Don't Blame the Future

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Don't Blame the Future

> *The Rambler has been thinking about the future for many years. He is concerned mostly about the immediate future-which is why he's a longtime subscriber to TV Guide. But he believes that asking historians to make predictions about the distant future is like asking a meteorologist about the weather next year for your outdoor wedding. Go ahead and make your plans, but don't be surprised if the meteorologist who predicts sunny and warm doesn't RSVP.*

In transportation, predictions are a common practice at the project level (such as loading over a 20-year design life, expected noise levels, and environmental and air quality impacts) and the theoretical level as experts try to figure out where transportation is headed. (Usually, it isn't.) In this feature, the Highway History page has given the Rambler license to apply the wisdom of his mighty 20-20 hindsight to past predictions.

Here Comes the Future

History is a slippery thing-hard to figure out, prone to 180-degree flip-flops upon further research, open to debate by all comers, and subject to conspiracy theories. What's worse, people never learn from history, often drawing only the conclusions that support what they plan to do anyway.

And that's just the past, which after all has already happened.

As for what hasn't happened, the future is the hardest thing to predict. And the farther into the future, the harder it gets. For example, in 1892, the American Press Association asked 74 of the leading men and women of the day to predict what life would be like 100 years hence-in other words, our recent past-and published the results in newspapers around the country as part of the hoopla leading to the 1893 World's Columbian Exposition, which opened on May 1, 1893, in Chicago. In the field of transportation, the experts predicted:

- The railroads and telegraphs will be owned by the government.
- Electric-powered high-speed rail will be developed--with speeds up to 100 mph. Passengers will be able to eat breakfast in New York City and have supper in Chicago.
- A railway will be built from New York City to Argentina.
- Airships will facilitate travel and goods will be transported by pneumatic tubes.
- It will be as common for the citizen to call for his blimp as it is to call for his buggy or boots.
- Electric carriages will take the place of horses.
- Every country road will be lined with shade trees.
- Safe ocean navigation will be assured by having two steamers leave together and maintain communications by fog bells.
- Railroads, steamboats, stages, and horseback riders will still be employed to deliver the mail.
- The trolley railway will solve the problem of overcrowding in our cities.
- Transportation problems in great cities will be solved by some new genius who is yet unborn.

As this brief list indicates, a few of the predictions mentioned roads, and one very bold individual went so far as to predict that they will be improved. But none of the experts predicted, even remotely, the future of the automobile and the highway, much less the airplane. As for that unborn genius who would solve the transportation problems in cities? We're still waiting . . .

(The Rambler is old, but not old enough to have been around when these essays were written in 1892. He is, however, old enough to have purchased a collection of the essays called *Today Then: America's Best Minds Look 100 Years into the Future on the Occasion of the 1893 World's Columbian Exposition*, American World Geographic Publishing, November 1992. The essays make for interesting reading, but also serve as a cautionary tale for those who attempt to make predictions beyond the contents of their daily planner.)

The advantage of a prediction about life 100 years later is that the futurist will not be around to be mocked about the inaccuracy of the forecast. The seer can go to his or her grave knowing that in the 1990s, among other changes, people will live to 150 years old, the United States will include 60 States, some of them as far away as South America, a standing army won't be needed, taxation will be reduced to a minimum, law will be so simplified that "the occupation of two-thirds of the lawyers will be destroyed," the government also will have grown more simple, and food so concentrated that a single pill will furnish a day's nutritional needs.

The shorter the predictive window, the more likely the seer will be around to offer excuses. For example:

- "I know I said it would be sunny, and it rained and lightning struck the gazebo. Anyway, best wishes on a happy marriage."
- "I was certain that Fox network would renew 'Wonderfalls' after the network 'suits' realized how poorly they had scheduled it. Well, at least we have the great DVD."
- "When I said the world would end on July 12, 2003, I really meant 2073. Never was good with math-sorry for any inconvenience."
- "I realize I predicted the Baltimore Orioles would be contenders in the American League East Division this year. How was I supposed to know [fill in the blank]?" [Said each spring from 1998 through 2006]

Still, the Rambler wondered, perhaps a shorter predictive window would produce more accurate predictions. With that thought in mind, the Rambler came across the September 1969 issue of *National Geographic* containing an article by Fredric C. Appel called "The Coming Revolution in Transportation." Appel was inspired to write the article by riding on SR.N4, named the *Princess Margaret*, a hovercraft ferry capable of transporting up to 254 passengers and 30 automobiles across the English Channel:

> To me, SR.N4 symbolized the transportation revolution that lies ahead of us. Exciting machines? A vast array has already reached or passed the experimental stage.
>
> What are they like? When will they become commonplace? And-most important-what problems lie between our traffic-choked, smog-shrouded transportation systems of today and the alluring systems of the future?

