From the Park to Parking: The Evolution of Suburban Mobility

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INTRODUCTION

Like suburbia itself, the literature on suburbia is at first glance an exhausting sprawl. Since two seminal books in 1980s—Kenneth Jackson's *Crabgrass Frontier* (1985) and Robert Fishman's *Bourgeoisie Utopias* (1987)—publishers have turned out several hundred volumes of suburban study, from the fire-and-brimstone damnation of James Howard Kunstler's *The Geography of Nowhere* (1994) to Robert Bruegmann's contrarian defense, *Sprawl: A Compact History* (2006).[1]

Architects and architectural historians have largely been absent from this literary cottage industry, preferring the richly familiar confines of the traditional city. Their exurban excursions (*Learning from Las Vegas*, most notably) have emphasized the extremes of vernacular over the quotidian.[2] The cultural, economic, social and technological bases of suburbia are well documented; its evolution as a designed physical environment much less so.

Design writers have indulged a handful of architect-designed prototype developments and visionary proposals, such as Frank Lloyd Wright's Broadacre City (1932) or Clarence Stein's Radburn, New Jersey (1928). Yet in the real suburbs, banality and repetition cannot be traced to a design philosophy, let alone an actual designer. Housing tracts, arterial roads and shopping centers seem less like places and more like commodities, standardized solutions crafted by anonymous consensus and dropped from the sky fully formed.

While its built environment homogenizes, suburbia's demographics have broadened. The edge city boom of the 80s and 90s pulled the civic center from downtown to "post-urban" constellations of highway interchanges, malls, and office parks. Americans of all ethnicities and economic classes have resettled outside the urban core in borderlands, bedroom communities, and exurbs.[3]

Today's suburbanites are kitchen workers renting a bunk bed in a crowded bungalow, empty-nest couples in vacant McMansions, and three-generation immigrant families crammed into modest townhouses. Suburbia, like the United States itself, no longer defines a single cultural, economic, or ethnic territory. Thus, the very definition of "suburban" relies more than ever on the built environment. We have not sufficiently examined the specificities of this environment, nor the processes by which cultural assumptions, professional practices and design responses created it.

WHO MADE THE SUBURBS?

This is especially true when it comes to that chariot of suburbanization: the car. The DNA of the car seems to be encoded for dispersion and expansion, so we have understood the Model T (1908) as suburbia's progenitor and the mass motorization of the postwar era its everlasting guarantor. Automotive and suburban expansion are now so culturally intertwined that we have forgotten their beginnings as unique forms of reaction to the industrialized city.

This is not to say that the codependency of car and suburb is in any doubt. Rather, it is to suggest that automobility and suburbanization enjoy a mutually supportive legend that has obscured and oversimplified the origins of the physical patterns that dominate 21st century America. This paper will attempt a first step toward excavating those origins by addressing the relationship between suburbs and cars at their meeting point: the street.

Street rights-of-way consume roughly one quarter of urban land. Given the vast amount of land they occupy in all environments—far more than buildings—it seems odd that we have invested so little time in examining streets. The particular use that interests me here, the suburban residential street, accounts for just 15 percent of total vehicle miles traveled yet makes up 80 percent of the national road stock.[4]

New Urbanist readings of history, and particularly the works of Andres Duany and his followers, direct the most blame for suburban streets and their shortcomings at modernist architects and planners. This charge has been widely repeated but is supported by little factual evidence.

Generally, it is true that urban-planning manifestoes produced in the 1930s and 40s by Le Corbusier, Josep Lluis Sert, and CIAM captured the imagination of many architects and planners. Their influence was indirect, however, and their application was severely limited by a lack of attention to practicalities.

Historian John Gold has argued that these interwar prototypes were "spare-time, low-budget" polemics better at proclaiming the death of the street than in detailing its successor. No less a modernist than Erno Goldfinger (the designer of London's Trellick Tower) noted that Le Corbusier's drawings were wonderful to look at but "they did not tell you how to build the houses and streets or where to dig the drains."[5] Further, the reliance upon large swathes of state-supplied towers in the park as a solution to the housing problem was directly at odds with the American preference for lassiez-faire capitalism, detached houses and decentralized government.

