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THE REALITY EFFECT OF TECHNOSCIENCE

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in

HISTORY OF CONSCIOUSNESS

by

Julian C. Bleecker

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The Dissertation of Julian C. Bleecker
is approved:

_____
Professor Donna Haraway, Chair

_____
Professor Teresa de Lauretis

_____
Professor Lisa Rofel

_____
Robert C. Miller
Vice Chancellor for Research and
Dean of Graduate Studies

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Abstract

This dissertation titled “The Reality Effect of Technoscience” by Julian C. Bleecker investigates the social, cultural and political meaning of three technology-based popular culture artifacts: Virtual Reality technology; film-based special effects as seen in the science-fiction film *Jurassic Park*, and; the simulation games SimCity2000™. Individually, these three artifacts serve as points of entry for discerning how these specific forms of computer-based visual and computer-based knowledge representation reveal the cultural politics of cities, indicate how popular notions of the possibilities offered by genetic science and engineering arise, and offer insights into how historical and contemporary social institutions shape how advanced imaging technologies are built and inform their possible uses. Collectively, I use these artifacts as instances of “The Reality Effect of Technoscience” — *the process by which a specific artifact attains a sense of tangible, social, political and cultural reality that is contingent on other social agents’ engagement with the artifact*.

My investigation begins by determining who and what makes up the social, cultural and political character of these specific technology artifacts. It is my overall objective to reveal how, in these particular examples, these constitutive "agents" — the who and what — operate to give the artifact substantial meaning such that the artifact becomes "real."

In my approach, a computer program or an article in a popular science journal, for example, are "agents" that inform the meaning making process in a way that is on par with human scientists or science-fiction film fans. These are examples of the human and non-human agents which, through their activities, contribute to the "Reality Effect" of these artifacts. Through their activities these agents "socialize" these artifacts, which is tantamount to making the artifacts socially relevant, or making the artifact "matter."

My research determines that artifacts become "real" through the activities of agents who engage in the task of giving the artifact meaning proper to the idiom in which the agent operates. These many-layered, fraught and heady engagements occur at throughout a large matrix of social, political and cultural activities. My research reveal such engagements through a close investigation of the practices relevant to the artifact in question.

Acknowledgements

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This dissertation is dedicated to my mother Barbra Jean Bleecker, the memory of my father Theodore Irwin Bleecker, and the memory of a great friend, Lisa Summa.

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The Virtual Reality Effect

In 1992 Silicon Graphics Inc. (SGI) was a formidable computer graphics hardware manufacturer. Their workhorse line of computers were the necessary equipment to produce the kinds of imagery found in visual special effects for film, armored vehicle training, driving simulation, virtual reality, and the large visual displays necessary for real-time flight simulation used by the military and major airlines. Their RealityEngine™ was the high-water mark in the computer graphics field in terms of sheer processing power and capacity to render complicated visual scenes. As described in the computer's technical overview:

> RealityEngine is not only designed to address low-end and mid-range visual simulation applications for development and training, but due to the inherently flexible nature of the system, it extends simulation into the realm of visualization, entertainment, and virtual reality applications.(*RealityEngine in Visual Simulation Technical Overview*)

I was first introduced to the RealityEngine™ while, appropriately enough, involved in the nascent Virtual Reality industry. In the early 1990s there was a standard Virtual Reality "kit" that, for about $250,000, comprised a workable configuration of hardware and software necessary to render moving, stereoscopic imagery complete with the head-tracking rig that

allowed one to strap on a pair of clunky goggles into which were projected flat, colored shapes. Moving your head around translated the scenes in virtual space as if one were "really" in these sadly lifeless computer-generated worlds. For double that price, one could get a system that tied two of these RealityEngine's™ together into something called RB2 meaning "Reality Built for Two." RB2 allowed two individuals to don the goggles and enter a "shared" computer graphics world. It was packaged as an off-the-shelf configuration of computers, input devices and head-mounted goggles by a small Virtual Reality company called VPL in the mid 1980s and early 1990s.[1]

In this context, what I wish to investigate is the veritable collapse of "objective reality" and artifactuality that Virtual Reality and the RealityEngine™ suggest. At the level of savvy, considered marketing strategy, one could argue that SGI gave this particular computer with a name that would seduce image makers whose work demands a degree of representation that closes the perceived gap between markedly "unrealistic" images and those that reproduce the intricate details and representational data of "reality." The seductive beckoning of a computer whose trade name suggests an appliance that allows one to exert some kind

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1 VPL was rumored to stand for "Visual Programming Language."

of influence — or establish a privileged purview over — "reality" is sure to woo a fair proportion of imaging professionals. The name gives the sense that this computer is a mechanical device that mysteriously drives a causally functioning universe suggesting unabashedly a configuration of machinery kin to the eighteenth-century clockwork model of the phenomenal world. This word play on "reality" and "engine" also performs the same meaning-making work as the device it signifies. Both the name of the device and the verisimilitude of its visual renderings summon forth the image of a mechanical "works" that, through some Rube Goldberg like meshing of gears, is the behind-the-scenes producer of "reality".

Even a vaguely anchored definition of reality is tricky. It is a discursive idiom that is extraordinarily broad in its usage, and varied in its specific degrees of precision and levels of technical particularity. Reality scarcely translates across the myriad of discourses and social infrastructures that use this highly energized term.

While employed as an engineer at the University of Washington, Seattle in the early 1990s I was engaged in the work of what is often termed "Virtual Reality." I became fascinated with the way "reality" in this expression became a means to fuel provocative discussions that sustained public interest in the Virtual Reality field, despite its lack of a practical commercial product. VR summoned forth armchair epistemologists into the

debate as to what might count as “reality” when such is generated by a computer. It was equally provocative that the basic suite of technology used for generating Virtual Reality worlds was called a RealityEngine™.

It is important to emphasize that the RealityEngine™ is not merely an apparatus that produces interesting visual displays. It is very much a meaning-making device. Through the use of visual representation the Reality Engine and those using the device craft renderings that — by virtue of the material and semiotic technoscience embedded in its hardware and software — create an appearance of ‘things as they are.’ Tropes that produce the appearance of fact are not solely limited to the domain of language or discourse but are also found performing their intricate truth-making work within materially constructed devices such as the RealityEngine™. The RealityEngine™ might be considered a device that performs a discursive move toward the appearance of reality, a language instrument as versatile as a trope in, for instance, written language (White 1978 p.2-3).

Of all the things one might imagine as creating reality, how does a machine make reality? Within an instrumental machine such as the RealityEngine™, coupled with what was, in the early 1990s, its notable “applied” field of Virtual Reality, how does truth-making happen? How does

the RealityEngine™ and its evolutionary kin enter into the arena of lived experience together with other fully socialized technocultural beings?

The answer to these questions *are* the technoscience that is at work amongst Virtual Reality and the RealityEngine™. What I call the "reality effect" of this VR-RealityEngine™ amalgam is the process and the result of these entities joining the tangle of social infrastructure that has within its purview this slippery idiom "reality."

The kind of technoscience at work amongst the Virtual Reality / RealityEngine™ couple is a rich and complicated affair. In what follows, I will describe three aspects of this technoscience. First through my own experiences in the Virtual Reality field. Second, through a reading of Virtual Reality's tussle with the U.S. Supreme Court. Finally, I will offer a technology-biography of the RealityEngine™. This biography explicates the ocular and perspectival technoscience embedded within the device. The former refers to the RealityEngine's™ reliance upon the visual biology of the human eye, the latter the literal inscription of perspectival geometry within its electrical circuits.

Sorting The Reality From The Virtual

"If there's no way to establish what is true, we're sunk"[2]

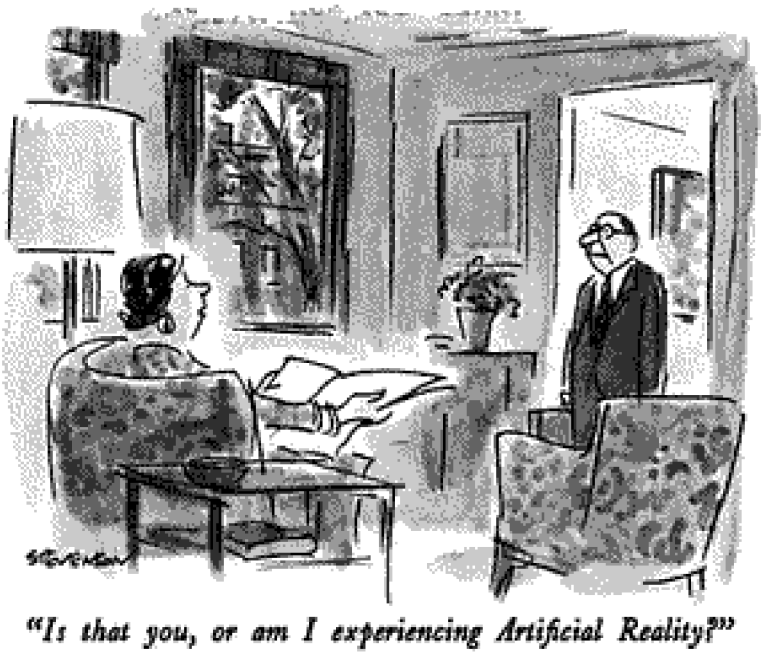

Figure 1 New Yorker Magazine Cartoon Lampoons Virtual Reality.

