An Archeology of the Metacity

Brian McGrath with S.T.A. Pickett

Introduction On February 8, 1971, NASDAQ, the world's first electronic stock market, began on-line trading. Forty-five years later, trillions of dollars of stocks are traded daily over the Internet, accelerating the pace of globalization, enlarging the reach of urbanization, and heightening inequality. By the end of the 1970s, a number of social counter-revolutions accompanied the technical acceleration of financial trading that began the decade. In 1979, Shah Mohammed Reza Pahavi left Tehran, to be replaced by Ayatollah Ruhollah Khomeini; Russia's invasion ignited the Afghan jihad; Karol Wojtyla, the newly elected Pope John Paul II, visited Poland; Deng Xiao Ping enacted his economic reforms in China; and Margaret Thatcher was elected Prime Minister of the United Kingdom. As Christian Caryl has pointed out, 'The forces released in 1979 marked the beginning of the end of the great socialist utopias that had dominated so much of the twentieth century. It was in 1979 that the twin forces of markets and religion, discounted for so long, came back with a vengeance.'[1]

By the 1980s, urban observers began to note some of the effects that the digital globalization of capital and the return to the primacy of markets and religion had on cities. Joel Garreau's *Edge City: Life on the New Frontier,* and Neil Smith's *The New Urban Frontier: Gentrification and the Revanchist City,* revived Frederick Jackson Turner's *The Significance of the Frontier in American History*. Turner's thesis, first introduced at the World Columbian Exhibition in Chicago in 1893, claimed that the American wilderness was tamed by industry at the beginning of the twentieth century. The cultural veneer over a tamed wilderness – the City Beautiful – was on display in its full glory in the Columbian Exhibition that year. The forces behind the urban transformation at the twentieth century's end remained hidden to both urban theorists and city residents. While Garreau enthusiastically championed the shiny new urban frontier at the periphery of older American cities, Smith identified gentrification as the revenge of capitalists, simultaneously reclaiming the centers of these same cities. Like two blind men describing an elephant differently from feeling its tail and its trunk, Garreau and Smith missed a new global pattern in urbanization that was appearing simultaneously in the center and edge of America's cities in the 1980s.

Clearly the historical distinction between rural and urban, edge and center was no longer viable in describing late capitalist processes and patterns that are transforming both. We can neither champion nor demonize capital as the lone force shaping urban form when it is manifested so differently in various physical contexts. A new urban theory must not only reflect on the simultaneous remaking of spatial frontiers both at the center and periphery of existing cities, but must also be situated at the frontiers of traditional urban disciplines. In 1979 each of the co-authors of this chapter found himself amidst the sprawl of Garreau's edge cities in central New Jersey. That year I began my graduate studies in architecture at Princeton, and Dr. Steward Pickett was teaching at

1 Christian Caryl, **Strange Rebels: 1979 and the Birth of the 21st Century** (New York: Basic Books, 2014), p. xiii.

Rutgers University in New Brunswick. McGrath's voice appears in the first person, while Pickett's parallel trajectory is represented by the third person. The two of us, first separately in our own fields, and then in collaboration, became strange rebels in redefining and intertwining the fields of urban design and ecology under the rubric of the metacity at the beginning of the twenty-first century.[2]

Thirty-five years after global finance began its digital turn, the term metacity was introduced by UN-Habitat in the *State of the World's Cities Report* in order to identify hyper cities with a population of more than twenty million people.[3] The Habitat report closely followed projections at the turn of the twenty-first century that planet Earth, for the first time in history, had become predominately urban. Rather than just describing a handful of sensational super-sized conurbations, we deploy the term metacity in order to comprehensively identify the planetary urbanization predicted in 1970 by Henri Lefebvre in *The Urban Revolution*. Together, and in conversations with David Grahame Shane (Section VII in this volume), we began to redirect the term metacity not only to theoretically move between urban center and periphery, but also to create a transversal practice towards collective, global action.[4]

This chapter is an archaeological analysis of the metacity, uncovering the last four decades of global urbanization through the disciplinary biographies of an architect and an ecologist. Following Foucault, this chapter forms an archive of ruptures in the formation of knowledge rather than historical continuities of inherited 'truths'.[5] Looking at urban form through the lens of examining social, technological and cultural ruptures rather than continuities can be put in relation with Pickett's articulation of the emergence of the non-equilibrium theory of disturbance ecology.[6] Both architecture and the ecology of the city must be examined not in stasis, equilibrium or balance, but in a complex system in flux. An archaeology of the metacity will not only closely examine the impact globalization, rapid urbanization and inequality have had on urban form, urban nature and urban actors, but point to potential collaborative action that can be undertaken in response.

I have catalogued an archive of our experiences of the emergence of the metacity into four decades following the introduction of electronic trading at the New York Stock Exchange in 1981. This chapter will begin in the 1980s when Pickett and I explored two separate frontiers. My work began within the very neighborhood of New York's gentrifying Lower East Side that forms the case study of Neil Smith's 'new urban frontier'. Pickett's work began with his long-term research, studying forest succession in former agricultural fields in central New Jersey near Garreau's frontier of the edge city periphery. The 1980s represent the practices of design and ecology as attempts at 'damage control' through small scale, socially motivated material interventions and observations, blind to the spatial displacements and ecological processes brought with the onslaught of digital globalization of capital.

The second decade, the 1990s, saw architects and ecologists seizing digital tools as the 'means of production' and working at the interface of the urban and rural patterns, social behaviors and ecological processes. The emerging metacity needed to be identified both culturally and scientifically. Lefebvre's philosophical and social formulation of an agricultural world becoming completely urbanized aligns with the pioneering work of urban ecologists Mark McDonnell and Steward Pickett. Their seminal scientific research described urbanization as a complex environmental gradient spreading from the South Bronx in New York City to Litchfield, Connecticut. During the same time, I began coordinating the New York based advanced architecture and urban design studio at Columbia University, where the traditional focus of the studio within New York City's five boroughs was enlarged to encompass a region from Peekskill, fifty miles north of Manhattan, to Perth Amboy, thirty miles to the south.

The twenty-first century began in New York with the collapse of both the World Trade Center and the ideal of universal acceptance of global capital that it symbolized.

Lefebvre's *Urban Revolution* was published in English in 2003, the year in which the co-authors of this essay met and began to both theorize and operationalize a new expanded field between urban design and ecology with a large team of researchers, faculty and students comprising the Baltimore Ecosystem Study. The work, while focused on the region around Baltimore, Maryland, expanded and combined our scope of research to include the entire U.S. Northeast Megalopolis from Boston to Washington D.C. Digital tools were shared between scientists and designers through geographical information data bases and collaborative networks.

The final section of this chapter imagines the second decade of the twenty-first century, through a synthesis of material practice and digital tools towards new forms of design-led social and ecological activism, both 'close-up and remote'.[7] The year 2011 saw the appearance of the 'Occupy Movement' first on-line, then on Wall Street, and later encamped in Zuccotti Park and public spaces in other cities. The digital tools that allowed capital to so effectively globalize, were now calling protesters to question the inequities of the system. Romantic beliefs of nature and community, and

2 Brian McGrath and S.T.A. Pickett, 'The Metacity: A Conceptual Framework for Integrating Ecology and Urban Design', in Kongjian Yu (ed.), **Challenges in City Design: Realize the Value of Cities,** special issue of **Challenges**, vol. 2 (2011).
3 UN-Habitat, **The State of the World's Cities 2006/7**, p. 8.
4 Brian McGrath and D. Grahame Shane, 'Metropolis, Megalopolis, Metacity', in Greig Crysler, Steven Cairns and Hilde Heynen (eds), **The SAGE Handbook of Architectural Theory** (London: Sage Publications, 2012).
5 Brian McGrath, **Digital Modelling for Urban Design** (London: John Wiley & Sons, 2008).
6 S.T.A. Pickett and P.S. White, **The Ecology of Natural Disturbance and Patch Dynamics** (New York: Academic Press, 1985).
7 Brian McGrath and D. Grahame Shane (eds), **Sensing the 21st Century City: The Net City Close-up and Remote**, **AD** special issue, vol. 75, no. 6 (November/December) (London: John Wiley & Sons, 2005).

knowledge too situated in a specific space created blind spots that can only be overcome through collaborative repositioning of spatial and disciplinary points of view. The single city region can no longer be studied in isolation, and the metacity must be framed as a global phenomenon effecting the urban and rural worldwide.

All archaeologies, like this one, are stories, constructions of human imagination based in empirical evidence drawn from exhumations of layers of history, archival evidence, physical observation, data, but also of experiences, reflections and memories. Architectural and ecological histories are distinct and selective, as they often serve as justification for projecting an idealized and imagined future. But as the last three and one-half decades have shown, design and scientific history, if selective of the past, is also often blind to the present and the inherited myths of our respective archives of knowledge. Unbeknownst to us in 1981, the first experiments in electronic trading that took place at the New York Stock Exchange, would so fundamentally change both the architecture and ecology of the city, the region and the world beyond what any close reading of the present or any exhumation of the historical past could anticipate.

June 1981: Damage Control

Only capital and digital is global, the rest is damage control.[8]

In a quiet archive above Wall Street is a folder containing a trove of photographs depicting a grand interior in chaotic disarray. Wooden desks, file cabinets and chairs are upturned and a paper trail is scattered on the floor, as if disrupted by a mob of thieves or revolutionaries. Like a scene from a science fiction film, futuristic objects, tethered by wires and tubes from above, are being lowered into the grand neoclassical room. Although the 1905 New York Stock Exchange building designed by George B. Post was declared a National Historic Landmark in 1978, over one weekend in 1981 the neoclassical furnishings for paper trading were replaced by a futuristic spider's web of fiber optic cables, computer terminals and display screens. One Friday afternoon in June, the brokers and traders spent their last day in an analogue world of paper, and on Monday morning, they arrived to an array of electronic screens and teleprompters, communicating and recording the global flow of capital through digital technology. Today, although the vast majority of stocks are traded electronically, a small number of extremely highly priced stocks are still brought to the grand theater of capital on the physical trading floor.

