Immaterial Architectures: Urban Space and Electric Light

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Space and Culture 2005; 8; 126
DOI: 10.1177/1206331204266372

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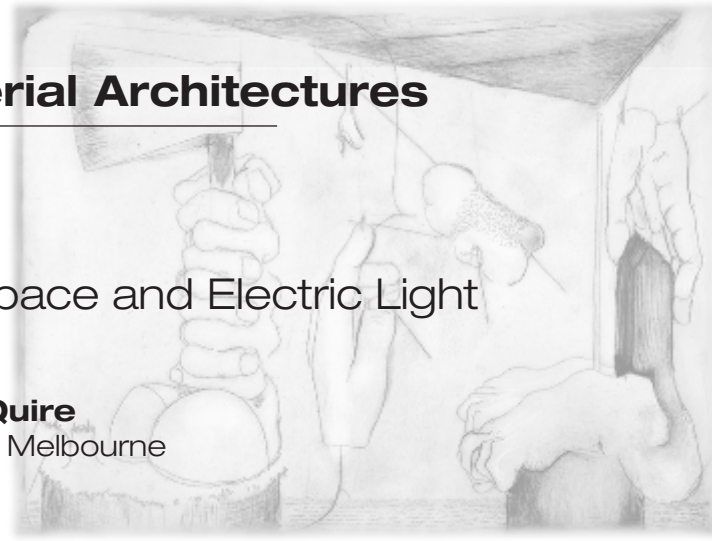

Urban Space and Electric Light

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Since its invention, electric lighting has had a decisive impact on the psychogeography of urban space. Concentrating on the period from 1880 to World War II, the author argues that electrical lighting has been a major factor in the emergence of modern urban environments, in which the traditional function of architecture as a stable ground has increasingly given way to a growing mutability of forms and fluidity of appearances. This tendency both paralleled and converged with the effects of modern media technologies such as cinema, contributing to the emergence of a new environment characterized by "relational space," in which the city is increasingly defined by the overlap of material and immaterial spatial regimes.

Keywords: *electricity; light; modern city; perceptual experience; relational space*

> Electricity is the pervading element that accompanies all material existence, even the atmospheric. It is to be thought of unabashedly as the soul of the world.
>
> —Goethe (1825)

> Electrification + Soviet Power = Communism
>
> —Leninist slogan of the 1920s

> If you build buildings with lights outside, you can make them indefinite, and then when you're through with using them you shut the lights off and they disappear.
>
> —Andy Warhol (1975)[1]

space and culture vol. 8 no. 2, may 2005 126-140
DOI: 10.1177/1206331204266372

From the first moment of its recognition as an independent phenomenon, electricity has been a source of profound wonder. Romantics rapidly identified it with a universal life force, dramatized in the archetypal modern creation scene of Mary Shelley's 1818 *Frankenstein* and distilled by no lesser authority than Goethe into "the soul of the world." A century later, the prospect of widespread electrification literally dazzled the industrializing world, inspiring entrepreneurs, artists, and revolutionaries alike with irresistible visions of a dynamic, electrified future. The electrification of industry and transport, combined with the extension of electrical grids into public streets and private homes, has been one of the key vectors of technological change demarcating industrial modernity from previous social forms.

Yet although there is a plethora of biographical accounts of the discoveries and business strategies of inventor-engineers such as Edison and Tessler, and numerous economic histories of the ferocious patent wars and internecine political struggles to form some of industrial capitalism's most powerful corporations such as General Electric and Westinghouse, there is a relative dearth of social histories examining the impact of electricity on everyday life.[2] Even scarcer are accounts of the way in which electricity has contributed to the formation of a distinctively modern sense of space, most dramatically through the electrical illumination of the modern cityscape, altering the city's appearances, rhythms, and modes of social inhabitation.

However, in the absence of systematic accounts, what can be found are snippets scattered through the writings of artists, architects, journalists, filmmakers, and other observers of the modern city. One thing most of these reports make clear is that even from the first, electrical illumination exceeded a purely functional role.[3] In this article, I want to trace this excessive use of light to argue that the inception of electrical lighting in the period from the 1880s up to World War II marks a fundamental threshold in the psychogeography of modern urban space. This threshold both parallels and converges with the effects of modern media technologies, resulting in the creation of lived environments in which the traditional function of architecture as a stable ground for experience has increasingly given way to a growing mutability and fluidity of appearances.