I came to work with Virtual Reality when I was a research assistant at a laboratory in which that technology figured centrally. The lab, called the Human Interface Technology Lab (HITLab) at the University of Washington, Seattle, was formative at the time. The HITLab was mostly populated by young, college-aged computer scientist graduate students and technology

2 (Jaron Lanier, VR pioneer, quoted in Schwartz 2002)

enthusiasts from the Seattle community. Several Ph.D. researchers led the lab's various research agendas and taught classes in engineering departments affiliated with the lab's purpose of creating innovative human-machine interfaces.

Considerations as to the epistemological and ontological status of "reality" were free-flowing amongst students and researchers at the HITLab. The prefix "virtual" attached to "reality" was one of the central motivations behind are questions as to what reality was, and what a suitable "virtual" approximation might be. Despite the metaphysical nature of these discussions, when it came time to put hammer to nail, what we developed were practical, instrumental technologies — devices such as advanced visual displays for aircraft — before anything else.

In the lexicon of technology terms, "virtual" is meant to indicate that there is a "real" form for which the virtual is an expedient approximation constructed for the sake of some measure of efficiency, usually financial. For instance, in the field of Computer Science "virtual memory" is meant to refer to some sort of emulation of computer memory as it exists as a hardware component. What typically sets the "virtual" apart from the "really real" is a deficiency in quality along one of the attributes that certifies the "really real" thing as "really real." For the example of a computer's "virtual memory", the *virtual* often refers to the fact that it is

like the “really real” memory, and can be treated like the “really real” memory, but it has the deficit of being significantly slower to retrieve and store information, but less expensive in proportion to the quantity of information it can maintain when compared to other forms of computer memory.[3] So, in function, for this example, the two are similar conceptually, yet practically speaking, differ in their capabilities and across performance parameters.

Our instrumentally oriented research question at the time was to consider the quantification of this deficit — an implicit gap between the “really real” and the “virtual.” What could be brought to bear from the known principles of human perception in order to close this gap? What were the thresholds of, for example, perception of motion that were relevant so that movement in the computer generated worlds would appear smooth as reality, rather than jerky as in a poorly constructed animation? For instance, we considered parameters such as the visual acuity of the human

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3 Typically, virtual memory is memory represented in software rather than hardware. Hardware memory is in principle faster than software memory mostly, I would argue, for complicated historical reasons. In the hierarchy of computer architecture, hardware — the assemblage of electronic components that become a computer — is the foundation, so to say, and software is an inscription that articulate the hardware, manipulating electronically represented information in various ways that have their own history which, with consequence, passes through the English mathematician George Boole. My point regarding the historically specific angle to this is not to be pedantic. Rather, I mean to indicate that the evolution of technical advances is always steered by “contingent” factors, such as tactical and strategic decisions by agents of influence. That is, it very well could be otherwise, with hardware programs manipulating “soft” representations of information.

eye which gave insights that helped determine the necessary resolution and color detail of the visual displays of Virtual Reality goggles. These examples and others were the sorts of factors to be considered during our efforts at overcoming the deficit between a poor facsimile of reality and our goal of virtual reality.

At the HITLab, I learned that representation works according to a principle that there is the thing-in-itself, out there — the “really real” — and deficient facsimile. In this instance, Virtual Reality represents — with an accountable, measurable deficit — a real world. The virtual will never be “really real”, but it is a worthy pursuit to attend to the representational gap, and stitch it closed to the best degree possible. In the best of all virtual worlds, this deficit should become infinitesimal and imperceptible. This was one of the goals that motivated us.

Our “language” for closing this gap between the thing and its representation, were our instruments. These instruments took the form of software and hardware tools that behaved in an instrumental mode, as “things” designed to be the means to the goal of creating the appearance of reality. The RealityEngine™ was at the center of this toolkit, including the Reality Built for Two (RB2) configuration. Together the RealityEngine™ and the RB2 system, our collection of computer programs, device drivers,

advanced computer graphics workstations and so forth were the means of producing virtually real worlds.

And that should have been it. With time, our collections of software, hardware, RealityEngine's™, and some hard engineering work would sufficiently approximate the qualities of really real worlds. And then our project would be done. Others would embark upon efforts to figure out where our real enough Virtual Reality was best employed.

Of course, this was not entirely the way things worked out. Instead of the conceptually simple task of writing faster software code, or designing better motion tracking sensors, or creating higher resolution visual renderings, the quest to real Virtual Reality required a much more formidable list of equipment and personnel for building real enough reality. The necessary gear — personnel and equipment, or human and non-human agents — on this quest can be listed succinctly, after which I will provide details of this inventory in the context of Virtual Reality:

1. **Instruments**
2. **Collegial Exchange**
3. **Alliances**
4. **Public Representation**
5. **Facility**

This is Bruno Latour's framework of the five sorts of activities I should describe in my effort to understand and reveal the technoscience of Virtual Reality (Latour 1999 pp.98-102).

> These are *five* types of activities that science studies needs to describe first if it seeks to begin to understand in any sort of realistic way what a given scientific discipline is up to: instruments, colleagues, allies, public, and finally, what I will call *links* or *knots*. (1999 p.99)

I have taken a liberty with Latour's fifth, conceptually elusive activity. I understand the "links" and "knots" to which he refers as the operational aspect of knowledge making. In my mind, the word *facility*, as in the means or capacity to get something accomplished, is more adequately descriptive of what Latour means when he describes this fifth activity as the thing that holds together the other four. In the context of Virtual Reality, I mean *facility* to emphasize the point that some agents — humans or non-human machines — are more adept at creating Virtual Reality than others. Some agents involved in Virtual Reality have better access to financial resources than others, or have deeper trust networks amongst colleagues and persons of influence, or render computer graphics scenes faster and with higher degrees of visual resolution. These agents will do better at linking and holding together the four other activities based on the facility with which they operate in their respective domain.

Through the description of my experiences in the Virtual Reality field that follows, I will indicate the manner in which each item in my inventory works. This is the list of resources necessary to create what I refer to as the reality effect. Not unexpectedly, a bit more is required to produce reality than cleverly scribed computer code and a deft hand with the soldering iron. These skills and practices are needed, certainly, but what a bland stew would result. Within the commingling of these five activities, action translates ideas, and newly made realities obtain. One might bend an old, trusty expression thusly: “Virtual Reality does not live by software and hardware alone.”

In order to discern how Virtual Reality first contracted the reality effect, it will be necessary to begin this biography in Boston where at the time I was designing minicomputers for a large computer equipment manufacturer. I found the work uninspiring and was on the look-out for more engaging, creative projects. I happened across an article in the *Whole Earth Review*, written by Harold Rheingold, an astute technology journalist whom I would later meet in Seattle while working on Virtual Reality (Rheingold 1990). In fascinating terms, Rheingold described Virtual Reality in such a way that I was certain involving myself would sate my creative urges. With this article and an earlier one from the same magazine, I learned enough about the key players in this nascent arena to

realize that I would have to travel to San Francisco and, perhaps, Seattle if I had any hopes of becoming involved in the burgeoning Virtual Reality field (Heilbrun and Stacks 1989).

Within a few short months I settled affairs in Boston and made my way to San Francisco. Rheingold's article served to articulate this formative, not-yet-wholly-formed entity that, together with other media journalist and book authors, gave life to Virtual Reality through their interviews with the field's leaders and their speculations about its future possibilites. Virtual Reality was born, to a large extent, of its public representation in the media and books.

Once tenuously in San Francisco, I did what all eager self-promoters do. I made a "cold-call" at the offices of VPL Research, Inc., in Redwood City. At the time, VPL was the knot that tied together the disparate elements that constituted Virtual Reality. In Jaron Lanier — a teddy bear-like be-dreaded ethnomusicologist — Virtual Reality had the sort of whimsical public face one might expect from radical technological innovations. Shirt-sleeved technicians and pipe-smoking scientists do not create things like Virtual Reality. Of course, they may do, but for public representation, whimsical innovation can only be practiced by whimsical innovators.

My experience trying to meet Lanier was a bit audacious, but I felt I had few options. At the time, I myself had shoulder length dreadlocks and

was greeted warmly by the receptionist. I asked to see Lanier, and was immediately asked if I was a friend. From the way the receptionist's gaze crossed me, I assumed that my dreadlocks would facilitate a translation of myself from a slightly bedraggled and road-weary stranger — potentially a threat, as my appearance had drawn nervous glances throughout my journey — to a friend of Lanier and, by extension, the company he founded to make Virtual Reality real. By translation, I am referring to "displacements through other actors whose mediation is indispensable for any action to occur" (Latour 1999 p.311). My "action" was to move closer to my goal of involving myself as a Virtual Reality technologist, perhaps as an employee of Lanier's nascent company. Through my appearance I hoped an introduction to this consequential actor in the Virtual Reality field would be facilitated. When I explained that I did not know Lanier personally, but was eager to meet him, I was told that he was currently giving a demonstration, and I would have to wait. I settled in the reception area and waited.

Later in my journey to become deeply involved in the VR field, I would effect a similar displacement when I met Thomas J. Furness who is the director of an important VR research lab at the University of Washington. These acts of displacement through 'indispensable actors' are not solely limited to human agents. The products sold by VPL were indispensable

actors in the embryonic days of VR. Of course it was possible to produce the same visual and sensory effect of a virtual world without VPLs standard suite of innovative hardware and software. Both home-made and commercial derivatives appeared of, for instance, VPLs black sensor-laden neoprene DataGlove™ that measured and computed the orientation of one's hand and the bend of one's fingers so that a virtual hand could be rendered in the computer graphics scenes for grasping objects. So too for VPLs EyePhones™, a scuba mask-like device with binocular displays that displayed the computer graphics scenes in full-color, with the stereoscopic effect necessary to create the illusion of depth perception. Despite the derivatives, during the VR heydays in the late 1980s and early VPL was the canonical source for VR technology and a significant public face for the industry. In this way, VPL was one of those indispensable actors whose credibility and "bond" was its founder and its innovative technology.