I completed my graduate studies in architecture the same month that computer terminals replaced desks at the New York Stock Exchange. I was trained in the traditional analogue tools of the Beaux-Arts architect in the leafy enclave of Princeton, sheltered from the burgeoning sprawl of central New Jersey. Moving to Lower Manhattan, I found a city with hundreds of thousands of vacant buildings and empty lots that awaited the imagination of an architect trained in the post-modern lessons of urban fragments and Italian gardens, mechanically drafted and hand rendered in prismacolor. As a newly apprenticed architectural designer in June 1981, I was oblivious to the new digital equipment my neighbors working on Wall Street now utilized, and could not foresee the urban future that was unfolding around my new home.

Like other artists and designers of my generation, I found myself on Neil Smith's frontier of the gentrifying Lower East Side of New York. The digital infrastructure of the new global economy was as invisible to most residents of the city in the 1980s as it was to me. It entered quietly into the interiors of governmental, corporate and educational institutions through drop ceilings and raised floors. Practicing as an architect at that time, many projects involved the renovation and rehabilitation of century-old row houses, tenements, lofts and prewar towers of buildings for the workers in the new digitally enhanced new service economy using the analogue tools of the architect developed in the nineteenth century.

New York's East Village was in deep decline following the end of World War II. The only modern construction was the Robert Moses-era Jacob Riis housing projects east of Avenue D along the East River, replacing the docks and warehouses that once served as workplaces for the immigrant neighborhood. Between 1969 and 1976, New York City lost around 600,000 manufacturing jobs but the city gained 500,000 service jobs back by 1987.[9] Between 1950 and 1980, the area became increasingly abandoned, before the shifts in the New York economy made it one of the most trendy, desirable and expensive neighborhoods in the city, with easy access to Wall Street and downtown Universities.

1981 was also when Ronald Regan began his first term as U.S. president, ushering in an era of deregulation, privatization, fiscal austerity and cutbacks in government spending. At the beginning of the 1980s, there were approximately 100,000 vacant and semi-occupied city-owned buildings and 10,000 city-owned vacant lots. Mayor Ed Koch was ready to take on the privatization and reduction of government spending dictated by the Municipal Assistance Corporation, a special state panel of Wall Street lawyers and bankers to oversee the new municipal fiscal austerity. This decade thus saw the birth of neoliberalism in New York City governance, with the Koch administration turning city agencies from social service providers to provisioning a conducive atmosphere for financial development.

Innovative community based movements in New York's East Village over the past five decades include the community land trust, homesteading, community gardening, Credit Union, arts

8 Gayatri Chakravorty Spivak, 'The Second Annual Carol Breckenridge Memorial Lecture in South Asian History', The New School, November 7, 2011.
9 Samuel M. Ehrenhalt, 'Economic and demographic change: the case of New York City', **Monthly Labor Review**, February 1993, pp. 40-50.

development and cross-subsidy program. Some examples were highly successful and remain urban models for today, while other social experiments lost government support, as the city tied itself to the economic advantage of the rise of real estate value. Frances Goldin and Thelma Burdick co-founded the Cooper Square Committee in opposition to Robert Moses' urban renewal plan for the East Village neighborhood just south of Cooper Union. The Committee created the first community based plan in New York in order to minimize displacement. The neighborhood also became a cultural hub, as Ellen Stewart was able to secure short leases from the City for her experimental theater incubator La MaMa on East 4th Street.

Liz Christy formed the 'green guerillas' and began to seed and plant on neglected city-owned vacant lots. On the prominent corner of Bowery and Houston Streets, just south of Cooper Square, they cleared out rubbish and debris and created a community garden. Dozens of community gardens bloomed throughout the neighborhoods of the Lower East Side and across New York, and the City's Department of General Services created Operation Green Thumb in 1978 to provide materials, service and one-year leases for gardens on city-owned vacant lots. The first reports about the disease that later became known as AIDS appeared, as in July of 1981 when the *New York Times* published the article 'Rare Cancer Seen In 41 Homosexuals'. The political action group ACTUP revolutionized the mediation of active resistance to the health crisis of AIDS. I took part in demonstrations at City Hall, Brooklyn Bridge, St. Patrick's Cathedral and Grand Central Terminal, as well as in weekly strategy meetings at The Great Hall in Cooper Union. Feminism, AIDS and community cooperative activism prepared the Lower East Side for the forces of changed unleashed in the 1980s.

My search through the archives of the New York Stock Exchange was to illustrate the text of my first publication, *Transparent Cities,* published by SITES Books in 1994. A boxed set of 24 acetate maps, each showing an elemental layer of Rome or New York from a particular period of time, was the result of diving into the map archives at the New York Public Library and at the Biblioteca Nazionale in Rome, but also in response to the experience of living in these two cities in the 1980s. The idea was to represent the city not as a fixed plan, but as a landscape in flux, changing slowly or abruptly according to technological invention, political change or social desire. The plates can be juxtaposed and superimposed in any order, producing new discoveries with each overlay. This overlay method was a way to understand the architecture of the city as the result of adaptive processes, and to invite ways for designers and communities to enter urban design as actors and agents of change. [1]

From my home and studio on East 4th Street, I conducted numerous architectural research and professional 'damage control' projects, which engaged with the vitality of these grassroots efforts, blind to the wave of gentrification that was to engulf the neighborhood in turmoil in the next decade. *Room in the City*[10], *Vacant Lots*[11], *Reweaving the Urban Fabric: a design proposal for affordable housing in Harlem*[12], *Safe Sex Piers*[13] and *New Schools for New York*[14] are among the study projects, exhibitions and publications of that decade. At the same time I began teaching architecture at the New Jersey Institute of Technology in Newark, which culminated with a studio sponsored by Architects and Planners for Social Responsibility. The students presented proposals that integrated the numerous, diverse and conflicting groups in the East Village in order to provide space for work, affordable housing, and cultural organization as well as permanent space for community gardens. [2]

A few miles south of Princeton, Steward T.A. Pickett joined the faculty of Rutgers in 1977. He began to work in the summer of 1978 documenting population dynamics in the Hutcheson Memorial Forest, a virgin old-growth forest transferred from the local Lenape tribe to Dutch settlers in 1701. Ironically, a few minutes from Garreau's Bridgewater Commons edge city, at the intersection of Interstates 287 and 78, the land was maintained by direct descendents of those settlers until the 1950s, when it became administered and protected by Rutgers University as the Hutcheson Memorial Forest. In 1958, ten farm fields adjacent to the forest were established as the Buell-Small Succession Study in order to examine how old farm field to forest succession actually took place in real time. In contrast to the belief that natural succession in an old-growth forest would achieve a balanced ecosystem, Pickett and colleagues observed more complex and patchy changes in the forest and fields resulting from the changing use of the surrounding, increasingly urbanized and ecologically disturbed landscape.

Pickett led the Buell-Small Succession Study of post-agricultural dynamics by studying permanent plots, which yielded surprising results that questioned the then dominant models of succession as deterministic and end-point oriented towards an ideal of climax. Succession is the change in species composition, structure, or architecture of vegetation through time. For ecologists, *architecture* refers to the arrangement in three-dimensional space of the distribution and clustering of species, of life forms of plants, or patches of vegetation. While succession ecologists initially assumed that one community of plants gave way to another, Pickett's work in disturbance ecology exposed the more complex blending of communities and sequential aberrations. This, the longest continuous

10 Raymond Beeler, **Room in the City** (New York: Princeton Architectural Press, 1987).
11 Carol Willis and Rosalie Genevro (eds), **Vacant Lots** (New York: Princeton Architectural Press, 1987).
12 Ghislaine Hermanuz, Marta Gutman and Richard Plunz, **Reweaving the Urban Fabric: Approaches to Infill Housing** (New York: Princeton Architectural Press, 1989).
13 Parsons School of Design, **Bearings** (exh. cat.) (New York: Princeton Architectural Press, 1991).
14 Joel Garreau, **Edge City: Life on the New Frontier** (New York: Doubleday, 1991), p. 24.

study of post-agricultural succession, revealed the complexity of population and community dynamics over time.[15]

During graduate school, Pickett employed gradient approaches experimentally and conceptually in dynamic successional plant communities. The work extended gradient thinking into the temporal dimension and provided conceptual and empirical evidence that the adaptations of early successional plant species were sensible in a world where natural disturbance occurred unpredictably in time and space. Pickett also worked with anthropologist Pete Vayda and students on human versus natural disturbance in Borneo, where they discovered that naturally created tree fall gaps were exploited – gardened essentially – and that all gaps had some natural and some human controlled aspects. This direct observation of indigenous forest practices helped him to imagine how the Lenape may have managed the forests of central New Jersey for a millennium. Pickett observed the failure of the 'climax' assumed in the 1950s by the ecologists of that era, to maintain itself in the absence of ground fires that the Lenape would likely have set, and under the growing pressure from the exploding suburban deer population.

The spatial pattern in old farms is crucial to how the forest extended into the fields. Pickett conducted experiments in collaboration with graduate students on disturbance, resource interaction, leaf litter effects, and consumption of plants and seeds by animals in old-field communities. He articulated the Non-Equilibrium Paradigm in ecology to summarize and generalize the insights discovered, and in 1985 co-edited *The Ecology of Natural Disturbance and Patch Dynamics* to help ecology codify the role of episodic events as organizing phenomena. Species coexistence could be based on differentiation in spatial mosaics over time. The Hutcheson Memorial Forest, sadly, could not reseed as rampant deer populations consumed the native understory, which was replaced by an invasive understory that was not appealing to the deer.

Adaptive and successional thinking has long appeared in both urban design and ecology. The Hutcheson Memorial Forest is one of the places where Pickett became convinced of the need for a new successional paradigm in ecology, since when it was conserved in the 1950s, it was confidently said that it was a 'mixed oak climax'. All one had to do was to save it, and to figuratively fence it off from human disturbance. The forest that exists today, with the invasive exotics, Norway maple and *Ailanthus*, with no oak regeneration, but with some remaining very old trees that shaded the Lenape Native Americans, is clearly nothing like what was thought to be a self-perpetuating ecological community. Lack of ground fire, an overabundance of deer, and some tree diseases have left the forest very different. In addition, the philosophy of leaving nature alone has proven inimical to maintaining the composition and structure that stimulated so many people to support conservation of the forest. Pickett, reflecting on the fifty years of research at Hutcheson Memorial Forest has come to see that sometimes what one saves – or makes – is knowledge, not a thing.

