We have seen that multiway boulevards are not inherently more dangerous than other major traffic-carrying streets, a conclusion that would hardly surprise Parisians or Barcelonians, or people who regularly travel along Eastern and Ocean Parkways in Brooklyn or The Esplanade in Chico. On the other hand, residents who live near the Grand Concourse in the Bronx, or drivers who use Queens Boulevard, might require a lot of convincing. And the professionals? How might they respond to analyses showing multiway boulevards to be no more dangerous than other major traffic-carrying streets? And what of the codified standards and norms of practice that largely control the design of roadways in the United States—standards that originate with the professionals?

We now return to one of our original questions: Can such boulevards be built today? Do today's standards and norms permit them? If the mayor and council of a U.S. city saw and liked a successful multiway boulevard in another city and concluded that the design would work well for one of their own streets, could they get it built? Would some of the positive attributes of the best boulevards be lost by following today's "rules of the road"? Even if it were not possible to build a street that exactly matched one of the model boulevards, could they build a *good* multiway boulevard?

## Street Standards and Their Impacts

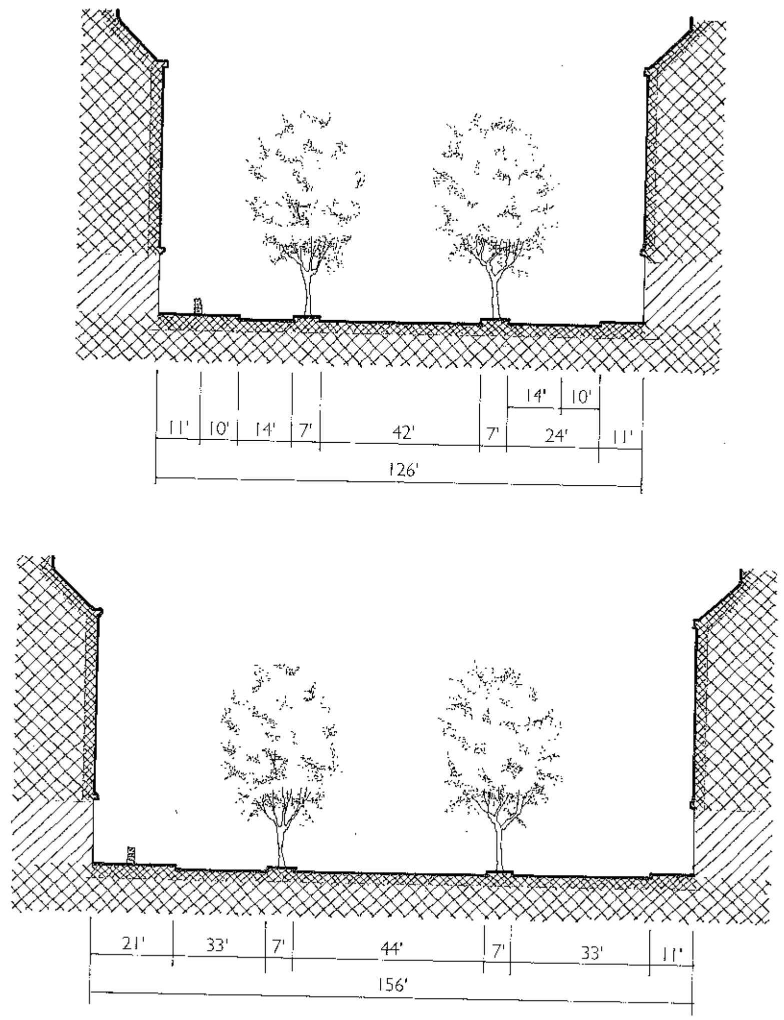
The answers to these question are not as easy to find as you might think. To start with, we have seen that boulevards do not fit neatly into the prevailing functional categorization of streets found in the various manuals of traffic engineering. So another question arises: Which standards or guidelines are most applicable to boulevards? The prominence of multiway boulevards in cities where they exist, their width and their high traffic volumes, makes it seem natural to classify them as arterial streets. At the same time, the unlimited access to abutting property and the local nature of movement on the side access lanes make them more like local streets. However, as transportation professionals tend to think of boulevards as arterials, we shall look mostly at standards for arterial streets.[1]

