

The Attack on the World Trade Center: Pragmatic Investigation into its Implications for Urban Design

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The skyjacked airplanes that flew into the World Trade Center Towers on the morning of September 11th murdered thousands of people, destroyed buildings, collapsed subways, crushed vehicles, disrupted utilities, and shut down businesses in the heart of the world's financial center. The attack planes also unleashed fear and aggression on a worldwide scale.

As architectural educators and practitioners absorb the shock of the al-Qaeda "raid", we are realizing that the destruction raises troubling questions for the profession.¹ The bombing is in part an assault on the role of architecture and urban design in globalization, particularly in cities. Specifically, it raises three critical challenges to the sustainability of modern building practices. 1) The attack challenges modern architecture's disrespect for established local patterns of building and their importance to traditional cultures. 2) It spotlights the physical hazards of recent building practices in skyscrapers. 3) And it casts doubt on the ability of modern architecture to control the forces of nature. These challenges to the sustainability of modern architecture result from the differing and often conflicting cultural perceptions of nature currently operative throughout the diverse regions of the Earth.

THE ORIGIN OF CITIES AND SUSTAINABILITY

One of the fundamental purposes of cities throughout their long history is to sustain life – not just physically, but also emotionally and spiritually. In order to sustain life, in order to create a sense of well-being among the citizens of a particular city, its inhabitants negotiate with nature on a continuous basis. Design translates these negotiations into urban forms, which in turn influences the behavior of city inhabitants, which in turn feeds into future design practices. These negotiations over time create

a feedback loop between urban dwellers and the rest of nature. The result is the countless types of urban settlement patterns and the multiple possibilities for sustaining life that each type represents.

To sustain life in cities, humans negotiate with three different but interrelated systems of nature: the nature of human beings, the nature of the material world, and the forces of nature. For instance, with regard to human nature, in a particular city, can women walk the streets alone as we see them doing in 19th century Impressionist paintings of Baron Haussmann's wide, straight Parisian boulevards? Or, as in 19th century Istanbul, do we see streets that twist and turn, taking us to courtyard cul-de-sacs where women are often cloistered, as we see in paintings by Jean-Leon Gerome? Each of these urban forms – straight boulevards or twisting streets – represents different perceptions of human nature that manifest as distinctive urban designs.

People living in cities also negotiate with the material world of nature, the world of trees, rocks, and other animals that provides materials to build with. If we looked into a city's garbage heaps, what would we find? . . . years and years of discarded building materials? . . . heaps of synthetic materials that are inflammable but whose smoke is so toxic that it can kill? Or do we see efforts to reuse and adapt waste for new purposes?

The third negotiation is with the forces of nature, such as climate, which distributes the energy of the sun around the earth. In the days following the catastrophic events of September 11th, when air travel was dramatically reduced, carbon dioxide levels in the atmosphere, which create the greenhouse effect, dropped by 25%. When New York Mayor Rudolph Guiliani restricted auto traffic in certain parts of Manhattan after September 11th, again carbon dioxide levels dropped.

These events give us critical information about our relationship to the forces of nature, which we are affecting in unexpected ways.

The destruction of the World Trade Center challenges modern architecture's negotiations with all three of the interrelated systems of nature mentioned above: the nature of human beings, the nature of the material world, and the forces of nature. These challenges are undermining the sustainability of the architecture and urban design that dominate globalization because perceptions of the aforementioned three natural systems guide urban design decisions.

In the following analysis, I have used Charles Peirce's semiotic categories of the Icon, the Index, and the Symbol to help evaluate the World Trade Center vis-à-vis global design practices. These categories, which are part of Peirce's pragmatism, situate the paper within an accepted architectural discourse. According to Charles Peirce: "An icon possesses the character that renders it significant, even though its object had no existence." "An index would lose the character which makes it a sign if its object were removed, but would not lose that character if there were no interpretant." "A symbol is a sign which would lose the character that renders it a sign if there were no interpretant."