Electricity and the Technological Sublime

As early as 1885, when Edison's incandescent lamp was less than a decade old and the illumination of public space a rarity, a scheme was mooted for lighting the entire city of Paris with what was grandly dubbed an "artificial sun."[4] The plan comprised one hundred 200,000-candlepower lamps mounted on a single tower soaring 1,100 ft in the Tuilleries Gardens. The fact that the scheme was both impossible, because lamps of such magnitude had not yet been invented, and impractical, because lighting the cityscape from one point would cause enormous contrasts of light and shadow, merely underlines the extent to which the very idea of electrical illumination has long had a powerful symbolic pull. By the 1880s, when electrical systems began to be widely adapted to practical uses, electricity was seen as the key to achieving a new level of control over the lived environment. The ability to convert night into day at the flick of a switch offered the most striking proof of the superiority of the modern present over the past, the most compelling evidence of the ability of technological progress to subdue even the basic diurnal rhythms of nature.

Equally telling is the rapture with which many people greeted their first sight of electric light. Only 4 months after Edison's famous demonstration outside his laboratories at Menlo Park in December 1879, the city fathers at Wabash hired the Brush Company to set up four 3,000-candlepower arc lights on the courthouse. The event attracted 10,000 visitors to the small town. The local paper reported,

People stood overwhelmed with awe, as if in the presence of the supernatural. The strange weird light exceeded in power only by the sun, rendered the square as light as midday. . . . Men fell on their knees, groans were uttered at the sight, and many were dumb with amazement. (as cited in Nye, 1990, p. 3)

Although it is probably wise to take such a tale with a grain of salt—after all, boosterism is grist to the mills of small town papers, which also reported that local farmers could expect giant pumpkins and corn stalks as a result of the new light—the report of the spectators' reactions should not be discounted too quickly. Even read as an apocryphal tale in the genre of credulous cinema audiences fleeing the image of the Lumière Brothers' onrushing celluloid train, it registers the extent to which electricity departed all previous protocols of illumination.[5] Prior to the 1880s, artificial light came only from various forms of fire. Candles, kerosene, and even gas were smoky, potentially dangerous flames whose ability to illuminate was clearly linked to their consumption of fuel. By contrast, the enclosed, vacuum-sealed incandescent lightbulb was a paradox: a light that was smokeless, fireless, and seemingly inexhaustible. Moreover, its intensity vastly exceeded anything previously seen or experienced, leading some female onlookers to resort to parasols so as to protect their complexions. Electric light seemed an anomaly that contravened natural laws, but it was experienced by most 19th-century observers as miraculous rather than monstrous.

The image of the Wabash public gazing at arc lights in silent awe indicates the extent to which electrical illumination belongs to what Leo Marx (1965) has aptly called the "technological sublime." In the romantic tradition, the sublime was linked to the grandeur of nature and the ambivalent feelings of wonder and terror natural phenomena evoked. For Marx, the technological sublime describes the widespread transference of these feelings onto technology around the end of the 19th century. One of the key sites for this transference was the appearance of massive industrial machinery such as the electrical turbine, an apparatus that generated not only electrical current but a seemingly irresistible series of concepts and metaphors. As electricity entered everyday life in industrializing cultures during the 1880s, *live wires*, *human dynamos*, and *electrifying performances* all became recognizable descriptors for a specific form of modern energy. *To feel electricity in the air* became synonymous with excitement, arousal, and even love.

Bright Lights, Big City

It was in this context that electricity spread through the modern cityscape in several waves. Initially confined to isolated sites such as the mansions of the wealthy and a few department stores seeking a novel means of attracting shoppers, it gradually expanded into public street–lighting schemes along major transport routes, before finally extending into large numbers of private homes.[6] Although public lighting had

been recognized as an important technique in policing public space since its origins in the 16th century, the spread of electric light exceeded any rational desire for maintaining public order.[7] As noted above, the first demonstrations of electric light proved capable of themselves attracting large crowds of fascinated onlookers. This realization inspired progressive entrepreneurs to install electric lighting as a novel form of advertising, particularly around city center businesses such as theatres and department stores. Other businesses learned to organize block street lighting, often via deals with electricity supply companies, as a way of attracting shoppers to their precincts at night. Electricity suppliers were happy to offer cheap power to increase the intensity of street lighting, recognizing its potential as a load builder, because a brightly lit street required corresponding increases in lighting of shop windows and signage. Adjoining areas were often forced to sign up too, as a defensive action. As Nye (1994) noted, this dynamic was a key to the extension of electric light in U.S. cities prior to World War I: "Shopkeepers understood lighting as a weapon in the struggle to define the business centre of the city, dramatizing one sector at the expense of others" (p. 177).

Although these changes produced significant effects on the look of the city, they were ad hoc and unevenly distributed. The first systematic explorations of the possibilities for using electric light to alter the appearances and ambiance of urban space occurred in the controlled environments of the world's fairs from the 1880s to World War I. It was here, in what Benjamin (1973a) aptly dubbed "places of pilgrimage to view the fetish Commodity" (p. 165), that governments and corporations combined to produce coherent visions of a fully electrified society for public display.[8] The 1876 Philadelphia Exhibition is notable in being the last major exhibition based on steam power; it was also one of the last that closed at night. After the 1879 London Exposition featured Edison's new incandescent bulb as a chief attraction, subsequent fairs became key sites for lighting innovation. Electric signs, flashing signs, the searchlight, the spotlight, and the floodlight were all first publicly displayed at world's fairs.

