117 stealth fighter, antisubmarine warfare systems, and thousands of advanced technology achievements that prove Lockheed's premier systems integration skills.

### Lockheed leads.

Lockheed leads in applying this capability to solving problems for civilian agencies and municipal and state governments. Our proven expertise in integration and operation of automated traffic management, environmental reporting, "smart" highways, parking enforcement, and automated welfare and child support systems are the state of the art and make Lockheed the logical choice for all systems integration programs.

Systems integration is a capability that demands advanced technology as well as reliable and affordable solutions. It demands a premier aerospace company. It demands Lockheed.



Watch NOVA on PBS, Tuesdays at 8 p.m.





# FUTURAMA 3



## To you, it's a satellite. To us, it's systems integration.

The United States' Milstar communications satellite is Lockheed's newest systems integration success. It will soon join the Navy's Fleet Ballistic Missile System, the Hubble Space Telescope, the F-117 stealth fighter, antisubmarine warfare systems, and thousands of advanced technology achievements that prove Lockheed's premier systems integration skills.

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Watch NOVA on PBS, Tuesdays at 8 p.m.

New York Times, July 21, 1993

## Rockwell battles gridlock with military technology.



### We're converting our defense electronics to create smart highways for tomorrow.

Today U.S. cities are enlisting Rockwell's expertise in sensors, signal processing, communications and software to develop new transportation systems that will eliminate highway congestion, reduce pollution and increase safety.

Rockwell is converting its defense technology to numerous commercial needs. From adapting GPS systems to revolutionize civilian and

commercial navigation. To applying rocket engine technology to increase the speed of our printing presses. And using Computational Fluid Dynamics to streamline sun-roof designs.

Rockwell constantly seeks new ways to best serve its customers. Finding new routes to leadership in the Electronics, Aerospace, Automotive and Graphics markets we serve.