GLOBALIZATION AND ITS ASSUMPTIONS ABOUT HUMAN NATURE: THE ASSAULT ON THE WORLD TRADE CENTER AS AN *ICON* OF MODERN ARCHITECTURE'S DISRESPECT FOR ESTABLISHED LOCAL PATTERNS OF BUILDING AND THEIR IMPORTANCE TO TRADITIONAL CULTURES

Commentators on the bombing of the World Trade Center argue that both Osama bin Laden and the lead suicide bomber Mohamed Atta believed that the World Trade Center represented an affront to Islamic fundamentalists, particularly followers of Wahhabism.²

Thirty-three year-old Mohamed Atta, an Egyptian architectural engineer and urban planner, flew the first plane into the World Trade Center. According to Fouad Ajami, professor of Middle Eastern Studies at the School of Advanced International Studies, Johns Hopkins University, Atta personally experienced the impact of modernity on traditional Egyptian culture:

"Atta . . . was born of his country's struggle to reconcile modernity with tradition. . . . There had come to Egypt great ruptures in the years when the younger Atta came into his own. A drab, austere society had suddenly been plunged into a more competitive, glamorized world in the 1970's and 1980's. The old pieties of Egypt were at war with new temptations. . . . Atta's generation . . . were placed

perilously close to modernity, but they could not partake of it."³

Between 1985 and 1990, Mohamed Atta studied architecture at the University of Cairo.⁴ In 1992, unable to find work in Egypt, he went to Germany to study urban planning and preservation at Hamburg's Technical University.⁵ He wrote his thesis on the conflict between Modernity and Islam evident in the renewal of the old quarter of the Muslim city of Aleppo, Syria, reputed to be the oldest continuously inhabited city.⁶ According to Matthias Frinken, a partner in the Hamburg planning office, Plankontor, where Atta worked: "He was very critical of capitalistic, Western development schemes. . . . He was critical of big hotels and office buildings."⁷ A *Time* Magazine writer reported that Atta "bemoaned Western influence – specifically, the rise of skyscrapers – in Arab cities."⁸

As many observers have noted, the two destroyed monoliths at the World Trade Center were not just anonymous structures in the New York City skyline. They were bold, and to some eyes, arrogant symbols of U.S. capitalism and Western development.⁹ They were icons of just the kind of skyscrapers that are rising in Arab cities at the expense of traditional urban patterns of living and working, which are closely tied to religious beliefs and practices.¹⁰ The holy men of all three monotheistic religions—Islam, Christianity and Judaism – all believe God destroyed Babylon because He "took it (the building of the Towers) as a challenge to Himself."¹¹

Osama bin Laden shared Mohamed Atta's view of the World Trade Center as an icon of capitalism. In an interview on Nov. 9, 2001 with the Pakistani newspaper, *Dawn*, bin Laden said: "the Sept 11 attacks were not targeted at women and children. The real targets were America's icons of military and economic power."¹² Bin Laden had ample opportunity to know modern architecture well. He grew up in a family of builders, earning a degree in civil engineering in 1979.¹³ Although Osama was born in 1957 in Saudi Arabia, the bin Laden family homeland is in Hadranawt, Yemen, "a vast region of deserts and mountains." In 1997 when CNN's terrorist analyst Peter L. Bergen visited Hadranawt, he recalls feeling as if he had stepped back into the middle ages. Bergen was particularly struck by the mud-huts, some of which rose fifteen stories from the desert floor. He recounts his realization that the bin Laden family's genius for building was part of their traditional heritage.¹⁴

Bergen goes on to say that:

"By the mid-1990s, the bin Laden group of companies had grown into a colossus whose worth was estimated at \$5 billion. . . . A sampling of the construction projects SBG (Saudi Binladen Group) has undertaken in recent years includes the renovation of the Cairo airport's runways; the reconstruction of the Aden airport in Yemen; and the

construction of a new suburb of Cairo, a Hyatt in Amman, Jordan, a seaside resort in Latakia, Syria, a mosque in Kuala Lumpur, a thirty-story office building in Riyadh, and a \$150 billion base for more than four thousand U.S. soldiers in Saudi Arabia.¹⁵

The family prosperity began when Osama's father won the trust of the Saudi King, Abdel Aziz ibn Saud, who reigned from 1932 to 1953.¹⁶ By the late 1960s, when Osama was still a young boy, the family business had helped, "to rebuild the al-Aqsa mosque in Jerusalem – the site to which the Prophet was transported in his Night Journey from Mecca. . . . The family company also renovated the holy places of Mecca and Medina, so the bin Ladens can claim with justifiable pride that they have reconstructed Islam's three holiest sites."¹⁷

