

## **The Car as Smartphone: Effects on the Built Environment and Sociality**

**Ben Schulman  
University of Illinois-Chicago  
Department of Communication**

The smartphone, as the car did before it, takes one where they wish to go. Both act as aspirational devices with, to paraphrase Carey's interpretation of Dewey, "the capacity to transform...the great society created by industry into a great community." (1989, pg. 143) Each carry out their navigational and wayfinding capabilities, whether it be to a physical or virtual destination, as directed by the end-user. As a condition of their ability to exist in both private and public domains simultaneously (Sheller & Urry, 2003), smartphones and cars compress time and space (Harvey, 1992) into a unified plane that is easily accessed, passed through, and discarded. Both carry their drivers out from personal into social space in order to complete commercial and social transactions, informing the dynamics of sociality. And both exert an influence on the physical shape the built environment takes, so as to allow for the most efficient transmission of its functions.

This paper examines the automobile's transformative effect on the street network, and traces the car's development, ascendance and dominance over social and physical space. In so doing, it also posits that the car and the smartphone perform similar functions in the their ability to reconstitute the built environment to accommodate their use, with each medium exerting an attendant effect on the construction of sociality. With demographic evidence mounting that emerging generations may be eschewing car use for smartphones (The Economist, 2012), the process of social and physical adaption is being repeated, with a reconstruction of public space and the street.

**First Heard on the Street: Street Networks and Communication**

It is necessary to first define the relationship between communication and the built environment, in order to see how the devices we employ to complete communicative transactions impact infrastructure and street design. Communication is predicated on finding space for interaction, with the growth of any particular place dependent upon how many exchanges can be successfully conducted by an ever-increasing amount of people. Historically, the street - functioning within a larger street network - has acted as that space. (Engwicht, 1993)

Streets "have served variously as play areas for children, market space for merchants, and foraging ground for hogs," in addition to their roles as circulators for movement. (Jackson, 1985, pg. 73) Traditional street networks display an organic pattern of development, naturally evolving into a series of rectangular - i.e., grid-like - structures to create multiple pathways for traffic and information distribution. (Fecht, 2012) Barthelemy and Flammini modeled urban development patterns to trace the shape of street networks via the number of connections found between roads and the number of intersections and centers within a network. (2008) As the complexity of the network increases, independent pockets of grid-like development replicate themselves within a larger framework to create multiple centers for exchange. (Barthelemy & Flammini 2008)

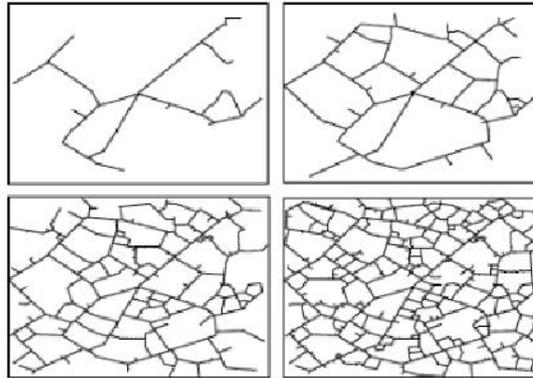


FIG. 3: Snapshots of the network at different times of its evolution: for (a)  $t = 100$ , (b)  $t = 500$ , (c)  $t = 2000$ , (d)  $t = 4000$  (the growth rate is here  $\eta = 0.1$ ). At short times, we have almost a tree structure and loops appear for larger density values obtained at larger times (the number of loops then increases linearly with time).

Barthelemy & Flammini model of street network development

As Engwicht has noted, in order to maximize the number of transactions while minimizing the travel to conduct them, cities and towns are naturally composed of two distinct spheres, *exchange space* and *movement space*. (1993) Exchange space naturally consists of nodes where interaction is fostered, such as public squares, bazaars, street corners and intersections, or the street itself. *Movement space* - roads or thoroughfares meant to connect points on the map- has served a secondary function allowing for the further flow of people, goods and information between disparate places. (Engwicht 1993)