Electrical lighting of the fairgrounds undoubtedly had utilitarian appeal, extending the hours available for leisurely consumption in the same manner that factory lighting had already extended the productive hours demanded of the working class.[9] However, far more striking was the excess over pure utility, as each city sought to outdo its rivals in the number of lights and the power of their illumination. The Chicago World's Fair of 1894 not only had more lights on its electrical building alone than were used by the entire Paris Exhibition of 1889 for which the Eiffel Tower had been built, but the Chicago fairgrounds also contained more light than any contemporary city in the United States. As Nye (1990, p. 37) pointed out, millions of visitors to these fairs saw more artificial light than they had ever seen in their lives.[10] They also saw it used in dramatic new ways: to delineate the outlines of buildings and pathways, to illuminate fountains and water jets, and to probe the depths of the night sky. *Cosmopolitan*'s reporter described the scene at Chicago in what can only be called glowing terms:

> Look from a distance at night, upon the broad space it fills, and the majestic sweep of the searching lights, and it as if the earth and sky were transformed by the immeasurable wands of colossal magicians and the superb dome of the structure that is the central jewel of the display is glowing as if bound with wreaths of stars. It is electricity! When the whole casket is illuminated, the cornices of the palaces of the White City are defined with celestial fire. (as cited in Nye, 1990, p. 38)

By the early 20th century, the emphasis began to move away from the sheer quantity of lights to the use of hidden lighting that enabled buildings to be displayed as striking forms in integrated artificial landscapes. Electric lighting granted a far greater level of control over appearances than had the softer light of gas lamps that required manual lighting and extinguishment. Electrification, with its capacity for automating and coordinating a range of "actions at a distance," accentuated the possibilities of orchestrating rapid changes in lighting across large surfaces. Lighting effects enabled buildings to be variously represented as a collection of independent architectural details or, alternatively, abstracted into a sculptural whole carved out of the surrounding darkness. Moreover, this process could be enacted as a time-based spectacle for a mass audience, who experienced in the outside world a succession of effects previously reserved for the interior spaces of the theatre, panorama and diorama. The world's fairs showcased the potential for electric lighting to establish a new rhetoric of urban space, opening the way for the city to be transformed into a performative space in which fixity of appearances would give way to increasing flux.

The new lighting techniques migrated rapidly from the idealized urban spaces of the world's fairs into more prosaic but no less fantastic environments such as the amusement parks on Coney Island outside Manhattan. Maxim Gorky's visit to Luna Park in 1907 found him entering a fabulous terrain composed of 1.3 million lights:

> With the advent of night a fantastic city all of fire suddenly rises from the ocean into the sky. Thousands of ruddy sparks glimmer in the darkness, limning in fine, sensitive outline on the black background of the sky shapely towers of miraculous castles, palaces and temples. . . . Fabulous beyond conceiving, ineffably beautiful, is this fiery scintillation. (as cited in Koolhaas, 1994, p. 29)

In the city center, the installation of street lighting and interior lighting for major businesses was followed by the adoption of electrical signs as a widespread form of spectacular illumination. The first blinking sign, spelling E-D-I-S-O-N, had been shown at the London Exhibition of 1882. By 1900, the use of commutators made it possible to organize visual sequences capable of producing the illusion of motion, exploiting the same effect of persistence of vision used by cinema. By 1910, more than 20 blocks on Manhattan's Broadway were covered in electrical advertising. The intensity of illumination lent the thoroughfare its famous sobriquet, and the Great White Way would soon be imitated by countless cities laying their own claim to being "modern."

Such dramatic shifts in urban appearances did not go uncontested. As early as 1896, the proliferation of advertising signs in New York led William Dean Howells to observe,

> If by any chance there is any architectural beauty in a business edifice, it is spoiled, insulted, outraged by these huckstering appeals. . . . It seems as if the signs might eventually hide the city. That would not be so bad if something could be done to hide the signs. (as cited in Nye, 1994, p. 187)

Electric lighting greatly accentuated the prominence of advertising signs, leading to the formation of associations in major cities such as New York and London with the aim of having objectionable signs removed or their construction blocked. Undaunted,

large corporations in the United States took brand promotion to a new level by floodlighting their skyscrapers. Icons of the age, beginning with the Singer Building in 1907, were baptized in light, the expense justified by their conversion into blazing symbols visible to millions. The Woolworth Building, which took over the mantle of world's tallest in 1913, had exterior surfaces designed with electrical illumination in mind.