After a short while, a door to the reception area opened and, instead of Lanier, out walked two rather large, bulky gentlemen in suits. Their presence preceded them in a way that says "security", and I instinctively braced against the chair. Following them was an individual I immediately recognized as Al Gore, then a U.S. Senator from Tennessee. Senator Gore

was the man the media credited with having "invented" the internet.[4] Presumably, the Senator was on a "fact-finding" trips, a name whose irony is particularly fitting in the context of this essay. Although I was not privy to the Senator Gore's stated objectives, it is likely a more precise description of his activities would have been fact-making in the form of *alliance-building*. Lanier glanced in my direction and continued on with the Senator and his entourage. Lanier, the innovator who was the public representation of VR, and Senator Gore, the powerful alliance-builder, were gone, out through another paneled door across the room.

The reality effect is always recursive, to borrow an idiom from Computer Science — a snake eating its own tail. For the sake of completeness, I will describe the means by which the Senator from Tennessee's *translation* intersected with mine, his being that *from* a lawyer who was elected to represent the good citizens of Tennessee *to* the principle author of legislation that sluiced funding that was used to connect public schools to the nascent Internet. His translations and mine are what have brought us to within a few meters of each other in this small, unglamorous reception area in Redwood City, California.

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4 There was a bit of controversy, as one might expect, with Senator Gore's status as the "inventor of the internet." The more interesting subtext of this controversy was the one about the privilege of authorship and ownership and the degree to which people would go to control the historiography of the internet.

Senator Gore's translation is made nearly frictionless. It is composed of **allies and colleagues, instruments, public relations,** and **facility.** The raw material that stokes the flames of professional politics are the allies, alliances, colleagues and political influence gained through the networks of favoritism, financial donations, and influential lobbyists. Legislative inscriptions — bills, resolutions, testimony, recorded minutes —are the senator's instruments of action. Some of these are words made enforceable by courts and, if necessary, the apparatus of state law enforcement. The action that obtains with these instruments is support — both grants as currency as well as explicit permission to pursue (or not pursue, as with, for example, stem cell research) certain activities protected by laws. The Senator's public relations staff orchestrate his public representation through CSPAN broadcasts, area news coverage as in, for this example, the consequential *San Jose Mercury News*. Finally the knot that tie it all together is the *facility* afforded a United States Senator. Specifically, his facility is the power and influence that keeps all of the above components moving forward, translating ideas into actions that effect his will and that of his constituents and lobbies. This facility to which I refer is metonymically represented by the Capitol Dome in Washington, D.C.

Of course, my own capacity to realize my will is composed of a far more modest set of resources. The humiliating outcome of my efforts to meet Lanier indicated this deficiency all too painfully.

Let's take stock thus far of this specific bit of technoscience I call the reality effect. The encounter just described, where federal legislator, armed secret service, whimsical innovative entrepreneur, and young overly enthusiastic computer programmer all came into brief contact was a spark in the engine of the reality effect. "Things" were happening. One could indicate "concretely", "materially" or with whatever solidifying idiom is suitable, that we were not solely in the realm of soft ideas. People built boxes containing instruments that United States Senators traveled to see. This was reality coming into being. Without resorting to any notion of causality, the Senator saw something in one of those rooms and would likely make "real" the event by drafting a staff memo. Perhaps at dinner that evening the Senator would offer a hint of enthusiasm to an individual of influence in Silicon Valley, who might further vascularize the reality effect by providing some supporting gesture — perhaps donating equipment — to further sedimentize Lanier's ideas (Latour 1999 Ch. 3).

While I never obtained an audience with Lanier (I would meet him a year later, and not be surprised that he could not recollect my sitting in the reception area), I was bolstered in my enthusiasm. Certainly if a United

States Senator demonstrated enough interest in VR to take time out from his busy schedule to visit sunny California, there was some promise of a bright future, if only I could negotiate a role for myself.

Shortly after my unexpected encounter with these powerful collaborators, I made my way to Seattle where a facility called the Human Interface Technology Lab was being established at the University of Washington. The HITLab was another locus of activity in the burgeoning VR field. The lab was positioned as an academic research facility, in which advances in computer-human interaction were investigated. My aspiration was to obtain a role as a technician at the HITLab as another possible point of entry into the VR field. Ultimately, I enrolled as a graduate student in an interdisciplinary engineering program whose curriculum was designed to coincide with the research and development goals of the HITLab. It was here at the HITLab, in two very modest trailers awkwardly situated on a small, muddy tract behind the University of Washington's heating plant that the reality of Virtual Reality was percolating.

Activities at the HITLab clearly demonstrated the reality effect. World building was going on here. It was happening in the practices of the lab proper through the work of self-proclaimed "world builders" who were responsible for "programming" the virtual worlds in computer code. A different sort of world building was also happening through alliance

building, collegial exchange, instrumentation, and representation. In the 1990's, the HITLab was one of the prominent facilities to tie all these pieces together and do so effectively. The reality effect for Virtual Reality was happening right in front of our noses and, while short of the language to explicate it at the time, we all knew some*thing* was coming into being. Something was happening.

How did we know? On any given day, news media from Japan and South Africa, Germany, Canada and elsewhere were ushered through the lab. A curriculum at the university was established, and the director of the lab given a full professorship and accommodating offices. There were frequent demonstrations to prominent visitors from large manufacturing, entertainment, and defense companies. The *Virtual Worlds Consortium* was established, which provided corporate members early access to research results in exchange for monetary support and equipment donations. Online discussion forums were hosted on the lab's computer network, and moderated by its staff of PhD. and graduate student researchers. The list went on, but in essence comprised the sorts of things necessary for the reality effect to obtain enough traction to make VR count as "real." Through the pragmatic efforts to create visual, reactive virtual worlds and the knotting together of alliance networks, VR was coming into being. And with this, the technoscience of VR was stitching shut the

correspondence gap and producing virtually indistinguishable representations of actual worlds.

As I have tried to indicate, more than advances in technical capabilities is required for the reality effect to take hold and to close this representational gap between virtual and real worlds. This gap is not merely one of visual appearances, or of the capacity of some technical apparatus to make one feel that a virtual world is has obtained some profound degree of verisimilitude such that it is indistinguishable from reality. There was all manner of world building activities involved in this effort. Leaders in the field employed their facility at enlisting colleagues, building coalitions, and garnering the kind of support that could create the institutions and companies that added bedrock to the task at hand. Networks of trust and alliance were formed in the spirit of collegial academic exchange. Instruments like the RealityEngine™ were assembled with the requisite technical features and capabilities, and marketed in such a way as to to fit into the list of necessary VR equipment. Public representation of VR distilled its promises, both the dubious transcendent possibilities for human consciousness that bore fruit largely as poorly rated film scripts, as well as the formidable advances VR research brought to such things as telepresence surgery, which today makes it practical for an

expert surgeon to perform certain procedures on a patient at a remote location.

These sorts of world building activities are a form of socialization. By this I mean the way in which VR comes into existence as a type of *social actor*. Over the years since 1993 when my direct involvement in VR ended as I pursued other interests, its socialization has diminished. I would suggest that is decline was because of the scarcely viable promises, the lack of a vision for a sustainable product within the tight constraints of consumer capitalism, and financial resources that shifted quickly to support the Internet gold rush.

Given its decline, I was surprised to see discussion of VR and its promise to create virtual scenes indistinguishable from reality appear in, of all places, a U.S. Supreme Court case in 2001 (John D. Ashcroft v. The Free Speech Coalition, Et Al. 2001; Schwartz 2002).

There are many ways in which one can measure the degree to which a non-human such as VR elevates its status as a socialized entity or social actor. In the previous section I described how VR did such as it became part of the popular imaginary, received the attention of politicians, crowned the aspirations of academic researchers and so forth. I also described how one of the central capabilities of VR is to produce digital imagery that is virtually indistinguishable from reality. In the following section I discuss

this U.S. Supreme Court case in which precisely this capability that is addressed. My discussion develops from the assumption that courts of law are themselves a kind of technical instrument that has as its task, in this case, measuring the capacity of VR to close the representational gap between virtually real and really real worlds.

On the surface the case is about extending child pornography prevention laws to cover digitally produced images. The Court must weigh the capacity of computer graphics imaging technology to produce images of virtual scenes of child pornography that are scarcely distinguishable from reality, even by image analysis experts. The government's concern is that these virtually real images leave prosecutors no way to determine if the laws protecting actual human children have been broken, particularly if a prosecutor or even an expert image analyst cannot tell the difference between an image of a human against that of a non-human child.

It is the degree of verisimilitude obtained by VR imagery that will determine the status of non-human virtual children as "first-class" entities on par with real human children, complete with the same legal protections. For my purposes, the case is an example of a non-human *object* — the digital VR world and its means of production — at the cusp of becoming a "first-class" entity *subject* to particular legal rights and warrants. My point is that when VR images become entities with

enforceable legal status or protections, the transition to socialized being is well underway.

It is not only because VR plays provocatively with the philosophically contingent meaning of "reality" that it serves as a useful example of this transition to socialized entity. I could offer other examples that indicate when and how non-human entities become entangled amongst us and our social practices. For example, the legally protected status granted the Spotted Owl, the protection of wild flowers in some U.S. States, huge stretches of Alaskan wilderness protected against oil exploration, or collections of digital data that, through an MP3 playback device, become a pop-song. Arguably, some non-human entities are more zealously protected than their human kin.