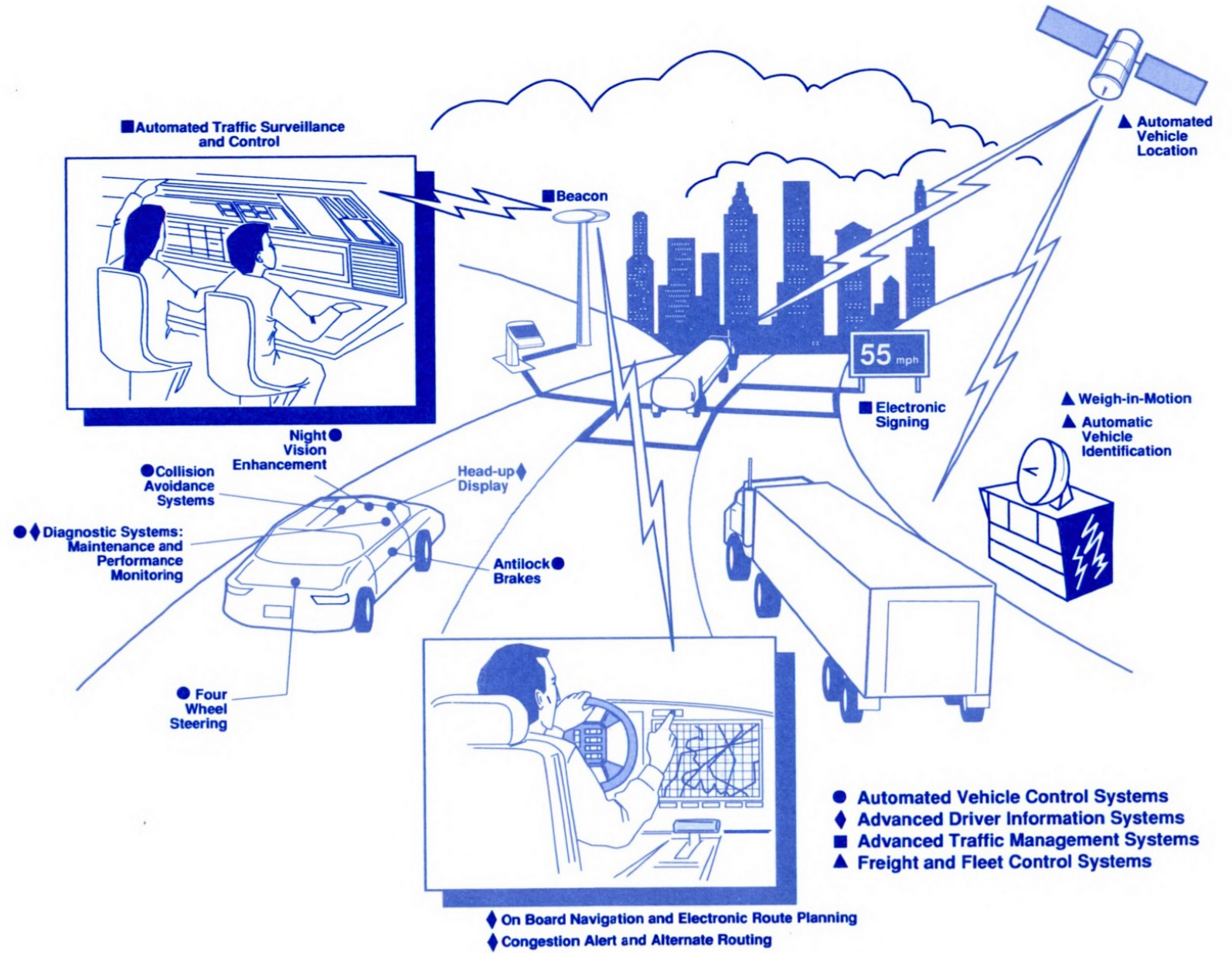


Rockwell International

ELECTRONICS / AEROSPACE / AUTOMOTIVE / GRAPHICS

Forbes, July 19, 1993

# FUTURAMA 3



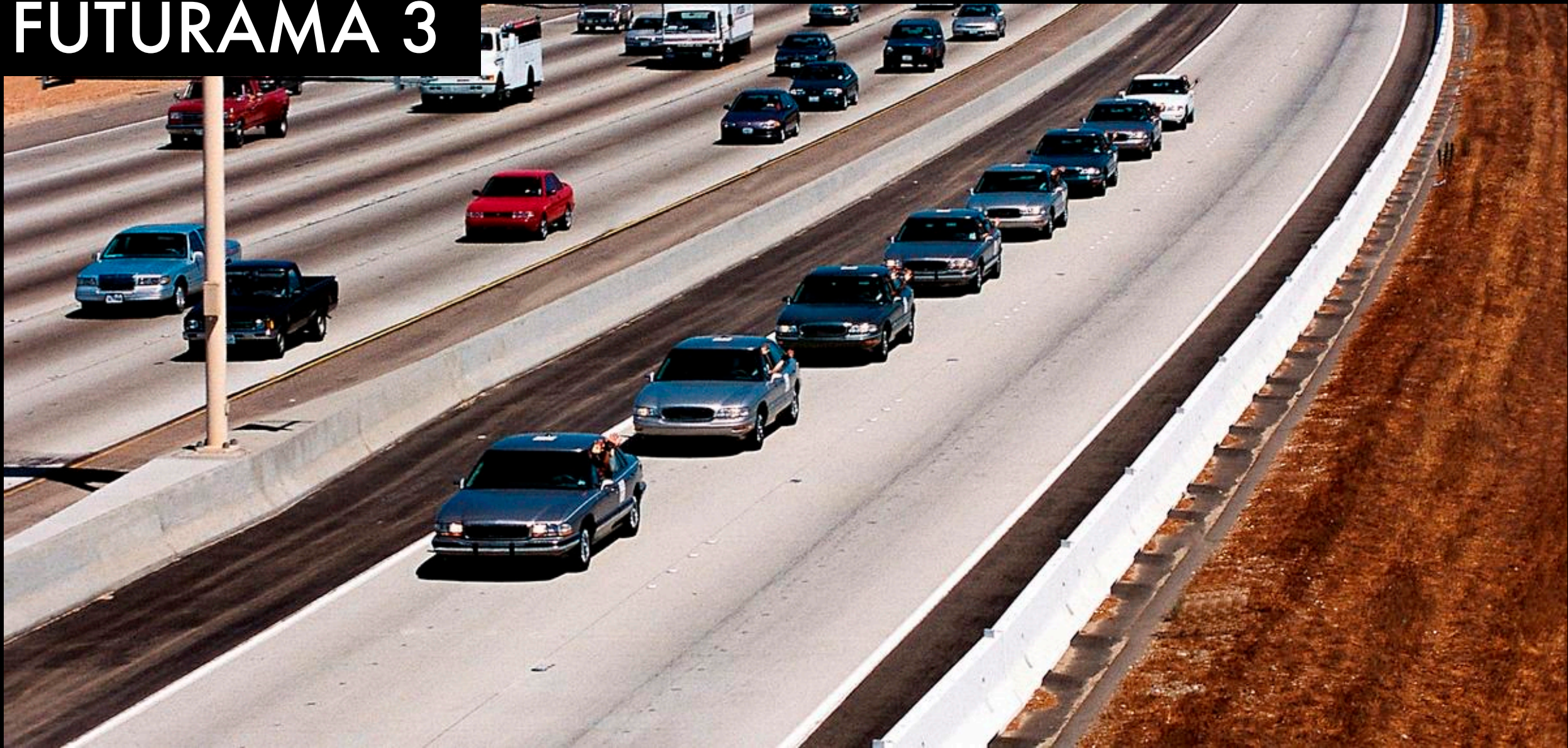
USDOT, *National Transportation Strategic Planning Study* (March 1990)

**Figure 9-1. Basic Components of an Intelligent Vehicle-Highway System**

# FUTURAMA 3



# FUTURAMA 3



UC Berkeley / California Path Program, 1997



*Futurama 4*

**Autonorama**

**Table Intro.1.** Since 1940, technofuturistic visions of crash-free, congestion-free driving have emerged roughly every 25 years (author). Each invokes new technology to gain new credibility.