If the messy commercial reality of this electrified environment offended the beaux-arts aesthetic, with its preference for the orderly neoclassical lighting and idealized urban spaces on display at the world's fairs, it proved ready-made for the European avant-garde. On his arrival in New York in 1917, Marcel Duchamp famously declared the entire city to be a work of art. When the great revolutionary poet and modernist proselytizer Vladimir Mayakovsky visited New York in 1925, he was impressed above all by the lights of Broadway:

> The street lamps, the dazzling lights of advertisements, the glow of shop windows and windows of never-closing stores, the lights illuminating huge posters, lights from the open doors of cinemas and theatres, the speeding lights of automobiles and trolley cars, the lights of the subway trains glittering under one's feet through the glass pavements, the lights of inscriptions in the sky. Brightness, brightness, brightness. (as cited in Woroszylski, 1971, p. 372)

Filmmaker Sergei Eisenstein's (1963) first impressions of New York register its vertiginous impact in strikingly cinematic terms:

> All sense of perspective and of realistic depth is washed away by a nocturnal sea of electric advertising. Far and near, small (in the *foreground*) and large (in the *background*), soaring aloft and dying away, racing and circling, bursting and vanishing—these lights tend to abolish all sense of real space, finally melting into a single plane of coloured light points and neon lines moving over a surface of black velvet sky. It was thus that people used to picture stars—as glittering nails hammered into the sky. (p. 83)

Although Eisenstein was prone to conceptualizing a wide range of phenomena, from literary images to Marxist dialectics, in terms of cinematic montage, his comparison alerts us to the extent to which the electrification of the modern city created a new perceptual matrix that strikingly paralleled the experience of cinema. The coincidence is still worth remarking. At the same moment in history that electric light charged the cityscape with spectacular effects previously reserved for specialized showplaces, the spread of new modes of rapid transit and the proliferation of glass architecture functioned to set every urban traveler's eye on a collision course with this shimmering, phantom city. This fusion of light, highly reflective surfaces, and mechanized movement rapidly became a hallmark of the modern city, establishing a spatiality that was both exhilarating and disorienting to its inhabitants. What emerges for the first time is an other city, an oneiric city that exists only at night and whose dream forms have only tenuous connections to the prosaic spaces of the waking day.

The Oneiric City

The experience of the modern city seen at night under electric lights conferred a novel sense of mutability on the previously immutable and monumental, converting

the stasis historically associated with architecture into a play of dynamic surfaces and seemingly plastic forms. The new skyscrapers of Chicago and New York, pierced by ever-greater windowed areas or skinned entirely with glass curtain walls, proved most susceptible to the growing sense of architectural ephemerality. To some observers, light seemed capable of dissolving their mass entirely. After visiting New York in 1910, Ezra Pound was moved to describe the evening city as the most beautiful in the world:

> It is then that the great buildings lose reality and take on their magical powers. They are immaterial; that is to say one sees but the lighted windows. Squares after squares of flame, set and cut into the aether. Here is our poetry, for we have pulled down the stars to our will. (as cited in Kenner, 1975, p. 5)

In France, where electric lighting operated on a far more restricted scale than in the United States, Le Corbusier's (1935/1964) characteristic enthusiasm for new technology emphasized the possibilities for the transformation of architecture:

> One Armistice Day in the evening, M. Citroën offered us that undreamed of revelation: a floodlit Place de la Concorde. Not just lit up by its street lamps, or the Republic's standardized little gas flames, but illuminated with all the floods of light made possible by electricity. The idea had come from America, the projectors from the war. It was (and continued to be every evening) one of the most astounding lectures on architecture that it would be possible to attend "in this wide world." Sublime straight lines, and oh, sublime French rigor! On that Armistice night a dumbfounded crowd standing in the square, held in the grip of a grace unshadowed by a single jest—on the contrary, of a grace imperious in its command—that crowd was able to listen *to architecture itself*. (p. 178)

Le Corbusier's vision of electric light converting mute architecture into a living, speaking entity situates the uncanny resonance of the new technological cityscape. In his famous 1919 essay "The Uncanny," Freud (1919/1955, pp. 219-252) defined the concept to include experiences in which inanimate objects seem to come to life, suggesting the sensation of the uncanny emerges in situations in which the boundary between the animate and the inanimate has become uncertain.[11] What Le Corbusier described above as a command performance in the son et lumière tradition, in which controlled light is used to unlock the tongues of buildings, was becoming an increasingly important part of everyday experience, particularly in the United States where nightly "floods of light" converted the city into a dynamic field of shifting intensities. The alteration of customary relations of dimension, distance, and materiality, as architecture came to life under the influence of lights, created a strange environment that no longer easily conformed to the stable "ground" of the traditional city. The apparent loss of physical solidity, the rapid alteration of scale and proportion, and the intermingling and overlapping of previously discrete spaces intensified the ambiguous relations between reality and fantasy, the animate and the inanimate, that characterize the urban uncanny.