The exurban landscape surrounding Hutcheson Memorial Forest represented American's urban future to Joel Garreau: socially diverse, economically rich, and denser than Japan.[16] 'New Jersey: Tomorrowland' is the first chapter in his pantheon of shining new *Edge Cities*. He identifies eleven edge cities within an hour's drive of Manhattan. Yet these New Jersey edge cities grew alongside the persistent decline of the state's large industrial-age urban centers. Camden, Newark, Patterson were all shrinking in population, with only those too poor to move out remaining. The flat, dense sprawl between Philadelphia and New York City, represents what Manuel Castells describes as 'an urban society without cities'.[17] What Garreau did not predict is that the shining new economy and lifestyle of the edge city frontier was preparing to reenter the historical center of New York City in Smith's frontier of gentrifying poor neighborhoods.

Romanticizing natural succession did not help regenerate Hutcheson Memorial Forest nor did the ideal of a forest community reaching a climatic equilibrium save the forest from invasive species. Likewise, the Lower East Side could not be barricaded from gentrification by grassroots community efforts alone. The political, economic and technological forces of a new global economy were well beyond the control of the residents of the Lower East Side. Iris Marion Young warns of 'the ideal of community' when seeking an urban 'politics of difference'.[18] Jennifer S. Light likewise warns of seeing the city through the false metaphor of a balanced ecological community going through successional change.[19] These micro scaled efforts were reduced to local damage control as they remained blind to the greater forces of change around them.

The roots of the metacity are found simultaneously in the two frontiers identified by Garreau and Smith of global digitalization and deregulation of capital. The social and ecological practices in urban design and ecology appeared with a narrow focus on damage control to local communities – both social and biophysical. The next section explores what happens when the digital means of production in the area of globalization and rapid urbanization are more widely distributed and the scales of analysis and action are distributed beyond the two frontiers of center and periphery connecting the urban and rural into one continuum.

15 S.J. Meiners, S.T.A. Pickett and M.L. Cadenasso, **An integrative Approach to Successional Dynamics: Tempo and Mode of Vegetation Change** (New York: Cambridge University Press, 2015).
16 Joel Garreau, **Edge City: Life on the New Frontier** (New York: Doubleday, 1991).
17 Manuel Castells, 'The Culture of Cities in the Information Age', lecture at Columbia University, 1999.
18 Iris Marion Young, 'The Ideal of Community and the Politics of Difference', in Linda J. Nicholson (ed.), **Feminism and Postmodernism** (London: Routledge, 1990), pp. 300-23.
19 Jennifer S. Light, **The Nature of Cities: Ecological Visions and the American Urban Professions, 1920-1960** (Baltimore: Johns Hopkins University Press, 2009).

August 1991: Irrational Exuberance On August 6, 1991 the worldwide web went live.[20] While the technology to publish hypertext pages on the Internet was previously developed by Tim Berners-Lee at the CERN lab (European Council for Nuclear Research), the user-friendly interface of web pages accelerated access to the Internet beyond military, government and academic users. August 1991 was also the month that I received a crash course in the beta version of new three-dimensional modeling software to prepare me to integrate digital modeling into my teaching at Parsons School of Design. Although Steve Jobs introduced the Macintosh computer in 1984, Chris Yessios at Ohio State University developed the first software for architects, called Form-Z, in 1989. Through the Macintosh computer, I attempted to link my interests in activism, cinema and design beyond the limits of 'damage control'. The PC and the Internet provided a sense of irrational exuberance to formulate methods of networking local design activities to achieve greater impact at regional scales.

After the publication of 'The Transparent City' in *SITES* architecture journal in 1990, I was also asked to teach 'Reading New York Urbanism' for the urban design students at Columbia University's Graduate School of Architecture, Planning and Preservation. The course combined fieldwork, cinema and art practices to 'read' and represent the urban landscape of New York using techniques such as the Situationist dérive. With the growth of the program I was soon asked to join David Grahame Shane in co-teaching his Five-Borough New York urban design studio. Through 1997 we engaged students in projects in the infrastructurally rich sites in the city that never were fully developed, such as Hunts Point, the Yankee Stadium and the Hudson and Sunnyside railroad yards.

Shifting focus in the mid-1990s we worked with the Department of City Planning and the Downtown Alliance on the issue of large-scale vacancy in the Wall Street business district, and the implications of the area shifting to a more mixed use area with the introduction of housing into many of the older pre-war office towers. In parallel with those studios, we partnered with the leaders of the newly designated Harlem Empowerment Zone, an outcome of Clinton era policy for Housing and Urban Development funds for impoverished neighborhoods. My experience in urban adaptation and change in the Lower East Side was critical in studios focused on the dual abandonment within the neighborhoods of Upper Manhattan, and the empty office spaces of pre-war buildings in Lower Manhattan. Both were the result of the new technologies of finance with the abandonment of city centers for Garreau's shining edge cities, the obsolescence of traditional office buildings in light of electronic trading, and the gentrification frontier developing in Harlem.

This horizontal and vertical restructuring of the city brought into question many of the received assumptions from our mutual training in the normative postmodern urban design theories of Aldo Rossi and Colin Rowe. *Transparent Cities* had argued for an alternative, time based representational technique of the city in contrast to the static typological and figure-ground techniques of Rossi and Rowe. In 1994 Dean Bernard Tschumi introduced the 'paperless studio' into the architecture programs at Columbia. The ability to layer information, but also to zoom in and out of scale within a model, continually alter the point of view, incorporate cinematic framing, movement and time images, as well as provide platforms for shared and interdisciplinary work – all these provided the tools for a new generation of urban designers over the next decade at Columbia.[21]

As coordinator of the Urban Design Studio 2 beginning in 1997, the sites of our analysis expanded beyond the political limits of the five boroughs of New York City. Studios incorporated a vast territory nearly 80 miles in length, from Peekskill, New York, an old industrial city on the Hudson River, to Perth Amboy, New Jersey at the mouth of the Raritan River. This geography encompassed the forested foothills of the Hudson Highlands to the north and east, and the network of old cities and new exurbs along the web of watersheds draining into the Hudson Raritan Estuary, as well as dozens of edge cities and forest and agricultural remnants. The new scale of inquiry now engaged the two frontiers of Smith and Garreau.

The personal computer opened up several key features for design: an intuitive user interface, the ability to share work and progress and to more freely collaborate, easy access to the Internet, and applications to use motion and animation, the representation of time, interactivity, the body in space, dynamic scaling and multiple points of view. Digital tools also expanded my practice as an architect into the realm of digital art in multiple exhibitions. In 1994, at the *Queer Space* exhibit at the Storefront for Art and Architecture in Lower Manhattan, I displayed a giant transparent screen where the voyeurism and cruising in urban space could be experienced in the gallery through a 3D digital model. In 1996, *Urban Diaries* was exhibited as a three-monitor digital animation installation at Parsons School of Design and an interactive web-based online text and photo essay which followed the daily lives of three individuals: in Bangkok, Taipei, and Bucharest. For the exhibition *City Speculations* at Queens Museum in 1996, I created two video animations of arriving in Rome at Termini Train Station and in New York through the Port Authority Bus Terminal. The detritus of history from aqueducts, viaducts, baths and piers was superimposed and looped with supertitles from the historical layers relating to the actors and statements that symbolized the times. [3]

Experiments in digital urban tools to help city agencies and neighborhood organizations re-imagine the city were first prototyped in the 1990s. I developed an urban design proposal

20 Mark Ward,'How the web went world wide', BBC news on Thursday, August 3, 2006, http://news.bbc.co.uk/2/hi/technology/5242252.stm (accessed April 27, 2015).
21 Brian McGrath, **Digital Modelling for Urban Design** (London: John Wiley & Sons, 2008).

for *Envisioning East New York* (1996) with the Department of City Planning, that situated precise local communities within a whole territory from the glacial moraine in southeast Queens, to the flat floodplain draining into Jamaica Bay that constitutes one of the most impoverished areas in New York City. With the Department of City Planning and the Van Allen Institute, I participated in a design study of incorporating big-box retail into New York neighborhoods and waterfronts such as Industry City in Sunset Park, Brooklyn (1996). The new global distribution logistics constitutes a new ecosystem, and this project refocused the question away from contextualizing a big box, to providing a modern distribution space for small and medium scale local businesses. A project with the Hell's Kitchen Neighborhood Association (1999) was developed from a deep dive into the archives of the Port Authority of New York and New Jersey. Combing through the annual reports of the organization since its founding in 1921, I calculated the number of housing units demolished in the various automobile and suburban bus infrastructure programs beginning with the construction of the Lincoln Tunnel, its expansion, and the construction and expansion of the Port Authority's bus terminal. The project called for the Port Authority to become the developer of affordable housing in the heart of Hell's Kitchen. [4]

Garreau's New Jersey edge cities were blamed for pulling creativity and productivity out of New York City through 1991, but the talent magnet returned to Manhattan and edge cities now appeared in the center. This is essentially Neil Smith's argument of retrenchment. However the grassroots movements in the Lower East Side held their ground. A community land trust was created at Cooper Square in 1991, and now a Mutual Housing Association manages 356 apartments in 22 renovated buildings formally owned by the city. A community based task force established in collaboration with city planners, created a new redevelopment plan that has resulted in 750 new mixed income apartments, retail and an amenity filled community center with gym and swimming pool. The community gardens were always managed by the city as temporary use, but when the city tried to sell the vacant lots, protests ensued. Over 100 gardens were saved at the last minute from auction through Bette Midler's New York Restoration Project rallying resources to purchase those lots and transfer them to the city parks department. The performing arts organizations on East 4th Street formed the Fourth Arts Block in 2001, securing their future in the neighborhood as well. [5]

Pickett moved to the Cary Institute for Ecosystem Studies, in Millbrook, New York in 1987, increasing his freedom to explore new areas and to think and synthesize ecological science in cities. At the Cary Institute, he joined Mark McDonnell in challenging classical successional research and conceptualization on applying ecological gradient frameworks to a vast urban transect across the New York City region. For McDonnell and Pickett, urbanization clearly creates complex environmental disturbances. Ecological gradients, either literally over space, experimental in the field or glasshouse, or abstract for measuring complex processes like urbanization, are part of the discipline's intellectual DNA. The gradient framework removed the blinders around the study of the New Jersey old-growth forest patch by bringing ecological processes within urbanization frameworks. Urban ecology was a radical pursuit at that time, where ecology was seen to be only *in* and not *of* the city. What is noteworthy about the ecological gradient approach is that it does not assume an idealized dense concentric urban model with a dense city center surrounded by suburbs and rural periphery, but rather a series of patches that can be measured in relation to the relative urban contexts in which they are found.