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## Futurama 4

# Autonorama

*Futurama 4*

# Autonorama



Introducing iPhone.  
Apple reinvents the phone.

 iPhone

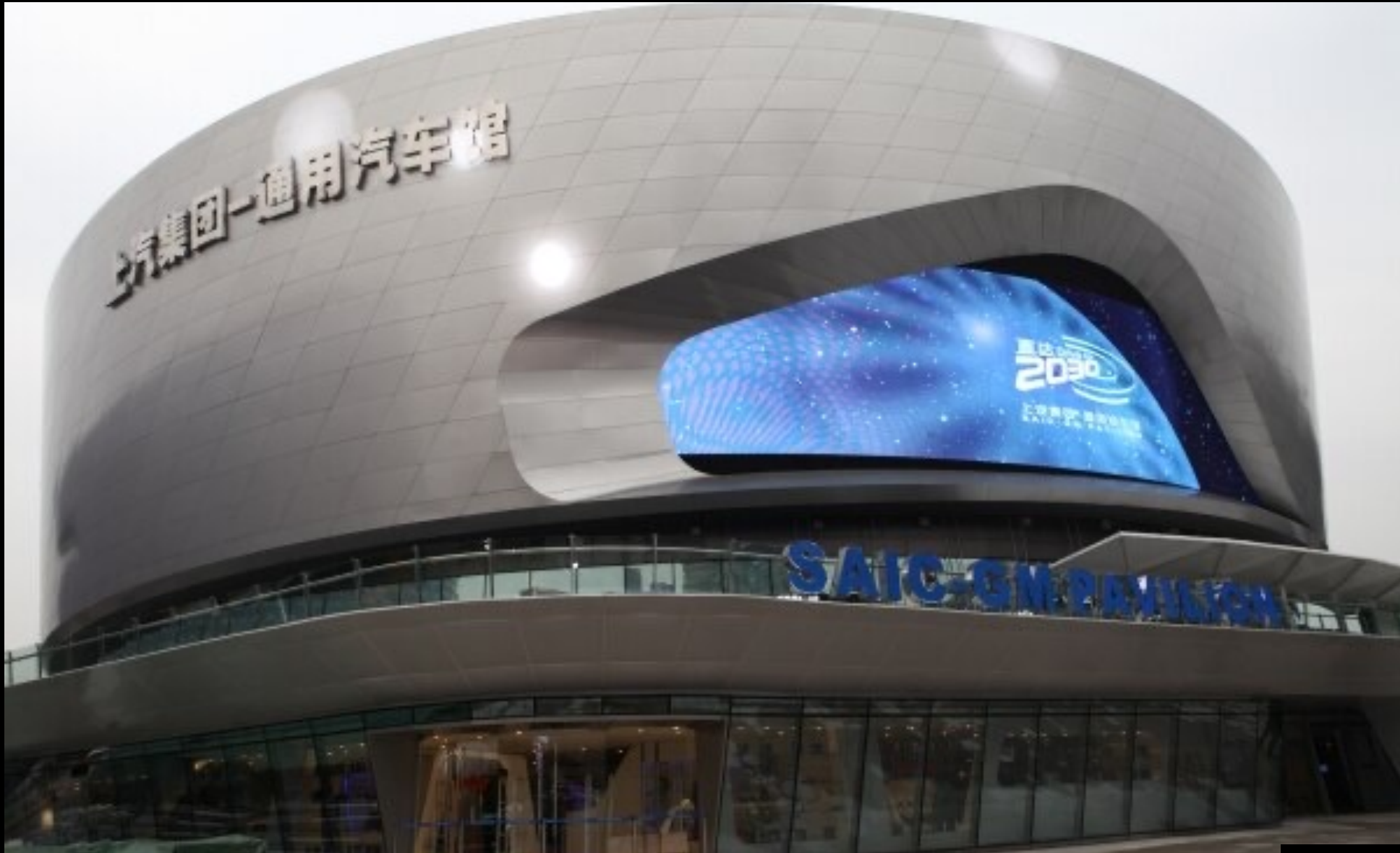
# FUTURAMA 4: AUTONORAMA

通用汽车 直达 2030  
GM DRIVE TO 2030





# FUTURAMA 4: AUTONORAMA



# FUTURAMA 4: AUTONORAMA

20 YEARS IN THE FUTURE

NEW FORM OF PERSONAL MOBILITY WILL  
BRING HARMONY TO OUR LIVES

A FUTURE THAT IS  
FREE FROM EMISSION  
FREE FROM PETROLEUM  
FREE FROM CONGESTION  
FREE FROM ACCIDENTS

FREEDOM OF MOBILITY BRINGS PEOPLE  
CLOSER TOGETHER

2030 XING - GREAT TOGETHERNESS

有意义的事……

# FUTURAMA 4



# FUTURAMA 4: AUTONORAMA



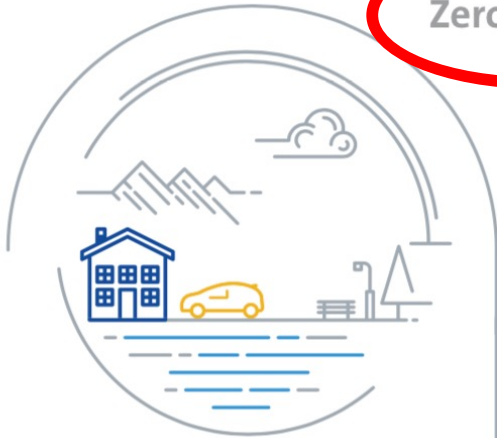
Drivers are connected to their social networks in the vehicles through the mobility Internet.

驾驶者在车上通过车联网与他们的社交网络互联。

*2030 Xing!* (GM-SAIC, 2010)



Zero Crashes.



2017 Sustainability Report



Zero Emissions.



Zero Congestion.



## TO OUR STAKEHOLDERS

General Motors Chairman and CEO Mary Barra.

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.