To answer those questions, he visited engineers, architects, transportation officials, and city planners in the United States and Europe. "Everywhere," he concluded, "I found signs that a revolution in transportation is on the way."

The Rambler decided to take a look at the "coming revolution" to see if it arrived in the 37 years since Appel conducted his globetrotting survey.

Guideways and People Capsules

Appel started by pointing out what any reader in 1969 would know from bitter personal experience, namely that while automobiles can move at 100 mph or more, "you average closer to 10 as you travel our clogged city streets." Much of the article would address this contradiction.

To unscramble "the national traffic jam," Appel said, "federal and state governments construct the Interstate Highway System, adding 42,500 miles to a Nation whose paving and rights of way now occupy as much land as the state of Kentucky." Unfortunately, "new roads often become clogged the instant they open." In addition to not solving the problem, the new freeways "threaten parklands and displace city residents."

No need to despair, however. Appel had seen the revolutionary future and it would become a reality "in your lifetime." The Rambler, therefore, invites the reader to compare his or her most recent drive into the city with Appel's account of what it would be:

> You ride through the city at 90 miles an hour, glancing through the morning newspaper while your electrically powered car follows its programmed route on the automated "guideway."
>
> You leave your car at the city's edge-a parklike city without streets-and enter one of the small plastic "people capsules" waiting nearby. Inside, you dial your destination on a sequence of numbered buttons. Then you settle back to finish reading your paper.
>
> Smoothly, silently, your capsule accelerates to 80 miles an hour. Guided by a distant master computer, it slips down into the network of tunnels under the city-or into tubes suspended above it-and takes precisely the fastest route to your destination.

If your ride was anything like that, the Rambler would like you to know that you are living in an alternate universe that science tells us does not exist. (But if it does exist, please let the Rambler know if "Wonderfalls" is still on television with new episodes in that universe.) As for our universe, Appel points out that while his scenario might sound far-fetched, "Every element of that fantastic people-moving system is already within range of our scientists' skills."

Automated guideways have been on the visionary wish list for decades, with transportation experts and scientists hard at work on a practical model based on the technology available at the time. General Motors (GM) Corporation has been one of the most active researchers. Its Futurama exhibit at the New York World's Fair, 1939-1940, gave the eager public a glimpse at a variation of such a network. It was designed by Norman Bel Geddes, a theatre and industrial designer who created the exhibit to show visitors what travel might be like on the "magic motorways" of 1960. One historian of the fair described Bel Geddes as:

> Short, chunky, wild-haired, voluble, temperamental, and eccentric . . . . A friend remarked that "his head is in the clouds, but his feet are certainly not on the ground." [Marquis, Alice Goldfarb, *Hope and Ashes: The Birth of Modern Times 1929-1939*, The Free Press, a Division of Mcmillan, Inc., 1986, p. 202]

Visitors took one of the 552 "sound chairs" on a conveyor that would carry them over the exhibit as a narrator described the cross-country trip. The narrator explained:

> Here we see one of our 1960 express Motorways. By means of Motorways of this type, conveniences and necessities are brought to the farmer's door and he in turn has access to broad, outlying markets. This superb one-direction highway, with its seven lanes accommodating traffic at designated speeds of 50, 75, and 100 miles an hour, is engineered for easy grades and for curves that require no reduction in speed. Cars from the farm roads and feeder lanes join the Motorway traffic at the same speed as cars traveling in the lane they enter. To insure safety, the various lanes are safeguarded by border separators and grass stripping.
>
> The bridge-like structure on the Motorway is a traffic control tower, from which efficiently trained experts advise drivers by radio control signals when and how they may safely move from one traffic lane to another.

Bel Geddes favored automatic control of the vehicles, as he explained in *Magic Motorways* (Random House, 1940), his elaboration on concepts that he could not illustrate in Futurama because of the limited narrative time of the exhibit:

> It is conceivable that a control operating directly-as a radio beam, broadcast from stations located along the highway-could provide the control desired. Or perhaps more simply, an electrical conductor imbedded within the road surface, carrying an electric current producing an electro-magnetic field, might provide direct control.

Automatic control would allow high-speed travel, but also eliminate the single biggest obstacle to safe, efficient traffic flow: the driver. Bel Geddes was not optimistic that drivers would improve, as in his comparison of early motorists with the drivers of the late 1930s:

> Has he too improved in these thirty years of motor-car experience as the car has improved? Not by any means. He is still, day in, day out, on three million miles of road, the same, as bad a driver as the fellow who drove a Chalmers in 1910. His eyesight is no better, he reacts no faster, he doesn't think any better, he gets drunk just as easily, he is just as absent-minded.

Moreover, while the driver had stayed the same, the driving skills needed had increased. "Today the situation is far worse, because he is still the same human being, and yet he has to handle both increased traffic congestion and increased speeds." Automated highways were the answer.