Before the easy distribution of communication across large geographic areas, the emphasis on exchange space, built at the human scale (CNU, 2012) was apparent within the built environment. Street networks composed of dense, multimodal, interconnected streets allowed for multiple social and communication opportunities that legitimized the establishment and growth of settlements. This growth served as the

impetus for places to emerge as legitimate market centers, thereby encouraging increased movement to pass through. Cities grew physically by incremental addition, replicating in fractal form, following the "pedestrian transportation web." (Salingaros, 2005)

With face-to-face communication as the predominant form of interaction - the body as communicative device - a representative street network developed to accommodate it. This pattern is evident from antiquity to the beginnings of the City Beautiful movement, with a distinct form of the street emerging to create spaces for interactions to take place:



Early Harappan grid-centric map,

"Plan of Excavated Housing Area Of Lower City," Mohenjo-Daro, modern Pakistan.



L'enfant's Washington D.C. Plan, 1791

Priene (Turkey) - late 4th century

New communicative technologies that began appearing in the late 19<sup>th</sup> century, such as the telegraph, harnessed the ability to distribute information over much farther distances, vanquishing geography. These technologies offered the opportunity, as Innis would write, to go "beyond the world of concrete experience and into the world of conceptual relations created within an enlarged time and space universe." (1950, pg. 30) Concomitant to the development of communicative technologies able to bridge time and space, a new infrastructure and built environment developed able to carry out the conduct of the predominant technological tool. The emergence of technologies meant to enhance the efficiency of *exchange space* - to extend empire as proxy " for the efficiency of communication" (Innis, 1950, pg. 29) - would lead to the eventual destructive mutation of the traditional street network by emphasizing the *movement space* of cities and towns, changing the very function of the street itself.

As explored by Hillier & Hansen in *The Social Logic of Space*, different forms of sociality require different types of spatial organization. (1984) Swyngedouw claimed all social and commercial interaction is "inscribed in space and takes place," (as cited by Graham, 1998, pg. 175) implying a fixity to geography (Graham, 1998), regardless of what tools are employed to conduct transmissions. The built environment then is a reflection of the predominant communication devices being used at given points in time that shape sociality. In other words, we develop an infrastructure necessary to accommodate the needs of our preferred communication tools.

### **Learning to Drive: Accepting the Car, Constructing a New Street**

For Innis, communicative tools are a technological determinant (Smith & Marx,

1994) to solidify empire. (1950) As papyrus was to Rome in its conquest over Egypt - becoming "the basis of a large administration empire" (1950 pg. 27) - the car was to America over the Western world in the 20<sup>th</sup> century. An embodiment of Madison's belief in the democratic power of enhanced communication technologies (Carey, 1989, pg. 6), the automobile's connective capacity to collapse distance and time is the 20<sup>th</sup> century symbol of technological salvation. With its ability to transmit people and information over large geographic spaces, the rise of the automobile portended the promise of technological salvation from the crowded urban form whose *raison d'etre* - proximity of space to enhance exchange opportunities (Engwicht 1993) - would become mutated as the car was readily adopted. Graham conceives of this convergence as "substitution and transcendence," (1998, pg. 171) in which human-centered spaces of exchange and daily life can be replaced by technological innovation. (1998) The promise of technological liberation from space challenged the organic composition of the street for the limitless growth of car expansion.

Before the car could clear a hegemonic path for itself, the street first needed to be redefined. The elemental structure of the traditional street network supports the creation of public space, as many converging points on the map harness the innate utility of communication. Habermas defines this as a public sphere where "citizens behave as a public body when they confer in an unrestricted fashion." (1964, pg. 49) The vehicle intruded upon this public space, often violently, and was first met with hostility and opposition, especially when motorists were involved in collisions with pedestrians in the public way. (Norton, 2008, pg. 30) By the 1920s, newspaper columnists, op-eds and letters to the editor across the nation reflected the scourge of

"the delinquency of drivers" threatening the safety and way of life for pedestrians. (Norton, 2008, pg. 30) Car manufacturers, motor enthusiasts and a legion of their supporters fought the image of the vehicle as an invasive source, promoting its utility beyond a "pleasure mobile" (Norton, 2008, pg. 30) and waging a massive propaganda and legal war to craft the image of the car and assert its supposed rightful space in the street. (Norton, 2008, pg. 7)