The modernist intent, however misguided and poorly applied, was to improve the urban core. The negative effects of mass motorization were painfully apparent by the mid-20th century. A frequent lamentation was that the motor vehicle, for all its brio and technical wonder, had sullied the town square with fumes, speed and noise. Many urban-design proposals, therefore, aimed to resolve the conflict between cars and the traditional city.

Some tried to save the city through massive parking-structure insertions like Paul Rudolph's 1963 Temple Street Garage in New Haven[6] or Louis Kahn's proposals for circular parking towers in Philadelphia. Others fantasized about structures with names like Motopia and Overstreet that cleverly stacked cars, people, and buildings in adjacent layers[7] or relocated traffic and other urban bodily functions outside a happily pedestrianized downtown.[8] Suburbs were merely the place from which the cars came, not a site for design intervention in itself.

While architects and planners indulged these urban fantasies—and most remained just that—city dwellers were not waiting for grand visions to materialize. They were voting with their feet (more accurately, their rubber tires) and flowing into suburbs that promised a yard, a driveway and a cheap mortgage. Developers and local bureaucrats were eager to accommodate this demand, which had been pent up during the war's rationing and material shortages, and carried on with the task of turning farm fields and forests at the city's edge into new subdivisions.

Their blueprints were not the proclamations of Corbu and CIAM. Far more influential were two technical bulletins on suggested subdivision designs published by the Federal Housing Administration in 1936 and 1938. Based on the work of Clarence Perry a decade earlier, these publications contained the genetic code of what we now know as "suburban": cul-de-sacs, curvilinear local-access streets, limited intersections, woodland buffers and boundary arterials.[9]

After 1938, the FHA's Land Planning Division reviewed individual subdivision plats and awarded conditional commitment to approved designs, which meant that developers could assure prospective buyers they would qualify for FHA-backed mortgages.[10] This was a powerful incentive for developers to hew closely to the FHA's published recommendations.

Another New Urbanist charge is that suburban streets are sized for the largest vehicle that might use them (the common 30-foot cul-de-sac radius is

said to represent the turning radius of the largest firefighting equipment).[11]

While fire departments certainly exercise influence in many local zoning and planning decisions, nothing in the professional handbooks I surveyed explicitly advises emergency-vehicle access as a design parameter. The American Association of State Highway and Transportation Officials' "Green Book" details the turning radii of various trucks and buses (not emergency vehicles) and does not recommend the dimensions be incorporated into residential areas.[12]

A best-practices guide of the early 1970s, *Residential Streets,* went out of its way to explain that newer fire equipment had smaller turning radii, and in any case, the scenario of a hook and ladder truck having to quickly reverse direction in a cul-de-sac was extremely unlikely. Similar explanations stressed that moving vans, snowplows, and garbage trucks were all capable of taking care of themselves without special design consideration.[13]

Denied the a conspiratorial axis of modernist designers and fire marshals as an easy answer to the shortcomings of suburban form, we must turn back to the history of its design as embodied in two seminal developments. They are important not so much for the influence they wielded on later practice but rather for the clarity of their ideas about nature and urban connectivity.

THE SUBURB AS RURAL REFUGE

Riverside, designed by Frederick Law Olmstead starting in 1868, is commonly credited as the first complete American suburb. It has little in common with today's subdivisions. Under towering trees (Olmstead planted 39,000) are sinuous carriage drives gently merging and splitting without sharp intersections, 700 acres of public grounds [fig. 1] and a lake for swimming, boating, and ice skating.[14]

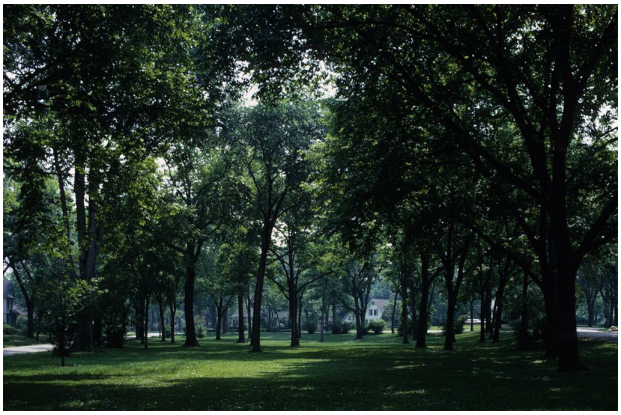

Figure 1. Common space, Riverside, Illinois.