Futurama was the most popular exhibit at the fair (visitors were given a lapel pin on their way out: I HAVE SEEN THE FUTURE). However, its engineering and technical concepts were well ahead of its times, and its philosophical underpinnings were rejected by the U.S. Bureau of Public Roads (BPR). In the same year that Futurama was enthralling fairgoers, the BPR completed its report to Congress, *Toll Roads and Free Roads*, which provided the first description of the Interstate System. The BPR's leaders, including Chief Thomas H. MacDonald, believed that the inevitable limits on financial resources meant highway officials had to focus on meeting current needs, rather than those that visionaries such as Bel Geddes, who had no fiscal responsibilities, liked to envision. *Toll Roads and Free Roads*, therefore, described a plan for addressing needs revealed by a systematic collection of traffic and financial data on roads throughout the country.

As *Business Week* magazine (September 9, 1939) put it in an article about Futurama:

> The federal Bureau of Public Roads is inclined to pooh-pooh the plan (though there are such as believe the bureau might do with a few new ideas).

Speaking of the BPR's proposal, the magazine observed that, "When they start pouring the concrete it will be interesting to see if any Geddes ideas have crept into the planning." As for Bel Geddes, who died in 1958, he did not live to see his vision of magic motorways become a reality 2 years later.

GM, the sponsor of Futurama, remained a leader in studying the automated highway. Appel visited the GM Technical Center near Detroit, where he found that designers were getting practical experience with the automatic devices on "today's cars" (such as power steering, electronic speed governors, automatic door locks, and self-regulated air-conditioning). "When more electric devices are added and the first computer-controlled highways are built," he concluded, "the era of the automated car will be here."

Dr. Lawrence R. Hafstad, GM's Vice President in Charge of Research Laboratories, told Appel:

> Automated highways-engineers call them guideways-are technically feasible today. In fact, General Motors successfully demonstrated an electronically controlled guidance system about ten years ago. A wire was embedded in the road, and two pickup coils were installed at the front of a car to sense its position in relation to that wire. The coils sent electrical signals to the steering system, to keep the vehicle automatically on course.
>
> More recently, we tested a system that also controlled spacing and detected obstacles. It could slow down an overtaking vehicle-even stop it, until the road was clear!"

The computer was seen as part of the solution, but as an outside force controlling the vehicle, not as a part of the vehicle. Neither Appel nor the scientists he consulted anticipated the widespread application of computer technology beyond the mainframe computers of the day.

Dr. Hafstad was aware of other guideway options being developed by competitors. Appel summarized the alternatives:

> In some systems, the car's power comes from an electric transmission line built into the road. In others, vehicles would simply be carried on a high-speed conveyor, or perhaps in a container. Computerized guidance systems vary, too.
>
> "Before the first mile of automated highway is installed," Dr. Halstad pointed out, "everyone will have to agree on just which system is to be used."

The automated guideway remains an elusive goal "in our lifetime." However, Section 6054(b) of the Intermodal Surface Transportation Efficiency Act of 1991 called for a demonstration of an automated highway system that took place on a 7.6-mile stretch of I-15 about 10 miles north of downtown San Diego, California. Thousands of high-strength ceramic magnets were embedded in the reversible lanes to allow for automated operation of specially equipped vehicles from August 7 to 11, 1997. GM's James Rilling, serving as program manager for the National Automated Highway System Consortium, concluded that the $11 million experiment went well, but as for running in automated tight formation, he said, it "feels rather close, especially at first," adding that "it's really exciting for about the first 15 seconds, then it gets really dull. It's like driving with a chauffeur." [Quoted in Steven Ashley's "Smart Cars and Automated Highway," *Mechanical Engineering*, May 1998]

The successful test on I-15 has not produced a version of the automated highway for daily use, as readers may have noticed. Since then, the focus has shifted to applying the lessons of the "intelligent vehicles" to crash avoidance. At the same time, an innovation not foreseen by Appel, global positioning satellites, has allowed onboard navigation systems and vehicle tracking devices that are becoming increasingly common. Michael E. Doble, a GM concept vehicle and technology manager, predicted in September 1996:

> By 2012 we will not need the magnets. With a combination of global positioning satellites and dead reckoning, you will tell the car where to go and not touch the throttle or wheel until you pull into a parking spot. [Holusha, John, "A Smart Road Starts to Take Shape in California," *The New York Times*, September 1, 1996.]

The Rambler awaits the arrival of this transportation system a mere 6 years after he wrote this article in 2006.

As for the other part of your daily commute foreseen by Appel, more than 30 systems for people capsules were under development at the time of his article. All the systems had common characteristics:

> They are controlled externally by a central computer. Vehicles move at high speed and at close intervals through a network of one-way passageways. Most are designed to carry small groups of people, affording privacy equal to that of a taxi.

