
The Twenty-first Century Parking Problem

You don't know what you've got till it's gone. They paved paradise and put up a parking lot.

—JONI MITCHELL

Children first learn about free parking when they play Monopoly. The chance of landing on free parking is low, about the same as the chance of going to jail. Monopoly misleads its players on this score, however, because parking is free for 99 percent of all automobile trips in the U.S.¹ This book will argue that another kind of deception is also at play on the Monopoly board because in the real world, there is no such thing as “free” parking. The cost of parking is hidden in higher prices for everything else. In addition to the monetary cost, which is enormous, free parking imposes many other hidden costs on cities, the economy, and the environment.

Why is most parking free to the driver? When only the rich owned cars at the beginning of the twentieth century, motorists simply parked their new cars at the curb where they had formerly tethered their horses and carriages. But when car ownership grew rapidly during the 1910s and 1920s, the parking problem developed. Curb parking remained free (the parking meter was not invented until 1935), but there were no longer enough spaces for everyone to park whenever and wherever they wanted. Drivers circled in vain looking for a vacant curb space, and their cars congested traffic. In the 1930s, cities began to require off-street

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parking in their zoning ordinances to deal with the parking shortage, and the results were miraculous. One delighted mayor reported:

We consider zoning for parking our greatest advance.... It is working out exceptionally well, far better than we had expected. In brief, it calls for all new buildings to make a provision for parking space required for its own uses.²

This sounds like a good idea. In one sense, it *was* a good idea. Requiring all new buildings to provide ample on-site parking did solve one problem—the shortage of free curbside parking—but the solution soon created new problems. Urban planners began to assume that most people would travel everywhere by car, park on-site while they worked, shopped, or dined, and then drive on to their next destination. Cities began to require each site to provide its own parking lot big enough to satisfy the expected peak demand for free parking, and most commercial buildings are now required to provide a parking lot bigger than the building itself. The required parking lot at a restaurant, for example, usually occupies at least three times as much land as the restaurant itself. Off-street parking requirements encourage everyone to drive wherever they go because they know they can usually park free when they get there: 87 percent of all trips in the U.S. are now made by personal motor vehicles, and only 1.5 percent by public transit.³

If drivers don't pay for parking, who does? Everyone does, even if they don't drive. Initially the developer pays for the required parking, but soon the tenants do, and then their customers, and so on, until the cost of parking has diffused everywhere in the economy. When we shop in a store, eat in a restaurant, or see a movie, we pay for parking indirectly because its cost is included in the prices of merchandise, meals, and theater tickets. We unknowingly support our cars with almost every commercial transaction we make because a small share of the money changing hands pays for parking. Residents pay for parking through higher prices for housing. Businesses pay for parking through higher rents for their premises. Shoppers pay for parking through higher prices for everything they buy. We don't pay for parking in our role as motorists, but in all our other roles—as consumers, investors, workers, residents, and taxpayers—we pay a high price. Even people who don't own a car have to pay for “free” parking.

Off-street parking requirements collectivize the cost of parking because they allow everyone to park free at everyone else's expense. When the cost of parking is hidden in the prices of other goods and services, no one can pay less for parking by using less of it. Bundling the cost of parking into higher prices for everything else skews travel choices toward cars

and away from public transit, cycling, and walking. Off-street parking requirements thus change the way we build our cities, the way we travel, and how much energy we consume. All the required parking spaces use up land, spread the city out, and increase travel distances. Free parking also reduces the price of driving wherever we want to go, so the increased travel distances combined with the reduced price of driving make cars the obvious choice for most trips. Because highway transportation accounts for half of U.S. oil consumption, which is a quarter of the world's oil production, American motor vehicles now consume one-eighth of the world's oil. Free parking helps to explain this extreme automobile dependence, rapid urban sprawl, and extravagant energy use.⁴

Parking affects both transportation and land use, but its effects are often overlooked or misunderstood. Many people see urban problems—congestion, pollution, decay, and sprawl—but even the most ferocious critics of cars often fail to connect these problems with parking policies. Consider the apocalyptic titles of these jeremiads against the car: *Autokind vs. Mankind*, *Car Mania*, *Dead End*, *The Pavers and the Paved*, and *Road to Ruin*.⁵ Off-street parking requirements contribute to the automobile-and-asphalt dominance the authors criticize, but none of the books even mentions parking. Parking is a blind spot in most studies of automobile transportation. Whether polemical or analytical, most books about cars and cities ignore the role that parking plays in both transportation and land use.

Journalists occasionally write about parking, usually with a critical tone. Here is *New York Times* columnist David Brooks's description of a shopper's trip to the mall in suburban Sprinkler City:

He steps out into the parking lot and is momentarily blinded by sun bouncing off the hardtop. The parking lot is so massive that he can barely see the Wal-Mart, the Bed Bath & Beyond, or the area-code-sized Old Navy glistening through the heat there on the other side. This mall is...so vast that shoppers have to drive from store to store, cutting diagonally through the infinity of empty parking spaces in between...there are archipelagoes of them—one massive parking lot after another surrounded by huge boxes that often have racing stripes around the middle to break the monotony of the windowless exterior walls.⁶

Brooks describes a scene that is all too real, and many people concerned about sprawl decry the expanses of land used by big-box retail. But few people realize that cities *require* the developers of these "dark Satanic malls" to provide the massive parking lots that remain nearly empty much of the time.⁷

Because I want to call attention to our mistaken parking policies, I toyed with alarmist titles like *Aparkalypse Now* or *Parkageddon*. I eventually settled on the more sober *The High Cost of Free Parking* because this oxymoron captures the conflict between free parking and its hidden cost. In this book I show that “free” parking distorts transportation choices, debases urban design, damages the economy, and degrades the environment. I argue that American cities have made devastating mistakes with their parking policies, and I propose reforms designed to undo the damage caused by nearly a century of bad planning.