Cars were also simply becoming more popular, affordable and of particular use to particular groups, as car manufacturers developed new models with target audiences in mind. (Kline & Pinch, 1996, pg. 75) Responding to changing attitudes about vehicles, Kline and Pinch have noted, "users precisely as users can embed new meanings" (1996, pg. 776) into technologies, and in the process, construct a new reality for the acceptance of technologies that were previously misunderstood or resisted. Defined by Adoni and Mane, this acculturation of tools is, "the social construction of reality...in which human beings act both as creators and as products." (1984, pg. 325) With the acceptance of the car on a large scale, the street was newly defined as belonging to cars, not pedestrians, and as a condition of this new reality, a new configuration of the street network, away from the traditional, human-scale street grid, emerged to reflect the new reality.

Whereas traditional street networks naturally encourage face-to-face interaction via intersection at the human scale, auto-centric networks attempt to endlessly extend the point of interaction outwards via machine. Movement space takes precedence over exchange space in carrying out acts of communication, delivering people and ideas to exchange spaces via fixed routes. The physical manifestation of fixed routes transforms

the traditional street network of grid-like, interwoven streets into a hierarchical road network of differently classified types of thoroughfares spilling into others. Streets feed into roads into collectors into arterials into highways, moving in a dendritic system. (Marshall, 2004, pg. 46) Rather than intersecting, the fundamental structure and intent of the street network extends outwards for the swift delivery of people and information via vehicle.



IMAGES AND MAPPING COURTESY OF URBAN DESIGN 4 HEALTH

Contrast between hierarchical street pattern (left) and traditional street networks (right) Image:

Seattle, WA maps, *Urban Design 4 Health*

The hierarchal road classification system uses space in an abstractly efficient manner to complete the technological magic trick of spatial deliverance. High-speed roads intended to eliminate and pass through intersections emphasize abstraction over facility and mobility over interaction. Hierarchies, rather than networks, form the framework for the movement and production of messages, as illustrated in Le Corbusier's la regle del 7V highway plan, (Marshall, 2004, pg. 45) wherein the street network is abolished and replaced with an auto-centric classification system with few intersecting nodes, and where the "pedestrian transportation web" is relegated to the

periphery of high-rise residential towers. (Marshall, 2004, pg. 44) What Jameson called the "the prophetic elitism and authoritarianism" (1984, pg. 54) of designs like Corbusier's Ville Radieuse was in effect a trade of *exchange space* for *movement space*.



Le Corbusier and Ville Radieuse

Eliminating the space for encounter, i.e., *exchange*, the emphasis on the *movement* of communication becomes paramount. Messages are no longer carried out across multi-modal, human-scaled venues, but instead are channeled "further in space" at increasing speeds. (Carey, 1989, pg. 155) The magic of this tomorrow's-future-today vision of techno-liberation and dominion over space as offered by the automobile is best envisioned by the Disney Corporation's 1958 "Magic Highway" video short, which optimistically paints a vision of a technological and transformative communicative Manifest Destiny for America along high-speed highways; a nation of movement space with no need to stop for exchange.



Tomorrow's Future Today - Disney's 1958 short "Magic Highway" (click to play)



A still from "Magic Highway"; Corbusier's vision via Disney. (click to play)

### **Go Ahead, Kill the Street: Content, Consumption and Sociality; What Cars Do**

Le Corbusier's dictum to "Kill off the street" (Marshall, 2004, pg. 44) is achieved in the absence of spaces for interaction. In such an environment, rather than exchanged face-to-face, communication is reliant on technological tools to carry out its transmission. The unilateral one-way attention required by cars to drive their operation encouraged the consumption of media in equally unidirectional habits. Content is therefore channeled via uni-modal forms, in what McLuhan deemed "hot media" formats, such as radios and televisions, and cars themselves. (1964) The "abstract

processes" (Williams, 1974, pg. 18) in which radio content was delivered, within the isolation of the automobile, separates the user from public space and interaction while simultaneously engaging them in the sociality of the broadcasted material. (Williams, 1974, pg. 88)