When the Child Pornography Prevention Act of 1996 was established, its language essentially made it illegal to produce, distribute, or own an image produced by any means, specifically including computer technology, that contained what appeared to be, or gave the impression of, a child engaged in a sexually explicit act. As the law was established to prevent child pornography, it was specifically preventing virtual child pornography. For the purposes of explicating the way non-human entities are made social beings, in what follows I describe the CPPA as a law that implicitly protects non-human virtual children from exploitation.

John D. Ashcroft v. The Free Speech Coalition

As a measure of the way in which VR is socialized, one need look no further than a recent U.S. Supreme Court ruling. In *John D. Ashcroft v. The Free Speech Coalition, Et. Al.*, the Court's central concern was to determine whether the Child Pornography Prevention Act of 1996 abridged freedom of speech (*Child Pornography Prevention Act* 1996). The Court was petitioned by the U.S. Government's Attorney General to uphold challenges to the CPPA constitutionality. The CPPA was created because computer imaging technology could now produce images that appeared so real that it was impossible to determine if the virtual scenes indicated the exploitation of a real human child. If an image were a virtual representation created on a computer without a real human child, then no human child was involved nor exploited. But without a means to make that determination, the government was at a loss to prosecute possible offenders.

For the purposes of my argument, it is the way the case can be interpreted as a debate about whether a virtual, verisimilar non-human child should have the same protected status as a real human child. I am not concerned with the narrow context of what the Court refers to as "virtual child pornography." The crux of this example is the argument that a non-human technocultural entity — a virtually real image of a child — may

appear so real, or present the impression of being real, that it must be included in a protection statute that, in this context, brings it legally on par with real human children.

The example also indicates how a social institution such as the U.S. Supreme Court is a kind of technical instrument analogous to, for example, the RealityEngine™. Like the RealityEngine™, the Court makes worlds and provides the kinds of mediations that can turn something once ethereal and insubstantial into a stable and resilient entity.

The CPPA was meant to address the development of imaging technologies that were not in existence at the time earlier child pornography laws were created. Specifically, the advances in computer graphics technology that made it possible to create images of a non-human, digitally produced child which appeared virtually indistinguishable from a real human child.

In a Congressional Finding attached to the CPPA, it is determined that the capabilities of computer imaging technologies can close the representational gap between the really real and virtual.

> (5) new photographic and computer imagining [sic] technologies make it possible to produce by electronic, mechanical, or other means, *visual depictions of what appear to be children..that are virtually indistinguishable to the unsuspecting viewer from unretouched photographic images*..

> (6) computers and computer imaging technology can be used.. *in such a way as to make it virtually impossible for unsuspecting viewers to identify individuals, or to determine if the offending material was produced using children*; (*Child Pornography Prevention Act*,,§2251 Congressional Findings emphasis mine)

The provisions in the CPPA at issue for this case were the CPPA's definition of child pornography and the sub-categories within that definition.

> "child pornography" means any visual depiction, including any photograph, film, video, picture, or computer or computer-generated image or picture, whether made or produced by electronic, mechanical, or other means, of sexually explicit conduct..(*Child Pornography Prevention Act*,,§2256(8))

The two specific categories of prohibited speech within this definition indicate how the statute addresses the capacity of virtual imaging technologies to close the representational gap and create an effective representation of a really real child to such a degree as to confuse reality with appearances, or allow reality to be subsumed under a visual impression of what one is looking at:

> "such visual depiction is, or appears to be, of a minor engaging in sexually explicit conduct;
>
> "such visual depiction is advertised, promoted, presented, described, or distributed in such a manner that conveys the impression that the material is or contains a visual depiction of a minor engaging in sexually explicit conduct.." (*Child Pornography Prevention Act*,,§2256(8)(B,D))

The government argues that the representational gap between virtual and real worlds has stitched close to a critical degree through advances in

digital imaging production and rendering technologies. According to the government, these advances make it extremely difficult to determine whether images are of a virtual or real world, or a virtual or real child. Consequently, it has become difficult if not impossible to determine if a real child has been involved — and exploited — in the creation of these images.

> The advent and increasing availability of computer technology has allowed individuals to generate computer images that are virtually indistinguishable from traditional photographs. This allows criminal defendants to inject reasonable doubt arguments into virtually every case.(John D. Ashcroft v. The Free Speech Coalition, Et Al. 2001 p.4)

The government argued that the CPPA's restrictions on the ownership, sale and distribution of digital, computer-generated virtually real images depicting child pornography should be upheld over and against the freedom of speech arguments of the case's respondents.

The case turned on the constitutionality of the CPPA. First Amendment cases almost always seem to present the most deleterious product of the correspondence between words and action. The gap between computer generated imagery, and action inspired by or compelled from those images is what concerns the government. If Virtual Reality has promised to bridge that gap from the very start, it would be called to the dock, maybe even the gallows.

For completeness, it is useful to consider the government's argument. Attorney General John D. Ashcroft's Deputy Solicitor General argued that computer images of child pornography that are virtually indistinguishable from traditional film-based photographs allow criminals to inject reasonable doubt arguments into their cases, thus weighing the odds against a successful conviction. In the case of traditional visual renderings such as unaltered photography or film in which computer imaging techniques are not used, the government can produce witnesses to the fact that a minor was involved (presumably, film crews) and rely upon conventional verification protocols (birth certificates, for instance.) In the case of the virtually real images, the government cannot adequately produce witnesses or verifications. To the first point, the only "witness" to the production of the virtually real image may very well be the individual who stands to be prosecuted (the technician or artist who produced the image on a computer), who would be well advised to invoke Fifth Amendment protection. To the other point, there is not an adequate protocol for determining what the age may be of a virtual, non-human child.

The central problem for the government was that, despite their verisimilitude, these virtually real images deviated from the usual means of prosecution. And the government was at pains to indicate that these

images are virtually indistinguishable from the real thing. Even expert witnesses have difficulty distinguishing between virtual and actual imagery. A citation was made in the government's argument to a case where an expert witness on cross-examination was unable "to tell definitively whether or not an image was of a real child" and this situation was certainly cause for concern on the part of the government (John D. Ashcroft v. The Free Speech Coalition, Et Al. p.5). The gap between the virtual and the real has closed to the degree that experts cannot be produced to "distinguish between a photograph of a real child and an imaginary child." This makes it difficult to prosecute "real child pornography" (John D. Ashcroft v. The Free Speech Coalition, Et Al. p.44). For the Virtual Reality community, this difficulty would appear to indicate that, at least in this situation, they have attained their goal but at the cost of a wary gaze from the US Justice Department. Ultimately, the petitioners failed to convince the Court as to the necessity (if not the constitutionality) of the CPPA.[5]

The Supreme Court ruled that the CPPA was unconstitutional on First Amendment grounds. The Court thought the CPPA overly broad in the

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5 The arguments on the part of the government, in my reading, seemed less concerned with the First Amendment than with lobbying for an effective means to prosecute technologically savvy child pornographers.

language used to define what could be a non-human virtual child. So broad, in fact, that even a character from literature that is currently protected by the First Amendment could fall within the definition. The First Amendment prevents laws that bar what we see, read, speak or hear unless the speech is defamation, incitement, or obscenity. It was the Court's opinion that the language of the CPPA would make illegal forms of speech that are currently protected. In their opinion, the Court gave such film examples as *Romeo and Juliet* (1996), *Traffic* (2000), and *American Beauty* (1999) as works that could be argued as illegal according to the wide latitude of the CPPA (John D. Ashcroft v. The Free Speech Coalition, Et Al. cf. Kennedy Opinion).

Of course the fact that the Court did not uphold the CPPA does not indicate that "virtual child pornography" cannot produce non-human virtual children that *appear to be* or *give the impression of* really real children. It only indicates that the CPPA was overbroad in its categorization of what may or may not be a real child.

For the sake of revealing the technoscience involved here, imagine if the language of the CPPA was less broad in its categorization. Or imagine if the Court were more inclined to assume that harm does indeed follow from speech in this specific case and, therefore, First Amendment protection must be elided. In such a case it is probable that the CPPA would be

upheld. In other words, there would still exist a law on the books that protected virtual, non-human children as well as real human children. On the surface, the fact that such a hypothetical variation of the CPPA may have established "virtual child pornography" as illegal may be so as to uphold generally accepted community standards regarding obscenity, regardless of whether a real child were exploited or not. In the hypothetical case, seeing what "appears" to be, or "gives the impression of", a child engaged in such an explicit act would be enough to uphold such a law. But, the more significant and conceptually challenging interpretation of the hypothetical would be to fathom the profound realization that, in the context of child pornography, *a non-human virtual child has the same protection under the law as a real human child*. In other words, the consequences for possessing or distributing an image of a non-human, computer generated virtual child engaged in explicit acts *would be the same* were that image of a real human child.

Of course, the Court was not arguing this point directly, but it is useful to look at the bit of technoscience commerce that is at stake. Indirectly, the Court was making a decision as to whether or not Virtual Reality would be enrolled in the collective of politically tangible and represented "things" — non-humans that require the force of legislative oversight and protective laws and that, once enrolled in such fashions, become kin to us

humans who are also always governed and legislated and entitled. Had the Court determined in favor of the government's argument, Virtual Reality characters would be alive and well, living amongst us and as real as their legally invoked kin, such as protected non-human species, embryonic stem cells, civil engineering practices for constructing dams that make provisions for salmon runs, or the anti-aerosol legislation that gives legally protected status to the ozone layer (Latour p.202). Had the Court upheld the CPPA, images produced using virtual imaging technologies *would get to count* as child pornography and thus be held in evidence as to the criminality of the individuals who produce, distribute, own, rent or purchase such digital images. It matters little that it would get to count in the questionable hinterlands of pedophilia, only that it had found its way into what Bruno Latour refers to as **a collective** and that Donna Haraway refers to as **Cyborgs** – the messy entanglements, hybrids, and associations that exist amongst humans and nonhumans (Latour p.304; Haraway 1991 Ch. 8). Nearly outside of these imbroglios, or not front-and-center before the legislative body of the US Congress, it counts for much less. Although Virtual Reality pundits and enthusiasts might be encouraged by the "freedom" afforded their efforts by virtue of no sort of engagement with legislative bureaucracies, such will not likely last long.