THE CAR EXPLOSION

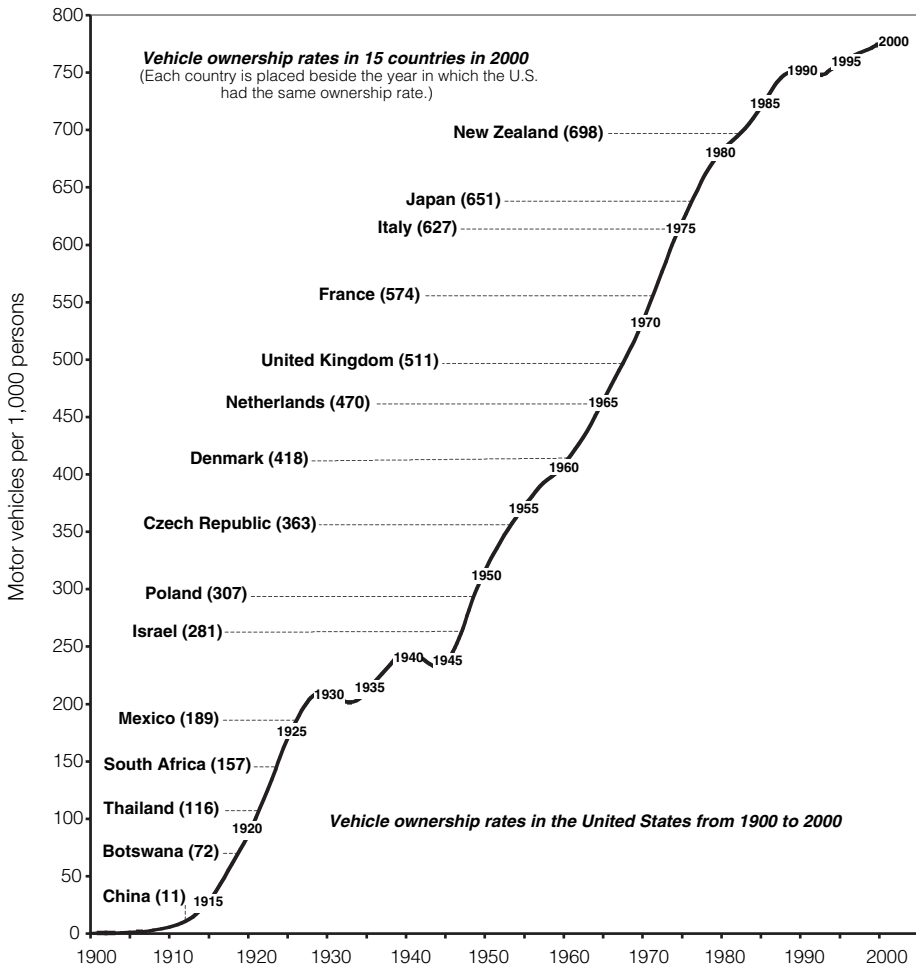
Coming to grips with the parking problem is essential because the rest of the world is poised to repeat America’s mistakes. America adopted the car much faster and to a far greater extent than other nations, and many factors help to explain this phenomenon—abundant land, rapid population growth, low fuel prices, and high incomes, among others. Abundant free parking also contributes to our high demand for cars because it greatly reduces the cost of car ownership. And because we own so many cars, we need lots of land to park them. We can speculate about the amount of land the whole world will need for parking if other nations ever acquire as many cars as Americans owned at the end of the twentieth century.

The first American gasoline car was sold in February 1896.⁸ By 2000, Americans owned 771 motor vehicles per 1,000 persons. Figure 1-1 shows the U.S. vehicle-ownership rates (motor vehicles per 1,000 persons) from 1900 to 2000. Apart from dips during the Depression, World War II, and the early 1990s, ownership rose rapidly. Fifteen other nations’ vehicle-ownership rates in 2000 are placed in the graph beside the year in which the U.S. had the same rate. In 2000, France had the same vehicle-ownership rate as the U.S. in 1972, Denmark the same as the U.S. in 1961, and China the same as the U.S. in 1912.⁹

China is now the world’s fourth-largest market for new cars (after the U.S., Japan, and Germany), but the U.S. still *added* more than twice as many vehicles during the 1990s (29 million) as China owned in 2000 (13 million). Other nations are, however, gaining on the U.S. Since 1950 the vehicle population has grown more than twice as fast outside the U.S. as inside (see Figure 1-2).¹⁰ And yet, taken together, in 2000 the world outside the U.S. owned only 89 vehicles per 1,000 persons—the U.S. rate in 1920. But just as the U.S. vehicle-ownership rate doubled in the five years after 1920, rapid growth may also occur soon in other countries.