The more we observe and study multiway boulevards, the more apparent it becomes that no single standard or guideline, though it may be important, is necessarily critical to their ultimate success or failure. Many characteristics, when combined, account for the best boulevards. Standards, however, tend to deal with single elements—lane widths, for example, or intersection design—in isolation. Because of the complexity of multiway boulevards, it is necessary to look not only at the standards for individual elements but also to analyze their combined effect. Most important: standards for the various elements must be related to the roles they play in the overall street design. To simply say that it would not be possible to build Avenue Montaigne or another fine street today is not enough. We need a more detailed study of the way multiway boulevards work in order to understand the impacts of the prevailing standards and norms.



## Lane Width Standards and Norms

Avenue Montaigne has a total right-of-way of 126 feet. There are three lanes for through traffic, two access lanes, at least three and sometimes four parking lanes, sidewalks, and medians. If rebuilt to American *minimum* roadway standards with no changes in the widths of sidewalks and medians, the avenue would need a right-of-way of 145 feet. *Desirable* standards would require 156 feet.[2] Those increases come to 15 percent and 24 percent, respectively. The amount of space presently devoted to vehicles—70 feet of combined roadway (or 80 feet where the access lane widens to allow more parking)—would increase to 99 feet using minimum standards, or 110 feet using desirable standards. Yet widening lanes to American standards would do little to increase the carrying capacity of the boulevard because the




**Avenue Montaigne: existing and hypothetical sections**
Approximate scale: 1" = 50' or 1:600

center roadway would stay roughly the same; it would, however, encourage faster movement of cars on the access lanes where most of the increase in width would occur. Our observations of pedestrians' behavior on the access lanes of Avenue Montaigne has shown that they treat them as part of their realm and mingle freely with the cars. That is possible only if cars travel very slowly, which they do, in part because the access lanes are narrow. Moreover, on all the boulevards studied, pedestrians were observed crossing the access lanes to the median against a red light, so shortening the distance they had to cover to reach the other side of the street when the light changed. Widening the access lanes, and so allowing traffic to travel faster, would increase the danger to pedestrians making that crossing. The balance in the use of the street would shift from pedestrians' needs to those of drivers.

Clearly, required lane-width standards alone do not make boulevards impossible to design, though they might make them less safe. They also make it difficult to introduce boulevards where rights-of-way are limited. Using minimum standards, access lanes limited to one parking lane and one travel lane, and a center roadway limited to two through lanes in each direction, a boulevard could be built in a 124-foot right-of-way. Using so-called desirable standards and increasing the center roadway to three through lanes in each direction would expand the required right-of-way to 166 feet. In both cases, the pedestrian realm would be weakened by the wider access lanes, because they would allow traffic to move faster.

Applying desirable lane-width standards to the access roads on Ocean Parkway, which presently has two parking lanes and one moving lane, would result in a 36-foot wide roadway, instead of the 24-foot wide roadway that now exists. It is not hard to imagine how pedestrians and vehicles alike might alter their behavior.

Table 3.6
Comparison between U.S. Lane-Width Norms and Existing Lane-Widths on Avenue Montaigne

| | *American norms* | | | | *Existing* |
|---|---|---|---|---|---|
| | Design speed | | | | |
| | Under 40 mph | | Over 40 mph | | |
| Lane Width | Minimum | Desirable | Minimum | Desirable | Avenue Montaigne |
| Curb/parking | 11′ | 12′ | 11′ | 13′ | 6′–7′ in access lanes<br>10′ in center road |
| Curb travel | 11′ | 12′ | 11′ | 13′ | None<br>7′–9′ in access road |
| Inside lane | 10′ | 12′ | 11′ | 12′ | 10′ in center road |
| Turn lane | 10′ | 12′ | 11′ | 12′ | None |

