Opening the Big Box

SHOT Presidential Address

Las Vegas, Nevada

14 October 2006

Rosalind Williams

The box I am referring to in the title of this talk is that of history. We in this room often

take special pains to open the black box of technology in order to understand how the

things in it work. We do this, however, not as technologists but as historians, whose

ultimate goal is understanding how history works. Today I want to make the case that the

relatively recent emergence of what we routinely if vaguely call our "technological age"[1]

raises the possibility that history works differently now because of the unprecedented

dominance of human-built devices and systems and activities connected with them; that

exploring this possibility should be one of our primary goals; and that such exploration

requires willingness to taste the forbidden fruit of technological determinism.

Before elaborating on these grand generalizations, I would like to provide some more

down-to-earth evidence for them. Or below-the-earth evidence, my first example is a clip

from a 2003 movie, *Matrix Reloaded*, the middle film in the Matrix trilogy directed by

the Wachowski brothers, Andy and Larry, and starring Keanu Reeves as Neo. The plot,

briefly: the Matrix has created a simulation of reality that has taken control of most of the

---

[1] This term was a key one in a debate between Melvin Kranzberg and Leo Marx following a book review
by Marx (of a collection in honor of Kranzberg titled *In Context*) that appeared in *Technology and Culture*,
Vol. 32, No. 2, Part I (April 1991), pp. 394-96; see "Communications: Comment and Response on the
Review of *In Context*," *Technology and Culture*, Vol. 33, No. 2 (April 1992), pp. 406-07.

world, except for the remnants of humanity, living in the underground city of Zion, who have retained awareness of their humanity. Neo's destiny is to save the last of self-conscious humanity from annihilation by the Matrix. This scene is set on the eve of a great battle: the warmaking machines launched by the Matrix are coming to attack Zion. The people of the city have listened to inspirational speeches by their leaders and, rousing themselves for battle, have engaged in semi-nude dancing and, for Neo, an night of softly lit but intense love-making with his beloved Trinity. Afterwards, wandering around Zion, he runs into the Counselor, a professorial type who heads the governing body of Zion. The scene opens with a gesture that can be appreciated by any historian of technology: the Counselor invites his younger colleague to come down to the engineering level:

C: Have you ever been to the engineering level? I love to walk there at night. Quite amazing. Would you like to see it?

N: Sure.

C: Almost no one comes down here unless of course there's a problem. That's how it is with people. Nobody cares how it works, so long as it works. I like it down here. I like to be reminded the city survives because of these machines. These machines are keeping us alive while other machines are coming to kill us. Interesting, isn't it? The power to give life, the power to end it.

N: We have the same power.

C: Ah, I suppose we do but down here sometimes I think about all those people still plugged into the Matrix. I look at these machines and I can't help thinking that in a way we are plugged into them.

N: But we control these machines, they don't control us.

C: Of course not. How could they? The idea is pure nonsense, but it does make one wonder, just what is control?

N: If we wanted we could shut these machines down.

C: Of course, that's it. You hit it: that's control. If we wanted, we could smash them to bits. Although if we did we'd have to consider what would happen to our lights, our heat, our air…

N: So we need machines and they need us. Is that your point, Counselor?

C: No. No point. Old men like me don't bother with making points. There's no point.

N: Is that why there are no young men on the Council?

C: Good point.

N: Why don't you tell me what's on your mind, Counselor?

(Quiet background music)

C: There is so much in this world that I do not understand. See that machine? It has something to do with recycling our water supply. I have absolutely no idea how it works, but I do understand the reason for it to work. I have absolutely no idea how you are able to do some of the things you do, but I believe there is a reason for that as well. I only hope we understand that reason before it's too late….

This is a movie, not a treatise, and I do not want to load too much cultural weight onto it. Nevertheless, the trilogy (and especially the first in the series, The Matrix, released in 1999) was a huge hit, so somehow a resonant chord was struck with the public, especially among the young. What struck me about this chat about "technology" is that neither the

wise old counselor nor the young action hero has any interest in understanding how things work. Instead, they ask why, to what purpose, for what meaning: they ponder the contradictory reasons for machines (to support life and to destroy it); they wonder who or what is in control of machines, if they are indeed in control; what the point of it all is. Similar questions keep being raised throughout the trilogy, especially questions about control and choice: whether individuals are programmed, whether they have real choices or only illusory ones, whether they are free, how cause and effect operate, who controls society, and, most of all, what is real.