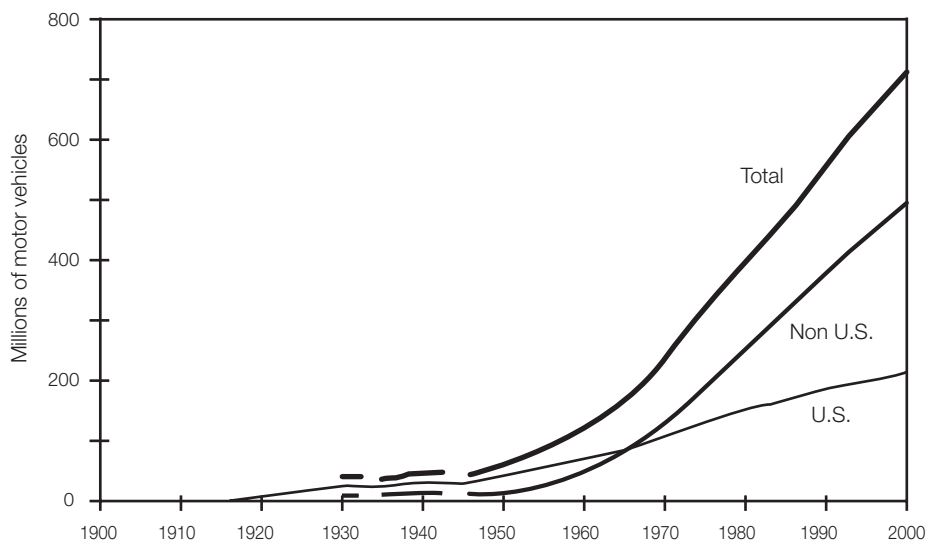
The 6.1 billion people on earth in 2000 owned 735 million vehicles. Imagine what would happen if all the countries on earth ever achieve the

Figure 1-1. Vehicle Ownership Rates: The United States from 1900 to 2000 and 15 Other Countries in 2000 (Motor vehicles per 1,000 persons)



Source: Tables H-1 and H-2 in Appendix H.

same vehicle-ownership rate as the U.S. in 2000: there would be 4.7 billion vehicles even if the human population does not increase.¹¹ A parking lot big enough to hold 4.7 billion cars would occupy an area about the size of England or Greece.¹² If there are four parking spaces per car (one at home, and three more at other destinations), 4.7 billion cars would require 19 billion parking spaces, which amounts to a parking lot about the size of France or Spain.¹³ More cars would also require more land for roads, gas stations, used car dealers, automobile graveyards, and tire dumps.

Figure 1-2. Number of Motor Vehicles on Earth

Source: Table H-1 in Appendix H.

If the past trends in vehicle ownership continue, the world will have more than 4.7 billion cars well before the end of the twenty-first century. Even if the vehicle population grows by only 2 percent a year, it will increase from 735 million in 2000 to 5 billion in 2100. Can the world supply all the fuel needed to power 5 billion cars? Will humans be able to breathe the fumes coming out of 5 billion exhaust pipes? And where will 5 billion cars park?

These questions are not meant to sound alarmist. A simple projection is often a poor forecast because technology and policy can change. For example, horse-drawn carriages befouled cities a century ago. In New York City in 1900, horses deposited 2.5 million pounds of manure on the streets every day.¹⁴ Projected growth in transportation demand made a public health disaster seem inevitable, but then the horseless carriage solved that problem. Now, horseless carriages create their own problems, but new solutions will arrive. Improved technology will increase fuel efficiency and reduce pollution emissions, but technology alone is unlikely to solve the parking problem. Regardless of how fuel efficient our cars are or how little pollution they emit, we will always need somewhere to park them, and the average car spends about 95 percent of its life parked.¹⁵

This book proposes new policies to solve our parking problems. After all, we don't want to see France or Spain paved for a parking lot. Before proposing any solutions, however, I will first explain what I believe creates most parking problems: *the treatment of curb parking as a commons*.

THE “COMMONS” PROBLEM

Free curb parking presents a classic “commons” problem. Land that belongs to the community, and is freely available to everyone without charge, is called a commons. City life requires common ownership of much land (such as streets, sidewalks, and parks), but the neglect and mismanagement of common property can create serious problems. Aristotle observed:

What is common to the greatest number has the least care bestowed upon it. Every one thinks chiefly of his own, hardly at all of the common interest.¹⁶

The archetypical commons problem occurs on village land that is freely available to all members of a community for grazing their animals. This open-access arrangement works well in a small community with plenty of grass to go around. But when the community grows, so does the number of animals, and eventually, although it may take a while to notice it, the land is overrun and overgrazed. Harvard economist Thomas Schelling describes the problem:

The commons has come to serve as a paradigm for situations in which people so impinge on each other in pursuing their own interests that collectively they might be better off if they could be restrained, but no one gains individually by self-restraint. Common pasture in a village of England or Colonial New England was not only common property of the villagers but unrestrictedly available to their animals. The more cattle (or sheep or whatever) that were put to graze on the common, the less forage there was for each animal—and more of it got trampled—but as long as there was any profit in grazing one’s animal on the common, villagers were motivated to do so.¹⁷

Free curb parking is an asphalt commons: just as cattle compete in their search for scarce grass, drivers compete in their search for scarce curb parking spaces. Drivers waste time and fuel, congest traffic, and pollute the air while cruising for curb parking, and after finding a space they have no incentive to economize on how long they park.