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

An aerial view of a complex highway interchange in a city, overlaid with futuristic data visualization. The scene is dimly lit, suggesting dusk or dawn. The highway has multiple lanes and overpasses. Overlaid on the scene are several glowing, semi-transparent shapes: a large purple oval on the left, a smaller green oval on the right, and a blue rectangular shape in the center. A network of thin, white and colored lines connects various points across the highway. In the upper center, there are two red triangles with the number '18,714' next to them, and a green triangle with the number '19,719' below it. A yellow box highlights a car on the lower left. The overall aesthetic is high-tech and futuristic.

**We see a future without congestion.**





### Editorial

November 15, 2016

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Contact Intel PR



**THE COMING FLOOD OF DATA IN AUTONOMOUS VEHICLES**

Technology	Data Volume
RADAR	~10-100 KB PER SECOND
SONAR	~10-100 KB PER SECOND
GPS	~50KB PER SECOND
CAMERAS	~20-40 MB PER SECOND
LIDAR	~10-70 MB PER SECOND

**AUTONOMOUS VEHICLES**  
**4,000 GB**  
 PER DAY... EACH DAY

intel

**DATA IS THE NEW OIL IN THE FUTURE OF AUTOMATED DRIVING**

*Brian Krzanich, CEO*



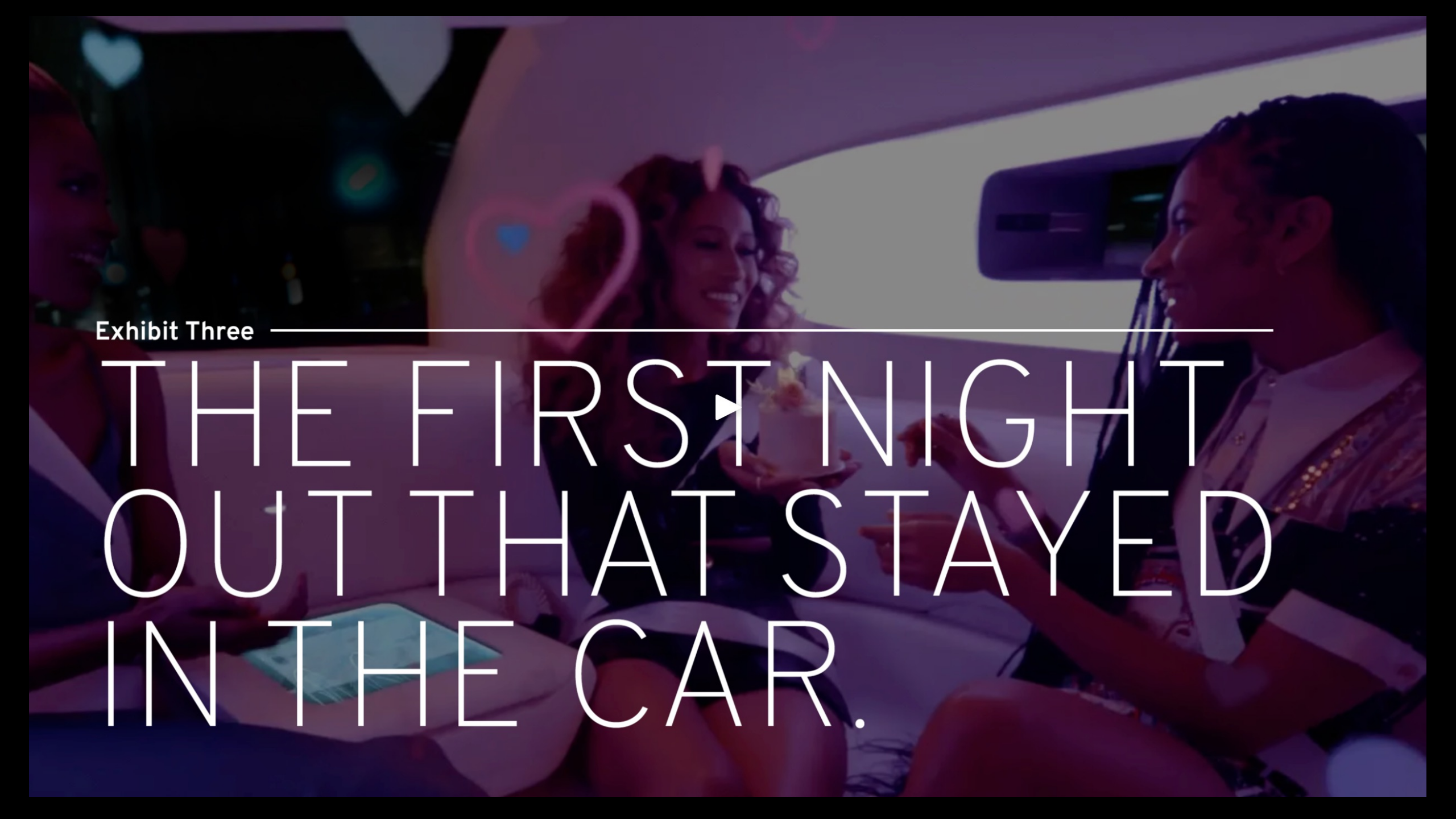
A group of young women in formal attire are sitting in a car at night. They are smiling and celebrating, with confetti falling around them. One woman in the center is holding a small cake. The car's interior is visible, including the rearview mirror and the back of the front passenger seat. The scene is lit with a soft, purple and blue glow, suggesting a festive or celebratory occasion.