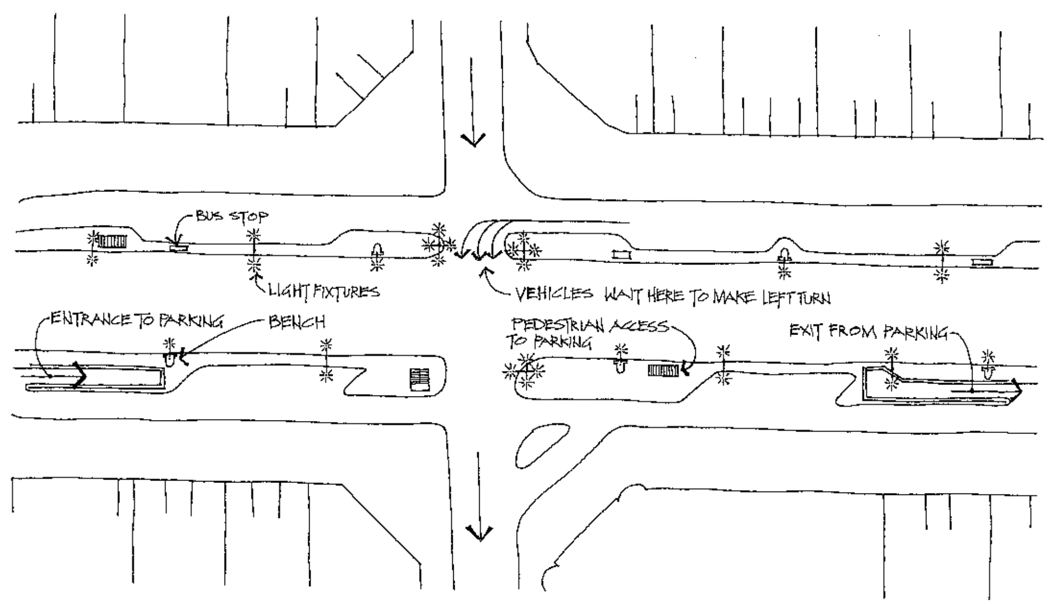
*Source: Guidelines for Urban Major Street Design: A Recommended Practice,* 1984.



## MEDIAN DESIGN

Applying the American recommended guidelines for the design of medians, a seemingly innocuous change, would seriously alter the Passeig de Gràcia, Avenue Montaigne, Ocean Parkway, and other fine boulevards. These guidelines address the questions of median widths and tree planting. The recommendation to limit the size of tree trunks to six inches in diameter would mean that most of the mature trees along the Passeig de Grácia, Avenue Montaigne, and Ocean Parkway would have to be replaced.[3] It is hard to imagine these streets without the large trees separating the various traffic lanes and providing shade for pedestrians in summer while creating a canopied drive for drivers. The logic of removing large trees because they may contribute to fixed-object accidents is questionable. Moreover, their presence along the medians helps create a physical and psychological barrier that enhances pedestrians' sense of being safe from the speeding cars in the center. Clearly, removing them would further weaken the pedestrian realm.

The basis of the median widths recommended in standard professional publications are geometric calculations related to the ways medians facilitate or hinder traffic movement. The only consideration for pedestrians is how medians might function as pedestrian refuges.[4] However, on Avenue Montaigne and the Passeig de Gràcia, as well as on other boulevards, we have observed a much wider array of functions for the medians—first and foremost as locations for transit stops, promenades, kiosks, and newsstands. As we noted, Avenue Montaigne's medians are approximately 7.5-feet wide. On Passeig de Gràcia, medians are between 6 and 22 feet wide and accommodate a host of things—including