On the flat prairie outside Chicago, Olmstead crafted a picturesque oasis inspired by Liverpool's Birkenhead Park and its surrounding villas, using the intricate terrain manipulations he had mastered while building Central and Prospect Parks in the previous decade.

Riverside also accommodated the evangelical culture that had intertwined with suburban development in the mid-19th century.[15] Riverside's residents joined a community of similar tastes and stature, ensconced within the morally superior environs of the country and free to celebrate "the grand fact that they are Christians, loving one another, and not Pagans, fearing one another."[16]

The Christian bonhomie took place 20 minutes by train from downtown Chicago. Olmstead thought the train "unsatisfactory," and pressed ahead with the second and, to him, more critical phase of the Riverside plan: a landscaped boulevard to Chicago.

The boulevard was to be 200 to 600 feet wide and lined with tasteful villas. In unrolling the natural splendor of Riverside to the city's doorstep, Olmstead would provide a connective amenity and further land for development. It was also a space for the important social custom of carriage drives, which filled the Sunday afternoons of the upper classes.[17] Carriage driving, unlike the more proletarian and scheduled confines of the railroad, was the mobile expression of wealth.

Olmstead understood the links between landscape, movement and social prestige. It was not just the size of the suburban lot or the design of the house that sat upon it that conveyed gentility, but the manner of arrival. Central Park, Riverside, and later Olmstead projects all used deployed narrow, curving ways as simulacra for rustic lanes, conjuring the illusion of country living. This use of streets to define a romantic landscape distinguishes Olmstead's vision of suburban life from the 20th-century mass-market versions [fig. 2].

Figure 2. Aerial view of Pikesville, Maryland. Sudbrook, designed by Frederick Law Olmstead immediately after Riverside, is in the upper-middle part of the image.

A 2004 study reiterated the importance of roads to the suburban pastoral. It documented the affection that residents of Bedford, New York, have for the town's dirt roads. Not only do the roads suggest a timeless rural landscape (in what is really a wealthy suburb of New York City), but the houses fronting them enjoy increased property values and social prestige. Dirt roads incur up to three times the maintenance costs of asphalt, but residents insist they be preserved. One resident even proposed expanding their reach by letting the town's paved roads deteriorate to barely passable. "If Bedford controls its roads it controls its habitat," he explained.[18]

THE SUBURB AS URBAN TECHNOLOGY

Shaker Heights, the Cleveland suburb developed by the Van Sweringen brothers between 1905 and 1933, controlled its habitat by controlling its streetcar line. Marketed strenuously to the upper-middle class, the houses' Tudor stylings were vetted by the developers themselves and encoded into design standards that specified even mortar colors. This mandated tastefulness was the outer wrapper on a state-of-the-art, preinstalled infrastructural array that included paved streets and stone sidewalks lit by electric lamps, storm and sanitary sewers, and underground lines supplying gas, electric, telephone, and water service.[19]

At the time, most developers built streets to minimal standards, sold lots and moved on. As a subdivision's number of homeowners increased, they would lobby the local government for infrastructure improvements and agree to pay recurring assessment fees in return. It might take decades for a neighborhood to become fully "modern."

The Van Sweringens' unusual investment in such a complete and expensive package of urban conveniences was risky, but effective. It mattered little that Shaker Heights' layout was nothing more than a warped gridiron saddled over an unimproved park, lacking any Olmsteadian pretense to picturesque surroundings [fig. 3]. The size and architectural quality of the houses, along with their unequalled infrastructural provisions, put the development in a class of its own.

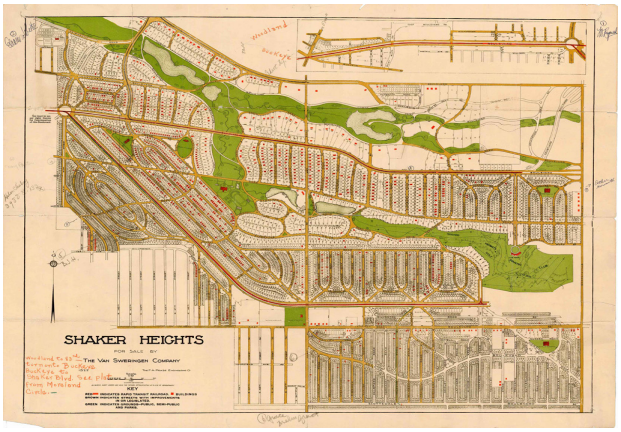

Figure 3. Plan of Shaker Heights, 1920s.