This collective consumption of content, consumed individually, fulfills Carey's idea of "a ceremony that draws persons together in fellowship and commonality." (1989, pg. 18) But in contrast to Carey's ritual view of communication - "the maintenance of society in time...the representation of shared belief," (1989, pg. 18) as fostered by the informality of messages exchanged through interpersonal connection - broadcast content as a foundation for sociality, consumed via hot media sources, allow organizational and/or corporate entities to disseminate and control messages. The broadcast corporate voice licenses a degree of power to the initiator of the message, as the receiver's sociality is informed by receiving preselected messages. This dynamic is expressed by Carey's *transmission* view of communication, an "extension of messages across geography for the purpose of control." (1989, pg. 18) The transmission view of communication is unto itself, as Carey posits, cut from the cloth of transportation; the car then, a manifestation of the American obsession with "movement in space" as a cultural act. (1989, pg. 18)

The personalization of the automobile, an effect of the encapsulated design of the object, informs a new sociality as well. Karin Knorr Cetina writes, "individualization then intertwines with objectualization - with an increasing orientation towards objects as sources of the self, of relational intimacy, of shared subjectivity and of social integration." (as cited by Dant & Martin, 1999, pg. 8) Cars can be personified to assume

human characteristics, due to our "routine collaborative action." (Dant & Martin, 1999, pg. 10) As an extension of personal space, the car is not only capable of eliciting feelings of oneness and as Knorr Cetina writes, inspiring "solidarity," (as cited by Dant & Martin, 1999, pg. 10) but assists in delivering one from the personal into the social.

The social dimensions of the car are varied; between the driver and the vehicle, between other drivers utilizing the roadway, and in the simple fact that cars carry people to destinations, in which the individual emerges from their compartmentalized public/private space into social space. The individuated act of driving is, as Redshaw has observed, the result of "a great deal of social cooperation" (2008, pg. 22), with each driver acting in concert with the driving mass to complete the flow of traffic. To drive, write Dant & Martin, is to be freed from Goffman's requirement of maintaining "civil inattention" on public transit - acknowledging one's presence while withdrawing the next moment to regulate fleeting social interaction. (Dant & Martin, 1999, pg. 11) This "'downtime' from the flow of sociality in peopled contexts...prepares us to re-enter a social scene when we arrive, refreshed and ready to engage with interactive sociality anew." (Dant & Martin, 1999, pg. 11)

The ubiquity of the car and its ability to offer the duality of simultaneous operation in public and private spheres solidified the prevalence of "mobile privatization" as a condition of modernity. (Williams, 1974, pg. 19) The car embodies increased mobility with the conveniences of the "self-sufficient home" (1974, pg. 19) - access to broadcasts, content, and the feeling of personal space enclosed in one device. Drivers operate inside of their vehicles in isolation, consuming information provided to them from institutional sources - whether via radio broadcasts, billboard advertisements, or

highway signage - and upon arrival at their destination, move into a social sphere of interaction. Allowing one to move through space and time while consuming content, and delivered into the social from the public/private sphere, the functions of the car are mirrored in the device that is perhaps challenging the automobile as the preferred method of deliverance: the smartphone.

### **You Cannot Kill the Street: What Smartphones Do**

A 2012 report by *The Economist* examined the trends behind recent decline in vehicle miles traveled (VMT) in the developed world. *The Economist* article highlights a study from the University of Michigan that found areas with large populations of youth online have lower rates of driver's licenses, which led the authors of the study to conclude their findings were consistent, "with the hypothesis that access to virtual contact reduces the need for actual contact." (Sivak & Schoettle, 2011, pg. 19) Additional data from KCR Research has found among American 18-to-34 year-olds, a growing number "say socializing online is a substitute" for car trips. (Economist, 2012)

Is this a correct correlation? Can online activity be related to car use? First, it is important to draw a distinction between the act of being online and the mechanism used to commit the act.

Much has been made about social media's effect on sociality. Shirky has enthusiastically championed the new organizational capacities of social media applications to challenge authority, writing, "When we change the way we communicate, we change society." (2008, pg. 17) A *prima facie* truism it may be, such simple statements overlook the means used to conduct the communicative transaction that enables social media. The computer or mobile device, utilizing its capacity to connect to

the Internet, is the tool that allows a user to harness social media's function of connection, engagement and exchange. For the 69% of American adults who use social media sites (Pew), these applications are an affordance of the communicative power of the Internet-bearing instrument. In the context of substituting car trips for online activity, social media does not influence sociality on its own, but is rather much more like the car radio, a broadcast medium. It is not the affordance of social media, but the exchange-carrying facility of the technological tool employed to complete communication that effects sociality.