Where many people want to use a scarce public resource, self-restraint does not produce any individual reward. Free curb parking thus presents the perfect commons problem—no one owns it, and everyone can use it. In his famous essay on the “tragedy of the commons,” Garrett Hardin used curb parking to illustrate the problem he was describing:

During the Christmas shopping season the parking meters downtown were covered with plastic bags that bore tags reading: “Do not open until after Christmas. Free parking courtesy of the mayor and city council.” In other

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words, facing the prospect of an increased demand for already scarce space, the city fathers reinstated the system of the commons.¹⁸

Some cities continue to gift wrap their parking meters in December, and they give motorists a commons problem for Christmas. Although voters may thank their mayor and city council for free parking at the time of peak demand, vacant spaces become even harder to find. Drivers circle the block searching for a curb space, and when they find one they occupy it longer than they would if they paid to park. What makes sense for an individual driver is bad for the community as a whole.

Although urban planners have not ignored the commons problem created by free curb parking, they have misdiagnosed it. Planners have identified the source of the problem not as the city's failure to charge market prices for curb parking, but as the market's failure to supply enough off-street parking. Cities therefore require ample on-site parking for all new buildings. The logic behind this policy is simple: development may increase the demand for parking, but cities can require developers to provide enough on-site spaces to satisfy this new demand. If a new building increases the demand for parking by 100 spaces, for example, cities can require it to provide 100 new spaces so that competition for the scarce curb parking doesn't increase. Curb parking remains a commons, and cities require enough off-street parking to satisfy the increased demand.

A major flaw in this solution, however, is the way planners estimate demand: they do not estimate it as a function of price. Instead, they make the unstated (perhaps even unconscious) assumption that all parking is free. They estimate the demand for *free* parking and then require enough spaces to meet this demand. In effect, urban planners treat free parking as an entitlement, and they consider the resulting demand for free parking a "need" that must be met. Off-street parking requirements create an abundance of parking spaces, driving the market price of parking to zero, which explains why drivers can park free for 99 percent of their trips. Off-street parking requirements are a fertility drug for cars.

Most markets depend on prices to allocate resources—so much so that it's hard to imagine they could operate in any other way. Nevertheless, cities have tried to manage parking almost entirely without prices. To see the absurdity of this policy, look at it from a new perspective. Cities require off-street parking because the market supposedly fails to provide enough of it. But the market fails to provide many things at a price everyone can afford. For instance, it fails to provide affordable housing for many families. Advocates for affordable housing usually find themselves in an uphill battle, but without a second thought cities have imposed requirements to ensure affordable parking. Rather than charge fair-mar-

ket prices for on-street parking, cities insist on ample off-street parking for every land use. As a result, most of us drive almost everywhere we go.

SKEWED TRAVEL CHOICES

Every transport system has three elements: vehicles, rights-of-way, and terminal capacity. Rail transport, for example, has trains, tracks, and stations. Sea transport has ships, oceans, and seaports. Air transport has planes, the sky, and airports. Automobile transport has cars, roads, and parking spaces. Two aspects of its terminal capacity set automobile transport apart from all other transport systems. First, automobile transport requires enormous terminal capacity—it is land-hungry—because there are so many cars and several parking spaces for each one. Second, motorists park free for 99 percent of their trips because off-street parking requirements remove the cost of automobile terminal capacity from the transport sector and shift it everywhere else in the economy. Free parking helps explain the enormous demand for automobile terminal capacity. By shifting the cost of parking from drivers to everyone else, off-street parking requirements provide a huge subsidy to motorists, and thus increase the demand for cars, parking spaces, and vehicle travel.

For a typical trip *to* work, the cost of parking *at* work (if drivers pay for it) is over half the total out-of-pocket cost of automobile commuting.¹⁹ But most drivers do *not* pay for parking, or at least not in their role as drivers. Because a cost-recovery price for parking is such a large share of the total cost of automobile travel, “free” parking seriously skews travel choices toward solo driving and away from other forms of travel that require less terminal capacity: public transit, carpooling, bicycling, and—the extreme case—walking, which requires shoes and sidewalks, but no terminal capacity at all. Free parking gives the largest subsidy per mile to the shortest vehicle trips—the ones that, without a parking subsidy, we would most likely make by walking, cycling, or public transport. Free parking is an invitation to drive wherever we go.

CURES THAT KILL

Most people know that cities require off-street parking spaces for every building, but few people—even those in the planning profession—have examined how these requirements affect cities. To see how parking requirements harm cities, consider how a popular medical practice once poisoned millions of patients.