Shaker Heights' most important urban technology was its streetcar connection to downtown Cleveland. The first streetcar suburb of Brookline, Massachusetts, as well as the Van Sweringens' own early developments, had shown a direct link between transport access and profitability. When the Cleveland Electric Railway Company refused to extend service to Shaker Heights, the brothers built their own line, eventually going deep into debt to buy out the New York, Chicago & St. Louis Railroad to install a fast, dedicated route to a station underneath their Terminal Tower complex on Public Square.[20]

The gambit succeeded spectacularly. Housing sales in Shaker Heights boomed. But the express electric contained the seeds of its own demise. Delivery trucks carrying bread, coal and milk to households may have rumbled over Shaker Heights well-appointed streets, but upper-middle-class housewives wanting to run a quick errand sought more convenient alternatives to an eight-mile ride to downtown. Thus the Van Sweringens built Shaker Square, an early shopping center with drive-up access.[21] Living so far from the city, made possible

by fast connections to downtown, would inevitably demand the more complete mobility of the car.

THE DIMENSIONS OF HEALTH AND WEALTH

In the early 20th century the need to accommodate streetcars, trucks, and horsedrawn vehicles as well as rapidly increasing automobile usage (there were 122 million people and 23 million cars in America by 1929) created a pressing need for urban street space. American cities already had much wider streets than cities in Europe, part of a tradition stretching back to the 1683 plan for Philadelphia,[22] where broad thoroughfares were meant to prevent the conflagration, congestion and disease that had traumatized 17th-century Londoners like William Penn.[23]

In the 19th century, miasmatic theories blamed disease on poor ventilation and inadequate plumbing, and prescribed more light and air to kill bacteria and more parks to turn bad air good. By 1900, the modern, healthy city was one with low density, wide streets, and electric streetcar lines that enabled workers to leave crowded old neighborhoods for verdant suburbs.[24] City governments began to assume the costs of paving from abutting property owners. Broad, finished thoroughfares displayed municipal purpose and prosperity.

In the United States, the discourses of city planning and capitalism have never run too far apart. "The streets of nearly all large cities are too narrow, being crowded and dark. A more liberal policy in planning streets would probably be of pecuniary advantage, as wide streets usually give a high financial value to adjoining property," wrote Harwood Frost in his 1910 book, *The Art of Roadmaking*.

Frost recommended downtown streets and sidewalks should have a combined span of 100 to 140 feet, reduced to 60 to 80 feet in residential areas, but warned "it is not necessary, or even desirable, that the whole width be paved; the central portion may be paved, a strip on either side being reserved for grass plats. The width of the pavement should be adjusted to the amount of traffic."[25]

Six years later, Amory Prescott Folwell complained of "mile after mile of minor residence streets, built to a standard of 60 feet total width with 36-foot roadway, where an 18, or at most a 22-foot roadway would be ample."[26] The wide street, the defender of light, air, and movement in the crowded city, had relocated from city to suburb along with the metropolitan managerial class.

Frost's and Folwell's complaints were of costs, both to build and maintain the extra road surface and to install storm sewers for increased runoff. The argument was repeated ninety years later in the third edition of *Residential Streets*, which recommended residential roadways 18 to 26 feet wide.[27] It printed a table showing that a 24-foot roadway would save a local government $12,000 per 100 feet versus a 36-foot pavement.

For most planners and engineers in the intervening decades, the aesthetic, financial and safety advantages of less paving remained unconsidered or unconvincing. "The tendency of many communities to equate wider streets with better streets and to design traffic and parking lanes as though the street were a 'microfreeway' is a highly questionable practice," *Residential Streets* observed sharply in 1990.[28] The formula of 8-10-10-8, a reference to the widths of the two parking and two travel lanes, was by now embedded all over suburbia, particularly in newer subdivisions further from the old downtown.

Curiously, the AASHTO "Green Book," a volume about as thick as a Bible and of equal importance to the traffic engineer, never explicitly recommended the 36-foot standard for local streets.[29] It noted that a 26-foot roadway (two 7-foot parking lanes and a single 12-foot travel lane) was common in residential areas, and even marveled, "the level of user inconvenience occasioned by the lack of two moving lanes is remarkably low in areas where single-family units prevail."