Appel described how one such system would work:

> Electrically powered cars, each seating as many as four persons, travel on aluminum tracks suspended from graceful arches over the city or threading through tunnels under the ground.
>
> Passengers board their waiting car in a spur tunnel, insert a destination card in a slot, and relax. The car, electronically controlled, merges smoothly into the traffic speeding through the main tube and travels to its destination by the most direct route.

Some travelers, including Appel, may have reservations "about surrendering control of your vehicles to a faceless computer." He took comfort in knowing that the computer would also control the other vehicles. "There will be no reckless driver to swerve into my lane, or thunder past on the wrong side of the road." Taking "the unpredictable human element" out of the equation would, he said, make traffic experts and life-insurance agents happy.

As Appel predicted, people capsules, in the form of elevated people movers, have been implemented. They have been successful in some settings, such as theme parks, but less so as a form of city transportation. People movers are in operation in Detroit and Miami, but have not been embraced by other cities.

Electric Cars

In the late 1960s, emissions from automobiles were recognized as one of the more adverse features of the internal combustion engine, especially in cities. While engineers were trying to reduce emissions, "they expect the number of automobiles to double within two decades," making solutions even more urgent.

Appel's contacts were focused on improving air quality through "as-yet-undeveloped batteries [that] will make electric vehicles feasible." At the time, driving range was the big problem for electric cars, which had a range of about 50 or fewer miles between battery charges, making them impractical for everyday use.

Alternatives to electricity were under consideration. Turbine engines were a possibility because they "burn fuel more efficiently than do piston engines." However, as Dr. Hafstad explained, "turbine technology is very young, while our conventional engines are very advanced." He predicted that it would "take years for the turbines to catch up." Another option was a variation on the fuel cell used in space capsules. It would convert fuel into electricity. Apple also noted a third option:

> Some auto firms are experimenting with hybrid electric vehicles, which use battery-powered motors in town and low-pollutant gasoline engines on the highway.

He cited a General Motors experimental Opel model to explain why the electric motor of the hybrid vehicles would be used mainly in cities:

> A low-pollutant combustion engine in the rear can charge the batteries as quickly as they are drained during low-speed city travel. Highway speeds, however, use electric power faster than it can be regenerated.

Appel concluded this section of his article with the observation that, "Almost surely the day will come when we will drive electric cars on our way into the city." As he saw it, the electric car was needed because of its potential for solving the "smog problem." Appel did not mention that it would reduce America's dependency on oil, especially from unstable foreign sources. At the time, gasoline was abundant at 35 cents a gallon, according to the U.S. Department of Energy (see http://www1.eere.energy.gov/vehiclesandfuels/facts/2005/printable_versions/fcvt_fotw364.html). The concern about oil prices and sources would become widespread a few years later when the oil shocks of the 1970s focused concerns on the reliability of oil supplies from the Middle East.

The electric vehicle does not, of course, dominate our auto fleet as of 2006. However, in 1999, Japan's Honda Motor Company introduced the two-seat Insight, the first gas-electric hybrid to enter the American market. Many automakers and consumers have since embraced the gas-electric hybrid for reducing fuel consumption and air pollution.

As for the "smog problem," the absence of the electric vehicle has not meant increased air pollution. Air quality has improved across the board in the United States, largely due to technological advances by motor vehicle manufacturers. The Clean Air Act of 1970, and its amendments, merit some credit for this change, but most of the reduction results from the catalytic converter, which became widely available in the mid-1970s. Gary Jensen of the Federal Highway Administration's Office of Natural and Human Environment wrote about the Nation's improved air quality in the July/August 2003 issue of *Public Roads*. Some excerpts:

> According to calculations based on data from the *National Air Quality and Emissions Trends Report,* 1999, published by the U.S. Environmental Protection Agency (EPA), emissions reductions from motor vehicles account for 84 percent of the total emissions reductions of the six criteria pollutants [from all sources, not just transportation] since 1970. The automotive, fuels, highway, and transit communities

> have managed to achieve this success in cleaning up the Nation's air with the help of tight EPA emissions standards and fuel requirements, while at the same time meeting increasing demands for improved mobility and safety . . . .
>
> Despite large increases in population, personal travel, and freight transportation; limited highway expansion; and the public's choices of transportation modes, on-road motor vehicle emissions declined 77 percent since 1970 . . . . And EPA expects this downward trend to continue well into the future.

Jensen's "Air Quality and Transportation," is online at https://www.fhwa.dot.gov/publications/publicroads/03jul/10.cfm.

Tunnels for Congestion Relief

If the solution to traffic congestion cannot be found on the surface, Appel found "a tantalizing bit of the answer" near Stockholm, Sweden, where he enjoyed a "people plaza" free of noisy traffic:

> [The] key to its success was a network of tunnels beneath it. Down there, trucks were supplying the stores with merchandise, and a subway ferried people back and forth from nearby Stockholm.