Pickett's Urban-Rural Gradient Ecology (URGE) program emerged from the collaboration with Mark McDonnell, Richard Pouyat, and others. It lasted for a decade and studied the effects of urban development on the functioning of red oak forest ecosystems along a 140 by 20 km transect from New York City to Litchfield County, Connecticut. The conversion of natural or agricultural landscapes throughout the world to highly modified urban landscapes is a global phenomenon. William Cronon's *Nature's Metropolis: Chicago and the Great West* and T.G. McGee's identification of *Desakota* – a mixed urban/rural type in Southeast Asia, both published in 1991, exhibit the growing awareness of the inability to separate urban and rural, city and nature. URGE provided a comprehensive way to study the ecological impacts of urbanization at both fine plot scales and comparatively over large metropolitan regions.

McDonnell and Pickett note that the commonly used terms 'urban' and 'rural' have multiple meanings and relate to a variety of conditions such as land cover, population density, the amount of impermeable surfaces, and cultural practices. By quantifying changes in ecosystem structure and function in relationship to varying levels of urbanization, they were able to obtain a greater understanding of urban and natural ecosystem interactions. The study of urban-rural systems through ecological gradient measurement could readily expand to discover new meta-patterns and interactions at genetic, physiological, population, community, ecosystem, and landscape levels. Furthermore, the linkages among interactions at various levels might well be sensitive to position along the gradient.[22] Ecological gradients are abstracted from complex mosaics. Commonly misunderstood as linear physical systems from center cities to rural hinterlands, gradients are neither linear nor necessarily defined by a physical transect. Gradients are a tool that enables researchers to order an ecological response along an axis of environmental conditions. The gradient is defined by the environmental variables, and not by the arrangement of sites across the landscape.[23]

22 M.J. McDonnell and S.T.A. Pickett, 'Comparative analysis of ecosystems along gradients of urbanization: opportunities and limitations', in J. Cole, G. Lovett, and S. Findlay (eds), **Comparative Analyses of Ecosystems: Patterns, Mechanisms, and Theories** (New York: Springer-Verlag, 1991), pp. 351-355.
23 M.J. McDonnell, A.K. Hahs, and S.T.A. Pickett, 'Exposing an urban ecology straw man: critique of Ramalho and Hobbs', letter to the editor in **Trends in Ecology and Evolution**, vol. 27, no. 5 (May 2012), pp. 255-256.

In ecology, there was a growing awareness that social science understanding had to be linked with the scale of gradient variable thinking. Attempts to link with such experts resulted in Pickett and McDonnell's co-edited 'Humans as Components of Ecosystems' as a step in this integrative direction. Pickett met social scientists Morgan Grove and William R. Burch, Jr., who understood ecology within a humanist framework. Burch and F.H. 'Herb' Bormann of Hubbard Brook Experimental Forest fame, both on Yale School of Forestry faculty, and residents of the same town in Connecticut, shared walks and talks around their 'neighborhood' pond.[24] Grove was Burch's student at Yale and pioneered social ecological research in Baltimore, Maryland. Since 1997, the Baltimore Ecosystem Study (BES), Long-Term Ecological Research program adopted the urban-rural gradient ecology approach, structured along the Hubbard Brook small watershed model, with linkages to social phenomena such as the neglected urban ecological frontier. In articulating what was new about the BES proposal, the team made the distinction between ecology IN and ecology OF the city, echoing Aldo Rossi's call for an architecture OF the city. This has been picked up widely in textbooks and framing discourses of urban ecology. The study adopted and expanded the human ecosystem framework of the Burch School with the conception of the city region as a social-ecological mosaic of great spatial heterogeneity and complexity.

Together with colleagues at the Cary Institute, especially Dr. M.L. Cadenasso, Pickett started using Geographic Information System (GIS) tools in 1998, both in South Africa and in Baltimore, Maryland. GIS was developed to help map forests in Canada by Roger Tomlinson in the 1960s. By the late 1980s desktop versions of GIS became available. GIS became a key tool of Cadenasso's development of the HERCULES land cover classification model (High Ecological Resolution Classification for Urban Landscapes and Environmental Systems).[25] This powerful use of GIS allowed the theory of patch dynamics developed in the previous decade to become operationalized in a way to understand spatial heterogeneity through the classification of land cover patches within a larger landscape mosaic. [6]

If the emergence in the 1980s of hyperlocal practices in neighborhoods or forest plots of projects classified here as 'damage control', the 1990s saw the introduction of new tools to understand the links between center and periphery, urban and rural and to understand patchy urban-rural interactions along long gradients. New scales of networked collaboration became possible with digital mapping, gradient measuring and communication tools, perhaps giving way to a sense of 'irrational exuberance'. The second decade of the emergence of the metacity saw digital technology as a key tool in linking the tactics of damage control to strategies to connect local and regional urbanization processes. Both Garreau and Smith saw frontiers in opposite directions. Linking edge city sprawl with inner city gentrification was crucial in theorizing the architecture and ecology of the metacity. Gradients are not a linear transect from urban to rural as in new urbanist simplistic conceptions of urban transects, but ways to measure the spatial heterogeneity of individual patches within larger mixed urban-rural systems.

August 2001: Inhabiting a Forest of Symbols

Nature is a temple in which living pillars
Sometimes give voice to confused words;
Man passes there through forests of symbols
Which look at him with understanding eyes.[26]

Marshal Berman employed Charles Baudelaire's forest of symbols to note the experience of New York as a multi-media theater of its own symbolic reproduction, both for the citizens and visitors to the city, but also to the world. New York is the ultimate expression of modernity, but Berman's book describes modernity as a cultural experience with capital at its core. Capital must annihilate everything that it creates and therefore *all that is solid melts into air*. In the final section of his book, 'In the Forest of Symbols: Some Notes on Modernism in New York', Berman describes Jane Jacobs as a radical rather than conservative figure, who celebrates the vitality, diversity and fullness of urban life.[27] But what happens when the lovely mixed historical neighborhoods of Lower Manhattan are transformed into a forest of symbols of capitalism?

The theme of the August 2001 Prix Ars Electronica Festival in Linz, Austria was *Takeover*. The festival, located in a post-industrial Rhine Valley city and begun in 1979, speaks to the broadening of cultural practice from fine artists to include digital media and science. At Ars Electronica, the democratization of digital tools brings more actors to cultural production and scientific research and the possibility to link the two. My web-based project *Manhattan Timeformations* with Mark Watkins received an award of distinction for net excellence in the 2001 Ars Electronica Festival. According to the jury, it 'demonstrates the significant potential of an intelligent connection between information and architecture – and realizes "information architecture" in the true sense of the word. *Manhattan Timeformations* intuitively allows insight into the processes that have taken place over the past 370 years in Lower Manhattan. Using multi-layering, the dynamic relations among the diverse factors of urban development are visualized.'[28]

24 F.H. Bormann and G.E. Likens, **Pattern and Process in a Forested Ecosystem** (New York: Springer-Verlag, 1985).
25 M.L. Cadenasso, S.T.A. Pickett, and K. Schwarz, 'Spatial heterogeneity in urban ecosystems: Reconceptualizing land cover and a framework for classification', **Frontiers in Ecology and Evolution** 5 (2007), pp. 80-88.
26 Charles Baudelaire, 'Correspondances' (1857), trans. William Aggeler as 'Correspondences' in **The Flowers of Evil** (Fresno, CA: Academy Library Guild, 1954).
27 Marshall Berman, **All That Is Solid Melts Into Air: The Experience of Modernity** (New York: Penguin Books, 1988), p. 316.
28 Hannes Leopoldseder and Christine Schopf (eds), **Cyberart 2001** (Vienna: Springer, 2001), pp. 25-26.

Manhattan Timeformations was developed for New York's Skyscraper Museum as a public art project with funding from a technology initiative from The New York State Council on the Arts in 1999.[29] A digital interface was developed in multiple public forums where Watkins and I presented the work in progress at the museum in its temporary location in a vacated Wall Street bank lobby. We interacted with tourists, traders during their lunch hour, as well as delegations from the Department of City Planning and the Mayor's Office a few blocks north. What we discovered in this modeling project was that it is during the economic busts that innovation happens. Air conditioning, glass curtain walls, automatic elevators and fluorescent lighting and the inventing of the mediated consumer economy were all introduced following the Great Depression and World War II. And of course, I have already demonstrated the impact of the introduction of the computer into the workplace in the 1980s during the economic recession following the oil crisis of the 1970s. [7]

In the years following the destruction of the World Trade Center on September 11, 2001, the interactive website of *Manhattan Timeformations* became a memorial as well as an archive of New York at the end of the twentieth century. Reaching a vast unseen audience via the Internet alerted me to the larger global impact made possible by digital design. From May 2002 to January 2003, I was invited to be part of the Lower Manhattan Cultural Council artist's residency at the World Financial Center, closed since the collapse of the adjacent World Trade Center. I developed an animation in which the physical history of Lower Manhattan – geological, environmental, ecological and built, could be experienced in visual relation to the actual clearing of ground zero and the ensuing planning discussions. *New York Ascendant: Here and Now* imagines new ways of accessing information in public space, emphasizing the viewer's body in motion.[30]

After *WIRED* magazine[31] published a review of *Manhattan Timeformations* in November 2001, J. Morgan Grove, a social ecologist from the U.S. Forest Service contacted me and proposed that I collaborate with him, S.T.A. Pickett and M.L. Cadenasso, currently a Professor at U.C. Davis. Together they were principal investigators in the Baltimore Ecosystem Study (BES), researching the complex urban ecology of the Baltimore Region. With the integration of the human ecosystem model into urban ecology research, design was the next frontier for BES.