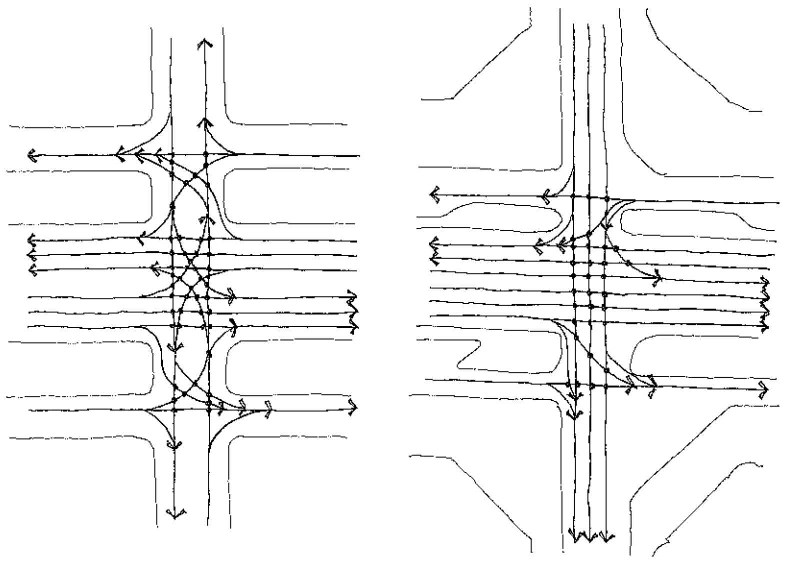

**The many functions of the medians on the Passeig de Gràcia**

benches, street lights, bus stops, and entrances to underground parking and the subway—which are on the wider portions of the medians. Near crosswalks at intersections the medians are widened, at the expense of a parking lane. This also provides a wider space for cars waiting to turn left from the access lanes.

## INTERSECTION DESIGN

The common presumption that intersections on multiway boulevards are necessarily dangerous was one of our reasons for pursuing the inquiries that led to this book. It is true that boulevard intersections have many more possible points of conflict—places where traffic crosses other traffic moving in a different direction—than intersections of normally configured two-way streets. The familiar intersection of two two-way streets each two lanes wide has 16 major points of conflict. An Ocean Parkway intersection, where all movements are allowed, has 50 conflict points. An intersection on Passeig de Gràcia, which has one-way cross streets, has 33 such points. Professional wisdom says that the number of possible conflicts should be kept to a minimum.[5] It is not at all clear, however, that having more conflict points actually causes more accidents. Ocean Parkway has one of the highest traffic volumes of all the boulevards we studied; yet, in spite of its many conflict points, it does not have a bad safety record.

Recommended principles for intersection design generally include favoring the heaviest and fastest traffic flow. On the Passeig de Gràcia the heaviest flow is of pedestrians: 3,304 per hour versus 1,808 cars. On the Avenue Montaigne the pedestrian flow is 1,328 people per hour, compared to 1,653 cars. We see, therefore, that the heaviest movement flow is not



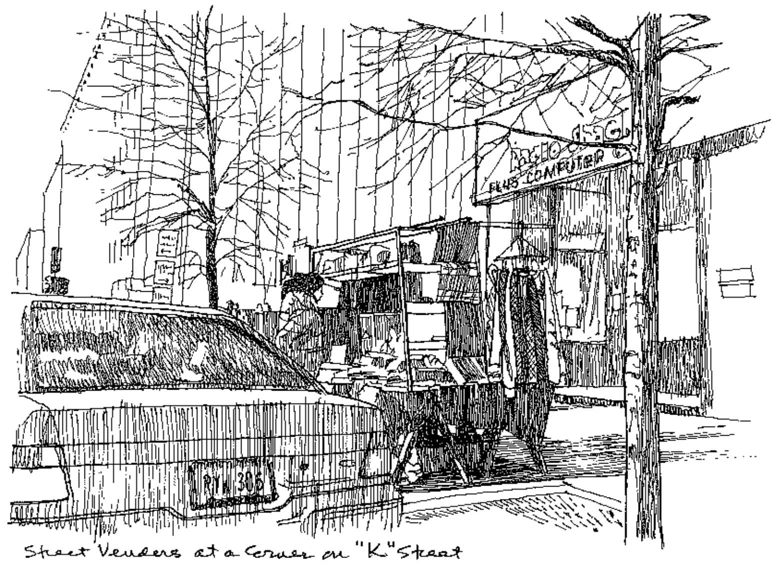
**Potential conflict points: Ocean Parkway and Passeig de Gràcia**