The transportation experts he consulted did not dismiss the concept as extravagant. Byron A. Bledsoe, principal engineer of the Highway Research Board (HRB), compared roads to utilities such as sewers and telephone lines that are installed underground. "In the future," he told Appel, "surface roads-especially the ones in downtown areas-may disappear too, leaving the surface for people." Aside from removing noisy traffic from the surface, tunnels would eliminate weather as a factor in traffic flow and avoid "the bitter disputes that have erupted in many cities over the displacement of people by surface construction."

Appel estimated that the average cost of a surface freeway in an urban area was $4 million a mile, compared with $7 million for deep-tunnel mileage. (He does not cite a source for these figures.) He expected technology to make tunneling cheaper "while land costs climb," thus increasing the cost of surface freeways. As the cost of surface freeways increased and tunneling decreased, "tunnels will become increasingly attractive to highway planners." The Office of High-Speed Ground Transportation in the U.S. Department of Transportation (DOT) was investigating new tunneling methods:

> Tunnels of the future may be bored by jets of flame or hyper-velocity jets of water. Chemicals, laser beams, or plastic-encased pellets of water fired from powerful gas guns may be used to cut through or break up the rock.

Tunneling technology has advanced since 1969, but none of these techniques is in use.

Appel's predicted network of tunnels has not come to be. Cost, geology, and technology are among the reasons why an idea that makes intuitive sense-when in doubt, bury the problem-has proven impractical. The experience in Boston, where one element of the Central Artery/Tunnel Project was to replace the elevated I-93 Central Artery viaduct with a tunnel, suggests that the cost of tunneling has not, as yet, slipped below the cost of surface construction.

Unlike some of Appel's predictions that did not make it into the 21st century, the network of tunnels is on view-by anyone who rents or owns the 2004 movie "I, Robot," starring Will Smith. The movie takes place in Chicago in 2035 when robots are in common use doing the jobs that humans don't want to do. In one early scene, traffic moves along a 10-lane elevated freeway, while a monorail carries passengers through the city. Surface streets are filled with pedestrians and bicycles, with a few automobiles and trucks that can move forward, in reverse, and sideways. Below the surface, traffic moves through a network of tunnels at high speeds, with the vehicles controlled by central computers, although drivers may assume control if they wish. The Rambler especially enjoyed the 5- or 6-minute scene where Chicago Police Detective Del Spooner's (Smith) car is chased through the underground tunnels by a horde of bad robots in large trucks, resulting in extensive destruction of trucks, robots, and Spooner's car, but not

Spooner. (Incident management in 2035 Chicago is handled by robotic vehicles that arrived quickly to clear the debris.)

Although "I, Robot" is fiction, the Rambler notes that in this visionary 2035, Chicago traffic is still congested. The elevated freeway and underground tunnels, even the surface streets filled with pedestrians, are depicted as heavily traveled in most scenes (in one, Spooner races a motorcycle through heavy tunnel traffic on a life-or-death mission). The one exception is the chase sequence, during which the tunnels were empty except for Spooner, the trucks, and the robots trying to kill him-much to the relief of innocent bystanders, no doubt. Sadly, even the technicians in charge of computer generated images cannot concoct visionary images of the world to come without traffic congestion.

Where People Go

Appel interviewed several other experts, including officials of the DOT, then only 2 years old (having begun operations on April 1, 1967). One expert was Dr. Paul Cherington, who was Professor of Transportation at Harvard at the time of the interview but had since become Assistant Secretary of Transportation for Policy and International Affairs. Dr. Cherington pointed out that "we have enough car seats on the road for every man, woman, and child-with enough seats left over to hold the entire population of continental Europe." Even so, a truck moves across New York City "at a slower pace today than a horse-drawn cart did 60 years ago."

He cited the Henry G. Shirley Memorial Highway (then part of I-95, now I-395 inside the Capital Beltway) in Northern Virginia. It had opened in 1949 as a 17-mile, four-lane expressway serving the Pentagon:

> Shirley Highway was a terrible old road, with traffic jams every day. So what did you do? You widened it into six lanes. Then what happened? Developers constructed high-rise apartments all along the new highway, and now five times as many people use the road. And what do you have today? A six-lane traffic jam instead of a two-lane traffic jam.

(At the time of the interview, construction was underway to widen Shirley Highway to 12 lanes, including reversible express lanes in the median. The first stretch of the reversible lanes opened for inbound buses in September 1969. The reversible lanes were opened for all high occupancy vehicles (HOV) in December 1973. Appel did not discuss HOVs, but the success of Shirley Highway express lanes prompted Federal and State highway officials to promote HOV lanes around the country.)

The problem, according to Dr. Cherington, was that "we have been operating on a mistaken principle-that the transportation routes should go where the people are." He added, "It's wrong. People tend to go where the transportation is!" The experience with the Shirley Highway illustrated his point.