For three years Victoria Marshall and I collaborated on urban design studios at Columbia University, and later I became a co-principal investigator myself. Learning the contingencies and legacies operating in Baltimore, the Columbia New York-based studio was now expanded to encompass the Boston-Washington megalopolis. Here we focused on the phenomenon of exurban sprawl in parallel with inner city abandonment as joint outcomes of national policy since Jean Gottmann's research from the 1950s. Working with scientists in the Baltimore Ecosystem Study marked the evolution from designing one single project at a time, to designing a range of options that foster systemic change. Instead of working for a single client or site, we developed a series of scenarios creating various choices for people throughout the Baltimore region, from plush estates, to older suburbs, to inner city row-house neighborhoods, inventing the role of the meta architect.

Another award winner at the Prix Ars Electronica in 2001 was Neeraj Jhaji, who developed ImaHima – which in Japanese means 'are you free now?' The location-based community service enabled mobile phone customers to locate and text simultaneously with a group of friends. NTT DoCoMo in Japan introduced the first full Internet service on mobile phones and the first smart phones to achieve mass adoption within a country in 1999. New software allowed texting and social phone networks that became a necessity for youth in hyper-dense Asian cities. Mobile devices began to move the Internet away from the desktop. As cell phones became smart phones, in 2001, Apple developed the iPod, where music downloaded from the Internet could be stored and played. The iPod was combined with the mobile phone and the Internet in the iPhone in 2007. Smart phones from 2012 onwards also have high-speed mobile broadband Internet web browsing, motion sensors, global positioning, and mobile payment mechanisms.

The impact of these micro-technologies together with the ability of GIS to overlay the global position of human or other species on the ground with continuous scanning from space, led to the special issue of *AD*, *Sensing the 21st Century City: The Net City Close-up and Remote*[32] co-edited with David Grahame Shane. The volume included reports from the streets of Johannesburg, the courtyards of Aranya, cyber-bangs in Seoul and call centers in Bangalore with news of giant infrastructural projects from the continental U.S. gas lines to China's great green wall. The juxtaposition of the implosion/explosion of edge city sprawl and inner city implosion was inspired by a line in the nouvelle vague filmmaker Jean Luc-Godard's self-questioning in *Two or Three Things I Know about Her,* 'Am I watching from too far or too close?' Notably, Rem Koolhaas borrowed this multiscalar title if not the participatory observation techniques in his helicopter view of Lagos in *Lagos Wide and Close* in 2006.

Koolhaas bragged about the number of hours clocked on airplanes and days spent in hotel rooms in the foreword of *S,M,L,XL*, so we should not be surprised that globalization for him created a generic city. In contrast, I was determined to understand the booming Asian megacity in the same way I understood New York or Rome, as an inhabitant. Beginning in 1995, I have lived between New York and Bangkok, Thailand, teaching and researching at the Faculty of Architecture, Chulalongkorn University. In the aftermath of the 1997 Asian financial crisis, I was able to understand

29 Brian McGrath and Mark Watkins, **Manhattan Timeformations,** 2000, www.skyscraper.org/timeformations, accessed May 10, 2015.
30 Nuit Banai, 'Siting the Everyday', in Erin Shirreff (ed.), **New Views: World Financial Center** (New York: Lower Manhattan Cultural Council, 2003), p. 8.
31 Evan Ratliff, 'Timescrapers', **WIRED**, November 2001, p. 39.
32 Brian McGrath and D. Grahame Shane, **Sensing the 21st Century City: The Net City Close-up and Remote, AD**, vol. 25, no. 6, November/December 2005.

the effects of globalization on the other side of the world from Wall Street. Over the next decades the political debate around globalization in Thailand was enacted in new urban forms as well as new political subjectivities. Two models played out, a sufficiency economy promoted by King Bhumibol Adulyade, and the other by Thailand's own strange rebel of neoliberalism, Thaksin Shinawatra. While Thai political uprisings in 1973 and 1992 bracketed military coups of 1977, 1981, 1986 and 1991, it had seemed when I arrived that the Kingdom was a stable democracy. After Thaksin's successful election in 2001 and 2005, a coup in 2006 ushered in a decade of conflict highlighted by the 'red shirt' occupation of the commercial center of the city in 2009.[33]

The thick, lived experience of globalization became a period of both extreme introspection and increased understanding of the scope of the territorial process of global urbanization. Essays such as 'Bangkok Simultopia' (2002), 'Bangkok Liquid Perception' (2003), and 'Face City' (2006) combined ethnographic and architectural observations, and described the deeply sensual experience within a tropical Asian megacity. As an urbanist, I used two new infrastructural projects from which to measure the urban change in Bangkok, Siam Central Station at the junction of the first two mass transit lines completed in Bangkok in 2000[34], and the Outer Ring Road, a industrial zone by-pass that transformed Bangkok's periphery into a agri- and aquacultural industrial and commercial fringe.[35] The center city study proved prescient when it became the new site of political demonstrations, first by the royalist 'yellow shirts' in 2006, and three years later by Thaksin's red shirt supporters in 2009. If the center faced a new insurgent public, the periphery faced new environmental challenges, as the unprecedented floods of 2010 halted the production of computer hard drives and the assembly of automobiles from inundated industrial estates.[36] [**8**]

Pickett went to South Africa first in 1994 to give a keynote to the South African Botanical Society about advances in the ecology of landscapes, heterogeneity, and disturbance. After that meeting, he was taken by his host, Kevin Rogers, to see several ecological research sites, where these ideas about heterogeneity were fully in evidence in the structure and change of the systems within the conservation and research into natural areas in savanna habitats. One of the sites was Kruger National Park, where Rogers and colleagues were conducting research on river structure and function. As a result of those interactions Pickett was invited to a research agenda-setting meeting focusing on South African savannas, rivers and watersheds, and later to develop research on the ecology of African urbanization.

Out of the South Africa trip grew a proposal to the Mellon Foundation to work with Rogers, Bob Naiman, Mary Cadenasso, and several others to investigate the connections between the rivers and the upland savanna. Cadenasso and Pickett focused on the riparian or streamside woody vegetation as a particularly neglected part of the eco-system. Although this work exposed him to the fascinating cultures and changes in South Africa, it was basically bio-ecological research. It had great relevance to the management of Kruger National Park, but it wasn't social-ecological research. Trips to South Africa for research often involved a weekend at the end visiting a fascinating city or some more urban area. Pickett's urbanistic observations during those times were only informal, but whetted his appetite to know more about urban processes in Africa.

Interactions with Melissa McHale of North Carolina State University starting in 2010 as part of the internationally inclusive Urban Sustainability Research Coordination Network began to expose Pickett more deeply to the new ideas that could come from understanding urbanization and the linkages between the urban and the rural in South Africa. Other international opportunities to better understand the diversity of urban processes included a visit to Auckland and Christchurch, NZ in 1999, Melbourne, the location of the Australian Research Centre for Urban Ecology directed by his former URGE colleague Mark McDonnell in 2003, and a visit to Adelaide for urban discussions in 2004. These interactions and visits prepared Pickett to see the broad relevance of the metacity concept in global contexts.

The metacity is both a forest ecosystem and a forest of symbols. My competition project for Queens Plaza in New York for the Department of City Planning and the Van Allen Institute was the first project in which I literally explored embedded digital sensing in public urban space. In the wake of 9/11, the proposal embedded digital sensors for security and environmental monitoring in subway stations, bridge crossings and traffic lanes with data, news and cultural event displays on electronic display devices.[37] From the local focus of organisms in space and time, within a vast urban/rural gradated ecosystem complex, linked together by new sensing and communication devices, the social and technological infrastructure of the metacity was ready to be activated. [**9**]

September 2011: Occupying the Metacity In September 2011, the on-line movement occupywallst.org was able to exploit a loophole in the policing of privately owned 'public' spaces in New York City, by physically occupying Lower Manhattan's Zuccotti Park. Thirty years after the trading floor of the New York Stock Exchange was occupied with the digital tools for global electronic trading, the Internet provided a forum for a social movement to occupy this space in between the two most potent symbols of global capitalism and its discontents: Wall Street and Ground Zero. For two months, before police cleared the plaza at 1:00 AM, November

33 Brian McGrath, 'War, Trade and Design: Urban Design and Counter Public Spheres in Bangkok', **Footprint** 12, Delft University of Technology, 2013.
34 Brian McGrath, 'Bangkok's CSD', **Regarding Public Space**, 30-60-90 (**Architectural Journal**, vol. 9), 2005.
35 Brian McGrath and Danai Thaitakoo, 'Tasting the Periphery: Bangkok's Agri- and Aquacultural Fringe', in Karen Franck (ed.), **Food and the City** (London: **AD** Magazine, 2004).
36 Brian McGrath, 'Zone Flood', **Extrastatecraft** 2012, http://extrastatecraft.net/Projects/ZoneFlood, accessed May 10, 2015.
37 Bill McGarigle, 'Mapping Places and Spaces', **Architectural Record**, June 2002, p. 180.

15, the space was occupied by an alternative vision of a community-based global city. From New York's Wall Street, Cairo's Tahir Square, Istanbul's Taksim Square, to Central Hong Kong, occupy movements organized and mediated through mobile smart mobs transfixed the world.

In June 2013 Edward Snowden, working for a subcontractor for the U.S. National Security Administration released thousands of secret documents about global surveillance to news outlets around the world. In the metacity, big data archives, comprised of minute details of the lives of billions of people, are collected by governments and the giant corporations like Alibaba, Amazon, Baidu, Facebook and Google. This decade is only half over, but the confluence between the embedded forces of 'damage control' of the city and the takeover of the means of production of the forests of symbols and of nature faces new challenges by the sheer magnitude of concentration of information-as-power into the hands of few.