As the car does, the smartphone enables users to operate in a simultaneous private and public sphere as they are delivered into a social sphere. The smartphone fulfills the car's role as a device of mobile privatization, in which the individual act of media consumption and access to the personal conveniences of "home" are mobilized. (Williams, 1974) Like the car, the smartphone is a device of "routine collaborative action" (Dant & Martin, 1999, pg. 10) that becomes personalized, a reflection of the "self of the owner." (Oksman & Rautiainen, 2003, pg. 299) While the car and smartphone perform many similar functions however, the user's manipulation of the tool to carry out its use differs immensely in scale and orientation - a hand-held versus two-ton machine. The manner of use requires an attendant environment that allows the user to control the device to perform its functions. Again as illustrated by Hillier & Hansen's assertion that different forms of sociality require different types of spatial organization (1984), the use of "mobile social networks can facilitate the flow of new kinds of information into public spaces and as such can rearrange social and spatial practices." (Humphreys, 2010, pg. 764)

Smartphone use demands a spatial configuration that allows the user to move throughout an environment while seamlessly and continually being engaged in communicative acts. Such an environment consists of a duality of Engwicht's exchange space (1993) - now happening online and in the offline world. The user exchanging messages online cannot be removed from physicality, even as they communicate through digital spaces, as all "social and economic activity is necessarily geographical." (Graham, 1998, pg. 175) The tangible action of sending a digital message on a smartphone, i.e., physically using an interface to create text and send messages, reinforces the physicality of the transmission. The unilateral attention the smartphone requires demands a spatial fix to allow the user to continue the act of transmission as a product of "distribution of presence in simultaneous interactions." (Rettie, 2005, pg. 19)

While the *function* of transforming the built environment to accommodate the construction of sociality may be the same for cars and smartphones, the attendant *form* demanded by each medium differs. The dendritic, auto-centric street network that emphasizes movement over exchange space (Engwicht, 1993) to allow the car room to carry out its transmission acts as an obstacle to the user sending messages through digital exchange spaces. Although driving has always consisted of dedicating "surplus attention" (Dant & Martin, 1999, pg. 8) to other tasks, the fixed focus both the car and smartphone draw from the user for its operation compete for attention. Traditional street networks, composed of multiple, dense, interwoven streets provide the environment for exchange on the physical and digital scale, whereas the hierarchical dendritic system concerns itself solely with movement.

Humphreys writes, "New communication technologies may have changed the spatial and temporal boundaries, but mediated communication is still shaped by locational and sociospatial factors." (2010, pg. 775) If more people are engaged in mediated communication via mobile device, locational and sociospatial factors will respond. And location is becoming central to the demographic cohort - the 18-to-34 year olds trading cars for smartphones in *The Economist* study - that are shifting towards cities and towns that exhibit the form of traditional street networks and space, "where the human scale of the individual...represent the basic unit of design." (CNU, 2012, pg. 2) In addition to a drop in vehicle miles traveled (VMT), the use of public transit has grown in the United States by some 3 billion trips since 1995 (APTA, 2012); America's 70 largest cities experienced a 63% growth in the number of bike commuters from 2000-2010 according to the American Community Survey (League of American Bicyclists, 2012); and a report for the non-profit think tank CEOs for Cities found the percentage of college-educated 25-34 year olds living within three miles of the central core of American cities grew 26% from the year 2000. (Cortright, 2011)

### **Old Space, New Media**

Critics such as Goldberger have derided the proliferation of mobile devices into the public sphere as promoting a "disconnected urbanism" as the public realm is splintered "out of space and into a virtual realm." (2004) The fragmentation of space into virtual and public realms disregards the associative qualities of place. As defined by Relph, place consists of "insiderness - the more deeply a person or group feels themselves inside an environment, the more so does that environment become, existentially, a place." (as cited by Seamon, 2012, pg. 2) This can be applied equally to

the virtual or public. Even if the space of the city may be split between virtual and physical realms, it is the spatial structuring of urban form, composed via traditional street networks, that allows one to consider trading one mode of transmission - the car - for another - the smartphone, and establish themselves in *place*.