The solution, as Appel summarized it, involved choosing from two basic approaches: "Increase the capacity of the system, or reduce the requirements." Many experts favored reducing demand. William Pereira, an architect and city planner in Los Angeles, explained that, "The idea is to shorten the desire lines of the people. In other words, to provide for almost all their needs in a more concentrated area, so that they have less reason to travel outside their own community."

Appel summarized the views of Pereira and other transportation planners who concluded that "most of our cities are too large to manage [and] it is from their size that traffic congestion, air pollution, high crime rates, and other social ills flow." These experts advocated "urban dispersal-breaking our big cities into smaller, workable units" along the lines Pereira suggested. Already, Appel found, new-town concepts were springing up that embodied what the experts were describing. He cited Reston, Virginia, and Columbia, Maryland, as well as unnamed towns in Europe, as examples of such communities.

Today, Reston and Columbia are fine places to live, but the "edge cities" growing along the Interstates are far more prolific. (The Rambler recommends Joel Garreau's Edge City: Life on the New Frontier, Doubleday, 1991.) Planners continue to seek ways to make urban areas "livable," "smart," "sustainable," and "walkable." The Rambler, who

considers home delivery of pizza the greatest urban innovation of the late 20th century, will take the cowardly way out and not discuss these trends, other than to observe that thus far, they do not appear to have solved our urban problems. (As for Pereira's Los Angeles, the Rambler has heard from reliable sources that traffic there remains a problem. Residents, he is told, spend more time scheming to beat the traffic than they do trying to sell their latest script.)

A more successful prediction came from Dr. John Pierce, Executive Director of Bell Laboratories in Murray Hill, New Jersey. Appel quoted Dr. Pierce as offering one long-range solution:

> I believe many workers of the future won't commute to work. They will *communicate* to work. Their homes will be connected to their offices via electronic communications. It's entirely within the realm of existing technology.

Telecommuting, whether from home or satellite offices, is a growing presence in the transportation picture. In an ideal world-you know, the one that will never exist-workers would live a walkable distance from their office. In the Rambler's view, telecommuting is the next best thing. As more homes are equipped with the needed equipment and as technology creates more ways of linking the office to the home or satellite location, telecommuting will continue to expand. Whether it will expand enough to reduce traffic congestion remains to be seen.

The Transit Option

Given "the auto's insatiable demands," Appel found that social planners "look longingly toward mass-transit systems." Although the challenge for cities was how to move large numbers of people, Appel commented that, "Mass transit is an almost universal problem in our cities." Profit-seeking companies had provided transit service through the 1950s, when cities began to create public transit authorities to replace the inefficient private operations. In the early 1960s, as cities confronted the disruption and displacement of Interstate construction, the Federal Government began providing funds to help cities with transit. As Appel wrote his article, experts were still trying to figure out how to increase use of transit, namely buses in most cities, as an alternative to the big highways.

One problem, as Bledsoe of HRB pointed out, was that, "There is a social stigma attached to riding mass transit." He added, "And people also would rather drive their cars because of the convenience and flexibility." The bus service of the future would offer "more seating room, better lighting, more ventilation, and more personalized service." Federal studies, such as a demonstration project in Peoria, Illinois, pointed in that direction. Appel described the Peoria operation:

> [A] bus line made local stops in a neighborhood, picking up passengers practically at their doors and carrying them directly to their places of work. The commuters paid a monthly rate for the service, which included such luxuries as reserved seats, coffee and doughnuts, and the morning paper to read on the way.

Such personalized service did not appear to be far off. Soon, citizens would be able to summon the nearest mini-bus by rubbing "special metal plates" posted on utility poles and connected to a central computer.

Professor Cherington predicted that, "There will be a continuing demand to drive to work, even if attractive, low-cost mass-transit systems are offered." To counter this desire, he had a bold prediction:

> Professor Cherington predicts a time, not far off, when driving in the city cores will be discouraged by restrictive laws. All incoming automobiles will be charged very high tolls, he believes; drivers without reserved parking places will pay even more. Eventually, authority may even prohibit all parking on the streets-a step which, in the average American city, will triple the vehicle-moving capacity.

That time, which appeared to be "not far off" in 1969, is getting closer, with London leading the way. In February 2003, London began charging private automobiles using the central area during weekdays. The idea of "value pricing" using

electronic toll collection technology that was not envisioned in the 1960s has become increasingly appealing to urban planners and practical to transportation engineers, if not yet palatable politically.

A Dream Train

The revolution was also coming to passenger rail, as Appel noted ("Don't write off the passenger train yet"). The new U.S. DOT was researching alternatives that, as Appel put it, were "just as fantastic as people capsules." He had in mind the "tube train, suspended and propelled by compressed air." The possibilities were, indeed, fantastic:

> Someday it may carry passengers along the Northeast Corridor at speeds of 350 miles an hour. On coast-to-coast runs, it conceivably could become supersonic!