According to Ahmed Rashid, author of *Taliban: Militant Islam, Oil, and Fundamentalism in Central Asia*, in 1990 when the Saudi royal family invited half a million American troops into Saudi Arabia, Osama bin Laden was "outraged by the proximity of American soldiers, some of them women in un-Islamic dress, to the holiest sites of Islam."¹⁸ In February 1998, bin Laden issued a manifesto denouncing the United States "for occupying the lands of Islam in the holiest of places, the Arabian Peninsula." He declared, "to kill the Americans . . . is an individual duty for every Muslim . . . in order to liberate the al-Aqsa Mosque and the holy mosque (Mecca) from their grip."¹⁹

Perhaps as disturbing to Islamic extremists as the occupying of the sacred Muslim sites by U.S. soldiers could also be the fact that the World Trade Center's architect, Minoru Yamasaki, was a leading practitioner of an architectural style that merged modernism with Islamic influences. Yamasaki was a favorite designer of the Saudi royal family. According to Manhattan architect Laurie Kerr,

"Yamasaki . . . won the commission to design the King Fahd Dhahran Air Terminal in Dhahran, Saudi Arabia. His design had a rectilinear, modular plan with pointed arches. . . . it was an impressive melding of modern technology and traditional Islamic form. . . ."

Yamasaki received the World Trade Center commission the year after the Dhahran Airport was completed. Yamasaki described its plaza as "a mecca, a great relief from the narrow streets and sidewalks of the surrounding Wall Street area." . . . Yamasaki replicated the plan of Mecca's courtyard by creating a vast delineated square, isolated from the city's bustle by low colonnaded structures and capped by two enormous, perfectly square towers-minarets, Yamasaki's courtyard mimicked Mecca's assemblage of holy sites – (with) the Qa'ba (a cube) containing the sacred stone. . . .

At the base of the towers, Yamasaki used implied pointed arches – derived from the characteristically pointed arches of Islam. . . . Above soared the pure geometry of the towers, swathed in a shimmering skin, which doubled as a structural web – a giant truss. Here Yamasaki was following the Islamic tradition of wrapping a powerful geometric form in dense filigree. . . .

The shimmering filigree is the mark of the holy. According to Oleg Grabar, the great American scholar of Islamic art and architecture, the dense filigree of complex geometries alludes to a higher spiritual reality in Islam, and the shimmering quality of Islamic patterning relates to the veil that wraps the Qa'ba at Mecca. After the attack, Grabar spoke of how these towers related to the architecture of Islam, where "the entire surface is meaningful" and "every part is both construction and ornament."

Having rejected modernism and the Saudi royal family, it's no surprise that Bin Laden would turn against Yamasaki's work in particular. He must have seen how Yamasaki had clothed the World Trade Center, a monument of Western capitalism, in the raiment of Islamic spirituality. . . .²⁰

Based on the above analysis, Osama bin Laden and Mohammed Atta's hatred for the West can be said to include abhorrence for modern architecture and its disrespect for traditional design. Additional support for this claim is an essay about hatred of the West by scholar Avishai Margalit and writer Ian Buruma. They explain that "Occidentalism, which played such a large part in the attacks of September 11," invariably involves "a deep hatred of the city". Margalit and Buruma argue that the presence of the modern city is constantly felt even in remote areas of the Islamic world.

"through advertising, television, pop music, and videos. The modern city, representing all that shimmers just out of reach, all the glittering arrogance and harlotry of the West, has found its icon in the Manhattan skyline, reproduced in millions of posters, photographs, and images, plastered all over the world. You cannot escape it. . . . It excites longing, envy, and sometimes blinding rage."²¹

Clearly, one critical deficiency of globalization to date, tragically missing from its architectural practices, is an understanding of societies in which spiritual leaders govern. These societies use an architectural language in which religion, rather than aesthetic or legal norms, regulates the significance of building forms and details. This raises several critical questions.

What are the global implications for modern architects of appropriating architectural forms and details from traditional cultures? Should the history of architecture be used indiscriminately as fodder for modern buildings? In the case of the World Trade Center, the failure to understand the difference between

religious, aesthetic and legal norms may have helped engender consequences that have shattered our sense of security.