This archaeology of the metacity outlined here follows a trajectory from the design and ecology as acts of 'damage control' blind to the impact that the introduction of electronic trading had on Wall Street. In the following decade, architects and ecologists began to use new digital tools with a sense of 'irrational exuberance' of the power to link local and global forces and processes. The twenty-first century began with an attack on symbols of the new form of capitalism that was created through digital globalization, but 2011 saw the occupation of city centers via widely dispersed digitally fed social activism. Digital design and ecological science developed enormously in the three decades between these events. However, ecological design has yet to fully engage the implications of the digitalization of capital, nor has it led to the realization of an equitable and environmentally sustainable urban future.

The trajectory of these research and design projects can be seen in relation to that weekend in June 1981 at the New York Stock Exchange. My work evolved from a material involvement as an architect with what we can call the damage control of the digital globalization of capital as it physically transformed New York following the fiscal collapse of the 1970s. Gradually I saw the introduction of digital design tools for more complex and systematic analysis and exploration of urban domesticity, social institutions and ecosystems. And finally I see digital tools embedded in space in order to create a more activist urban public.

Globalization has also begun to find a conceptual home in ecological science, and its urban application. For Pickett, a key moment in the globalization of urban ecology was the 2013 Strüngmann Forum working group in Frankfurt am Main. This international, multidisciplinary meeting articulated the continuum of urbanity globally. This joint social-ecological-spatial conception has the potential to connect research and application of ecological processes at many scales, with the various demographic, financial, cultural, material, and policy linkages that flow among places in the global urban realm. The scaling, interactions, and changes in the metacity can be guided by the continuum of urbanity as a multidimensional tool. These two powerful tools – the metacity and the continuum of urbanity – have proven useful in organizing insights garnered from international comparisons in urban ecology. During the last few years, Pickett was able to directly observe Chinese urbanization, and the sometime bankruptcy of the eco-city idea in practice, during three visits since 2008.

Victoria Marshall has explored the metacity framework in her work in two megadeltas in Asia: the Yangtze and the Ganges.[38] She uniquely combines patch dynamic mappings through satellite imagery with on-the-ground ethnographies of urban actors and agents. Although Asian urban transformations are the tidal wave of the moment, it is clear that an urban tide is now rising fast in Africa. A workshop in South Africa in 2014 focused Pickett's attention on the ruralization of the urban in Northeastern South Africa, and showed, again, the power of the continuum of urbanity and the concept of the metacity. This led to a return visit in 2015 for a longer period at which collaborations were deepened and the richness of connections of the urban/rural complex to the metropolis of Johannesburg could be observed.

Pickett, along with Cadenasso and Chris Boone, conducted a National Center for Ecological Analysis and Synthesis working group that critiqued ecosystem services concepts in light of environmental justice in urban systems. These ideas have been further developed during a Fulbright Fellowship in South Africa, when Pickett helped refine and extend the continuum of urbanity in a rapidly changing regional landscape. This led to an extension of the conceptions of ecology *in* and ecology *of* to ecology FOR the city.[39] These refinements resonate with the Earth Stewardship Initiative[40] that Pickett helped guide while president of the Ecological Society of America.

In 2011, Pickett and I published an essay called 'The Metacity: A conceptual framework integrating ecology and urban design'.[41] The essay synthesizes the previous three decades of design and ecology research both individually by the two authors, and a decade of working together collabo-

38 Victoria Marshall, 'Ecological Urban Design: Visuality and Landscape', **Nakhara Journal of Environmental Design and Planning,** 2014, vol. 10, pp. 113-126.
39 Daniel Childers, M.L. Cadenasso, J. Morgan Grove, Victoria Marshall, Brian McGrath, and S.T.A. Pickett, 'An Ecology **for** Cities: A Transformational Nexus of Design and Ecology to Advance Climate Change Resilience and Urban Sustainability', **Sustainability** 7, pp. 3774-3791. doi:10.3390/su7043774, 2015.
40 F.S. Chapin III, M.E. Power, S.T.A. Pickett, A. Freitag, J.A. Reynolds, R.B. Jackson, D.M. Lodge, C. Duke, S.L. Collins, A.G. Power, and A. Bartuska, 'Earth Stewardship: Science for Action to Sustain the Human-Earth System', **Ecosphere** 2(8), art. 89. doi:10.1890/ESA11-00166.1, 2011.
41 Brian McGrath and S.T.A. Pickett, 'The Metacity: A Conceptual Framework for Integrating Ecology and Urban Design', in Kongjian Yu (ed.), **Challenges in City Design: Realize the Value of Cities,** special issue of **Challenges**, vol. 2, 2011.

ratively in the BES. New urban forms when combined with new digital sensing, communication and social networking technologies constitute a virtual and real meta-infrastructure, present in all cities today. The essay also presented a new model of the meta-architect-ecologist, working collaboratively to provide design scenarios across vast regional differences. Employing meta-population and meta-community theories in ecology, design scenarios can be applied differently in different localities based on neighborhood preferences. While one neighborhood may choose to act individually on their own properties, groups may cooperate along normally neglected shared property lines. Other alternative scenarios would involve agreeing to public expenditure to develop green infrastructure along streets and rights of way. Designers acting in a traditional client-based method only engage a small percentage of the built environment, while a meta approach would engage a larger and more diverse public. [10]

The shared intellectual history and trajectory of practice outlined here, has culminated in the development of the metacity concept. The metacity idea is that detailed, long-term research on any city, such as in Baltimore, cannot be understood in isolation of larger regional, continental, and even global contexts and connections. Nor can individual design projects be set in isolation of the dynamics of urban fabrics at scales ranging from neighborhood to globe. Other new frameworks are emerging that exploit and clarify the global scope of urban processes, and lend richness to an understanding of the design of the metacity. Design research in any given city can be enriched conceptually by the insights garnered from vastly different cities and regional contexts. Local, regional and global connections and implications are developing in collaboration around the world, intent on advancing the metacity concept as a broad urban theoretical approach leading to widespread practical design actions. The metacity ties together key concepts and perspectives that explain and provide a working window to redirect the massive urban changes under way around the world and the means to achieve a just distribution of the goods of urban society and the natural resources of a biologically diverse planet.

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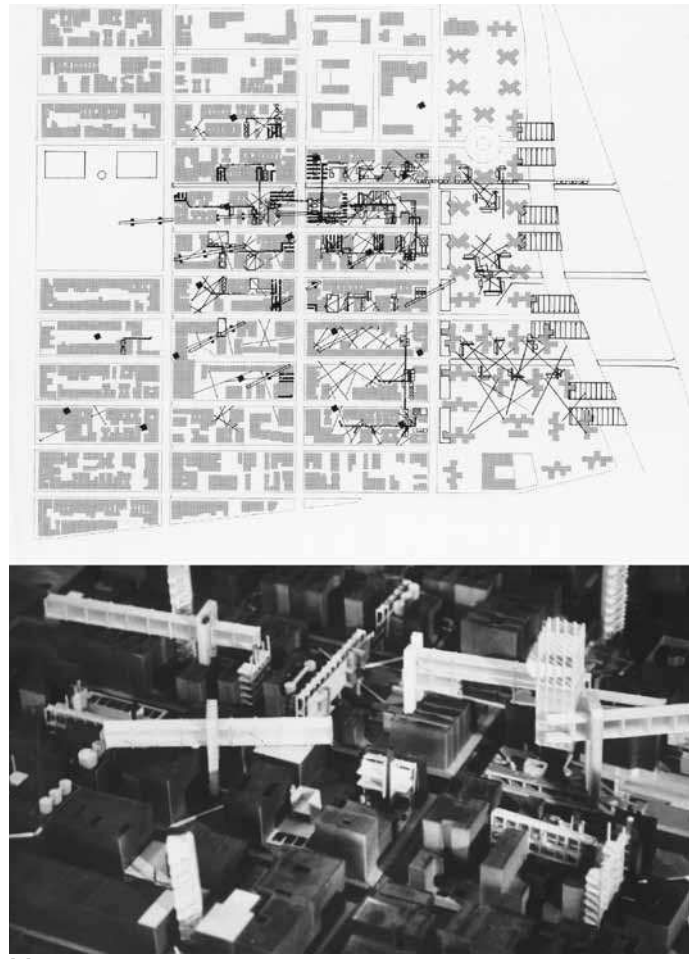
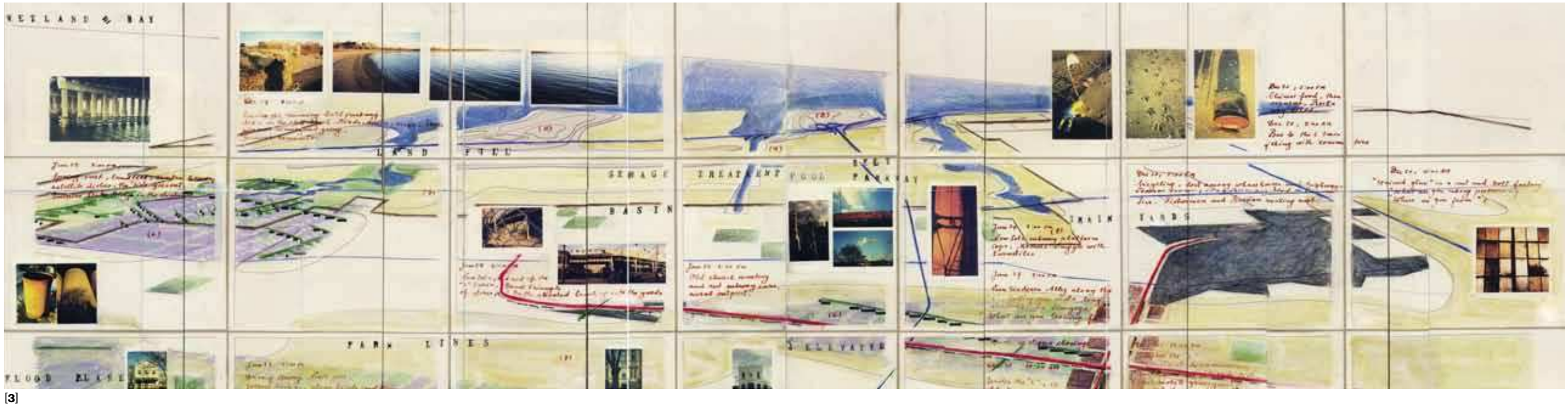
[1]