The ability of both the car and the smartphone to reconstitute physical space speak to each device's power to perform transformative functions in regards to form and sociality, as mobile privatized extensions of self. They both operate under Hay's interpretation of Williams - whom while writing of television is equally applicable here - as technologies concerned with "spatial distribution and arrangement of social subjects," acting as "social and cultural technology...within this social arrangement and material environment." (2003, pg. 171) Cars and smartphones may mirror each other in functionality and causal properties, but the dissonance in the type of effect each produces on the built environment is not necessarily mutually exclusive. Integration between the two mediums to "offer seamless connectivity between a smartphone and a vehicle's infotainment system," as envisioned by the Car Connectivity Consortium, seeks to sync the functions of the smartphone and subsume them within the vehicle by 2016. (Juniper Research, 2012) Such a development may well lead to new forms of sociality and an effect on the built environment, for not only does the way we build communities inform how we communicate, perhaps more aptly, the way we communicate informs how we build communities.

### Works Cited

- 01Lenfant.jpg. (n.d.). *SPUR - San Francisco Planning + Urban Research Association*. Retrieved December 13, 2014, from <http://www.spur.org/files/u2/01Lenfant.jpg>
- 21a\_Priene\_Map. (n.d.). *Classconnection.s3.amazonaws.com*. Retrieved December 13, 2012, from [http://classconnection.s3.amazonaws.com/1579/flashcards/684436/jpg/21a\\_priene\\_map\\_roth\\_aael03\\_06851.jpg](http://classconnection.s3.amazonaws.com/1579/flashcards/684436/jpg/21a_priene_map_roth_aael03_06851.jpg)
- Adoni, H., & Mane, S. (1984). MEDIA AND THE SOCIAL CONSTRUCTION OF REALITY : Toward an Integration of Theory and Research. *Communication Research, 11*(323). doi:10.1177/009365084011003001.
- American Public Transportation Association (2012). *2012 Public Transportation Fact Book*. Washington, D.C.: American Public Transportation Association.
- Barthelemy, M., & Flammini, A. (2008). Modeling urban street patterns. *Physics and Society*. doi:10.1103/PhysRevLett.100.138702.
- Brenner, J. (2012, November 13). Pew Internet: Social Networking (full detail) | Pew Research Center's Internet & American Life Project. *Pew Research Center's Internet & American Life Project*. Retrieved December 7, 2012, from <http://pewinternet.org/Commentary/2012/March/Pew-Internet-Social-Networking-full-detail.aspx>
- Carey, J. W. (1989). *Communication as culture: Essays on media and society*. Boston: Unwin Hyman.
- Cortright, J. (2011). *The Young and Restless in a Knowledge Economy*.
- Dant, T., & Martin, P. (2010). By car : carrying modern society. *Ordinary Consumption. Studies in consumption and markets, (2)*.
- Disney's Magic Highway - 1958 (n.d.). [Video File]. Retrieved from <http://www.youtube.com/watch?v=H8jZtwRJnRs>

- Engwicht, D. (1993). *Reclaiming our cities and towns: Better living with less traffic*. Philadelphia: New Society Pub.
- Fecht, S. (2012, April 6). Grid Unlocked: How Street Networks Evolve as Cities Grow. *Scientific American*. Retrieved from <http://www.scientificamerican.com/article.cfm?id=grid-unlocked-how-street>.
- Goldberger, P. (2003, November). Disconnected urbanism. *Metropolis Magazine*. Retrieved from [http://www.metropolismag.com/html/content\\_1103/obj/index.html](http://www.metropolismag.com/html/content_1103/obj/index.html).
- Graham, S. (1998). The end of geography or the explosion of place? Conceptualizing space, place and information technology. *Progress in Human Geography*, 22(2), 165-185.
- Habermas, J., Lennox, F., & Lennox, S. (1964). The Public Sphere: An Encyclopedia Article. *New German Critique*, (3), 49-55.
- Harappa city segment (1972). (n.d.). In *Hindupedia, the Hindu Encyclopedia*. Retrieved December 13, 2012, from [http://www.hindupedia.com/en/File:Harappa\\_city\\_segment\\_1.gif](http://www.hindupedia.com/en/File:Harappa_city_segment_1.gif)
- Harvey, D. (1990). *The condition of postmodernity: An enquiry into the origins of cultural change*. Oxford [England: Blackwell.
- Hillier, B., & Hanson, J. (2003). *The social logic of space*. Cambridge [Cambridgeshire: Cambridge University Press.
- Humphreys, L. (2010). Mobile social networks and urban public space. *New Media Society*, 12(763). doi:10.1177/1461444809349578.
- Innis, H. A. (1972). *Empire and communications*. Toronto: University of Toronto Press.
- Jackson, K. T. (1985). *Crabgrass frontier: The suburbanization of the United States*. New York: Oxford University Press.