In the universe of the Matrix, there is an engineering level of old-fashioned material machinery, pumping the water; but it coexists with a virtual world of technology, a completely symbolic construction, where opening the black box is deceptive because one encounters only bottomless levels of illusion, a maze of endlessly replicated Mr. Smiths, where human and machine are so intertwined that humans can no longer tell where one stops and the other begins. In the Matrix series, the big questions about technology are not about how it works, but about what is real, and how to remain human in a world dominated by human-made artifacts that seem to have acquired independent agency. To confront reality in the world of the Matrix requires a philosophical and skeptical mind, social solidarity, cool outfits, dark glasses, and kick-ass martial arts.

For further evidence about the dominance of technology in modern history, and the big-box questions this raises, all we have to do is look around us, at a world that is not literally underground but might as well be in its self-enclosure and dependence upon

machines to support human life: Las Vegas. We are meeting in a 21st century equivalent
of what Manchester in the United Kingdom or Chicago in the United States were in the
nineteenth century : a "shock city."[2] Las Vegas now has a population of 545,000, double
what it was in 1990. The metropolitan area is approaching two million people and is the
fastest-growing city in the country. Housing prices have almost doubled since 2003.[3]
Each year the Clark County school district, which covers an area larger than
Massachusetts, builds on the order of one 3000-seat high school, two or three middle
schools each of about 2000 students, and four or five 1000-seat elementary schools.[4]

Las Vegas is also a shock city in the sense of shocking us into a more critical history of
technology. Where is the black box here? If an old-timer who likes machines were to ask
you to come to the engineering level of Las Vegas, where would you go? One obvious
answer is—to the casino floor. To quote from the Wikipedia entry on the city, "The
primary drivers of the Las Vegas economy have been the confluence of tourism, gaming,
and conventions which in turn feed the retail and dining industries."[5] In short, the means
of production in this city, and its most notable engineering accomplishments, are based
on "technologies of addiction," designed to keep players in a zone of intensely
pleasurable human-machine interaction.[6]

---

[2] Referring to the title of the recent book by Harold L Platt, *Shock Cities: The Environmental Transformation and Reform of Manchester and Chicago* (Chicago: Chicago University Press, 2005).
[3] David Leonhardt and Vikas Bajaj, "Read Between All Those For-Sale Signs," The New York Times *News of the Week in Review*, Sunday, August 27, 2006, Section 4, page 1.
[4] Personal communication (email) from Brian Keegan, August 22, 2006.
[5] As of August 27, 2006.
[6] This term is used and explored by Natasha Dow Schull in her dissertation study of Las Vegas gamblers submitted for her doctorate in Cultural and Medical Anthropology from the University of California, Berkeley. Schull plans to publish a book titled *Machine Life: Design and Dependency in Las Vegas*, based on her dissertation.

But this is only the beginning of the strangeness of this place, which is so highly technological, but in ways so different from our usual associations when we think of "technology." Another engineering level here is Nellis Air Force Base, which covers 3.1 square miles and houses about 9000 people. Founded during World War II, in the post war years Nellis became the site of Area 51, "the Ranch," a top secret installation where spy planes were developed and tested, under military secrecy so tight that Area 51 was famously rumored (as you know if you have ever seen the television show The X-Files) as a storage site for UFOs and for experiments on aliens. What is unquestionably alien is another military installation in this neighborhood, the Nevada Test Site, where more than a thousand nuclear weapons were exploded above and below ground in the Cold War years: human-engendered processes that had never before taken place on the face of the earth, and that transformed this part of the earth into a moonscape.