The concept of the uncanny, like that of the "technological sublime" with its heightened mix of fascination and fear, is useful in focusing our attention on the ambivalence that dogs the ideal of the electrified city, undermining every attempt to split the rational precept of Le Corbusier's "radiant city" from its supposedly irrational double, the overcrowded Manhattan that gave birth to what Koolhaas (1994, p. 10) dubbed the

"culture of congestion." In practice, the orderly use of light as an integrated element of rational design has inevitably been overtaken by the excessive use of light for spectacular forms of display. In this regard, it is important to recognize the extent to which the city flooded with light and its double, the shadowy city at the dark heart of expressionism and film noir, are recto and verso of the same developmental forces of commodity capitalism. Nevertheless, the dream of their bifurcation has structured many of the key theoretical treatises of modern architecture, as well as a host of popular narratives. Exemplary of the latter is Thea von Harbou's (n.d.) novel *Metropolis* (which formed the basis for husband Fritz Lang's epic film in 1926):

> The workman No. 11811, the man who lived in a prison-like house, under the underground railway of Metropolis, who knew no other way than that from the hole in which he slept to the machine and from the machine back to the hole—this man saw, for the first time in his life, the wonder of the world, which was Metropolis: the city, by night shining under millions and millions of lights.
>
> He saw the ocean of light which filled the endless trails of streets with a silver, flashing luster. He saw the will-o'-the-wisp sparkle of the electric advertisements, lavishing themselves inexhaustibly in an ecstasy of brightness. He saw towers projecting, built up of blocks of light, feeling himself seized, over-powered to a state of complete impotence by this intoxication of light, feeling this sparkling ocean with its hundreds and thousands of spraying waves, to reach out for him, to take the breath from his mouth, to pierce him, suffocate him. (pp. 50-51)[12]

More noteworthy than von Harbou's florid prose is her recognition that, as much as the absence of light in the worker's underworld is at issue in the vertically stratified metropolis, so is the excess of light in the pleasure zones above. Unlike God's own light, which served to clarify truth for Descartes in his moment of radical doubt, electric light not only illuminates but intoxicates, doubling and redoubling the city, recreating the material bulk of its buildings, streetscapes, and squares as floating, dematerialized zones.

In this "ecstasy of brightness," the modern subject experiences the apotheosis of the technological sublime. The wholesale alteration of familiar spatial relationships promoted a new sense of fantasy or, rather, transformed the night city into a scene of fantasy. As Zizek (1992) pointed out, "Fantasy space functions as a kind of screen for the projection of desire" (p. 8). The oneiric night city rapidly became a key site, the symbolic screen on which the contradictory desires of the 20th century's "new man," split between restless ambition for the endless conquest of new frontiers and a nostalgic longing for the security of a stable home, would be projected and played out.

The recto-verso dynamic of spectacular illumination is also important in appreciating the way electrical lighting has contributed to the creation of a new "map" of the city. Not only did lighting illuminate key urban landmarks, it effectively deleted others, casting unattractive areas into impenetrable darkness. This capacity for architectural erasure was clearly appreciated by Andy Warhol, who shot his most notorious film, the 8-hour *Empire*, following the floodlighting of the Empire State Building in 1964. "The Empire State Building is a star," Warhol declared in his characteristic deadpan fashion, and for most of the film, the building literally is the star, continuously visible for more than 7 hours in an unmoving frame. Around 2.00 a.m., the floodlights

are switched off, and the last 45 minutes of the film are almost totally black. In an interview in 1975, Warhol commented,

> The best, most temporal way of making a building that I ever heard of is by making it with light. The Fascists did a lot of this "light architecture."
>
> If you build buildings with lights outside, you can make them indefinite, and then when you're through with using them you shut the lights off and they disappear. (as cited in Angel, 1994, p. 15)[13]

Lights enable modern skyscrapers, clad with glass curtain walls, to assume dazzling, indefinite forms and then, finally, to disappear, as if their monumental forms are no more than a conjuror's trick. The extension of electrical illumination, from individual structures to selected blocks and "great white ways" and, finally, to the entire city, created a whole whose impact vastly exceeded the sum of its individual parts. Electrical lighting provided the means through which the complexity of the modern city could be edited down to a few essential sites illuminated by floodlights, or grasped from above as a simplified pattern interspersed with unimportant blanks. The possibilities for wholesale architectural substitution via lighting effects resembled the selective appropriation of the cityscape that photography had been promoting at least since its industrialization in the 1880s. Submission of urban space to what Walter Benjamin dubbed the "selection" of the camera had generated the enormously popular genre of tourist postcards depicting urban landmarks, creating a territory of images that would increasingly help to shape the materiality of built urban form.[14] By World War I, a key cultural artifact of modern urbanity was the city skyline seen at night. By the start of World War II, what had once been mostly a hallucinatory promise capable of drawing millions of migrants and tourists had already become a familiar experience for many, transforming everyday apprehensions of urban space. In the process, deeply ingrained assumptions about the social relations of space were increasingly brought into question.