[2]

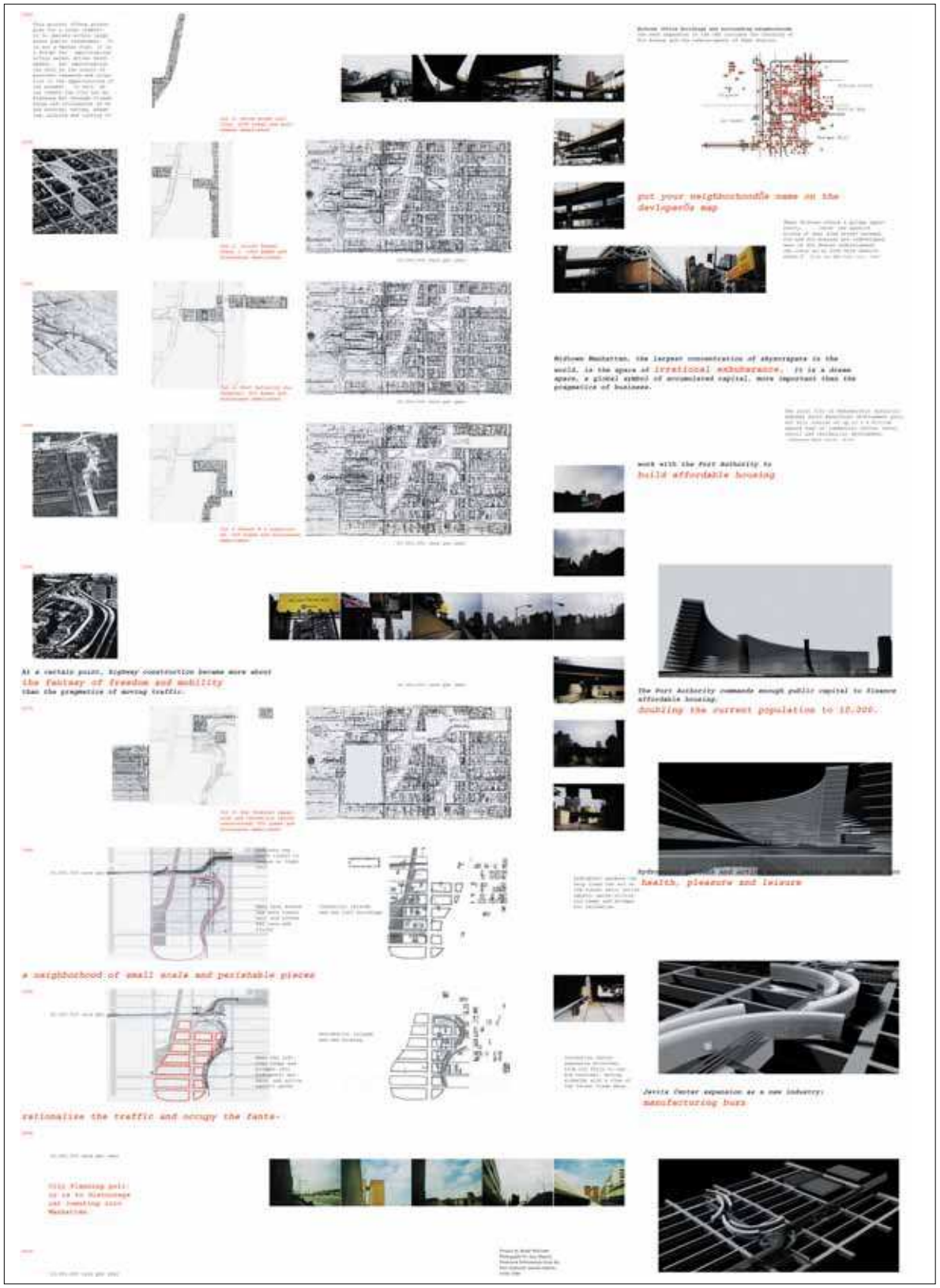


[3]

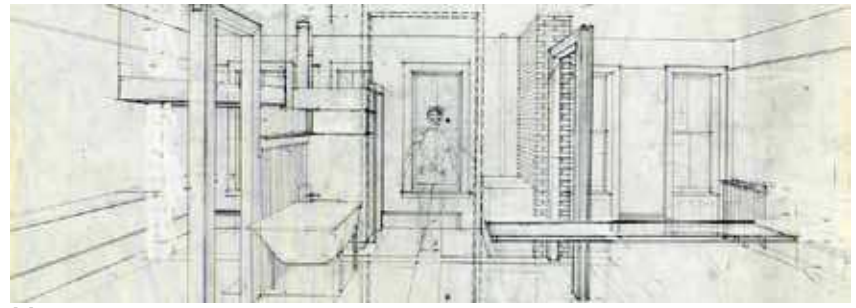
1 Transparent Cities (1989-1994) consists of a boxed set of 24 cartographic plates of Rome and New York drawn at the same scale. An accompanying 'user guide' encourages the random juxtaposition of plates to reveal certain ruptures in the histories of both cities.

2 Housing and Gardens: Can we have both? (1990) was an experimental studio in collaborative design, where various students took the position of specific communities in the neighborhood – affordable housing, community gardens, social service institutions, job training, market places – with the final result incorporating the diverse range of needs in the East Village.

3 One of the first uses of digital modeling in urban design, **Envisioning East New York** (1995) was a design competition with the Brooklyn office of the New York City Department of City Planning and The Architectural League of New York. The project integrated large-scale geological and infrastructural influences with neighborhood scenarios. With Ana Marton.



[4]



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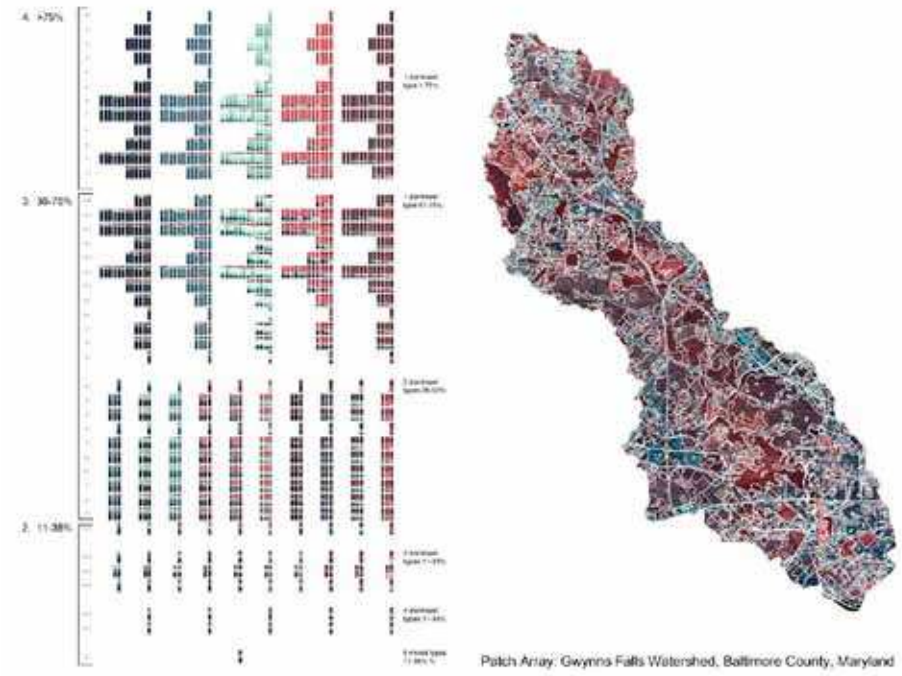
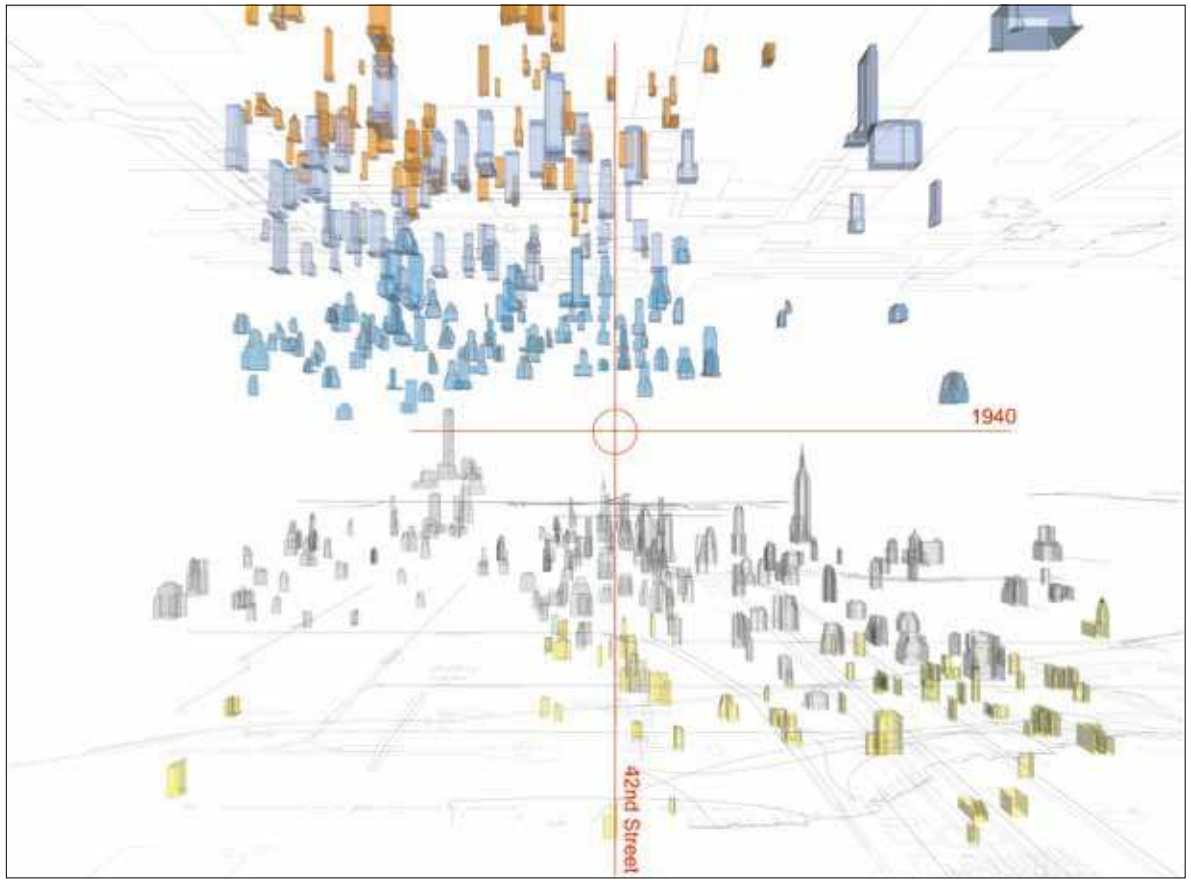