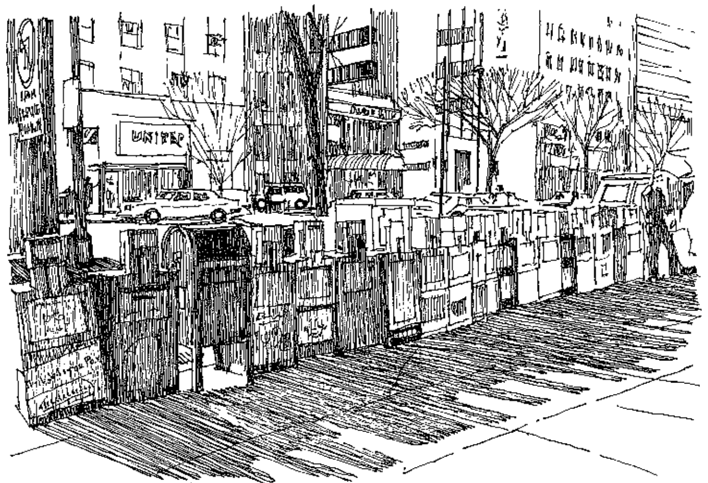
necessarily the fastest flow, and also that on some streets pedestrian flows are sizable. However, the principles of intersection design consider only vehicular traffic and do not take into account the existence of pedestrians and the possible ways that the two modes might interact. They assume the ideal of a single-function street and ignore the fact that in an urban area this ideal is probably neither attainable nor desirable. The Passeig de Gràcia and the Avenue Montaigne are prime examples of a very different approach to street planning, one in which pedestrians are recognized and welcomed and their needs are met.

The 1990 policy publication of the American Association of State Highway and Transportation Officials makes no distinction between major urban streets and expressways; they are both considered arterials. While the usefulness of frontage roads to facilitate access to adjoining property is acknowledged, that usefulness, according to the AASHTO, is overshadowed by the complexities they create at intersections. At intersections, the guide recommends a minimum separation of 150 feet between the right curb of the through lanes and the left curb of the frontage road.[6] Narrower separations (to a minimum of 8 feet) are acceptable, however, where frontage-road traffic is very light, where it is one-way only, or where some movements are prohibited at intersections. Thus, although one can still say that boulevards are possible under these norms, they are certainly not recommended or encouraged.

The Passeig de Gràcia and Avenue Montaigne employ two different solutions to the problem of boulevard intersection design. On the Passeig, the median width increases to 26 feet at intersections—providing room enough for cars wanting to turn left from the frontage roads to make a half-turn and wait for the light to change on the cross-street. They can then join the stream of cross traffic, either going straight to complete the left turn, or turning into the center lanes or the opposite frontage road to complete a U-turn. We have observed five or six cars waiting in this way without blocking the through movement on the access lane. This feature is aided by the one-way design of the cross streets, which enables cars to stack up across the whole width of the cross street. On Avenue Montaigne, the ac-



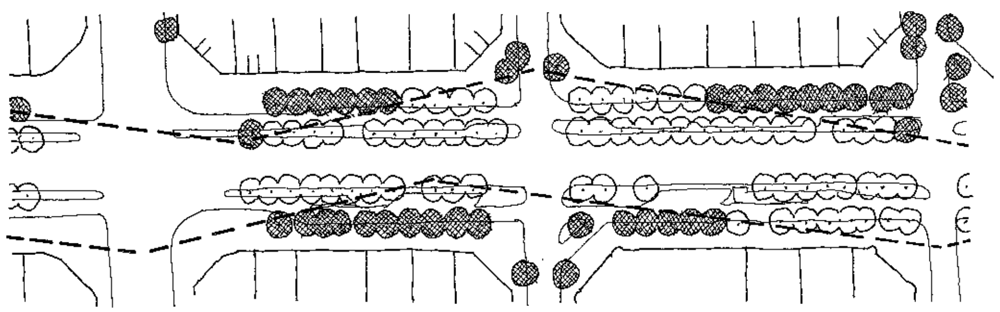
Street Vendors at a Corner on "K" Street



News vending boxes on "K" Street.