An Analogy: Lead Poisoning

From antiquity until the twentieth century, physicians prescribed lead as medicine to treat all manner of ailments. One eighteenth-century medical treatise stated:

When the reader has perused the following treatise he will be inclined to think that this metal [lead] is one of the most efficacious remedies for the cure of most diseases which require the assistance of surgery.²⁰

Doctors recommended “lead therapy” as a cure for abscesses, burns, cancer, contusions, gout, gunshot wounds, inflammation, itch, piles, rheumatism, ruptures, sprains, stiffness of the joints, and ulcers. Lead was useful in treating some of these ailments because it is toxic to microorganisms and therefore has local antiseptic properties. But physicians did not understand that lead is toxic to humans, and the medical misuse of lead killed many patients.²¹ Although lead poisoning—a byproduct of lead therapy—went largely unnoticed until the late nineteenth century, a few early critics, like Benjamin Franklin, recognized the harm. Because he was a printer, Franklin had much contact with lead, and he wrote to a friend in 1786:

The Opinion of this mischievous Effect from Lead is at least above Sixty Years old; and you will observe with Concern how long a useful Truth may be known, and exist, before it is generally receiv’d and practis’d on.²²

Despite Franklin’s warning, physicians continued to prescribe lead as a medicine until the twentieth century. They did so for understandable reasons: when the medical problem went away, the success could easily be attributed to lead therapy. But when the treatment did not work, or—worse—when it slowly killed the patient, the precise cause was less apparent; the patient was sick to begin with, and any number of factors could have been at play. The lead therapy sometimes produced a local antiseptic benefit and did help to cure one medical problem, but often did so at a high cost to the whole person.²³

Off-street parking requirements are similar. They produce a local benefit—ample free parking—while harming the whole city. Free parking increases the demand for cars, and more cars increase traffic congestion, air pollution, and energy consumption. More traffic congestion in turn spurs the search for more local remedies, such as street widenings, more freeways, and even higher parking requirements. Off-street parking requirements quietly create citywide problems that are far worse than the local ones they are meant to solve.

Although parking requirements resemble lead therapy in producing a local benefit while harming the whole system, the comparison goes only so far. Lead poisoning kills people, after all, and parking requirements do not. But this should not cheer us. Physicians continued to recommend lead as medicine until the twentieth century, even as their patients regularly died from the treatment. If physicians were so slow to recognize the evidence of lead therapy's lethal effects, planners may take even longer to recognize the more subtle systemic harm from parking requirements, no matter how strong the evidence.

Lead therapy and parking requirements are not the only professional practices that evolved into conventional wisdom without good theory or careful research. Medical practice was astonishingly primitive as recently as a century ago. Writing in 1981, Lewis Thomas (Chancellor of the Memorial Sloan-Kettering Cancer Center in New York) described a leading medical text that was published in 1896. The book presents a picture of medical practice *circa* 1900 that eerily resembles planning for parking today. Here is Thomas's dismaying description of the book:

The public expectation then, as now, was that the doctor would *do something*. There was no disease for which a treatment was not recommended.... Every other page contains a new, complex treatment always recommended with the admonition that the procedure be learned by rote (since it rarely made any intrinsic sense) and be performed precisely as described. Acute poliomyelitis had to be treated by subcutaneous injections of strychnine; the application of leeches; the administration of belladonna and purgative doses of mercury; the layering of thick ointments containing mercury and iodine over the affected limbs; faradic stimulation of the muscles; ice-cold shower baths over the spine; and cupping [bleeding].... All of this has the appearance of institutionalized folly, the piecing together of a huge structure of nonsensical and dangerous therapy, and indeed it was. The pieces were thought up and put together almost like thin air, but perhaps not quite. Empiricism made a small contribution, just enough in the case of each to launch it into fashion.²⁴

This description of precise, disciplined folly bears a depressing similarity to contemporary parking policy. Every land use has a parking requirement that is learned by rote. A gas station must provide 1.5 parking spaces per fuel nozzle, and a mausoleum must provide 10 parking spaces per maximum number of interments in a one-hour period.²⁵ Why? Nobody knows. The requirements rarely make any intrinsic sense, but parking spaces must be provided exactly as required. Empiricism makes a small contribution, just enough in the case of each requirement to launch it into the zoning code. Medicine is a much older profession than urban plan-

ning, and perhaps planning for parking is at the same stage of intellectual development that medicine was in 1900. Planners are under tremendous pressure to *do something* about parking, and, just as doctors did a century ago, they have erected “a huge structure of nonsensical and dangerous therapy” in response. Off-street parking requirements do not solve transportation problems, but make them worse.

Poleodomogenic Catastrophes

Parking requirements are now firmly entrenched in planning practice, but experience suggests that future planners may regret them. Urban planners of the 1950s and 1960s hurled themselves into implementing some truly bad ideas. High-rise public housing projects were once state-of-the-art, but many cities have since demolished them. Urban renewal (which Jane Jacobs compared to bloodletting) was once the best hope of downtowns, but most cities have now abandoned it in favor of historic preservation. Similarly, some cities have shifted from minimum parking requirements to parking caps, and other cities may follow. We do eventually recognize our mistakes, and we may some day condemn off-street parking requirements just as we now condemn the urban renewal disasters of the twentieth century.²⁶

The problems caused by parking requirements resemble iatrogenic illnesses in medicine. *Iatrogenic* illness (illness caused by a physician) is a combination of the Greek *iatros* (physician) + *genic* (generated). Medical history is filled with iatrogenic illnesses, including lead poisoning. Catastrophes caused by city planners can be called *poleodomogenic*, a combination of the Greek *poleodimos* (city planner) + *genic*. Poleodomogenic catastrophes like slum clearance and urban renewal happen because city planners sometimes mistake Pandora’s box for a toolkit. In *The Reflective Practitioner: How Professionals Think in Action*, MIT planning professor Donald Schön described:

the counterintuitive consequences, the harmful side effects, and the unwanted by-products of implemented plans. Plans designed to solve problems either failed to solve them or created problems worse than the problems they had been designed to solve.²⁷