Exhibit Three

---

# THE FIRST NIGHT OUT THAT STAYED IN THE CAR.

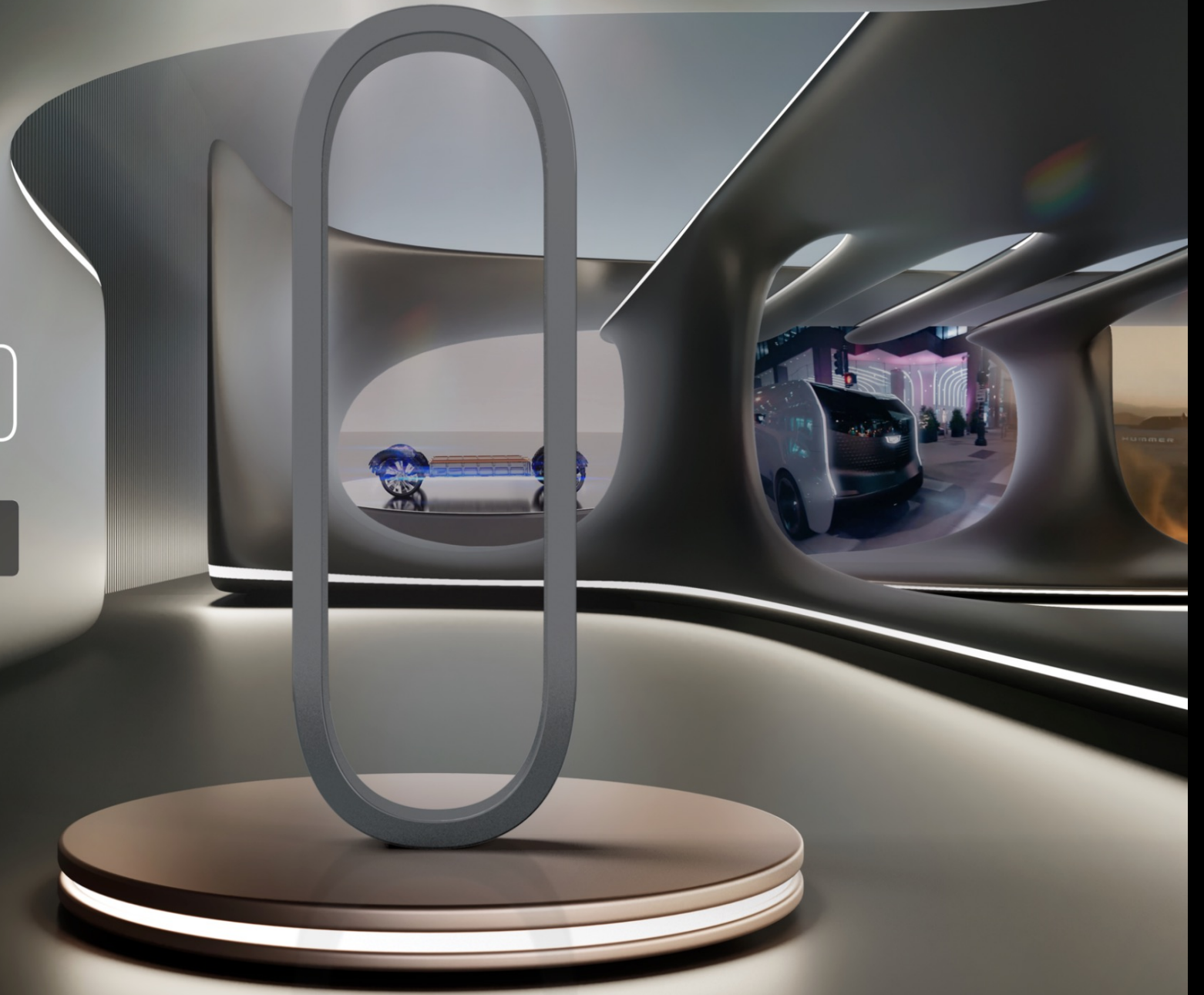


# EXHIBIT ZERO



Visit the  
Exhibit

Watch the  
Talks



GENERAL MOTORS



Zero Crashes.



2017  
Sustainability  
Report



Zero Emissions.



Zero Congestion.