GLOBALIZATION AND ITS ASSUMPTIONS ABOUT MATERIAL NATURE: THE ASSAULT ON THE WORLD TRADE CENTER AS AN INDEX OF THE PHYSICAL HAZARDS OF RECENT SKYSCRAPERS

The collapse of the World Trade Center Towers shocked the world. Those who witnessed it from the streets of New York City or live on their televisions couldn't believe their eyes. In the days and weeks since the fall of the buildings, the process of grieving has been marred by serious questions about the culpability of the building materials, structural system, and floor layout of the two monoliths. The Federal Emergency Management Association has hired the American Society of Civil Engineers to lead the federal inquiry into the collapse in order to determine exactly when and how the 110-story twin towers fell. One theory is that some steel beams did not have adequate fireproofing, causing them to weaken more quickly.²²

Writing in the October issue of the *New Yorker* staff writer, John Seabrook, argued that "the attack on the towers . . . highlights several potential weaknesses in the way that many modern-high-rises are constructed." His summary of those weaknesses follows:

"The perimeter structures of most high-rises erected since the nineteen-sixties resemble tubes. Inside, a massive hollow core made of steel and/or concrete contains many of the services: elevators, stairwells, and bathrooms. Because the core and perimeter columns carry so much of the load, the designers could eliminate interior columns, with the result that there is more open floor space for the tenants. . . . engineers (also) reduced, or eliminated, the use of concrete (although it is more fire-resistant than steel) in supporting the structure (of these high-rises).

The floors in most of the high-rise buildings erected since the sixties are much lighter in weight than the floors in the older buildings. . . . The developer can (also) increase the number of floors in the entire building because hollow spaces created below each floor surface allow builders to install heating and cooling ducts within the floors, rather than in a drop ceiling below them."²³

But these innovations, which builders welcomed, had potentially deadly consequences that firefighters foresaw.

"In 1976, the New York City Fire Commissioner, John O'Hagan, published "High Rise/Fire and Life Safety," in which he called attention to the serious fire-safety issues in most high-rise buildings constructed since 1970, referring to such buildings as "semi-combustible.

. . . The questionable performance of the fire protection used in these buildings, combined with the greater expanse of lightweight, unsupported floors, O'Hagan said, created the potential for collapse of the individual floors and of the entire structure. He also pointed out that the open spaces favored by modern developers allowed fires to spread faster than the compartmentalized spaces of the earlier buildings, and that the synthetic furnishings in modern buildings created more heat and smoke than materials made out of wood and natural fibres."²⁴

Regardless of O'Hagan's warning, the changes to skyscraper building practices that Seabrook describes "led to a high-rise boom in New York City during the sixties and seventies. The World Trade Towers, conceived in 1963 and opened in the early seventies, were the most famous products of that era." Is not their collapse an index of the physical hazards inherent in current skyscraper technology?

According to Glenn Corbett, assistant professor of fire science at John Jay College of Criminal Justice, writing in the January 14, 2002, *New York Times*, "This is the world's largest structural collapse in history and we think it demands a lot more than what's been put forth at this point."²⁵ On March 6, 2002, "the leader of the investigation into the World Trade Center's collapse and the director of the federal agency that evaluates major fires and building failures called for the adoption of new national standards for the construction of public and governmental buildings to make them more resistant to catastrophic failures in the event of terrorist attacks." According to *New York Times* reporters, Eric Lipton and James Glanz:

"The call for the new standards could have serious implications for how skyscrapers are designed and built, and . . . for how much it costs to build them. Some experts say the recommendations could effectively result in limiting the height of high-rises in the United States, and could discourage the use of commonplace designs, like open, arching atriums below towering office structures.

. . . "Some structural engineers say it will be important to decide exactly how big a category of buildings any new codes would apply to: every structure over five stories, or just those that have prominence or symbolic power that might attract attacks.

"People will begin to make value judgments," said Norman Koonce, an architect who is the executive vice president and chief executive of the American Institute of Architects. "This is something that's extremely critical not just to the architects, but to the American public as well."²⁶

GLOBALIZATION AND ITS ASSUMPTIONS ABOUT THE FORCES OF NATURE: THE ASSAULT ON THE WORLD TRADE CENTER AS A SYMBOL OF THE INABILITY OF MODERN CIVILIZATION TO CONTROL THE FORCES OF NATURE

When the airplanes penetrated the Twin Towers, they unleashed two forces of nature, whose awesome magnitude is rarely experienced in modern cities, – the power of fire and of gravity. Specifically, the impact of the airplanes hitting the buildings ignited the firepower of fossil fuel. Gravity overwhelmed the melting steel structures, bringing them crashing to the ground, like erupting lava from an exploding volcano, pulverizing all that stood in their way.