Geometry + Optics = RealityEngine™

We should now look at how Virtual Reality's virtually real imagery was produced through a technology-biography of the RealityEngine™, the canonical computer imaging device used during VR's glory days in the1990s. The digital hardware that lies at the heart of the RealityEngine™ is an integrated circuit called the Geometry Engine (Clark 1982). This piece of silicon is the cornerstone of Silicon Graphics' founding; James Clark, while a professor at Stanford University, sought to build the basic functionality of computer image processing in digital hardware. Previously, computer graphics renderings relied on software and some special purpose hardware to draw images and move objects in those images. Such tasks require intensive calculations that, Clark and others recognized, could be computed many orders of magnitude faster should there be a dedicated piece of hardware. A customized integrated circuit designed to perform the complex algebraic and geometric computations necessary to "draw" with a computer. Fortuitously, during the early 1980's, a new technology for developing such hardware became available: Very Large Scale Integration (VLSI). VLSI technology makes it possible to design and build relatively large, complex integrated circuits such as the Geometry Engine in the microscopic confines of a small wafer of silicon.

Clark, along with his colleagues and graduate students, designed the Geometry Engine using this new technology (Clark p.133). Although the mathematical and geometrical principles necessary to draw, transform, and move images of objects in a simulated, Cartesian three-dimensional space were well understood, in the early 1980's the technical task of embedding such principles on a wafer of silicon required special expertise. Working closely with engineers, scientists, and technicians scattered throughout Silicon Valley, Clark was able to mobilize sufficient resources to realize his vision of a special purpose VLSI integrated circuit that would perform the necessary calculations for graphics rendering, and do such at unprecedented speed.

After refining their design, Clark and his colleagues managed to develop the hoped-for integrated circuit. So useful was the Geometry Engine to those who demanded fast, efficient, and powerful computer graphics renderings that Clark and others formed Silicon Graphics, Inc. (SGI) in 1982.

With regard to the Geometry Engine and the kinds of "realistic" renderings it facilitated, it is important to consider those conditions that made possible the production of images that appear "true" to life. One need not go much deeper into the specific kinds of calculations the Geometry Engine performs so well in order to catch a glimpse at the important Euclidean geometrics and perspectivalism built into the very soul

of this integrated circuit and, by extension, the RealityEngine™. As described in the technical paper that documents the results of their development of the Geometry Engine, the chip is at its essence an engine for high-performance graphics processing relying on the fundamental requirements of perspective:

> The notable characteristics of the system are:
>
> • **General Instruction Set** — It executes a very general 2D and 3D instruction set of utility in all engineering graphics applications. This instruction set includes operations for matrix transformations, windowing (clipping), perspective and orthographic projections, stereo pair production and arbitrary output device coordinate scaling.[6]
>
> • **Curve Generation** — The system will generate quadratic and cubic curves and all of the conic sections, i.e. circles, parabolas, hyperbolas, etc. (Clark 1982 p.127)

While this point is the central theme that guides the RealityEngine™ toward the production of an apparent "reality," I will condense my remarks to the important history of optics, visuality, and geometry that serves as the conditions of possibility for SGI's success as a self-proclaimed "leading supplier of high-performance visual computing systems" (Corporate

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6 Put simply, *matrix transformations* refer to the mathematical computations necessary to move, scale, and rotate the virtual representation of a three dimensional object. Windowing, or clipping, refers to computation that determines whether a virtual 3D object is "in view" – either because it lies outside of a virtual cone of view that defines the currently visible region of the virtual scene. Arbitrary output device coordinate scaling refers to an ability to translate the scale of a virtual scene to a rendering device in an easily configurable fashion, so that the chip itself remains "agnostic" when it comes to an end-users required display technology. In other words, the chip can render to a printer or large visual display equally well, lending it a significant degree of flexibility both from a technical and marketing perspective.

Backgrounder). This is the history that makes it possible for perspectival representations to tropically slide toward the appearance of "reality".

The significance of perspectivalism to the production of an apparent "reality" has been well-documented by any number of art historians and visual theorists (Samuel Y. Edgerton 1975, 1991; Wright 1983). What must be emphasized is the historical specificity of perspectivalism in particular, and the privileging of vision in general. While the adage "seeing is believing" is often taken as a truism, the nobility of vision, its privileged status as that sense which captures "reality" in an unadorned and unmediated fashion, has everything to do with the history of perspectivalism. Martin Jay's epic account of ocularcentrism tells us this much at least (Jay 1993). Jay's history details the privileging of vision as it moves from the Church's commitment to provide a glimpse of divine light through optical geometrics, to the specifically modern, secularized notion of the ocular sense as that which "produces 'the truth' about external reality" (1993, p.53). Significant for my investigation is the distance this history instills between visual knowledge and belief, between the literal and figural as they obtain in the historically and socially situated practice of seeing images. Jay encapsulates the history of visuality and perspectivalism while summarizing the detailed archival work that sustains his argument:

> If one had to summarize the contribution of the medieval and early modern struggle over the proper role of the visual in the preparation of the modern ocularcentric culture that followed, three points should be stressed. First, the medieval metaphysics of light...kept alive the assumption that vision was indeed the noblest of the senses, despite its potential for deception and the arousal of lascivious thoughts. Second, the lengthy dispute over the idolatrous implications of that metaphysics and the Church's visual practices led to a new awareness of the difference between representation and fetishism...[Third] [t]his in turn helped prepare the way for what might be called the secular autonomization of the visual as a realm unto itself. The early modern separation of the visual from the textual...was crucial in the preparation of the scientific worldview. (1993, p.44)

It is this separation, what Jay suggestively calls the "denarrativization of the ocular," that is significant for the apparently unadorned and chaste fidelity of perspectivally-anchored images produced by the RealityEngine™ (1993, p.51). As Jay and others remind us, centuries of craftwork went into fashioning vision as the purveyor of "truth" and scientific objectivity. The effectivity of the RealityEngine™ and the Geometry Engine to produce the "really real", which is precisely their commercial viability, is that the history of vision and geometrics that is perspectivalism is embedded in the Geometry Engine's integrated circuits. Ensured by the historically specific force of vision to attain to a certain "truth", the RealityEngine™ leverages itself against mere appearances and secures a position among other technoscience devices that tropically move toward depictions of "things as they are." Geometry plus the history of ways of seeing plus optics make the RealityEngine™.

As material elements that insure the appearance of "reality", *technical terms* in the computer graphics field — high-resolution, for instance — suggest a specific closure, one that implies a kind of clarity that is intimate to the Latin root from which perspective derives. According to Jay, *perspectiva*, derived from *perspicere*, means "to see clearly, to examine, to ascertain, to see through" (1993, p.53). The OED reminds us that "resolution" also means the process by which a discordance is made into a concordance, a decision or verdict on some point, and the removal of doubt on some point from a person's mind. These are all descriptions of the closure the RealityEngine™ promises. Similar descriptions of the meanings accorded to many other optical tropes can be found.

To condense my remarks on the RealityEngine™, I would remind the reader that this device operates tropically, guiding its users along the path *away* from "reading the world as an intelligible text (the 'book of nature') to looking at it as an observable but meaningless object" (1993, p.51). In its materiality, the RealityEngine™, situated in a history of visuality, functions as a material troping device, swerving images that may be possibly read figurally to images that count as objective reality, without meaning prior to their being rendered, bound to the Cartesian three-space that undergirds modern scientific inquiry.

The conditions of possibility for the RealityEngine™ are readily discerned: one need not dig too deep in order to excavate the embedded perspectivalism built into this device. Within the art history, science studies, and history and philosophy of science literatures, the power of perspectivalism to be taken as a "true" and "realistic" depiction of the world is well-documented. Given the historical and social specificity I outlined above, how might one contest the "reality" of the RealityEngine™? Certainly it is not an objective reality, true for all time and place; after all, such perspectival renderings as the RealityEngine™ produces were invested with a whole wealth of meanings in a different historical context that had nothing to do with scientific objectivity. Does the important science studies work of historically and socially situating an artifact carry the force necessary to contest the "reality" here? Is such alone sufficient to find those important loop holes where conventional technoscience can be undone in the process of fashioning a differently conceived technoscience world?

Ironically, a true story will have to suffice in response to these important questions. In 1994 I attended a talk given by an SGI technical salesman who discussed the capabilities and virtues of the RealityEngine™. He displayed a whole series of glitzy computer graphics images and was quick with the corporate rhetoric concerning the "revolutionary" potential

of visual computing. During the question-and-answer session, I proposed a modest definition of the "reality" that the RealityEngine™ produced, giving a quick-and-dirty history of perspectivalism. The speaker's head nodded appreciatively and he seemed quite intrigued by this somewhat radical history of his company's flagship computer. He affirmed my history, explaining that he had never stopped to consider the contingency of visual truth. But, he said, I was right, as far as he was concerned, and, therefore, the RealityEngine™ does produce a visual depiction of reality! What I had done, quite inadvertently as I had imagined myself to be undoing the "truth" produced by this machine, was prove to him SGI's claims as to the RealityEngine™'s effectiveness as a device that can "mimic — and magnify — reality" (Corporate Backgrounder 1995).