General Motors, 2010

*Conclusion*

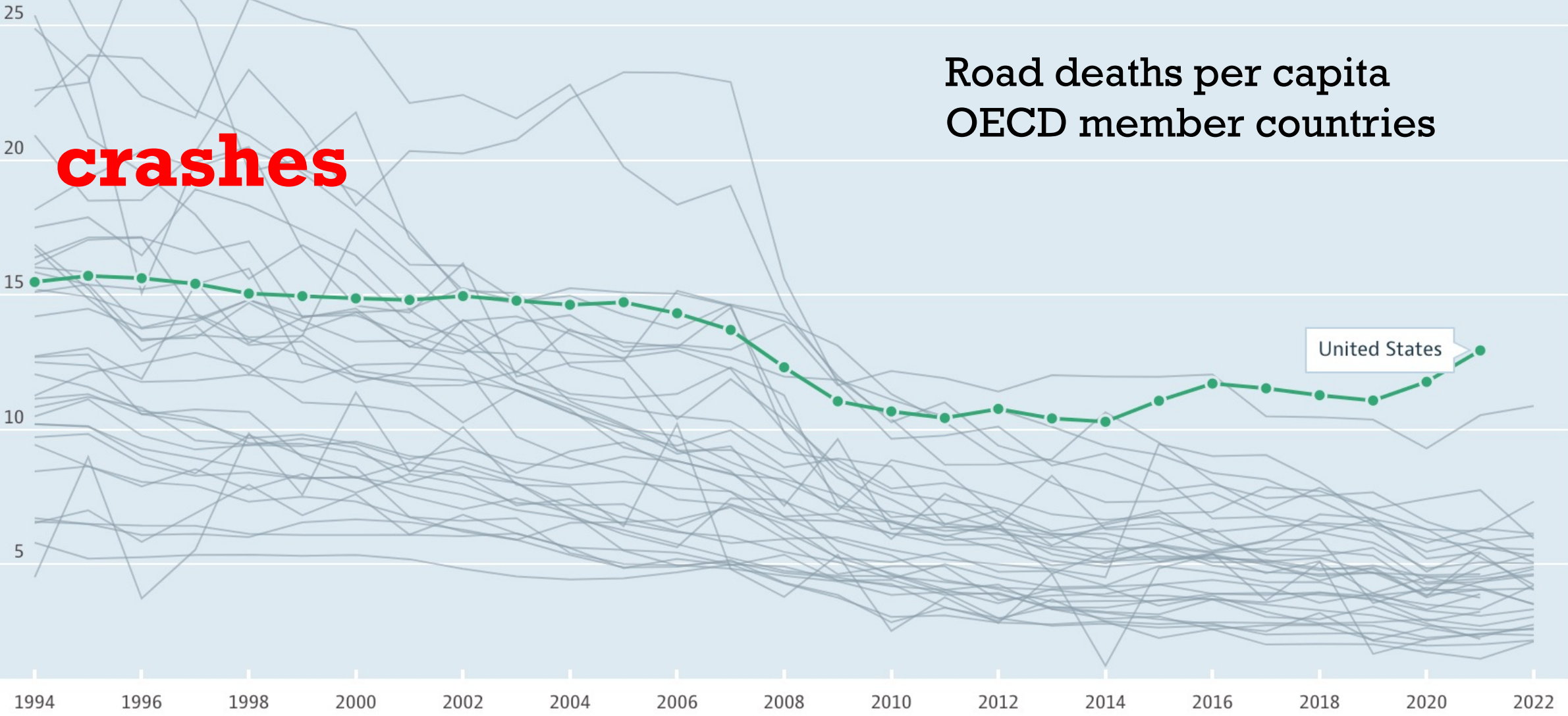
There's no place like home.