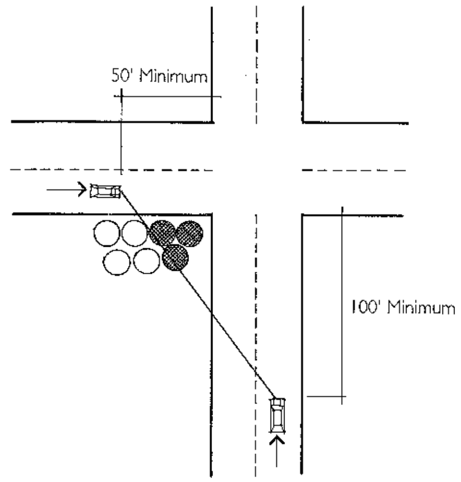
cess lanes are raised slightly, by a one- to two-inch curb, and they turn inward slightly, toward the center of the intersections. The result is that priority for all kinds of turning movements clearly belongs to the cars in the center lanes, and drivers turning from the frontage roads use caution, somewhat like drivers entering the street from a driveway.

During our observations, we encountered no situation in which trees seemed to create a problem for drivers at intersections. Many other structures—for example, bus shelters and kiosks—are more obtrusive, bulkier, and more likely to obstruct sight lines. Yet they must be located near intersections for functional reasons. Parked and waiting cars can block the view, too, but also serve as warnings to drivers on the main street to slow down. At many intersections, especially on American streets, newspaper delivery boxes placed side by side provide a much more formidable barrier to sight for a driver sitting low in a car—and for



**Effect of applying site distance norms to the Passeig de Gràcia**






**Site distances and tree removal**

pedestrians moving into an intersection—than a row of densely planted trees. And newspaper boxes have none of the redeeming functional and aesthetic value of trees. Moreover, tree trunks at intersections are never more intrusive than the large-diameter poles that carry traffic signals and other paraphernalia, which seem to be standard equipment at all intersections of any significance.

Practical experience notwithstanding, the clear sight distances for a typical boulevard recommended by prevailing standards and norms—assuming speeds of 40 miles per hour and six lanes of traffic—are 520 feet for a passenger car and 680 feet for a truck.[7] Application of these sight distances to the Passeig de Gràcia would be disastrous. Many, many trees would have to be felled. This would destroy the street. Boulevards are characterized by rows of trees that run uninterrupted to the intersections, making them the strongest element in the definition and memorability of the street. Yet many U.S. municipal standards we have seen recommend keeping trees back a fixed distance from intersections—as much as 40, 50 feet, or more.

Where, we ask ourselves, might such standards for sight distances and setback distances have come from? They seem to defy the findings of field experience, and yet they are frequently one of the textbook problems given to student engineers.[8] The basic assumption of such exercises is that auto safety is positively correlated to sight distances and inversely related to speed. That is, the greater the distance from which drivers approaching an intersection can see vehicles at the intersection, and the more slowly they are traveling toward it, the better opportunity they will have to spot possible dangers and avoid accidents by stopping. Fine so far. From this assumption, therefore, the problem for the student is: Assuming a given speed on the boulevard (40 miles per hour seems to be the magic number), how far back from the intersection should a tree be planted in order to achieve the desired safe-sight distance? A table of required stopping distances at various speeds may accompany the question, or a diagram showing offending and nonoffending trees, to make the same point. One can easily imagine finding such a problem on an examination, replete with variations comparing accident prevention at different speeds. These are the sorts of problems that students generally answer correctly, especially if they have been asked them on earlier exams; the tables and diagrams are easily remembered.

The problems with such exercises are apparent. Why the 40 miles per hour speed assumption? What if there is a traffic light or stop signs? Isn't it reasonable to expect that drivers on the side streets will stop? Perhaps most strange of all are the trees in the accompanying illustrations: they are drawn as large cylinders with wide-spreading branches coming all the way to the ground. They are visually totally impermeable—bizarre trees indeed! The diagrams (and the logic) forget that a tree is really no different than a post or a pole or any of the hundreds of other minor visual intrusions—including people—that are a part of normal life.