Jameson, F. (1991). *Postmodernism, or, The cultural logic of late capitalism*. Durham: Duke University Press.

Kline, R., & Pinch, T. (1996). Users as Agents of Technological Change: The Social Construction of the Automobile in the Rural United States. *Technology & Culture*, 37(4), 763-795.

League of American Bicyclists (n.d.). 2010 Bike Commuting Data Released. *League of American Bicyclists*. Retrieved December 13, 2012, from <http://www.bikeleague.org/news/acs2010.php>

LeCorbu- img-3.jpg. (n.d.). *Strates - Matériaux pour la recherche en sciences sociales*. Retrieved December 13, 2012, from <http://strates.revues.org/docannexe/image/5573/img-3.jpg>

Marshall, S. (2005). *Streets & patterns: The structure of urban geometry*. London: Spon.

McLuhan, M. (1964). *Understanding media: The extensions of man*. New York: McGraw-Hill.

Norton, P. (2011). *Fighting Traffic: The Dawn of the Motor Age in the American City*. Cambridge, Mass: MIT Press.

Oksman, V., & Rautiainen, P. (2003). "Perhaps It is a Body Part": How the Mobile Phone Became an Organic Part of the Everyday Lives of Finnish Children and Teenagers. In *Machines That Become Us: The Social Context of Personal Communication Technology* (pp. 293-310). New Brunswick, New Jersey: Transaction Publishers.

Redshaw, S. (2008). *In the company of cars: Driving as a social and cultural practice*. Aldershot, England: Ashgate Pub.

- Rettie, R. (2005). Presence and Embodiment in Mobile Phone Communication. *PsychNology Journal*, 3(1), 16-34.
- Salingaros, N. (2005). Connecting the fractal city. In *Principles of Urban Structure*. Amsterdam, Holland: Techne Press.
- Seamon, D. (2012). Physical and Virtual Environments: Meaning of Place and Space. In B. Schell & M. Scaffa (Eds.), *Willard and Spackman's Occupational Therapy*. Philadelphia, PA: Wippincott, Williams, & Wilkens.
- Seeing the back of the car. (2012, September 22). *The Economist*. Retrieved from <http://www.economist.com/node/21563280>.
- Sheller, M., & Urry, J. (2003). Mobile Transformations of 'Public' and 'Private' Life. *Theory, Culture & Society*, 20(3), 107-125. doi:10.1177/02632764030203007.
- Shirky, C. (2008). *Here comes everybody: The power of organizing without organizations*. New York: Penguin Press.
- Sivak, M., & Schoettle, B. (2011). Recent Changes in the Age Composition of Drivers in 15 Countries. *University of Michigan Transportation Research Institute*.
- Smith, M. R., & Marx, L. (1994). *Does technology drive history?: The dilemma of technological determinism*. Cambridge, Mass: MIT Press.
- Street-Patterns.jpg. (2010, March 14). *Auckland Transport Blog*. Retrieved December 13, 2012, from <http://transportblog.co.nz/wp-content/uploads/2010/05/street-patterns.jpg>
- Sustainable Street Network Principles*. (2012). Chicago, IL: Congress for the New Urbanism.
- Telematics & Smart Vehicles Infotainment & Commercial Uses, Insurance & Vehicle Recovery 2012-2016. (2012, March 13). *Juniper Research | Telecoms Research*

*Services | Free Wireless Research | Mobile Market Forecasting.*

Retrieved December 14, 2012, from

<http://www.juniperresearch.com/reports.php?id=382>

Williams, R. (1975). *Television: Technology and cultural form*. New York: Schocken Books.