My mistake had been to imagine that — solely by the force of language, of my rhetoric — I might undo the force of perspectival visuality to create the appearance of "reality." In hindsight, I had forgotten the important lessons Shapin and Schaffer describe with regard to Robert Boyle's Air-Pump and the three technologies that he deployed to ensure the establishment of matters of fact: the material technology of the air-pump "embedded in [its] construction and operation"; a literary technology that dispersed the phenomena the air-pump produced to those who were not present at the experimental displays; and a social technology "that

incorporated the conventions experimental philosophers should use in dealing with each other and considering knowledge-claims" (Shapin and Schaffer 1985 pp.25-40). Each one of these three technologies would have to be accounted for in any investigation of technoscience, particularly those that intend to contest technoscience knowledge or meta-knowledge claims. Therefore, one must not stop short at an analysis of the material technology — the physical and semantic characteristics of the RealityEngine™ that facilitate its role in the Virtual Reality industry as a visual-reality producing instrument. Were I to consider further the conditions that might make the RealityEngine™ an artifact that is situated within its particular material, social, and semiotic knot, I would have to consider breakdowns in claims to "transcendent truth" or objectivity at the level of the dispersion and the level of the exchange and discussion of such claims. Thus, my work would include identifying a particular practice that employs SGI's computers, such as the RealityEngine™; I would have to dig deep for eruptions within any or, at best, all of these three technologies and leverage such eruptions in such a way as to contest the meta-physical, but not embedded, "reality" of the RealityEngine™. The overarching goal would not be to debunk or deny any sort of claims to "truth" that the RealityEngine™ might produce. Rather the goal is to situate the social,

semiotic and material substance without which the RealityEngine™ would not exist, nor produce its compelling “really real” effects.

In what follows, I will investigate how SGI’s technology is taken up in a specific visual practice — special effects in popular film. Such is the power of the RealityEngine™ to produce realistic images that the machine has found its way into that discerning field of visual cultural production, Hollywood film. Most conspicuously, the Steven Spielberg film *Jurassic Park* sought out the very best image generation computers to render with remarkable verisimilitude the dinosaurs that center the drama of the film. While originally the production of the film was to use time-proven animatronic robots for the dinosaurs, an eager group of animators at George Lucas’ distinguished special effects house, Industrial Light and Magic (ILM), took it upon themselves to produce a test reel of computer generated dinosaurs — produced on SGI equipment — that convinced Spielberg of the possibility of doing an unprecedented amount of the film’s production on computer graphics workstations. Thusly committed to the value of computer graphics for his assured block buster, Spielberg contracted with ILM to do the bulk of the special effects work. ILM made such an investment of time, SGI equipment, and technical personnel that the computer graphics workstation is certain to be a formidable component of film production for some time to come. In the next chapter on *Jurassic*

Park, I would like to take up the question of this component as it facilitates the production of realistic dinosaurs.

The Special Effect of Technoscience

Jurassic Park, Steven Spielberg's mega-blockbuster film based on Michael Crichton's novel, concerns the reanimation of dinosaur species from paleo-DNA found preserved in Jurassic era blood-sucking insects, fortuitously preserved in tree sap. The narrative is centered around a "test run" of the park's computer-controlled safari-like tour of the various dinosaur species' paddocks. Concerned financial backers fear that the park's safety infrastructure may not be up to the task of providing a safe vacation experience so experts (all scientists) have been dispatched to inspect the facility. An explosive mixture of cutting-edge computer programming, carnivorous dinosaur species, greedy technical help, and overly ambitious park management provide the film's drama. Inevitably, the park's containment apparatus fails, the most intimidating dinosaurs escape from their paddocks, and our heroes (and villains) are sent scurrying for their lives.

The technoscience within the film's drama will concern us shortly. At this point I would like to investigate the way the film attempts to ground itself in genetic science in such a way as to create the appearance of

genetically reanimated dinosaurs as “really real,” as something that genetic science might possibly create. How is it that the film is able to depict realistic genetically engineered dinosaurs? My analysis takes two approaches. The first looks at the knowledge making practices described in the film narrative proper, and the way technoscience is employed as part of the film’s actual production. The second approach investigates the technoscience that is the digital and mechanical special effects used to produce significant parts of the film. My thorough-going concern throughout is to understand the relationship that exists between the technoscience to produce genetically engineered creatures and the technoscience to produce the appearance of genetically engineered creatures.

Jurassic Park Technoscience

Discerning the relationship between science itself and science as narrated in fictional narratives can start by looking to the relationship between scientists and their growing role as science consultants for the film industry. David A. Kirby investigates this relationship, describing how the science-fiction film, with the help of the science consultant, informs the production of scientific knowledge amongst other scientists (Kirby

2003). Kirby's essay provides a thorough analysis of the four-way intersection amongst scientists, the production of scientific knowledge, non-specialists film audiences, and the film studios' directors and producers who are just looking to tell a good, profitable story. At each of the four inevitable fender-benders, we find out the ways in which the film's visual images are produced, fought over, negotiated and taken to count as scientific knowledge. For my purposes, it is the production of science by scientists that is crucial to understand the tension between the science of *Jurassic Park* and the science of genetic engineering.

In Kirby's essay, it is argued that the discourse of a science-based fictional film be considered a legitimate mechanism of technical communication, albeit outside formal channels. The difference between formal and informal engagement with scientific knowledge draws a distinction between the science acquired by specialists versus lay-persons who are non-specialists. The fictional film serves as a high-budget opportunity for other specialist/scientists to virtually witness, through an elaborate visual explication, a scientist-consultant's theory about a particular scientific phenomenon. Kirby describes these fictional films as "modeling spaces" that

> ..act as virtual witnessing technologies and inter-specialist communication vehicles, because film-makers are asking science consultants to help them develop models of the natural world. The use of films as modeling tools is quite common in scientific practice..computer-generated animation models have long been routine..(Kirby 2003 p.248-249)

Here Kirby is referring to the practice whereby scientists produce consensus as to scientific matters-of-fact through the visual witnessing protocols as explicated by Shapin and Schaffer in *Leviathan and the Air-Pump* (Shapin and Schaffer 1985).

In the case of *Jurassic Park*, questions about dinosaur morphology are presented and, effectively, brought to a conclusion through the film's drama. In the film, the paleontologist — Alan Grant — is based on paleontologist Jack Horner, who served as the film's science consultant. Kirby points out that many of the dinosaur characteristics presented in the film have no definitive consensus within the paleontology community and remain open topics for discussion, debate and hypothesis. In *Jurassic Park*, though, Horner's perspective and conclusions on many of these topics is offered up in a way that settles many of the debates, chiefly through visual evidence and didactic narrative.

> ..examples in the *Jurassic Park* series of concepts that can be attributed to Horner include the hypotheses that dinosaurs were warm-blooded animals, that they had a communal nature, that *Velociraptor* used sophisticated communication, that *T. rex* nurtured its young, and that *T. rex* was exclusively a scavenger..in the case of the *Jurassic Park* films only one side of dinosaur 'science' got screen time.(Kirby 2003, p.253)

The science of these questions continues in the guise of inter-specialist technical communication through a variety of channels, including other popular (i.e. non-specialist) venues. Paleontologist Stephen Jay Gould wrote a response to the film's speculations about dinosaurs in *The New York Times Review of Books*, focusing (correctly) not on the film maker's story, but the scientific debates that the film glosses over (Gould 1993). (I will return to this sort of specialist technical communication later, when I discuss a pointed critique in the Journal of the American Medical Association of the film's scientific flaws.)

Kirby's analysis makes an effective point: even for the speculative or fictional context, the power of a visual display to help guide an idea through the epistemological slalom course toward its end goal as an accepted piece of knowledge can be formidable. What we can conclude in the particular case of *Jurassic Park* is that the technoscience of dinosaur morphology and genetic re-animation can be brought to the level of popular and scholarly debate through the fictional science film.

If in this way technoscience can be made through science-fiction film, what is the technoscience of the science-fiction film's making? Stephen Prince takes up this question in one of the earliest essays on how film theory might address the proliferation of computer-based, visual special

effects (Prince 1996). Prince sets out to describe how the “indexical” approach to analyzing a photographic image was turned to an analysis of the film image. The approach makes the assumption that a photographic image refers indexically to what it displays and as such represents reality.

Prince offers two dominant modes of computer-based image manipulation based on practices in the digital special effects trade: image processing and computer-generated imaging (CGI) (Prince 1996, p.27). The former essentially refers to digitally painting the individual frames of a film, either to add or remove components of the visual rendering. Such was used in *Jurassic Park* to draw reflections of the dinosaurs in reflective surfaces in order to add to a scenes verisimilitude. The later practice – CGI – creates visual components within the film by building and animating digital models of, for instance, dinosaurs or human figures and electronically exposing renderings of these animations directly onto film stock.