This lament about planning resembles what Lewis Thomas said about medicine:

The tendency in medicine to try something, anything, to “try it out,” persists. Perhaps the profession will outgrow its vulnerability to fads and fancies as the scientific base for diagnosis and treatment steadily matures, but the long record of well-intentioned folly is both an embarrassment and a warning.²⁸

I believe planners will eventually admit that off-street parking requirements are a well-intentioned folly similar to lead therapy—a poison prescribed as a cure. Parking is desirable in most locations, but you can have too much of a good thing. The principle that “the dose makes the poison” applies perfectly to parking.²⁹ By prescribing massive overdoses of parking spaces, planners are poisoning the city. This sounds harsh, but it is a criticism of current practice, not of individual planners. Physicians who prescribed lead therapy were following the professional doctrine of their time, just as planners who require massive overdoses of parking are following the professional doctrine of our time. Planning for parking has caused severe adverse reactions, and if a policy is judged by its consequences, off-street parking requirements are a catastrophe. I hope the analogy with lead poisoning will provoke those who advocate parking requirements to explain their reasoning and defend their methods, but reform of even the worst practice can be a slow process (as Ben Franklin predicted), and parking requirements are unlikely to be an exception.

Professionally induced disasters are not unique to urban planning and medicine, of course. Before the *Titanic* sank, shipbuilders underestimated the need for lifeboats. Before the *Challenger* exploded, engineers underestimated the ambient temperature necessary for safely launching the space shuttle, and before the *Columbia* burned up, they underestimated the damage caused by shreds of foam striking the shuttle’s wings. Sometimes dramatic disasters like these must occur to stimulate reforms in a profession, but—like lead poisoning—the harmful consequences of parking requirements are insidious. Nevertheless, they confront us everywhere: automobile dependency, traffic congestion, energy waste, air pollution, and perhaps even global climate change. Although not the sole cause of these problems, parking requirements intensify them.

THE TWENTY-FIRST CENTURY PARKING SOLUTION

If parking requirements do more harm than good, how should cities plan for parking in the twenty-first century? In this book I analyze the parking problem, criticize current planning practice, and propose reforms. To foreshadow my arguments, I will summarize the three main parts of the book. Parts I and II analyze the parking problem, while Part III proposes solutions.

Part I examines our current approach to planning for parking. Urban planners set minimum parking requirements for every land use, but the requirements often seem pulled out of thin air or based on studies that are poorly conceived (e.g., samples taken at times of peak demand at sites where parking is free) and limited (e.g. the typical sample size is statistically inadequate). In turn, these faulty standards and policies are



Stuart Cohen, Transportation and Land Use Coalition

Figure 1-3. Parking is desirable, but you can have too much of a good thing.

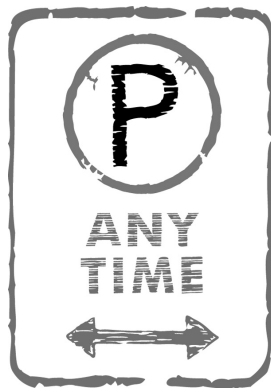
perpetuated as they are copied from one city to the next. The many significant costs related to current parking policies (e.g., increased housing prices, unjust subsidies for cars, distorted transportation choices, sprawl, social inequity, and economic and environmental degradation) are not a consideration. Beyond their quantitative flaws, parking requirements are also divorced from any qualitative criteria: they ignore what the results *look like*.

Part II shows that cities inadvertently create the economic incentive to cruise for curb parking when they charge too low a price for it. Research at six sites showed that an average of 30 percent of the cars in congested traffic were cruising for parking. Cruising increases vehicle travel without adding either vehicles *or* real travel. The aggregate consequences of all this cruising—congested traffic, wasted time, squandered fuel, and polluted air—are staggering.

Part III offers new solutions to the parking problem. It explains how a well-functioning market with prices that vary by the time of day and day of the week can balance a variable demand for curb parking with the fixed supply of curb spaces. If cities charge market prices for curb parking, drivers will usually be able to find an available space near their des-

tinuation. Market-priced curb parking will therefore save time, reduce congestion, conserve energy, improve air quality, and produce public revenue. The real barrier to charging for curb parking is political, not technological. I argue that cities can overcome this political barrier by returning all meter revenue to the neighborhoods that generate it. Where nonresidents pay for most curb parking, using the revenue to pay for neighborhood public services can persuade residents to support charging market prices for their curb parking spaces. And if cities charge market prices for curb parking, spillover will no longer be a problem, so they can remove their off-street parking requirements. These three reforms—charge fair-market prices for curb parking, return the resulting revenue to the neighborhoods that generate it, and remove the zoning requirements for off-street parking—can align our individual incentives with our collective interests and produce enormous benefits at almost no cost. All these benefits will result from subsidizing people and places, not parking and cars.