Relational Space and the Cinematic City

In conjunction with the proliferation of transparent and highly reflective surfaces, the ability to illuminate the cityscape in new ways introduced an important new dimension into urban design, one that belonged to neither architecture nor sculpture as traditionally understood. What emerges in the modern city is a new environment increasingly characterized by the overlap of material and immaterial spatial regimes, as distance becomes subject to new exigencies and urban surfaces increasingly function as illuminated screens. This "mixed reality" is an inherently dynamic and unstable environment: If appearances can shift rapidly, so can meanings.

A 1912 editorial in *The New York Times* underlined the impact of new communication technologies such as telephone and wireless radio on traditional spatial boundaries such as solid walls: "All through the roar of the big city there are constantly speeding messages between people separated by vast distances and . . . over housetops and even through the walls and buildings are words written by electricity" (as cited in Kern, 1983, p. 64).

Coupled to the impact of electrical light, many fundamental spatial parameters seemed to be shifting. In their famous "Technical Manifesto" of 1910, the Italian futurist painters responded to the effects of "electricism" (one of Marinetti's prospective names for his movement) by proclaiming the abolition of space: "Space no longer exists: the street pavement soaked by rain beneath the glare of electric lamps, becomes immensely deep and gapes to the very centre of the earth" (reprinted in Appollonio, 1973, p. 28).

Although similar manifestos announcing the annihilation of space and time were a founding tenet of 20th-century modernist culture, the theme is perhaps more accurately described as a recurrent moment in the technological transformation of modern life. As Schivelbusch (1986, p. 10) has observed, similar narratives had emerged in the 1820s, when the invention of the steam-powered train literally changed the way that people saw and experienced the landscape. The increased speed of travel, the elevated perspective offered by embanked rail lines, and the closeting of train travelers in windowed carriages that minimized physical interaction with the landscape all combined to alter the balance between foreground and distant elements. This tearing of the accustomed envelope of spatial continuity was widely described in terms of the "annihilation" of time and space for several decades from the 1820s, at least until the new mode of travel was routinized, and people were able to contemplate travel at 30 miles an hour with equanimity.

Schivelbusch's work is useful here in two ways. First, it can help us to understand that the discourse of the annihilation of space is part of a historical cycle of rupture and recuperation that recurs throughout industrial modernity. In the first phase of this cycle, older forms of spatial continuity are emptied out and made redundant, a process that, for the most part, is grasped reactively in the language of annihilation. In a second phase, intuitive and creative uses are made of the new "discontinuity." A key site for this process in modernity has been art, exemplified by the emergence of cubism and new techniques of representation such as collage and montage. Here, the key spatiotemporal experiences of industrial modernity—acceleration, fragmentation, and simultaneity—became the subject of new forms of visual experimentation that influenced all subsequent developments in modern art.

Schivelbusch's account also implies a third phase, in which the narrative of annihilation subsides as the new social experiences are subsumed into the dominant cultural ensemble. What deserves greater emphasis here is the extent to which this process of habitualization is itself dependent on a gradual paradigm shift in the social relations of space and time, as new continuities are established at a more "abstract" level.[15]

The development of cinema is a particularly relevant point of reference in this context. Early film has been influentially described by Tom Gunning (1989) as promoting an "aesthetic of astonishment" in which the experimental disintegration of space-time in film was an integral part of the spectator's pleasure. In the period from about 1907 to 1914, this diverse experimentation gradually solidified into a new set of "continuity" rules establishing the spatiotemporal framework underlying the model of "classical narrative cinema" that came to dominate film production. This shift altered the cadence of cinema, as it moved from a marginal cultural form to an institutionalized mass entertainment. It also opened the way for the gradual reintegration into popular culture of the radical challenge cinematic vision posed to the coherence of the modern subject. The fragmentation and reassemblage of the visual field that the cinematic apparatus promotes brought with it a radical potential to destabilize the accustomed

stability and centrality of the viewing subject. The development of an institutionalized form of narrative cinema was the means by which this potential has been subsumed into modern culture, not so much as a decentering of the self but as the basis for a heightened sense of individual autonomy and mastery. Although this recuperation of cinematic form as mainstream culture is neither total nor stable, it indexes an important shift in the social relations of space and time. Narrative film has been an important means by which the modern subject has integrated the new plasticity of space and time evident in a world crossed by global flows of images and information, without fatally disturbing the narcissistic, omniscient sense of individual mastery promoted by commodity capitalism as dominant subjectivity. This dialectic of rupture and recuperation situates the constant arguments as to whether cinema is capable of revolutionizing perception, as Walter Benjamin famously prophesied, or whether it has become part of the industrial techno-culture that "drills" the modern subject in the logic of increasingly abstract social relations of space and time (McQuire, 1998, pp. 71-81).