Before a shocked world, the al-Qaeda strike transformed two of the US's most renowned creations – the skyscraper and the airplane – into weapons of its own destruction. The first skyscrapers ever built rose from the ashes of the great Chicago fire of 1871. Just as each succeeding generation of skyscrapers has been extolled as impervious to fire, the creators of the first modern tall buildings were convinced that they were fireproof. By 2001 these tall buildings had grown to over 1400 feet. The first power-driven craft to succeed in defying gravity took to the air in the years 1900-1903 at Kitty Hawk, North Carolina. By 2001 planes were logging 40,000 flights a day within the United States. The forces of nature had seemingly been bent to human desire. Modern civilization had tamed the untamable.

There seemed to be no constraints on what modern human beings were capable of doing. Unheard was the warning embedded in the tale of Prometheus. Zeus chained and tortured Prometheus because he stole fire from the Gods to give to humankind. After reading the published interviews with New York City Fire Department personnel about the events of September 11, can anyone doubt the inability of modern technology to control the destructive power of fire? Fire Lt. William Ryan recalled that because communication was so poor, many firefighters didn't know which tower was which. He also told a stunned interviewer that in the chaos he himself didn't realize until about 3 o'clock in the afternoon that the Twin Towers were gone, – hours after they had imploded. The south tower collapsed at 9:59 in the morning, and the north at 10:28.²⁷

Modern society seems also to have forgotten the precautionary warnings about the human relation to gravity implicit in ancient stories like that of Icarus who flew too close to the sun, melting his wax wings. Efforts to keep astronauts in outer space for prolonged periods have produced unexpected results: the weakening of bone density leading to osteoporosis. According to architect Marc Cohen of NASA's Advanced Projects Branch humans cannot stay in space longer than a year because of increased bone porosity and other damage done to human organs without the effects of gravity.²⁸

Why has modern culture lost a sense of the limits understood by earlier societies? Visiting Ground Zero, architect and critic Michael Sorkin could not help worrying whether his habit of aesthetizing experience was standing in the way of his taking in the full enormity of the wreckage of the two mangled deathtraps.

“Visiting the site of the disaster in its immediate aftermath. I struggled to take in the somber beauty of twisted steel surrounded by the smell of death – the pulverized rubble that seemed too small to contain all of what was there before. I worried that something in me also had to die, some capacity for enjoyment, if only that shopworn sublime.”²⁹

Has the habit of aesthetizing, – of making sublime even the most horrible of experiences –, blinded us to the “awe” in the awfulness of the forces of nature? Has the habit of treating natural forces as capital, – as solely resources for our consumptive society –, caused us to forget the possibility that nature cannot be controlled? Have we created a second modernity in which we are besieged by the unforeseen and often deadly consequences of our actions, – the “bads” instead of the “goods” promised by the Enlightenment?³⁰ The collapse of the World Trade Center suggests that we have.

CONCLUSION

This brief review of investigations into the attack on the World Trade Center relevant to urban design suggests that globalization has ignored one of the fundamental purposes of cities: to sustain life.

The critical question in the recovery of Lower Manhattan is whether we can rebuild so cities can again sustain our lives. As hundreds of firemen and policemen and ordinary people rushed to the bombed World Trade Center to help, the sustentative meaning of a city was reaffirmed before the eyes of the world. Sustainability has continued to set the tone for recovery efforts in Lower Manhattan. Human sustainability has been paramount in discussions with rescue workers and families of the victims, economic sustainability in debates about how much office space to rebuild, and environmental sustainability in the monitoring of air quality and the commitment of the Lower Manhattan Development Corporation to “promote sustainability and excellence in design, for environmentally sensitive development”.

As part of the process of remembering the thousands who died on September 11th, rethinking our relationship to human nature, material nature and the forces of nature can guide the reconstruction of Lower Manhattan, thus making the rebuilding a symbol for the 21st century of the essential reason cities were first created: to sustain life.