**crashes**

# Road deaths per capita OECD member countries

United States



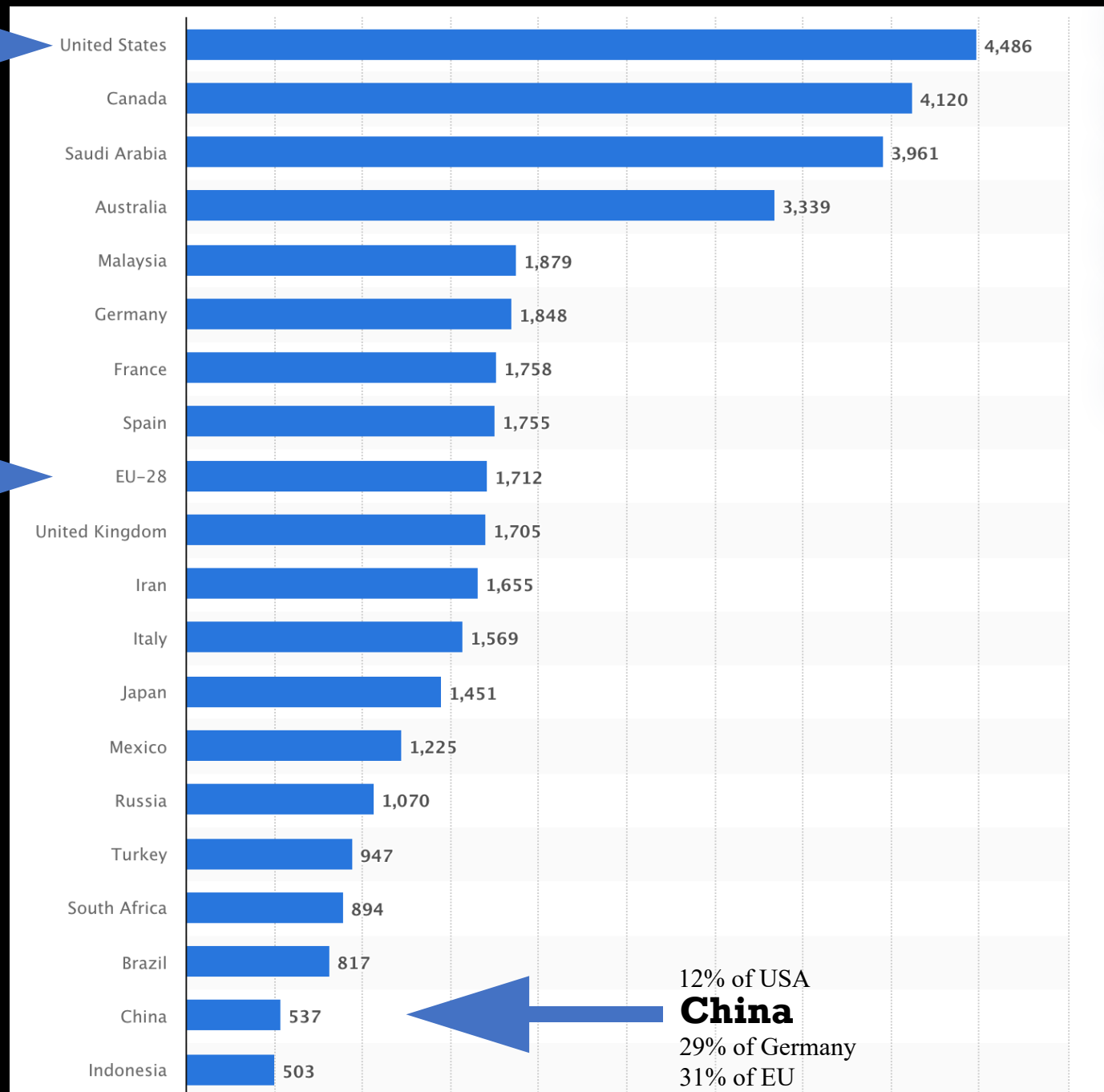
# emissions

## USA

2.4 x Germany  
2.6 x EU  
8.4 x China

## EU

38% of USA  
93% of Germany  
3.4 x China



12% of USA  
**China**  
29% of Germany  
31% of EU

**Per capita carbon dioxide emissions attributable to road transport, 2018**  
*kilograms of CO<sub>2</sub> per capita (Statista)*

# congestion

# INRIX



## 2022 INRIX Global Traffic Scorecard

Bob Pishue, Transportation Analyst  
January 2023

### UNITED STATES ANALYSIS & RANKING

In 2022, Chicago (155 hours lost ), Boston (134), New York (117), Miami (105) and Los Angeles (95) ranked in the top 5 for congestion impact in the US. Both Chicago and Miami now have more traffic congestion and delays than they did pre-COVID, while Boston, New York and Los Angeles still lag 2019 levels.

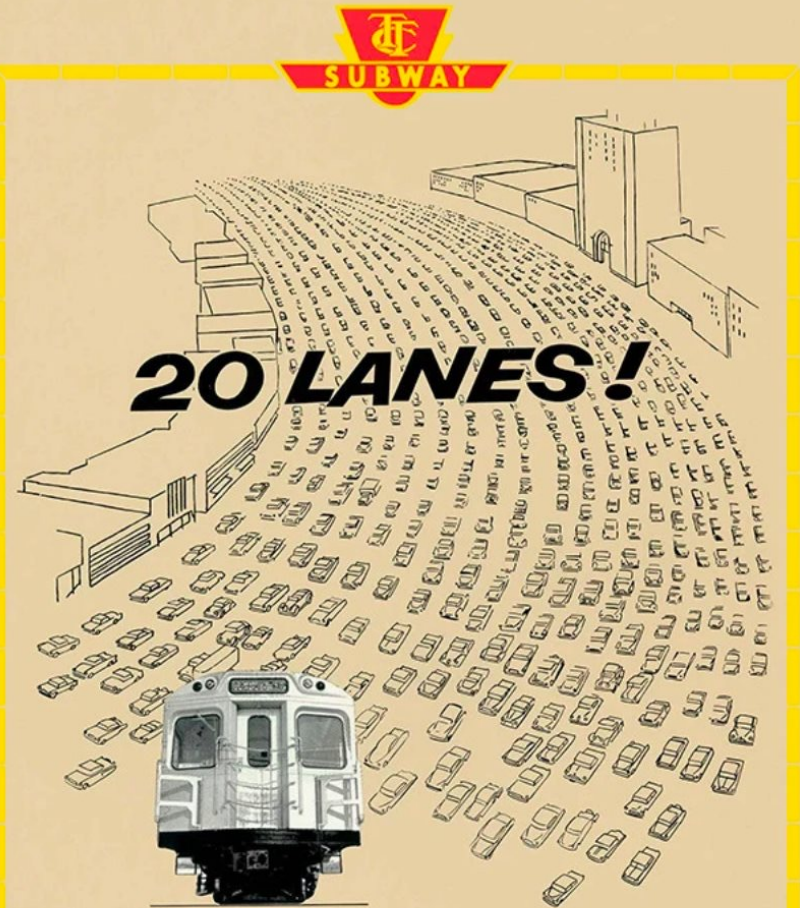
In the top 25, some of the biggest increases in delay occurred in Miami and Las Vegas. Miami saw an increase of 39 hours of delay over last year, a 59% increase, and drivers in Las Vegas lost 13 more hours in 2022 than the year before, a 46% increase. For the first time, Nashville also cracked the top 25 list, as drivers lost 41 hours to traffic congestion in 2022, a 14% increase over 2019 levels.

Of the 295 US urban areas analyzed, 179 are still below their pre-COVID normal levels, while 116 have surpassed them. Of the top 50 ranked areas, just 12 have exceeded 2019 levels, indicating it's the smaller, less-congested cities that have already "returned to normal" in terms of traffic.