## Parking

The design guidelines for major urban streets cite a number of reasons for strongly discouraging parking: reduction in street capacity, inappropriate use of public space, accidents associated with parking or parked vehicles, obstruction of fire-fighting apparatus, and impaired sight lines.[9]

Parking on the access lanes, however, performs an essential function on Passeig de Gràcia and the Avenue Montaigne, as well as on the better U.S. multiway boulevards. Avenue Montaigne has one or two parallel parking lanes. The Passeig de Gràcia has a variety of parking configurations. The parked cars separate moving cars and pedestrians. Drivers looking for a place to park slow the traffic on the access lanes.

These boulevards have a reasonable, though not overwhelming, amount of parking. They are readily accessible by public transportation and taxis, which run on special reserved lanes of the central roadway, allowing them to move faster than private cars. The result is a balance between cars and pedestrians, private and public transportation, that is conducive to a lively and pleasant street.

## Standards, Norms, and the Pedestrian Realm of Boulevards

If we examine a cross section of Avenue Montaigne, we see that the area devoted to pedestrians on the sidewalks and the medians consists of 44 percent of the total width of the street. On Passeig de Gràcia, it is 50 percent of the total width of the street. The lane widths on these two boulevards are substandard by American norms, especially in the access lanes. On Avenue Montaigne, as we have seen, some access lanes are 24-feet wide. To accommodate the uses it does under desirable lane-width norms in the United States, Avenue Montaigne would have to be 30 feet wider. Most of the widening would occur on the access lanes, which would be expanded to 36 feet (an increase of 50 percent). If we consider how Avenue



Montaigne really works, with the side access lanes as part of an extended pedestrian realm stretching from the buildings to the outer edge of the medians, we see that 67 percent of the width of this boulevard is geared to a pedestrian scale and speed. If the access lanes were widened, or parking on them were limited, drivers could go faster and would tend to use them more. Access roadways would then cease to operate as an extended pedestrian realm and become more a part of the motorists' realm. If that happened, the medians would become less useful to pedestrians because they would be separated from the sidewalks by fast-moving traffic. The delineation of the pedestrian realm would be further weakened by the removal of trees near intersections, and of all large trees on the medians—in order to "improve" sight lines—or by the construction of breaks in the medians to reduce the number of turning movements at intersections. As a result of applying the various guidelines and requirements, the area of the street devoted to the pedestrian would drop from 67 percent of the total to 25 percent, completely disturbing the balance between pedestrian and vehicular movement and between local and through traffic.

It is apparent that while existing standards and roadway-design guidelines, as well as design practices, do not make building multiway boulevards completely out of the question, they do make it extremely difficult. Perhaps more important, creating streets like the very best of these boulevards—the Avenue Montaigne or the Passeig de Gràcia, or, in the United States, Ocean Parkway—becomes highly unlikely, well-nigh impossible. It must be noted that no single guideline actually does the damage on its own; it is their combined force that prevents us from designing and building good boulevards today. It is the pedestrian realm, the local-serving part of a multiway boulevard, that suffers the most from the application of prevailing standards.

But there is hope!

There is a somewhat discretionary character to the roadway-design standards found in the various professional handbooks and published guidelines, one that emerges in discussions with engineering professionals. Relatively few of the standards or guidelines are stated as *requirements.* They are *recommended* standards and guides. There are also fewer "thou shalt" admonitions in the state laws governing the design of highways and streets than you might expect. There may well be admonitions referring to the various published standards that make it near to impossible to attain federal or state funding for projects that do not conform to those standards. Yet a remarkable amount of discretion is left in the hands of local city engineers when it comes to building streets in their jurisdictions. Engineers may refer to a standard to justify doing something one way or rejecting another possibility, but in the end they have considerable design leeway, if they want to use it.

Today's ways of designing and building major roadways need not be tomorrow's way. The multiway boulevards in the United States and elsewhere, it is clear, deserve a second look. With that in mind, and based upon the research that constitutes the body of this book, it is appropriate to explore ways of redesigning existing boulevards that are not working well and designing new ones that meet the multiple needs of truly urban streets in urban communities. That is the subject matter of Part Five. First, however, we look at a large number of additional multiway boulevards from a wide variety of cities around the world.