NOTES

- ¹ Michael Sorkin, "Collateral Damage, Assessing the cultural and architectural aftermath of September 11th," Talk given at Cooper Union, Sept. 25, 2001. Posted on http://www.metropolismag.com/html/content_0102/sor/index.html. Other concerned citizens are raising similar questions. Harry Belafonte, discussing the World Trade Center disaster, recalled Martin Luther King's question after learning about the four young girls killed in a church fire in Alabama, "Why do they hate us so much?" World Music Café, National Public Radio, Thanksgiving, November 2001.
- ² See "The Beginning and Spreading of Wahhabism," Part Two, Translated, for the most part, from Ayyub Sabri Pasha's Turkish work *Mir'at al-Haramain*: 5 volumes, Matba'at-i Bahriyye, Istanbul, 1301-1306 A.H.; http://www.ummah.net/Al_adaab/wah-36.html; "Bin Laden Adheres to Austere Form of Islam" By Neil MacFarquhar, *International Edition of the New York Times*, Oct. 7, 2001: <http://www.nytimes.com/2001/10/07/international/middleeast/07S.AUD.html>; "Rise of Islamic Fundamentalism," By Col B.S. Burnmeister, The South African Defense College, Thaba Tshwane outside Pretoria, South Africa: http://www.mil.za/CS/ANDFCJ/Suppl/TrainingFormation/DefenceCollege/Researchpapers2000_02/burnmeister.htm; "Islamic Extremism: Wahhabism," on *About: The Human Network* with Austin Cline http://atheism.about.com/library/islam/blfaq_islam_wahhab.htm.
- ³ Fouad Ajami, "Nowhere Man," *New York Times Magazine*, October 7, 2001. <http://sohek.colorado.edu/~parisr/SEPT11/Ajami.htm> For 20 years Ajami headed Egypt's security service.
- ⁴ John Hooper, "The Terrorist: The shy, caring, deadly fanatic," *The Observer*, September 23, 2001. <http://www.observer.co.uk/hcaronterrorism/story/0,1373,556630,00.html>
- ⁵ *ibid.* See also Atta's homepage where he uses the name, Mohamed El-Amir, <http://babsouria.free.fr/memid275.htm>
- ⁶ John Hooper, "Mystery Man: The 'nice' town planner who killed thousands," *Sidney Morning Herald*, September 16, 2001. <http://www.smh.com.au/news/0109/16/world/world16.html>
- ⁷ Hooper, "The Terrorist," *op. cit.*
- ⁸ *Time Magazine* (online), "Atta's Odyssey," October 8, 2001 Vol. 158 No. 16. www.time.com/time/magazine/article/0,9171,11101011008-176917,00.html
- ⁹ Sorkin, *op. cit.*
- ¹⁰ Janet Abu-Lughod, "The Islamic City – Historic Myth, Islamic Essence and Contemporary Relevance," *International Journal of Middle Eastern Studies*, Feb. 1987.
- ¹¹ Ian Buruma and Avishai Margalit, "Occidentalism," *The New York Review of Books*, Jan. 17, 2001, p. 4.
- ¹² Hamid Mir, "Osama claims he has nukes: If US uses N-arms it will get same response," Interview published in *Dawn*, Nov. 10, 2001 <http://www.dawn.com/2001/11/10/top1.htm>
- ¹³ Pankaj Mishra, "The Afghan Tragedy," *The New York Review of Books*, Jan. 17, 2002. <http://www.nybooks.com/archives/>
- ¹⁴ Peter L. Bergen, *Holy Wars, Inc. Inside the Secret World of Osama bin Laden*. New York: The Free Press, 2001, p. 42
- ¹⁵ *Ibid.*, p. 46.
- ¹⁶ *Ibid.*, p. 44.
- ¹⁷ *Ibid.*, p. 44-45.
- ¹⁸ Mishra, *op. cit.*, p. 45.
- ¹⁹ *Ibid.*, p. 46.
- ²⁰ Laurie Kerr, "The Mosque to Commerce," December 28, 2001. <http://slate.msn.com/?id=2000207>
- ²¹ Ian Buruma and Avishai Margalit, "Occidentalism," *The New York Review of Books*, Jan. 17, 2001, p. 4.
- ²² Associated Press, "Engineers Studying WTC Collapse," *New York Times*, January 14, 2002, p.22.
- ²³ John Seabrook, "The Tower Builder," *The New Yorker*, November, 19, 2001, p. 64.
- ²⁴ *ibid.*
- ²⁵ Associated Press, "Engineers Studying WTC Collapse," *New York Times*, January 14, 2002 (online). James Glanz and Eric Lipton, "New Agency to Investigate the Collapse of Towers," *New York Times*, Jan. 17, 2002.
- ²⁶ James Glanz and Eric Lipton, "Rules Sought to Help High-Rise Endure Disaster," *New York Times*, March 6, 2002.
- ²⁷ Kevin Flynn and Jim Dwyer, "9/11 in Firefighters' Words: Surreal Chaos and Hazy Heroics," *New York Times*, January 31, 2002.
- ²⁸ Conversation with Marc Cohen, Jan. 23, 2002 at Ames Research Center, Moffett Field, California.
- ²⁹ Sorkin, *op. cit.*
- ³⁰ Ulrich Beck, *World Risk Society*, Blackwell Pub., October 1999.