#### United States Findings

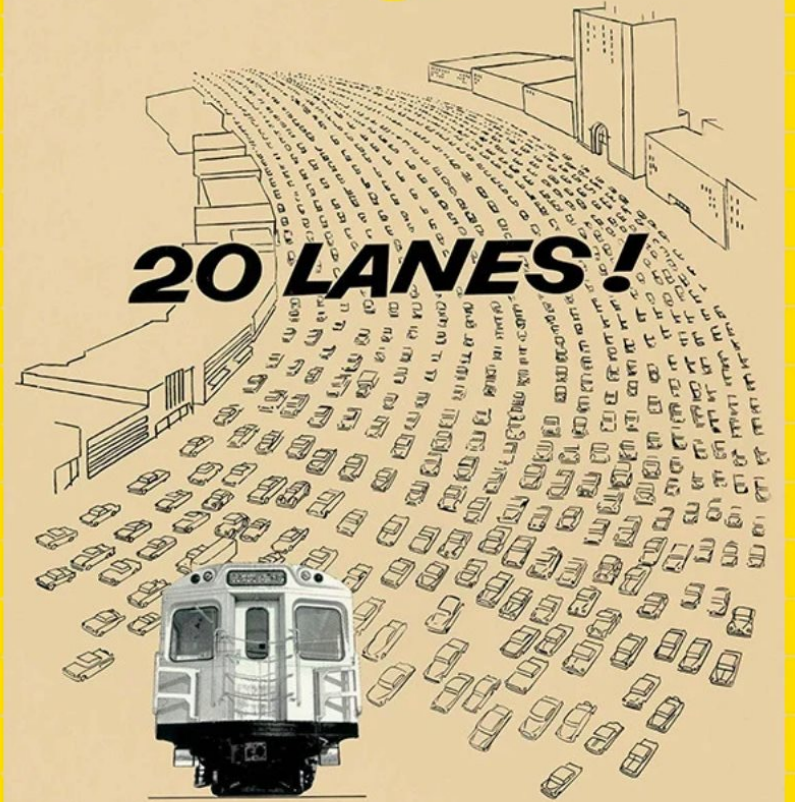
- Time Lost: 51 hours, up 15 hours from 2021
- Cost to Driver: \$869, up \$305 from 2021
- Cost to Country: \$81 billion
- Fuel Costs: Up 32%
- Collisions: Up 4%

**congestion**



**A highway 20 lanes wide  
would be required to carry  
in automobiles the number  
of people now being served  
by Toronto's Subway.**





**20 LANES!**

**A highway 20 lanes wide  
would be required to carry  
in automobiles the number  
of people now being served  
by Toronto's Subway.**





Hertz  
How Many Electric Cars are in the US ...



Cars.com  
Best Electric Cars & How to Buy an ...



EV Connect  
Commercial EV Charging Station...



Car and Driver  
2023 Chevrolet Bolt EV Review, Prici...



4 days ago  
Car and Driver  
EV Concepts Include S...



Car.USNews - U.S. News & World Report  
How Much Do Electric Cars Cost? | ...



Reuters  
EV pivot ...



The Motley Fool  
The Largest EV Companies in 2023 | The ...



Harvard Gazette - Harvard University  
an EV increases your carbon footprint ...



Subaru  
A Guide to Electric Vehicles | Subaru



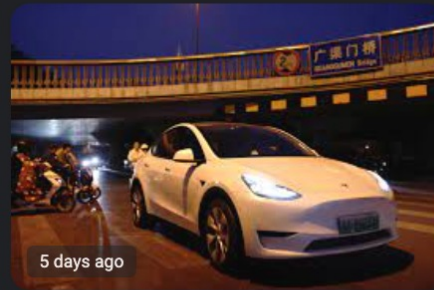
Open Access Government  
The EV fleets are coming - but are we ...



ET Auto  
Americans would consider EV purchase ...



EvoCharge  
What Is EV Charging & How Does it Wor...



5 days ago  
Reuters  
Tesla's China-made EV sales fall 17.8 ...



Hyundai USA  
2023 Kona Electric SUV | All-Electric ...



J.D. Power  
How to Maximize EV Range



YES! Magazine  
Electric Trains Everywhere: A Solution ...



Rail Engineer  
Tram Speed Protection - Rail Eng...



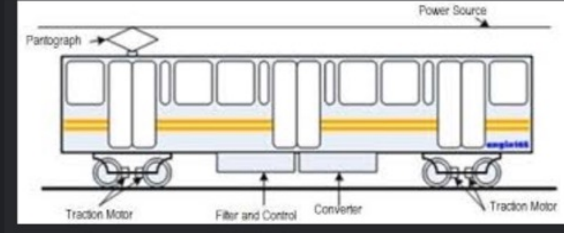
TST Ebike - In stock  
TST@ Surfer 27.5" Step-Thru ...



electrive.com  
six battery-electric trains ...



Dreamstime  
Trolleybus stock photo. Image of b...



ResearchGate  
The main parts of the electric train ...



WIRED  
Bluetran Lightning Revie...



Kyodo News  
Japan's 1st new tram system in 75 ye...



eix.global  
Trams – the spirit of our future, not a ...



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Giant Pakyak E+ Cargo E-Bike With ...



Electrek  
M8 electric trains replace diesel ...



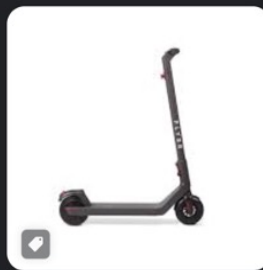
American-Rails.com  
Electric Locomotives In The USA



Inhabitat  
Stadler electric trains are on their ...



WIRED  
Aventon Adventure.2 Ebike Review: F...



Radio Flyer · In stock  
Flyer S533: Folding Electri...



Hungary Today  
Budapest Has World's Busiest Tram Network



Aipas eBike  
A6-Dual battery Cargo Ebike



Pixabay  
30+ Free Trolley Bus & Bus Images - Pi...



Paintcad illustrations  
Electric locomotive class