My favorite engineering level here in Las Vegas is the analogue of the works gazed at by the Counselor and Neo: the hydraulic systems that keep the city water flowing. If you are going to build a city of this size in a desert with an average annual rainfall of 4.49 inches, the control of nature starts with control of water. The construction of Hoover Dam in the 1930s, which created Lake Mead, the largest man-made reservoir in the United States, made possible a "shock city" in the desert. But Las Vegas has moved beyond control of nature to its replacement. In the 1990s a second, much smaller (6000 acre-feet compared to 28.5 million acre-feet) dam was constructed to make an artificial lake, Lake Las Vegas, in the vicinity of Henderson and Green Valley (which is neither), upstream of Lake Mead. Lake Las Vegas was constructed purely (if one may use that word in this

context) to make money from the creation of a new world: a recreational and resort environment based on lake-front property in the desert. Far from having a functional purpose in terms of water supply, damming the canyon upstream from Lake Mead interfered with the long-standing recycling of water from Lake Mead to Las Vegas and back again. To create waterfront real estate, the effluent stream of wastewater from Las Vegas had to be rerouted; it is now pumped back into Lake Mead through two seven-foot diameter pipes that go under Lake Las Vegas, thus sparing the sensibilities of the wealthy new residents and visitors who visit or live along the two-mile-long shorelines in custom residences (on the south shore) or (on the north shore) a string of commercial developments financed by Hyatt, Ritz-Carlton, and similar corporations.[7]

A civil engineer who worked on the Lake Las Vegas project told me that he considered Las Vegas "the most artificial of cities." "It is beyond geography," he added.[8] This part of the world illustrates what Elting Morison was talking about when he said, in the 1960s, that humanity had reached a critical threshold, having moved beyond bringing "the natural environment under control, to replacing it by an artificial environment of our own contriving"[9] The only flow that matters in this humanbuilt world is that of money. From this perspective, the most impressive engineering level of Las Vegas is right here, the Strip. The Imperial Palace, the hotel where we are meeting, is built on a piece of roadway that has attracted people and construction from downtown ever since the aptly named Mirage, the first megaresort, opened on the Strip in 1989. With land on the Strip now

---

[7] Telephone conversation with Michael Keegan (Keegan Engineering, P.C.), September 19, 2006.
[8] Ibid.
[9] Elting Morison, *Men, Machines, and Modern Times* (Cambridge, MA and London: The MIT Press, 1966), p. 16.

going for $20-$24 million an acre, older hotel-casinos are regularly being demolished to clear land for the resort equivalent of McMansions, catering to upscale visitors, not to shabby academics. What Schumpeter called the "creative destruction" of capitalism goes on here, literally, as buildings are imploded and cleared to make way for new and more profitable ones. Check this out on the website "Las Vegas Casino Death Watch," which, by the way, lists the Imperial Palace, recently purchased by Harrah's, under the heading "At Death's Door."[10]

What does Las Vegas tell us about our "technological age"? In a memorable footnote towards the beginning of Chapter 15, "Machinery and Modern Industry," in *Capital*, Karl Marx expresses the wish that someday there might be written a "critical history of technology" analogous to the history of nature that Darwin had recently written. Marx notes that the history of technology would be easier to compile because he ourselves have made human history. Then he describes what would be included in such a critical history:

> Technology discloses man's mode of dealing with Nature, the process of production by which he sustains his life, and thereby also lays bare the mode of formation of his social relations, and of the mental conceptions that flow from them.[11]

What is disclosed about technology in Las Vegas? A mode of dealing with non-human nature that goes far beyond its control to its replacement and creative destruction; a mode

[10] http://www.jetcafe.org/npc/gambling/casino_death_watch.html
[11] Karl Marx, *Capital: A Critique of Political Economy*, trans. Samuel Moore and Edward Aveling from the 3rd German edition, ed. Frederck Engels (New York: Modern Library, Charles H. Kerr and Co., 1906, p. 406n.

of forming social relations driven by an apparently unquenchable thirst for military and economic power; and mental conceptions that seem to erupt from the id, in fantasies of pleasure and plenty. Las Vegas discloses the intensity of only partly conscious desires and drives that can be harnessed and augmented by technological means: biological, economic, military, political, and psychic. Las Vegas discloses how much the manipulation of symbols has become a dominant activity on "the engineering level." Las Vegas discloses technological history as much as River Rouge and the Brooklyn Bridge, the steam engine and the light bulb, and what it discloses is disturbing and challenges us to keep expanding our understanding of the term, as members of this society have been doing for over fifty years now.