In sum, this book offers not just a critique of free parking, but it also suggests how planners can frame an argument—economic, social, environmental, and aesthetic—about new ways to plan for parking that are sensible, effective, and fair.



CHAPTER 1 NOTES

1. The 1990 Nationwide Personal Transportation Survey asked respondents, Did you pay for parking during any part of this trip? for all automobile trips made on the previous day (see Appendix B). Respondents reported that they parked free for 99 percent of their trips. Most drivers probably feel that they pay for parking on more than 1 percent of their own trips, and many do. Drivers who live in older and more compact cities undoubtedly pay for parking more frequently than do those who live in sprawling suburbs. Americans make 235 billion vehicle trips a year, so if they pay to park on 1 percent of these trips, they pay for parking more than 2 billion times a year, but they also park free 233 billion times a year.

2. Mogren and Smith (1952, 27).

3. The 2001 National Household Travel Survey found that 87 percent of trips of less than 50 miles were made by personal vehicle. Of the rest, 1.5 percent were by public transit, 1.7 percent by school bus, 8.6 percent by walking, and 1.7 percent by other modes (United States Department of Transportation 2003a, 21 and 25).

4. See Davis and Diegel (2002, Tables 1.4, 1.13, and 2.5) for the data on energy consumption for transportation in the U.S. The U.S. consumed 25.9 percent of total world oil consumption in 2001 (Table 1.4). Transportation accounted for 67.3 percent of U.S. oil consumption (Table 1.13), and road transportation accounted for 75.5 percent of U.S. oil consumption for transportation (Table 2.5). Therefore, U.S. road transportation accounted for 13.2 percent of world oil consumption ($25.9\% \times 67.3\% \times 75.5\%$). Road transportation refers to travel by cars, trucks, motorcycles, and buses. In 2001 the U.S. imported \$104 billion worth of petroleum, which accounted for 8 percent of total imports and 29 percent of the balance of trade deficit (U.S. Census Bureau 2002a, Exhibits 1, 6, and 9).

5. See Schneider (1971), Wolf (1996), Buel (1973), Kelly (1971), and Mowbray (1969). The word “parking” does not appear in the index of any of these books. Academic writers also fail to analyze how parking affects transportation and cities. Consider two recent texts by distinguished scholars of transportation and urban planning: *Essays in Transportation Economics and Policy* by Gómez-Ibáñez, Tye, and Winston (1999), and *Urban Land Use Planning* by Kaiser, Godschalk, and Chapin (1995); parking does not appear in the index of either of these books.

6. Brooks (2002, 19 and 24).

7. William Blake (1757-1827) was referring to an earlier land-use problem (smoky factories during the Industrial Revolution) when he asked “And was Jerusalem builded here/Among these dark Satanic mills?”

8. Flink (1976, 15) reports that Charles and Frank Duryea made the first sale.

9. Appendix H shows the data on human and vehicle populations from 1900 to 2000. The high rank of New Zealand in vehicle ownership can be explained by its low population density (a population of 4 million in a country 10 percent larger than the United Kingdom) and a large supply of second-hand cars from Japan; both Japan and New Zealand drive on the left, and Japan’s strict vehicle-inspection program strongly encourages the export of cars after only a few years.

10. The data for the total number of vehicles in the rest of world are available only in selected years before 1946 (1930, 1935, and 1937-1940). Although the U.S. owned half of all the world’s vehicles in 1965, it owned only 30 percent in 2000.

11. The 6.079 billion persons on earth in 2000 owned 735 million vehicles. If 6.079 billion persons owned 771 vehicles per 1,000 persons (the U.S. rate in 2000), they would own 4.7 billion vehicles—over six times the actual number of vehicles on earth in 2000.

12. Not all motor vehicles are cars, but vehicles other than cars—such as trucks—occupy even larger parking spaces, so estimating the space required to park 4.7 billion cars will

underestimate the space required to park 4.7 billion vehicles. A typical parking lot holds about 130 cars per acre (335 square feet per car); this is equivalent to 83,200 cars per square mile (130 cars per acre x 640 acres per square mile). At this density, 4.7 billion parked cars would occupy 56,000 square miles (4.7 billion cars ÷ 83,200 cars per square mile). England and Greece each occupy 51,000 square miles.

13. See Chapter 7 for the ratio of parking spaces to cars. The area of France is 212,000 square miles and the area of Spain is 192,000 square miles. Another way to imagine the area needed to park 4.7 billion cars is to look at a parking lot big enough to hold 100 cars. Forty-seven million of these 100-car lots would be needed to park 4.7 billion cars.

14. Flink (1976, 34).

15. Increases in fuel prices will spur increases in fuel efficiency, and increases in parking prices will spur increases in parking efficiency. Automated garages, for example, reduce the space needed for parking because they typically store twice as many cars in the same volume as a conventional garage (see Appendix A). Other changes, such as car-sharing arrangements, may also reduce the share of the time that cars are parked. See Appendix B for the average time a car is parked.

16. Aristotle (*Politics*, Book II, Chapter 3). A century earlier, the Athenian historian Thucydides made a similar observation: “[The Peloponnesians] spend a small fraction of [their time] considering any public matter and the greater part acting on domestic interests; each thinks that his own negligence does no harm and it is someone else’s business to use foresight on his behalf, so that when the same notion is entertained by everyone separately it goes unobserved that common interests are being destroyed collectively” (Thucydides, Book 1, Section 141, p. 69). Ronald Lipp (2001, 92) comments that the human tendency to neglect common interests is so fundamental that a literature search would find early statements of the problem in many cultures.