The Green Book's cul-de-sac diagrams, however, show an 18-foot travel and parking lane looping back on itself to form just such a 36-foot roadway. It recommends that collector streets, if they include parking, range from 34 to 44 feet. What constitutes a collector is vaguely defined as something in between a dead-end local street and an arterial, and the authors admit, "in many cases there may be no discernable difference between the collector and the local access street within a neighborhood."

Bucks County, Pennsylvania's influential standards manual of 1980 defined a "subcollector" with parking as a 36-foot section, while prescribing a col-

lector without parking from 24 to 32 feet wide.[30] Guidelines published by the Institute of Transportation Engineers starting in 1965 were even more prescriptive, calling for residential pavement widths of 32 to 34 feet.[31] By the early 1970s, the 36-foot section was the rule.[32] Public works departments and zoning boards may have found it simplest to adopt a single dimensional standard, even if the streets it prescribed were extravagant.

There were also economic incentives to overbuild. Since the birth of the Interstate highway system in the 1940s, road projects have been partially funded by state and federal governments, lessening the cost to the localities that typically carry them out. Economist Andrew Haughwout has pointed out that these improvements generate quick benefits for municipalities, which are able to recoup their share of the cost through taxes on rising property values.

Further, the lack of state-level coordination fragments decisionmaking, and tacitly encourages towns and cities to compete for economic activity via roadway improvements.[33] Unlike an investment in schools or policing, whose property-value benefits are apparent after several years, a new, widened or resurfaced street provides an immediate and tangible boost to a town's image, and defers the question of maintenance to the next administration.

THE WIDE STREET AS SPATIAL GUARDIAN

To anyone who has encountered it outside of a moving vehicle, the wide suburban street with few cars looks obviously wasteful [fig. 4]. Traffic engineering and local-government enthusiasm alone do not explain its persistence. The wide street—by which I mean a local, non-arterial street over 24 feet wide—has less-recognized attributes which have made it a perfect companion to the American suburb.

We tend to understand the street from the changing single-point perspective of the driver, or as two parallel lines on a map or plan. Consider instead the street framed as a static, lateral view, like the one a homeowner would see looking out a front window.

Seen from inside the first floor of the house, which dictates a low viewing angle 20 to 50 feet back from the curb, a 36-foot street does not appear terribly wide. The front lawn, trees and parked cars screen the expanse of asphalt, reducing it to a background element.

What remains serves as a useful visual separator from the front lawn across the way. It becomes a buffer managing the transition from the parking lane (over which the homeowner will feel a strong sense of ownership) to the traffic lane effectively marking the boundary with the neighbor across the street. When the neighbor's habits and housekeeping are contrary to a homeowner's own, the wide street functions as the proverbial good fence.

The wide street also helps to separate house and garden from moving traffic. A typical six-foot wide car moving down the middle of a 36-foot wide street would be separated from either curb by a 15-foot zone of empty asphalt and parked cars. The high speeds encouraged by wide streets are a concern, but with children's play and other family activities removed to the privacy of the back yard, not an overriding one unless the traffic volume is unusually high. The street becomes a moat containing the spaces of domesticity.

Early in the motor age, Clarence Stein acknowledged this with park-like respites from the increasingly dangerous, high-velocity street. At Radburn, New Jersey, and in later developments such as Chatham Village in Pittsburgh (1936) and Baldwin Hills Village in Los Angeles (1941), Stein turned homes inward to face a common green, restricting access streets and driveways to the rear. Later "model" suburbs like Irvine, California (1971); Columbia, Maryland (1966)[34] and Reston, Virginia (1964)[35] scaled up this model, weaving a network of pedestrian and bicycle paths through green spaces.
The leafy, car-free havens were a symbolic surrender. They announced the complete dedication of the street to car movement, and suggested that non-motorized travel and recreation could be safe and pleasant only in a separate set of roadless spaces.

Even the traditional sidewalk had become suspect. In the 1970s, *Residential Streets* fretted about the increased cost and runoff area of sidewalks. "Realistic evaluation," it noted, "often will reveal sidewalks on one or both sides of a minor residential street will be superfluous."[36]

Perhaps because of this attitude, many suburbs' sidewalks are nonexistent or unreliable. They start

Figure 4. Columbia, Maryland, early 1970s.

and stop abruptly, changing sides of the street for no apparent reason. Their surface is uneven and cracked in contrast to well-maintained roadways. They are rarely wide enough for two people to walk comfortably side by side.