But try as we might to expand our concept of "technology," we are inevitably limited by presentism. In SHOT we often apologize for our emphasis on recent history and try to expand our range as historians in time as well as in space. This is all to the good, but I am referring to a more pervasive type of presentism: that is, our assumption that "technology" has any place in history at all. This is something new under the sun. In past societies, technological events and activities occurred all the time--they had to, for human life to be sustained—but they were absent from the historical record, considered unworthy of unworthy of historical remembrance. For the Greeks and Romans, history was the record of great deeds and great words; for the Christians of the Middle Ages, the record of God's revelation in the world; for both, the practical arts were the background against which these significant dramas, whether human or divine, were played. For historians until the seventeenth century, technological activities and constructions were

self-evidently necessary to provide biological support for life and to construct a world for human dwelling. Historical activities were a different thing altogether: they were rare words and deeds that stood apart from the everyday, that rose above the level of the repetitious if essential maintenance of life and the non-glamorous but also essential construction of a material world as a stage for both life and history.[12] At least in the West, from which these examples are taken, the idea that technology has a role in history itself, much less that it has a leading role – or even less that it might become a primary element in writing history – was unthinkable. "Prehistory" could be defined by technology – early stone age, late stone age, bronze age, iron age, and so forth. History begins where epochs cease to be defined by dominant tools.

Have we come full circle, returning to technology to categorize phases of human activity, so that prehistory and post-history reconnect now after a long interlude of history defined as great deeds and words? Or, to restate the question, why do we now need the term "technology" to describe historical events, when for much of the past the term was not available? (The articles by Eric Schatzberg, Ron Kline, and Ruth Oldenziel in the last issue of *Technology and Culture* give a wonderful summary of the evolution of the term in the modern West.)[13] What has changed in how history works? Is "technology" describing a new set of historical events and forces?

---

[12] Hannah Arendt, *The Human Condition*, 2nd ed. [Chicago and London: Univ. of Chicago Press, 1998 (1958)], p. 42.
[13] Ruth Oldenziel, "Introduction: Signifying Semantics for a History of Technology," pp. 477-85; Eric Schatzberg, "Technik Comes to America: Changing Meanings of Technology before 1930," pp. 486-512; and Ronald R. Kline, "Cybernetics, Management Science, and Technology Policy: The Emergence of `Information Technology` as a Keyword, 1948-1985, " pp. 513-35, in *Technology and Culture*, Vol. 47, No. 3 (July 2006).

These are questions for us all, no matter what our time and place of specialization. They are questions that confirm Mel Kranzberg's claim that "All history is relevant, but the history of technology is the most relevant."[14] If so, why is this now the case? If we insist on the role of technology into history, it implies our conviction that technology is no longer to be understood as a setting for historical action, or as a means of supporting the life of the actors. It has become part of the historical drama.

In *Matrix Reloaded*, the Oracle who gives Neo hints as to his destiny intones, more than once: "Some things in this world never change. Some things do change." This is less stupid than it sounds at first. Indeed, in a similar way, a very smart and deep thinker, Hannah Arendt, was asking what has changed and what has not changed in the human condition, in her book by that title published the year SHOT was founded. Arendt's book is organized around what she proposes are three fundamental elements of "the human condition"--labor, work, and action. When the human condition changes significantly, so do the conditions of history. What follows is a brief summary of and gloss upon her analysis of how this is happening because of technological changes.

First, labor: new sources of energy and modes of production have vastly multiplied the productivity of human labor. This unprecedented increase, primarily in the past two centuries, is truly something new under the historical sun. In the nineteenth century, despite all the tragedies and miseries that accompanied industrialization, the possibility of universal abundance and opportunity was central to historical, political, and utopian

---

[14] Melvin Kranzberg, "Presidential Address: Technology and History: `Kranzberg's Laws,'" *Technology and Culture*, Vol. 27, No. 3 (July 1986), p. 553.

thought of all varieties. In the twentieth century, despite continued tragedies and miseries and ever-growing anxiety about environmental limits, the possibility of globalizing abundance and opportunity, made possible by exponentially greater labor productivity, is still an article of faith for many elites (who do not hesitate to exploit the deep hope it inspires) and, more important, also for many ordinary people around the world. When Joel Mokyr, in *The Gifts of Athena*, surveys the past two and a half centuries, he concludes. "The rise of western economies based on economic growth and technological progress is the central event of modern history. Nothing else even comes close." [15] There are many reasons to challenge whether material growth so seamlessly results in social progress, and to criticize the grossly uneven distribution of its benefits, but the increase in productivity has been astounding and transformative.