With the increasing use of computerized image manipulation technologies in film, there arises a theoretical problem for “classical theory”

> For reasons that are alternately obvious and subtle, digital imaging in its dual modes of image processing and CGI challenges indexically based notions of photographic realism..a digitally designed or created image can be subject to infinite manipulation. Its reality is a function of complex algorithms stored in computer memory rather than a necessary mechanical resemblance to a referent. (Prince p.29)

Prince then sets out to develop what he refers to as a "correspondence-based model" of cinematic representation. I will return to this model later in this chapter when I discuss the cinematic special effect in detail. But, to this point, Prince's correspondence model relies upon the relationship between "selected features of the cinematic display and a viewer's real-world visual and social experience" (Prince p. 31). What Prince describes in this essay is largely the mechanical aspects of the technoscience that goes into creating seamless renderings. These are the instrumental mechanisms that create the kinds of physiological visual cues to which our eyes and associated perceptual apparatus are accustomed. If a special effect is to appear realistic, it must be perceived as such based on our experience as to how objects behave in our world, even if that special effect represents something that does not exist, as in a fantasy character, an acrobatic sequence of movement that could not possibly take place in real life, or the appearance of a dinosaur. For instance, if a computer creates a model of a dinosaur and digitally composites it with a live actor, one would

expect to see a shadow cast by the dinosaur, identical lighting conditions, focus and so on.

> A perceptually realistic image is one which structurally corresponds to the viewer's audiovisual experience of three-dimensional space. Perceptually realistic images correspond to this experience because film-makers build them to do so. Such images display a nested hierarchy of cues which organize the display of light, color, texture, movement, and sound in ways that correspond with the viewer's own understanding of these phenomena in daily life (Prince, p. 32)

And further,

> ..the more important point is that present abilities to digitally simulate perceptual cues about surface texture, reflectance, coloration, motion, and distance provide an extremely powerful means of "gluing" together synthetic and live-action environments and of furnishing the viewer with an internally unified and coherent set of cues that establish correspondences with the properties of physical space and living systems in daily life. *These correspondences in turn establish some of the important criteria by which viewers can judge the apparent realism or credibility possessed by the digital image*. (Prince, p 33)

In the case of *Jurassic Park* Prince reveals a couple of the techniques the digital artists used to adhere to this notion of correspondence. In the film's scene where the velociraptors hunt the two children, "..the film's viewer sees their movements reflected on the gleaming metal surfaces of tables and cookware. These reflections anchor the creatures inside Cartesian space and perceptual reality and provide a bridge between live-action and computer-generated environments" (Prince, p.33). Further, Prince points

out how proper rendering of motion and movement is crucial to capturing a convincing digital animation. In the case of *Jurassic Park*, the animators

> ..derived gait-specific rules for their dinosaurs by studying the movements of elephants, rhinos, komodo dragons, and ostriches and then making some intelligent extrapolations.. Human and animal movement cannot look mechanical and be convincing; it must be expressive of mood and affect (Prince, p.33)

To summarize, Kirby shows how the technoscience that is made through and outside of the films through the inter-specialist communication and the non-specialists' (e.g., the lay public or science enthusiasts) engagement with the genetic science, paleontological speculation, and so forth. Prince shows the instruments and techniques that are the technoscience involved in the making of a realistic film. Both refer explicitly to the force by which visual renderings allow one to witness the product of the particular technoscience undertaking. The act of witnessing produces more than an aesthetic appreciation of the visualization by itself. Something in excess of the constitutive organization of light and shadow on film obtains. In the case of the paleontologist Jack Horner for whom *Jurassic Park* becomes a well-attended public modeling space in which to display their hypothesis about dinosaur life, the excess value obtained by these visualizations is that Horner's speculation inches its way closer to an accepted matter-of-fact. According to Prince, when one takes an instrumental approach and develop computer algorithms that draw on film in a way that approximates

in minutiae our prior experiences as to how animals that are similar to dinosaurs walk and run, and how light, space and surface interact one obtains an excess in the form of a realistic image and, consequently, a compelling visual story.

These instances of the power of visualization in the context of *Jurassic Park* lead us to a consideration of the latent subject of the entire *Jurassic Park* narrative: DNA. Prior to the visual modeling space afforded a paleontologist or the technical means of actually rendering dinosaurs with sophisticated computer graphics equipment comes this "sublime object of biology", the thing without which *Jurassic Park* would not be possible (Doyle 1997, pp. 27-35).

DNA Is Not Deoxyribonucleic Acid

Jurassic Park is a narrative that indicates more than anything the powerful, excess meaning of DNA. Nowadays, much different from the acronym standing for deoxyribonucleic acid, and more a singular compressed idiom or symbol, what DNA has come to mean is the possibility for unfettered, complete, flawless reproduction; the promise of a code that, through some instrumental means, will translate into the thing that code signifies.

Although focusing on the *Jurassic Park* novel, Stephanie S. Turner's literary analysis *Jurassic Park Technology in the Bioinformatics Economy* captures the story's technoscience. Turner reveals the dense meanings of reproducibility and perfect clones that saturate DNA (Turner). Her analysis is apropos of the film as well, and perhaps more so. For Turner, the cloning narrative in *Jurassic Park* is one where the inherent horror that can result from a "bad copy" is the story's message (Turner 2002, p. 903).

Briefly, it is the lure of creating a perfect dinosaur through genetic cloning that seduces the *Jurassic Park* scientists and their investors. By producing a dinosaur theme park, they hope to profit on a public's general fascination with these creatures. In order to create a relative safe and contained theme park, it is necessary to alter the genetics of the reproduced dinosaurs so as to make them sterile and relatively tame. Despite their best efforts, the scientists' efforts are thwarted by life itself, because life finds a way to reach beyond its own boundaries. The dinosaurs reproduce, become capable of strategic thought, and prove to be far from tame. This is life's form of entropy.

Turner points out that the *Jurassic Park* story is more than a cautionary tale about genetically cloning dinosaurs for their consumption as consumer entertainment products. The story is also about cloning scenarios and cloning narratives, generally speaking.

> ..cloning scenarios such as the Jurassic Park narrative negotiate the telos of DNA in a number of ways that suggest the possibility for all kinds of copies, not just bad consumer biologicals..The controversy over the meaning of DNA among conservationists, adventurers, and entrepreneurs surrounding these speculative cloning scenarios justifies..misgivings about the belief that information can circulate unchanged among different material substrates. As it turns out, there is plenty to "clone from," and that is strong support for representations of reprogenetics technologies that also function as productive interventions in the surplus of meaning surrounding DNA. (Turner 2002, p. 904 citations removed)

Turner describes the central theme of the story's cloning narratives as a "copy problem" that relies on reading DNA as a code/script. It is only through the metaphor of a code/script that it becomes possible to instrumentalize DNA in such a way that it can be translated via genetic technoscience and materialize the life represented by the DNA code. Although the *Jurassic Park* narrative may be read as an admonitory tale of the "its not nice to fool with Mother Nature" variety, Turner maintains that this critique of genetic engineering and bioinformatics fails because *Jurassic Park* falls prey to its own warning.

> By seeming to critique profit-driven science, bad copies and unlikely alliances, the novels serve as a reminder of the illusory aspect of this idealism...An obvious source of failure of the novels to carry out an unimplicated critique of the bioinformatics economy, for example, is their circulation as commodities within the same mass culture that maintains the ideology of DNA as a consumable object. *Jurassic Park* the novel is made into *Jurassic Park* the movie, with the inevitable book and movie sequels duly following. It is as if the Jurassic Park narrative were being cloned repeatedly. (Turner 2002, p. 903)

Here Turner's analysis vaguely alludes to the dense fabric of intertwined, rhizome-like marketing extensions that is Jurassic Park™ the consumer brand. *Jurassic Park* has been able to reproduce itself through all of its film sequels, novels, science-oriented documentaries, behind-the-scenes DVD "extras", strategic co-marketing agreements, and so on. Although the *Jurassic Park* narrative was cloned and morphed into sequels and branded swag, it never did so without loosing something for the effort, whether that was public interest or revenue. Subsumed by its own story, the Jurassic Park™ brand inevitable moves beyond the control of its marketing-oriented creators, falling prey to the force of entropy in the same manner as the genetically reanimated dinosaurs of the brand's own narrative. *Jurassic Park's* story is its own DNA and the telos of Jurassic Park™.

Turner's keen eye toward what she refers to as the "surplus of meaning surrounding DNA" and my suggestion that *Jurassic Park* is a perpetually self-replicating, self-referencing, self-absorbed consumer brand alludes to what Sarah Franklin refers to as "the excesses of *Jurassic Park*" (Turner 2002, p.904; Franklin 2000, p.207). In the incisive essay "Life Itself", Franklin elaborates on the formidable density of the Jurassic Park™ money-making enterprise – its notable financial and marketing excess. As of the spring of 2004, Jurassic Park and all its film sequels have earned more than

$900 million, not counting merchandise and licensing revenues.[7] The reach of Jurassic Park™ spread, Franklin reports, largely through the strength of its licensing arrangements and a seamless insertion of Jurassic Park™ branded dinosaur exhibits at prominent museums.

> More than 500 companies were licensed to sell more than 5000 products connected to *Jurassic Park* worldwide..Just as *Jurassic Park*, the film, 'stretched the envelope' of animatronics and special effects, so too did the market saturation achieved for *Jurassic Park*, the global brand, overturn previous industry standards. By March 1994, less than a year after its release on 11 June 1993, the film had grossed over a billion dollars in merchandise alone (Franklin, 2000, pp. 207-208)

With a large public audience now hungry for all things saurian, science museums curated dinosaur exhibits, including the Carnegie Museum of Natural History in Pittsburg, Pennsylvania, and the American Museum of Natural History in New York City. The latter exhibit was unapologetically affiliated with Jurassic Park™, titling the exhibit 'The Dinosaurs of *Jurassic Park'*. Clips from the film looped on television monitors throughout the exhibit, and dioramas were created to feature scenes from the movies and their associated props (Franklin, 2000, p.210).