The spatial relations emerging from the dynamic interactions between electric light and urban space can also be profitably understood in terms of this cycle of rupture and recuperation. In the first decades of the 20th century, the electric city no longer provided a stable grid against which time and space could be measured in traditional terms. If electric light helped to turn the city into a promise—"bright lights, big city"—capable of drawing millions out of the countryside and across the oceans, the spatial experience of the illuminated city profoundly challenged customary understandings of place, boundary, dimension, and locatedness. In doing so, it crystallized one of the defining dilemmas of modernity: Enhanced possibilities for individual freedom and self-expression are counterpointed by a growing sense of displacement and loss of traditional forms of identity. The historic function of city design as a map of social and political order, as well as a repository of collective memory, began to give way to a new spatial organization in which the coordinates of self, home, and community would have to be plotted in new ways. In particular, any and every physical location now had to be reckoned in relation to its potential displacement by the activation of a circuit or the overlay of an image flow. Insofar as the illuminated city suspends historically recognizable living coordinates, it could function as a screen for the projection of the quintessential modern fantasy of personal freedom to reinvent the self, a fantasy offset for many by its price tag of increased alienation and chronic identity crisis.

One of the most influential and effective ways of representing the spatial complexity of the new urban environment emerged in cinema, itself an offshoot of the incandescent lightbulb and a desire for new forms of spectacular display. If cinema has become an indelible frame for the way in which the modern city is seen, this is in no small part because we have increasingly come to experience the modern city as cinematic. Saying this, I do not mean simply that we experience the city as an image, a surface without material substance, but rather as a complex, dynamic space produced through the interaction of light and movement. In cinema, the pleasures and confusions of the modern city were intensified and put on display. The editing and systematic erasure enabled by the illuminated cityscape was paralleled in film, in which the presumption of a continuous spatial field gives way to a new awareness of juxtaposition, dislocation, and interpenetration. But equally, cinematic montage emerges as one of the principal techniques for reconnecting the dispersed fragments and frac-

tured moments of the modern universe, generating new models for grasping the abstract space-time of the modern world.

This theme was influentially explored by Walter Benjamin, drawing on Georg Simmel's analysis of the psychological conditions of the modern metropolis and Freud's work on human adaptation to battlefield shock. Benjamin (1973b, p. 252) famously offered cinema as the historical device necessary to school the 1930s "man in the street" in the new exigencies linking phenomena such as "big-city traffic" to world-historical political events. Cinema's abrupt switchings, sharp juxtapositions, and capacity to generate meaning from seemingly random collisions all seemed peculiarly tailored to the staccato rhythms and spatial dispositions of urban life. If such an approach reached a formal peak in the 1920s "city symphony" films of Walter Ruttmann, Dziga Vertov, Alberto Cavalcanti, Joris Ivens, and others, a similar logic informed creative work across disciplines, including painting, architecture, photography, literature, and poetry. Artists in all these domains sought appropriate means to choreograph their heightened awareness of spatial multiplicity and temporal simultaneity through techniques of collage and montage.

The critical aspect of all these forms of cultural production was their foregrounding of spatial contingency. In comparison to the integral spatial envelope that dominated the classical world and its key visual forms such as the geometric perspective of European oil painting, modern spatiality loses its submission to a stable centered point of view. Once rendered dependent on individual points of view—or, as Albert Einstein famously put it, the observer's frame of reference—space is increasingly experienced as a relative rather than an absolute value. Relational space lacks integral qualities. Its properties are contingent rather than fixed, dependent on a complex of unstable and shifting relations measured by statistical probability rather than precisely defined coordinates. Relational space is exemplified by the ephemeral Brownian motion of anonymous city crowds whose tidal movements became the hallmark of big city life.

By the first decades of the 20th century, the absolute values of space and time that defined the Newtonian universe had already been dethroned in physics by quantum mechanics and relativity theory. The electrification of the city, in conjunction with the deployment of new media such as cinema, telephony, and radio, was perhaps the most spectacular manifestation of a parallel dislocation of the social relations of space and time. In fact, this kinship can be pushed further to argue that the electrification of urban lighting is an integral part of the creation of modern media environments.

Long ago, Gaston Bachelard reminded us that "everything which casts a light sees" (as cited in Schivelbusch, 1988, p. 96). What I have suggested here is that electric lighting, with its unprecedented intensity, precision, and automated control, set in motion a complex psychogeography of seeing and being seen that has become integral to the contemporary cityscape of promiscuous display and everyday voyeurism. The extension of electric lighting created the foundations for the camera-laden city of postmodernity, with its ubiquitous circuits of surveillance and countersurveillance, but also established experimental zones of space creation, foreshadowing the mutual commerce of lighting, electronic media, and urbanism in the present. As we witness the current widespread deployment of sophisticated systems of computerized lighting and visual projection, the proliferation of giant-screen televisions in shopping malls and public squares, and the development of "smart buildings" that eschew the modernist glass wall for screen walls capable of chameleon shifts, we are once again be-

coming conscious of significant redefinitions in the ambiance of urban space.[16] What remains to be seen is whether this new phase of "rupture" further extends the dominance of commodified space in the contemporary cityscape or, in the gap created by the disturbance of existing spatial dispositions, opens it to a new political critique.