Second, work, by which human beings have recreated their own environment. Arendt prefers to call our surroundings the world – the relatively durable, objective, shared world of things, which houses individual lives and which "is meant to outlast and transcend them all."[16] While labor arises from the body, in never-ending life cycles of production and consumption, the world is constructed by humans from non-human nature through fabrication.[17] The world is therefore always to some degree artificial, but in the past two centuries the human-built world, or "second creation,"[18] has come to dominate or even displace the natural or given one. Las Vegas provides an especially visible example.

---

[15]Mokyr, *The Gifts of Athena: Historical Origins of the Knowledge Economy* (Princeton and Oxford: Princeton University Press, 2002), p. 285.

[16] Arendt, p. 7.

[17] Arendt, p. 136.

[18] These terms and others are discussed by Thomas P. Hughes in *Human Built World: How to Think about Technology and Culture* (Chicago and London: University of Chicago Press, 2004), esp. pp. 2-5, 10-11.

Other examples, less visible but more troubling, are climate change and the

disappearance of life forms as humanity becomes "the first species in the history of life

to become a geophysical force."[19] This too is something new under the historical sun,

involving processes of novel and unpredictable scale, scope, complexity, and pace.

Third, action: yet another transformation of the human condition, the intensification of

human action through technological means, or in this case more precisely because of

techno-scientific means. In Arendt's analysis, new forms of action undermine the

durability and stability of the world:

> we no longer use material as nature yields it to us, killing natural processes or
>
> interrupting and imitating them … Today we have begun to "create," as it were,
>
> that is, to unchain natural processes of our own which would never have happened
>
> without us, and instead of carefully surrounding the human artifice with defenses
>
> against nature's elementary forces, keeping them as far as possible outside the
>
> man-made world, we have channeled these forces, along with their elementary
>
> power, into the world itself.[20]

Writing in the late 1950s, Arendt used automated manufacturing, scientific research in

general, and atomic energy in particular as examples of the ways human beings are

channeling natural forces into the world. We would now add two even more powerful

examples: irreversible environmental processes (especially those associated with global

warming) and biotechnologies that remove the quotation marks from her reference above

to the human ability to "create." The harnessing of elementary forces of creation and

[19] Matthew Scully, "God is Green," review of Edward O. Wilson, *The Creation*, in The New York Times Book Review, Sunday, September 10, 2006, p. 9, quoting Wilson.
[20] Arendt, pp. 148-49.

reproduction underscores her argument that human action is redefining the boundaries of what we think of as history. "Only because we are capable of acting, of starting processes of our own, can we conceive of both nature and history as systems of processes."[21] As techno-scientific action becomes part of history, the line between history and nature becomes blurred: acting into nature becomes part of acting in history.

With this new variety of historical action – "acting into nature" by starting processes – outcomes are uncertain, responsibility is diffused, and possibilities for starting anew are diminished. Technological change has not ended "old-fashioned" history. It has not eliminated aggression, scarcity, or the quest for power. It has not made history jump onto a new track. Some things do not change. But some things do change. By massively altering the human condition, technological means have intensified the processes of historical change. I would propose an analogy with global warming: in the historical world, as with the physical atmosphere, there is a lot more energy being pumped into the system. As a result, the workings of the system become both more intense and less predictable. In Arendt's words, in this new type of historical action, "uncertainty rather than frailty becomes the decisive character of human affairs."[22]

Which brings us to technological determinism. I don't have to remind you that among SHOT members, this has been a "heresy," a "bogeym[a]n" (these telling words come from a provocative Mel Kranzberg-Leo Marx exchange about the volume *In Context,*

---

[21] Arendt, p. 232.
[22] Arendt, p. 232.

edited in Mel's honor).[23] Lately there seems to be a mini-trend in the history of

technology towards confronting this spectre, as, for example, in Paul Ceruzzi's essay in

last summer's *Technology and Culture*, reflecting on Moore's Law, in which he said that

his "modest" goal was "to ask that we step back from a social constructionist view of

technology and consider that, in at least one instance, raw technological determinism is at

work."[24] Steven Usselman, in his recent review of Alfred D. Chandler's work, wonders if

human-generated actions might overwhelm individual and even collective will, if they