Yet people still walk, and the street often finds itself a de-facto sidewalk. Parked cars create something of a protected zone, and the generous width provides room for drivers moving at high speeds to spot an interloping pedestrian or cyclist and cut a wide berth.

For all its shortcomings, the wide residential street has proven acceptable enough to designers, policy-makers, and users to become an entrenched feature of suburbia. Only recently have alternatives gained momentum in the United States. Skybridges and pedestrian malls have given way to the Netherlands-originated *Woonerf*, or shared street, concept. Congressional legislation would make "complete street" design for pedestrians, cyclists and the handicapped a federal priority.[37] Planning agencies have implemented major right-of-way reconfigurations, such as the Ninth Avenue Bikeway in Manhattan. Portland, Oregon's "Skinny Streets" program has been underway since the early 1990s, and similar approaches are being tried nationwide. Urbanists are pushing street design toward performance standards and away from engineering specifications.[38]

Though the changes are overdue, they should not be hasty. Suburban streets were not imposed by a single stroke of professional conspiracy or technological determinism. Like all built typologies, they evolved as an accumulation of individual design responses to specific problems. We would do well to better understand this legacy. Otherwise the long-awaited rethinking of street design will fail to win over a nation of 210 million drivers and 246 million cars.[39]

ENDNOTES

1 http:// www.worldcat.org, accessed 15 August 2010. A WorldCat search on the keyword "suburb" for non-juvenile, non-fiction books in English published since 1985 returned 1,516 hits. A sample analysis indicated about half were suburb-focused, including academic works, local and personal histories, technical studies, and dissertations.

2 Venturi, Robert, et al. *Learning from Las Vegas*. Cambridge, MA: MIT,1977.
Vinegar, Aron. *I am a monument: on Learning from Las Vegas*. Cambridge, MA: MIT, 2008.
Venturi Scott Brown & Associates. *On Houses & Housing*. New York: St. Martin's Press, 1992.
Learning from Las Vegas, based on a 1968 Yale studio, mapped out the geography of asphalt, autos and buildings on the Strip and compared the A&P parking lot to the gardens at Versailles, yet its thesis was "Symbol dominates Space." (Venturi, p. 13). The 1972 followup studio, "Learning from Levittown," was also apparently intended to be published as a standalone volume (Vinegar, p. 223, note 98), but it's brief appearance in 1992's On Houses and Housing (VSB&A, p. 50-58) suggested the studio had been concerned with middle-class design tastes over suburban spatial organization.

3 Teaford, Jon. *The American suburb : the basics*. New York : Routledge, 2008.

4 Southworth, Michael, et al. *Streets and the Shaping of Towns and Cities.* Washington, DC: Island Press, 2003. p. 5.

5 Gold, John. "The Death of the Boulevard," in *Images of the Street : planning, identity and control in Public Space*. London: Routledge, 1998. p. 49.

6 Rudolph, Paul. "To Enrich our Architecture." *Journal of Architectural Education*, Vol. 13, No. 1, Spring 1958.
Reconciling the scale of the car with the scale of the human was a constant preoccupation for Rudolph, who wrote: "The automobile could be regarded as a kind of outer garment in which we sometimes clothe ourselves, but a closet must be provided so that we may shed this special garment before entering the great outdoor gathering places of our cities. These closets will one day be a major and exciting architectural form in our cityscape, equal in grandeur to our great bridges. They will be so big that they will act as orienting devices, defining spaces and helping to give cohesion to the city pattern."

7 Jellicoe, G[eoffrey] A. *Motopia: a study in the evolution of urban landscape*. New York: Praeger, 1961.
Mayerovitch, Harry. *Overstreet : an urban street development system*. Montreal: Harvest House, 1973.

8 Franzen, Ulrich. *Street* (film). New York: American Federation of Arts, 1973. http:// urbanomnibus.net/2009/02/ulrich-franzens-street, accessed 25 August 2010.

9 Wolfe, Charles. "Streets Regulating Neighborhood Form: A Selective History," in *Public*

Streets for Public Use. New York: Van Nostrand Reinhold, 1987. p. 110-113.