Rensselaer Polytechnic Institute in Troy, New York, had built a model-a 12-foot long aluminum vehicle in a 2,000-foot testing tube-in its wind-tunnel room. Dr. Joseph V. Foa, Professor of Aeronautics and Astronautics, described for Appel "the full-size train of his dreams":

> It would race through its 18-foot diameter metal tube at 350 miles an hour, with huge propellers pumping the air from the front to the rear of the train. The air-cushion suspension would maintain a large clearance between the train and tube walls. Thus a relatively inexpensive rough-surfaced tube could be used.

It would initially be powered by gas turbines, but Dr. Foa could foresee electric or nuclear power as a future alternative.

When Appel asked if the tube train could travel at supersonic speeds, Dr. Foa smiled. "We think it has supersonic capabilities, but that's further into the future. At this point we'll settle for a few hundred miles an hour." The Professor smiled again when Appel asked if any transportation executive would be "daring enough to offer to pay for a tube-train system." Dr. Foa replied:

> Train speeds upwards of 150 miles an hour aren't practical on existing track systems. Any high-speed line would have to be built from scratch-the Japanese did it when they put in their 130-mile-an-hour rail line from Tokyo to Osaka [this was the first "bullet train" or Shinkansen, which opened in 1964].
>
> So if you are going to start from the ground up, a tube system has many advantages. A tube train passing through a city creates little noise. The tube can be suspended, buried, or even run through buildings. Inside the tube you have a controlled environment; maintenance costs would be low, and you're protected from weather and vandalism.

At the same time, the DOT was experimenting with other high-speed train options using steel wheels. Three such trains were in operation in North America, with the DOT financing two of them ("an 85-mile-an-hour experimental [TurboTrain] linking Boston and New York, and a 120-mile-an-hour train between New York and Washington, which promises to be a commercial success"). The other experimental line was in Canada, the 90-mph "Rapido" linking Toronto and Montreal. The lines ran on existing track, with the Boston run powered by a variation of the aircraft jet engine, the New York-Washington line by electric motors fed by a trolley, and the Rapido using diesel.

Appel was unsure if railroads could compete with airlines, but thought the increasing number of high-speed passenger trains in the Northeast Corridor would provide a clearer picture. Citing the Japanese bullet train, he suggested that "the pressure will grow to improve any transportation systems that can move large numbers of people safely and comfortably."

He wrote this prediction a few months before the June 1970 bankruptcy of the Penn Central, the Northeast's dominant railroad, focused attention on whether the country should take over the passenger rail service that the freight railroads had been providing for decades at a financial loss. Congress responded by passing legislation in 1970 creating the

National Railroad Passenger Corporation to oversee the operation of intercity passenger trains. Amtrak began operating on May 1, 1971.

Not wishing to provoke America's railfans, the Rambler will simply point out that high-speed passenger rail has not yet overcome all obstacles to competition with the airlines. However, a version of commercial high-speed rail has been operating-with some interruptions-in the United States since Amtrak began running its Acela tilt trains in the Northeast Corridor on December 11, 2000. The trains are capable of 150 mph, although most stretches of track cannot yet support top speed.

With the advantage of hindsight, we know that tube-trains have not yet found their niche in the marketplace. Again applying that hindsight, the Rambler thinks it odd that Appel, while in New York to meet with Dr. Foa, did not stop at Brookhaven National Laboratory on Long Island, where early experiments in magnetic levitation (maglev) trains using superconducting magnets were underway. Senator Daniel Patrick Moynihan (D-NY) would promote the concept in legislation, but attempts to build maglev lines in the United States ran into the financial blocks Appel foresaw in discussing tube trains with Dr. Foa. The first commercial maglev train opened in Shanghai, China, in 2004.

Blah Blah Blah

In describing "The Coming Revolution in Transportation," Appel discussed jumbo jets and supersonic jet transportation (the British-French Concorde), airports of tomorrow, V/STOL vehicles (Vertical or Short Take-Off and Landing), air-cushion water vehicles, and advanced warships.

As far as the Rambler, a highway guy at heart, is concerned, blah blah blah.

The Rambler will now get back to the good stuff.

Near Certainty

While writing his article, Appel visited with the first Secretary of Transportation, Alan S. Boyd (1967-1969), and the second, John A. Volpe (1969-1972), who was in office at the time.

Discussing vehicles of the future, Boyd cautioned:

> Don't forget that future innovations in transportation will have to be superimposed on a system which already exists-a system which is being expanded and being built to last for a long, long time.

Volpe was more optimistic about the prospect for change:

> Of course, our immediate problem is to implement the transportation we have now and make it safer. But I feel we'll need some entirely new systems within the next ten years.