"might compel changes more sweeping than anyone fully intended and so forceful that

even the most powerful and privileged among us cannot impede them."[25] This mini-trend

is no doubt inspired by current events, affecting many people besides historians. For

example the technology- and power-obsessed protagonist of a recent novel, Ian

McEwan's best-selling *Saturday*, a neurosurgeon who usually feels very much in control

of his life, goes to sleep after a bad day, feeling "weak and ignorant, scared of the way

consequences of an action leap away from your control and breed new events, new

consequences, until you're led to a place you never dreamed of and would never

choose…."[26]

I would like to make some fairly simple points about this topic, though a discussion about

it could fill this evening and indeed the whole meeting. To begin with, if "uncertainty

rather than frailty becomes the decisive character of human affairs," then the spectre

---

[23] Kranzberg, "Communications," *Technology and Culture*, p. 406.
[24] Paul Ceruzzi, "Moore's Law and Technological Determinism," *Technology and Culture*, Vol. 46, No. 3 (July 2005), p. 593.
[25] Usselman, "Alfred D. Chandler's The Visible Hand," *Technology and Culture*, Vol. 47, No. 3, (July 2006), p. 595.
[26] Ian McEwan*, Saturday* (New York: Anchor Books, 2005), p. 287.

haunting SHOT—and, more importantly, humanity—is not so much technological

determinism as technological **in**determinism. Here we confront a basic ambiguity in the

term, one of the many. "Determination" has often been interpreted as referring to "laws"

or at least objective conditions that guide history in an inherent and predictable way, the

laws being rooted in structures external to human will. This interpretation of

determination implies an understandable connection between cause and effect, whether

retrospectively or prospectively: because technological structures are built in a certain

way, they have certain effects on culture, politics, or other social phenomena. In this

sense, technological determinism is not necessarily the opposite of social construction; on

the contrary, technological determinism can be socially constructed if the shaping powers

want to do this to obtain or maintain social control. So, for example, a software system

may be designed precisely so you will be told by the person using it "the computer won't

let me do what you are asking."

But, Arendt suggests, technology-based processes begun by human beings can escape

intended purposes all too quickly and completely. In this case human-built systems fail to

maintain predictable or logical connections between cause and result. Mel told us that

technology is neither good nor bad nor is it neutral. Nor, I would add, is it stable; what

"it" is, is unstable, and it creates historical conditions that are inherently unstable.[27]

Unstable, but still powerful: another understanding of determination (and in my view, a

more valid one) interprets it as simultaneously "setting bounds" and as "exerting

---

[27] For a fuller discussion of indeterminacy, see Philip Scranton, "Determinism and Indeterminacy in the History of Technology," in Leo Marx and Merritt Roe Smith, eds., *Does Technology Drive History? The Dilemma of Technological Determinism* (Cambridge and London: The MIT Press, 1994), pp. 143-168.

pressures." In the words of Raymond Williams, in his brief but illuminating chapter on determination in *Marxism and Literature*, "In a whole social process, these positive determinations [in the sense of exerting pressures], which may be experienced individually but which are always social acts…have very complex relations with the negative determinations that are experienced as limits."[28] The kinds of positive and negative determinations at work in history are not constant; they evolve over time; and in our time, technology-based ones have become dominant as never before.

What I am saying here is not very new or even provocative. Henry Adams said it, far better than I am, over a century ago. He pointed to the eruption of "forces totally new"[29] and tried to understand their origins and implications. As historians of technology, our wariness of technological determination as a simplistic materialism—as if we could count on predictable cause and effect relationships anyway--should not keep us from acknowledging the power of technological systems and processes in history.[30] Thus in SHOT, I propose, we are not just adding another subfield to historical studies; we are making a stronger claim, that we are redefining historical studies because the way history works is changing. The history of technology not just a worthwhile endeavor. It is so significant that it is worth fifty years of effort, on the part of hundreds of scholars, to establish and nurture a learned society: something else new under the sun.

---

[28]Raymond Williams*, Marxism and Literature* (Oxford and New York: Oxford University Press, 1977), p. 83. Williams remarks, "No problem in Marxist cultural theory is more difficult than that of 'determination'" (p. 87).

[29] Henry Adams, *The Education of Henry Adams: An Autobiography* (Boston and New York: Houghton Mifflin, 2000 [1918]), p. 382.