10 Girling, Cynthia, et al. *Yard, Street, Park : the design of suburban open space.* New York: John Wiley, 1994. p. 86.

11 Duany, Andres, et al. *Suburban nation : the rise of sprawl and the decline of the American Dream*. New York: Macmillian, 2001. p. 66.

12 *A Policy on Geometric Design of Highways and Streets* [a.k.a. "Green Book"]. Washington, DC: American Association of State Highway and Transportation Officials, 1984. p. 20-27.

13 *Residential Streets : objectives, principles & design considerations*. New York: American Society of Civil Engineers; Washington, DC: National Association of Home Builders; Urban Land Institute, 1974. p. 41; 1990, p. 53.

14 Rybczynski, Witold. *A Clearing in the Distance : Frederick Law Olmstead and America in the Nineteenth Century.* New York: Scribner, 1999. p. 293-295.

15 Fishman, Robert. *Bourgeois utopias : the rise and fall of suburbia.* New York: Basic Books, 1989. p. 97-104.

16 Upton, Dell. *Architecture in the United States.* New York: Oxford University Press, 1998. p. 119-121.

17 Rybczynski, p. 291-292.

18 Duncan, James, et al. *Landscapes of Privilege : the politics of the aesthetic in an American suburb*. New York: Routledge, 2004. p. 80- 83.

19 Stilgoe, John. *Borderland : origins of the American suburb, 1820-1939*. New Haven: Yale University Press, 1988. p. 246.

20 Stilgoe, p. 247.

21 The prototypical forerunner was Market Square, built in the Chicago suburb of Lake Forest in 1916.

22 Kostoff, Spiro. *The City Shaped : urban patterns and meanings through history*. New York: Bullfinch, 1999.

23 Subverting the planned grid, landowners cut whole blocks into smaller interior parcels to hold the modest houses of the working class, and laid narrow streets to access them. This unplanned process formed what could be called the first subdivisions in North America.

24 McShane, Clay. *Down the asphalt path : the automobile and the American city*. New York: Columbia University Press, 1994. p. 23-25.

25 Frost, Harwood. *The Art of Roadmaking*. New York: The Engineering News, 1910. p. 303.

26 Folwell, Amory Prescott. *Practical street construction*. New York: Municipal journal and engineer, 1916. p. 130.

27 *Residential Streets*, 2001 (3rd ed.). p. 24.

28 *Residential Streets*, 1990 (2nd ed.). p. 37.

29 AASHTO, "Local Urban Streets" in Chapter V, "Local Roads and Streets." This Green Book distinguished only between "rural" and "urban" conditions; the latter included developed environments such as towns and suburbs.

30 *Performance Streets : a concept and model standards for residential streets*. Doylestown, PA: Bucks County Planning Commission, 1980. p. 16-21.

31 Southworth, p. 104.

32 *Residential Streets*, 1974. p. 32.

33 Haughwout, Andrew. "Infrastructure and Social Welfare in Metropolitan America." *Federal Reserve Bank of New York Economic Policy Review*, December 2001. p. 482-483.

34 "History of Columbia: a story of a planned community." Columbia, MD: Columbia Association Archives. http://www.columbiaarchives.org, accessed 14 December 2011.

35 Grubisich, Tom. "Reston, Virginia," in *Encyclopedia Virginia*. Charlottesville, VA: Virginia Foundation for the Humanities. http://www.EncyclopediaVirginia.org/Reston_Virginia; updated 28 April 2010, accessed 25 August 2010.
Robert Simon, whose father had been a major investor in Radburn, founded Reston in 1964. Simon's experience as a returned GI living in suburban Long Island led him to create Reston as a denser, civic-minded (and unusually for the time, racially integrated) alternative to typical subdivisions. Despite much publicity for the development, sales were slow, and in 1967 Simon ceded to control to his biggest lender, Gulf Oil.

36 *Residential Streets*, 1974. p. 22; 1990 (2nd ed.), p. 58.

37 *Complete Streets Act of 2009* (111th Congress, S.584, H.R.1443). http://thomas.loc.gov, accessed 25 August 2010.

38 Southworth, p. 142-145.

39 Federal Highway Administration. *Highway Statistics 2009*. Washington, DC: U.S. Department of Transportation. http://www.fhwa.dot.gov/policyinformation/statistics/2009/dv1c.cfm, accessed 1 July 2011.