He rattled off the problems with airports, mass transit, and rail transportation, and said that, "Research is showing us that there are better ways to transport people on those short city trips than the methods we're now using." He summed up:

> What we need most is a coordinated policy-a balanced transportation plan that can bring this Nation efficient, economical, safe ways of traveling.

That, in fact, was the reason the U.S. DOT was established and remains its guiding principle.

Thinking about these comments, Appel wondered if the "new generation of vehicles" he had observed-"more versatile hydrofoils, air-cushion boats and trains, automated cars, V/STOL aircraft, jumbo jets, supersonic transports"-would revolutionize transportation. He recalled all the glorious benefits these inventions would bestow on society-speed,

safety, reduced noise, less pollution-but then thought of Secretary Boyd's caution about innovation being superimposed on the existing system. With that in mind, Appel sifted through what he had seen and identified "certain points [that] seem to crystallize into near certainty." They were:

> Electric cars should be common within a decade. They will be "pure" electrics, if batteries become lighter, more powerful, and longer lasting; otherwise, "dual-mode" vehicles-battery-powered in town but propelled by gasoline engines on cross-country trips.
>
> Computer-controlled highways will almost surely become a reality, for when the human element is removed, vehicles can travel safely at faster speeds, closer together. In fact, most experts believe that each lane of automated highway could move the traffic of three or four of today's uncontrolled lanes.
>
> There will be heated debates about which type of guideway to use, but remember this: A similar decision was faced, and resolved before our universal system of color television went into operation.

Because complete reconstruction of cities was out of the question, Appel believed that the "super-block" concept might be superimposed on existing streets:

> Spread out a map of your city, and with a pencil mark it off into squares eight city blocks to a side. Those squares are super-blocks; your grid of pencil lines traces boulevards which serve the blocks along their perimeters.
>
> Refine your plan, now, by barricading most streets within each super block to channel the traffic into logical, efficient routes-and you will be looking at your city as it may appear a decade or so from now.
>
> Planners expect each super block to evolve into a city within a city. New stores will cluster in a shopping center at the core, making it easy for residents to confine most of their shopping trips to brief rides on the bus. The desire lines have been shortened; transportation requirements have been reduced.
>
> Look again at your city of super blocks. Streets still occupy precious land that might be used for other activities. Since subways have proved feasible, why not put virtually all roads underground? Planners in the 1980's may well be thinking along those lines.
>
> And along those lines: If you dig tunnels under a city, why not tailor them for computer-controlled people capsules? Able to travel at high speed and at close intervals, they can move more passengers more rapidly than buses or subway trains could.

Appel predicted that ships and railroads would carry the bulk of long-distance freight. After a few more predictions in blah blah territory, Appel concluded:

> Yes-on land, in the air, and on the sea-the transportation revolution is ready to be launched.
>
> The planning has been done. Most of the machines are in existence. If those other machines seem like fantastic dreams, consider how many of today's realities-supersonic planes, television, computers, and the like-were just fantastic dreams less than three decades ago.
>
> Human barriers remain-the type of problems that the Secretary of Transportation encounters each day in his work. But even those problems can be solved, if the urge to solve them becomes great enough.
>
> Will it become great enough? Ask yourself that question tomorrow-while you're creeping through city traffic at 10 miles an hour in your 100-mile-an-hour automobile.

Scorecard

The scorecard on Appel's points that crystallize into near certainty is not good. In Appel's defense, the Rambler would point out that he claimed they were "near" certainties, not certainties.

The gas-electric hybrid automobile is the only near certainty that is now in common use. Some of the concepts he was most enthusiastic about, such as underground tunnels, people capsules, and super blocks, have yet to make their appearance. What is clear is that many of the problems the "coming revolution" was going to address, including traffic congestion, safety problems, and urban sprawl, are still with us.

Perhaps they always will be. However, the Rambler would like to think that the "new genius who is yet unborn," who was predicted in 1892 to walk among us by 1992, is perhaps lurking just around the corner with a revolutionary innovation that no one saw coming.

> **A Note From The Rambler**: Those interested in past projections of the future might want to read: Corn, Joseph J., and Horrigan, Brian, *Yesterday's Tomorrows: Past Visions of the American Future*,The Johns Hopkins University Press, 1984.
>
> In addition to viewing the tunnel traffic option in *I, Robot*, readers may be interested in two recent films that contain visionary future urban transportation networks. *Minority Report*, Stephen Spielberg's 2002 film starring Tom Cruise, takes place in 2054 in Washington, D.C., where individual cars operate on automated guideways that use maglev technology so cars can move horizontally and vertically, with the sides of buildings a routing alternative. Also, Luc Bresson's 1997 comedy/science fiction film *The Fifth Element* presents Bruce Willis as a New York City cab driver 3 centuries from now. The scenes early in the film of his traffic experiences suggest that instead of getting better, the city's current traffic problems will be expanded to a three dimensional nightmare. The Rambler recommends both films.