[6]

4 The Heart of Hell's Kitchen South (1999) was an advocacy project for the Hell's Kitchen South Neighborhood Association and the Design Trust for Public Space to demand that the Port Authority of New York and New Jersey replace the affordable housing destroyed in the construction of the Lincoln Tunnel and Port Authority Bus Terminal. With Ana Marton.

5 An apartment for a performing artist on East 4th Street (1988).

6 Landcover patch array, Gwynns Falls Watershed, Baltimore County and City of Baltimore (2005). With Mary Cadenasso, Steward Pickett, Victoria Marshall and Phanat Xanamane.



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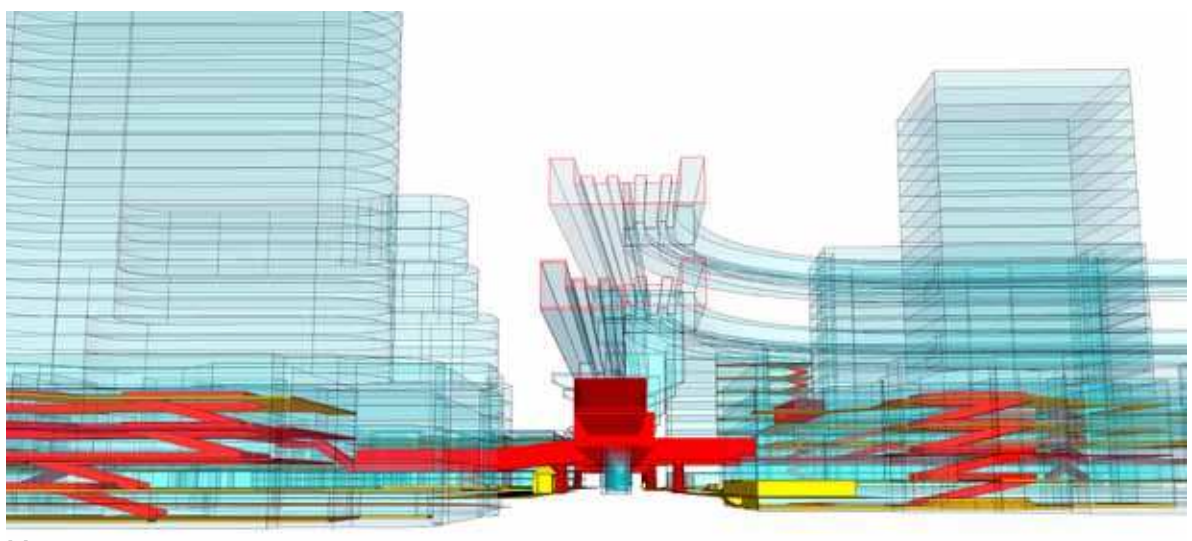

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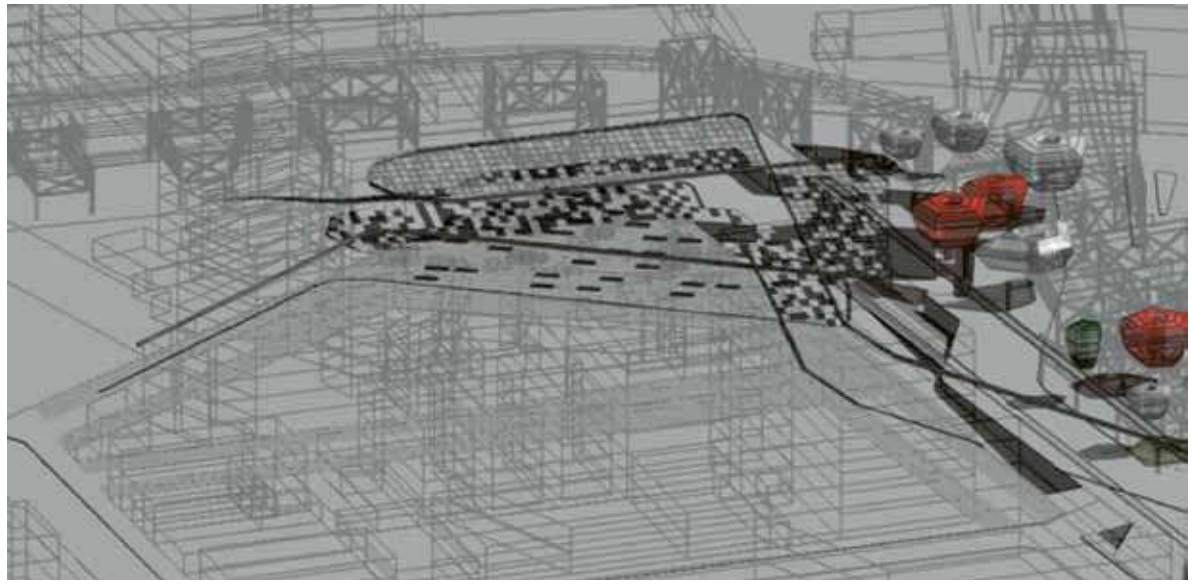
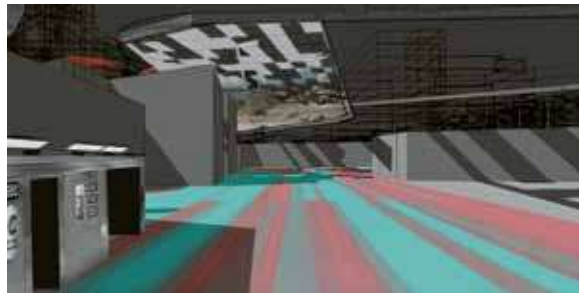
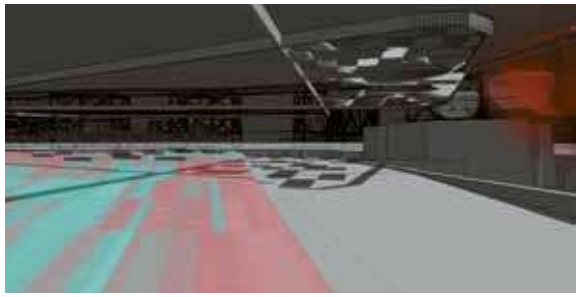




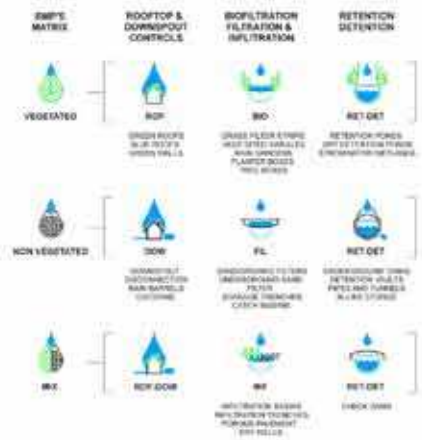


[9]

7 Manhattan Timeformations (2000), view of digital model centered on 42nd Street on the 1940 timeplane looking east.
8 'Mobile section' through Bangkok's central shopping district showing layers of infrastructure and privately constructed connective public space (2007).
9 Competition entry for Queens Plaza that links multiple environmental, security and public sensing and surveillance devices to digital displays, public surfaces and landscape responses (2002). With Jose Echevarria.

Next page:
10 Social attributes and design variables of the metacity according to landcover patches, Baltimore County and City of Baltimore (2010). With Mateo Pinto.

social ATTRIBUTES
design VARIABLES



We have been compiling a database of best practices in urban water management, from which we created a matrix of design option variations (vegetated, non-vegetated and mixed). This taxonomy will allow us to include our design scenarios within the HERCULES land cover framework.

The BMP matrix plays out on our three test sub-watersheds, where vegetated practices are explored in **Baisman Run**, non-vegetative ones in **Watershed 263**, and mixed types in **Dead Run**. Additionally, we are interested in the preferences of the residents of three target neighborhoods in these sub-watersheds, each which represent different social agency by different actors:

ME Private Parcel Change

US Cooperation Change Between Neighbors

OURS Public Infrastructure Change

The neighborhoods have different balances between individuals, neighbors and public infrastructure. Springlake Park Court Road is a recently constructed private subdivision of estates on five-acre lots draining into a forested open stream tributary to **Baisman Run** above Oregon Ridge Park in Cockeysville, Lamsale Headwaiter Catchment contains a few blocks in the Harlem Park neighborhood in **watershed 263** in west Baltimore. This area contains a much higher percentage of public land including the unusual condition of inner-block public parks created in the late 1950's urban renewal project. Bristol Park Road is a street of older ranch houses on small lots that drains from Winslow Park into **Dead Run** in Catonsville, just outside the Beltway. This area represents a condition of private homes with front and backyards draining into a public street which is filtered through an open stream in a public park.