Notes

1. Goethe is cited in Asendorf (1993, p. 153); Lenin's statement, "Communism is Soviet power plus the electrification of the whole country," was made in 1920 and reprinted in Lenin (1966); Warhol is cited in Angel (1994, p. 15).

2. The notable exceptions are historians David Nye (1990, 1994) and Wolfgang Schivelbusch (1988), although Schivelbusch's main focus was gas rather than electric lighting.

3. This excess over and above any pure functionality was already apparent in the earlier generation of public experiments with electricity conducted by those such as Sturgeon and Saxon in London in the 1830s. Morus (1998) has emphasized the spectacular nature of their displays, concluding that the creation of special effects such as giant sparks was an indispensable element not only in attracting public attention but in winning the battle of public opinion.

4. Nye (1990, p. 29) discussed this plan published in *Electrical World*. Schivelbusch (1988, pp. 3-5) discussed a similar proposal by architect Jules Bourdais to erect a 360-m tower near the Point-Neuf with arc lights strong enough to illuminate the entire center of Paris, noting that it was one of the final two projects considered for the celebration of the centenary of the French Revolution. It eventually lost out to another engineering triumph, Gustave Eiffel's tower.

5. The first demonstrations of the Lumière Brothers' pioneering *cinematographe* at the Grand Café in Paris included the now famous short film, *L'arrivée d'un Train en Gare La Ciotat*, showing a train pulling up to the station platform. For years, the tales of the audience fleeing this apparition were widely circulated and served to prove both the traumatic realism of the new medium and the credulity of the early audience. Although more recent scholarship is agnostic as to the factual basis of these accounts, I would argue they can be profitably read as indexes of the revolution in the social relations of representation that the new medium produced.

6. A good account of these common phases for the spread of electrification is found in Platt's (1991) economic history of the electrification of Chicago. Although electrification of the world's major cities began in the 1880s and was an established fact by World War I, electrification of regional cities, like the extension of power to rural areas, was a much slower and more uneven process.

7. Schivelbusch (1988, pp. 83-99) discussed the origins of public lighting schemes in Europe in the 16th century and their linkage to the extension of the absolutist state, which controlled an enormous amount of people's daily routines. During the various 19th-century rebellions in Paris (1830, 1848, 1871), lantern smashing constituted a collective act of rebellion against state authority. Although here I am not concentrating on the relation between lighting and the policing of public space, it is important to recognize that light retains a major role in the imposition of social order, demonstrated by the chaos following blackouts such as those that affected New York in 1974.

8. The world's fairs also played a critical role in securing venture capital to finance the development of electrical technology and the rollout of electrical infrastructure. Bazerman (1999) provided a detailed account of Edison's machinations in relation to the major fairs of the 1880s, which included payments to key members of the technical juries evaluating competing electrical systems, as well as the more conventional techniques of modern public relations.

9. On the electrification of factories in the United States, see "The Flexible Factory" in Nye (1994, pp. 185-237).

10. Although world's fairs and similar exhibitions were not profitable in themselves, the National Electric Light Association in the United States noted their value as "load builders" was instrumental in increasing demand for street lighting and other uses of power.

11. On the relation of the uncanny to space and architecture, see also Vidler (1992) and McQuire (1997a, 1997b).

12. According to Lang, his film was itself originally inspired by a visit to New York:

> I first came to America briefly in 1924 and it made a great impression on me. The first evening, when we arrived, we were still enemy aliens so we couldn't leave the ship. It was docked somewhere on the West Side of New York. I looked into the streets—the glaring lights and the tall buildings—and there I conceived Metropolis. (as cited in Robinson & Bletter, 1975, p. 67)

13. The reference to "the fascists" is probably to Albert Speer's radical use of dozens of searchlights pointed vertically into the night sky to construct a vast stadium of light for Hitler's rallies.

14. See for example Schor (1992).

15. It is important to appreciate that these three "phases" I am describing are overlapping rather than linear and that *abstract* is a relative term, referring in particular to the emergence of the reflexive subjectivity conditioned by the heightened role of media and communication technologies in everyday life. See, for example, Lash (1994, pp. 110-173).

16. Interactions between light, new media, architecture, and urban design have been the subject of increasing attention in the past decade. See, for instance, Riley (1995), Lozano-Hemmer (2000), and Ranaulo (2001).

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