[30] "Indeed, the dilemma of technological determinism is probably a false problem, since technology *is* society, and society cannot be understood or represented without its technological tools." Manuel Castells, *The Rise of the Network Society*, 2nd ed. (Blackwell, 2000 [1996]), p. 5, citing Mel Kranzberg in arguing against the "dilemma of technological determinism" (p. 5n).

This brings us back to SHOT, and to the end of this talk. In considering the destructive habit here in Las Vegas of blowing hotels into piles of rubble, I have been thinking about the angel of history, which is the name that Walter Benjamin gave to Paul Klee's drawing "Angelus Novus." It shows this heavenly but bewildered creature, Benjamin explains, with his face turned toward the past, its wings caught in a storm blowing in from Paradise with such violence that the angel cannot close them. Benjamin goes on, "The storm irresistibly propels him into the future to which his back is turned, while the pile of debris before him grows skyward. This storm is what we call progress."[31]

The storm is progress, and the angel is SHOT. Here in Las Vegas, in a building that will soon be a pile of debris, blown by the gale of so-called progress, despite our supposed expertise with "technology," we have no more clue than any other learned society what the future will be like. I remember an Executive Council meeting in the early 1990s

---

[31]The work of art is Paul Klee, Angelus novus, 1920,32, oil transfer drawing and watercolor on paper on cardboard, 31.8 x 24.2 cm. The Israel Museum, Jerusalem, Schenkung John und Paul Herring, Jo Carole und Ronald Lauder, Fania und Gershom Scholem.
Walter Benjamin's interpretation is found in the ninth thesis in *Über den Begriff der Geschichte* (On the Concept of History / Theses on the Philosophy of History), published posthumously in 1939: "A Klee painting named 'Angelus Novus' shows an angel looking as though he is about to move away from something he is fixedly contemplating. His eyes are staring, his mouth is open, his wings are spread. This is how one pictures the angel of history. His face is turned toward the past. Where we perceive a chain of events, he sees one single catastrophe which keeps piling wreckage and hurls it in front of his feet. The angel would like to stay, awaken the dead, and make whole what has been smashed. But a storm is blowing in from Paradise; it has got caught in his wings with such a violence that the angel can no longer close them. The storm irresistibly propels him into the future to which his back is turned, while the pile of debris before him grows skyward. This storm is what we call progress."
A manuscript copy of Benjamin's "Theses on the Philosophy of History" was passed to Theodor Adorno by Hannah Arendt, who crossed the French-Spanish border at Port-Bou a few months later, and was subsequently published by the Institute for Social Research (temporarily relocated in New York) in 1942.

where we were discussing whether SHOT communications should be handled via email and the then-emerging web. We worried ourselves about whether it was undemocratic to use email—or undemocratic not to use it. We are still trying to understand where the historical winds are blowing us as a learned society. Here are some gales we confront:

Who is our audience, at a time when the non-academic public shows increasing interest in large issues of technology and history, when the engineering profession is going through an identity crisis, and when international communications open up opportunities beyond our historical heartland of the United States and Western Europe;

What kind of publications should we support, in the age of the internet and electronic access to our past printed files;

Where will historians of technology will find jobs;

Where we will find financial support for our research and outreach and educational initiatives;

How do we find and use sources for research;

How do we find time for societal activities when people are so busy with family and work, when demands of home institutions keep growing, while support from them for organizations like SHOT keeps being squeezed;

How do we respond to societal calls for service in policy areas on top of our "day jobs";

How do we find money for scholarly activities when public support is declining, or insists upon often unwieldy demands for multidisciplinary collaborations; when foundation support keeps shifting its priorities; when individual donors come and go; and when oil futures or the blackjack tables do not look like the best investment for SHOT resources;

How to fund travel to meetings and other SHOT events in an age where space and time have most evidently not been annihilated.

All these forces involve technology; they exert severe limits and pressures; and they cannot be evaded. But members of SHOT do not feel like victims of technological determinism, do not feel helpless. Instead, we try to respond, and mostly do respond, with creativity and responsibility. We try to make decisions in a technological world that nevertheless seems a very human world. We continue to open the big box of history, while also working together to take care of our fair Society as it confronts profound historical changes; and all of us, young and old, like to visit the engineering level, checking out the devices and systems there, talking about how they work, what they do, and what they mean.