17. Schelling (1978, 111-113).

18. Hardin (1977, 21). Garrett Hardin was a professor of human ecology at the University of California at Santa Barbara and the author of many books and articles on biology, ecology, and ethics. Hardin (1977, 27) also used parking meters as an example of social arrangements that encourage responsible behavior: “To keep downtown shoppers temperate in their use of parking space we introduce parking meters for short periods, and traffic fines for longer ones. We need not actually forbid a citizen to park as long as he wants to; we need merely make it increasingly expensive for him to do so. Not prohibition, but carefully biased options are what we offer him.” Most parking meters, however, are in the central business district and curb parking is free almost everywhere else.

19. Chapter 7 shows that for a typical commute trip, the driver’s total variable cost of automobile commuting (operating cost plus parking cost) is \$2.32 a day if the employer pays for parking, but \$8.09 a day if the driver pays for it. Free parking at work therefore subsidizes 71 percent of the total variable cost of automobile commuting.

20. Goulard (1784, 2).

21. In her research on the medical history of lead, Jane Lin-Fu (1992) describes lead poisoning as the only preventable man-made disease that was allowed to remain pandemic for centuries.

22. Letter to Benjamin Vaughn on July 31, 1786. Reprinted in Goodman (1945, 556). Available online at www.ledizolv.com/LearnAbout/LeadHazards/benfranklin.asp. See also McCord (1953, 398). Lead was added to gasoline (and thus to urban air pollution) through most of the twentieth century, showing that Franklin was correct in warning about how long a useful truth may be known before it is acted on. Lead additives to gasoline improved automobile performance but polluted the air that drivers (and everyone else) breathed.

23. Lead was used for many purposes where its immediate benefits were appreciated but its long-term harm was unrecognized. The Romans wore lead oxide as a cosmetic, prepared food in lead pots, stored wine in lead vessels (lead tastes sweet, and improved the wine's flavor), and drank water delivered in lead pipes (the word "plumber" comes from the Latin word for lead, *plumbum*). Lead poisoning may even have contributed to the decline of the Roman Empire. University of Michigan environmental chemist Jerome Nriagu (1983) argues that the aristocrats' diets were unusually rich in lead, and that this helps explain why only one of Rome's original aristocratic families had any surviving members by the second century AD. Although many people must have died of lead poisoning throughout history, diagnosis is difficult long after their deaths. Nevertheless, the famous case of Ludwig von Beethoven's hair provides startling evidence. Beethoven suffered from many painful medical problems during his life: kidney stones, hepatitis, rheumatism, skin disorders, and deafness. When he died in 1827, admirers snipped locks of hair from his corpse and revered them as relics. Analysis of several strands of this hair in 1995 showed massive lead toxicity in Beethoven's body at his death, more than 40 times the normal presence of lead (Martin 2000, 235). Lead poisoning may have caused, or at least exacerbated, his many illnesses. The source of the lead in Beethoven's body is unknown, but it could have come from cookware or tableware that contained lead, from wine that was "plumbed" to lessen its bitterness, or from lead therapy.

24. Thomas (1981, 40). Lewis Thomas, M.D., served as dean of the New York University School of Medicine and president and chancellor of the Memorial Sloan-Kettering Cancer Center. When Thomas went to medical school in the 1930s, his father (also a physician) gave him the textbook (*Therapeutics of Infancy and Childhood*) with the advice that although the book was out of date, there were things in it that might be useful. When the younger Thomas looked through the book while he was a medical student, he found it bewildering and irrelevant to medicine in the 1930s, but as he grew older, the book fascinated him as a historical document that showed the state of the medical profession in 1900. The book's distinguished author (Dr. Abraham Jacobi) was one of the major figures of his time in academic medicine, and his popular textbook ran through several editions.

25. See Table 3-4 in Chapter 3.

26. Consider also these 180-degree turns in transportation planning. In the 1950s, many cities created one-way street systems to speed traffic through downtowns, and in the 1990s converted them back to two-way streets to calm traffic. Similarly, in the 1950s, many cities eliminated on-street parking in downtowns to speed traffic and provided off-street parking lots instead. In the 1990s, a common strategy was to redevelop off-street parking lots to increase downtown density and to restore on-street parking to calm the traffic flow and to buffer pedestrians from moving vehicles.

27. Schön (1983, 206). Similarly, Berkeley planning professor Michael Teitz (2000, 304) refers to "the disasters of public housing and urban renewal in the 1950s and 1960s.... It may be fair to say, however, that planners did learn from these errors."

28. Thomas (1981, 42). Similarly, Reyner Banham, Paul Barker, Peter Hall and Cedric Price (1969, 435-436) wrote, "planning tends to lurch from one fashion to another, with sudden revulsion setting in after equally sudden acceptance.... Planning is always in thrall to some outmoded rule of thumb."

29. The sixteenth century Swiss physician Paracelsus (1493-1541) wrote, "Dosis facit venenum" (The dose makes the poison). No substance is inherently poisonous, but too much of anything in the system can be poisonous.