The popular press got caught up in the opportunity to sate the public's appetite for anything to do with dinosaurs. Time Magazine ran a cover feature on dinosaurs that included in its science section two articles on the

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7 (http://www.boxofficemojo.com/movies/?id=jurassicpark.htm)

science of dinosaurs, one from the perspective of new insights on dinosaur behavior brought forth from the paleontology world, the other on the fascinating computer graphics technology used to create these dinosaur behaviors in *Jurassic Park*, the film (Lemonick 1993; Corliss 1993).

As a way to fortify the longevity of the Jurassic Park™ brand, allowing for this sort of movement into and out of the narrative proper allows for the frictionless creation of self-referential brand extensions, as Franklin is careful to point out. Even the book about the making of the Jurassic Park™ film appears in the film itself (Franklin 2000, p. 208)!

What proves more interesting than the degree to which Jurassic Park™ is able to replicate itself in the context of consumer marketing — and do so tirelessly, over and over again — is another sort of replication effect that Franklin reveals. It appears as though most if not all invocations of Jurassic Park™ insist on an "invitation to witness" the science behind-the-scenes of what we, as an audience, know to be a fiction or, at best, a speculative bit of science.

> The film relies fundamentally upon an axis of the visual in which everything depends on how much you don't see behind the scenes, and everything you do see as a result of this exclusion. What is of interest is the extent to which this axis does not hold steady, but becomes the central invitation of the film: both as a cinematic or museum spectacle, and as a commercial enterprise, the invitation to go 'behind the scenes' is the provocatively repeated refrain (Franklin, 2000, p. 216).

Franklin notes the many ways in which the curtain is pulled back on the means by which these dinosaurs are made real. Early in the film's drama, the scientist-visitors who are dispatched to the park to see it first hand and verify that that it is safe are stunned to a state of reverence after seeing the first dinosaurs. Immediately after this moment of shock, they are taken behind the scenes at the park headquarters to stand in awe at the ingenuity and technical prowess of the geneticists who were able to reanimate dinosaurs from found DNA (Franklin 2000, p. 200-201).

This moment in the film is the template for this shuttling back and forth between the variously shocking/horrifying/fantastic/fun 'magic' and the awe-inspiring and ingenious craftwork that produces the apparent magic. No sooner have we seen the film than we are invited back to the Jurassic Park™ world through a television documentary to see how the animatronic dinosaurs were handled by master puppeteers, or flip through a special effects industry trade magazine to see the computer gurus applying a new algorithm to obtain a "realistic" dinosaur skin (Duncan 1993).

As Franklin suggests, this template is prototypical of contemporary technoscience. The "invitation to witness" is a form of science pedagogy for the lay public, both in the form of general publicity as well as science journalism (Franklin, p. 216). The museum exhibits that leveraged the star-power of Jurassic Park™ demonstrate this much, at least. Cobbled together

with props from the movie is the science lessons of paleontology, brought to you by Jurassic Park™.

Another kind of self-similar behavior obtains, as Franklin notes, between the film's technical production and its narrative about the highly technologized genetic reanimation of dinosaurs from paleo-DNA (Franklin, p.200). In the next section, I will pick up on this observation and extend its insight as a way to introduce my later discussion on special effects, or what the film theorist Christian Metz called *trucage*.

The narrative basis of *Jurassic Park* relies on the plausibility of reanimating dinosaurs via genetic engineering. Such a plausible exercise is still a kind of science fiction, and not an empirically established fact in the form of a witnessable act. Nevertheless, the principles of genetic engineering described in the film's narrative dictate that such an act is possible, and it is only a matter of finding the appropriate baseline materials (i.e. paleo-DNA) before the act becomes possible.

The irony of *Jurassic Park* lies herein: its special effects and narrative basis in genetic engineering implode; both special effects and genetic engineering operate according to the same conjuring power. Franklin insists on such a collapse: reanimating dinosaurs on a computer graphics workstation — named, according to the skewed joking sensibility of self-

assured, self-invisible technoscience, RealityEngine™ — is scarcely different in principle than performing the same magic act via genetic synthesis.

> The narrative concerning the successful resurrection of extinct dinosaurs by genetic engineers using fossilized DNA, is reproduced in the visual promise of the cinematic spectacle, which offers state-of-the-art special effects technology to animate the extinct dinosaurs..and to achieve this using the maximum visual enhancement attainable. As the film's narrative content is by this means collapsed with its cinematic realisation – both highly technologised attempts to bring dinosaurs to life – the dystopic fantasy of the Crichton novel is to an extent made manifest in the Spielberg movie. They are both concerned with producing virtual life. (Franklin 2000, pp. 199-200)

Indeed, it would seem that this collapse is deliberately built into the film's production and its narrative in such a way as to insist upon the indistinguishability between the scientific knowledge claims within the film's diegetic content and the knowledge produced by the scientists whose genetic engineering principles motivate the story. We get to see the same RealityEngine™ computer workstations used for the special effects production during the film's various control room scenes. Jurassic Park imitates its production in this regard, constantly and subtly reminding the astute viewer of the technoscience of its trucage production throughout the film's diegesis.

Drawing from the companion book *The Making of Jurassic Park*, one can see countless examples where the production of the film collects with the insistence of a gravity well all matter of apparatuses, tropes, jokes, and

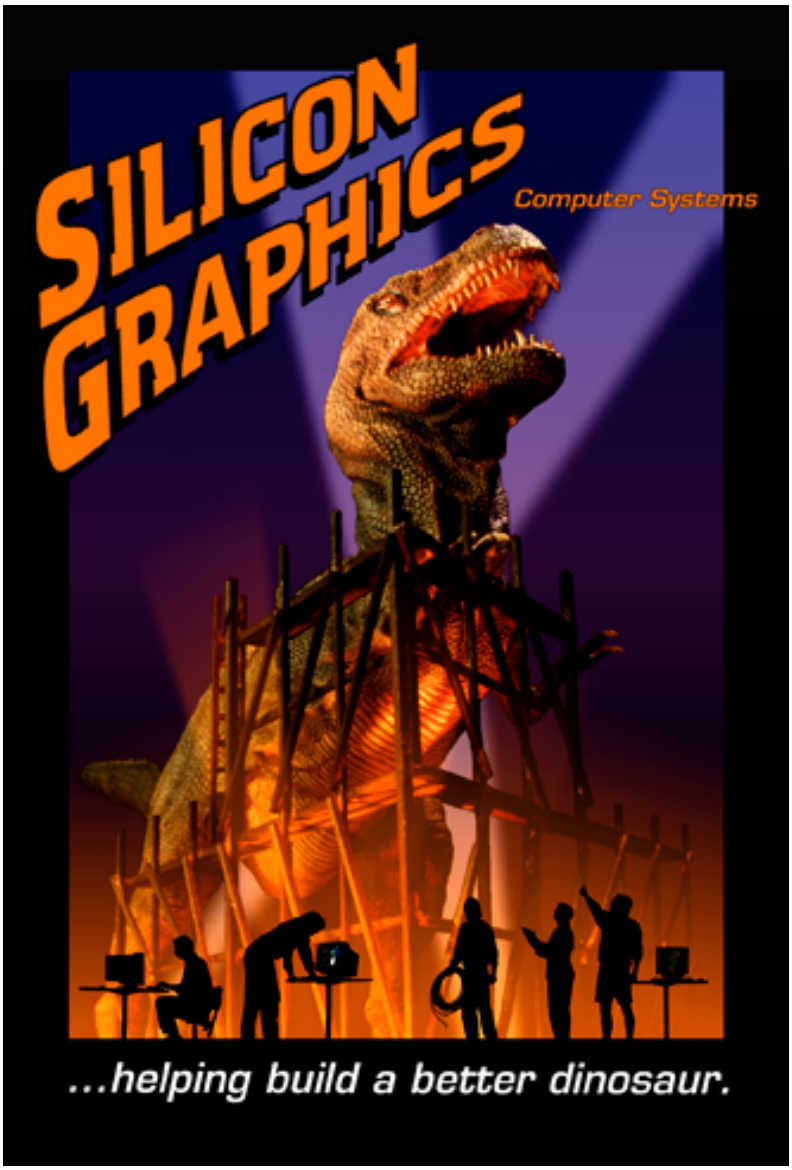

Figure 2 Silicon Graphics Publicity Poster Promoting Its Contributions To "Jurassic Park."[8]

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8 The Silicon Graphics Corporate Website contains a description of the context in which this poster was produced. It reads, “For those individuals who cannot get enough news, merchandising, press releases, articles, and other shameless hype about Jurassic Park, this may be for you! Last fall, to publicize SGIs participation in the making of Jurassic Park, both through our systems at Amblin [Steven Spielberg’s production company], ILM [Industrial Light and Magic], and Stan Winston Studies as well as the machines which

myths about what constitutes life (Shay and Duncan 1993). In this book, seemingly incontrovertible evidence is offered claiming that life means genetics, that our very ontology is the genetic way of life. The book describes the dense layers of production that went into the film, taking the reader backstage to the various special effects houses that were instrumental to *Jurassic Park's* stunning visual success. If we think of this book as a kind of blueprint or planning handbook for what counts as life, one can see the material organization and mythic history of a genetic ontology, beginning with a perversion of DaVinci's "Perfectly Proportioned Human" in the form of a fairly androgynous body enveloped by a genetically constituted Raptor. Genetic life envelopes *Homo sapiens* and, by virtue of the cantankerous, perversity of his wisdom, produces the coded, non-geometric, informatic *Homo geneticus*. In this image set, expressed genetic code in the form of a genetic creature (the Raptor outline) proportions *Homo geneticus*, not the Euclidean geometric perfection of circle and square.

Although the dramatic substructure of *Jurassic Park* concerns a genetic engineering feat that has yet to be conducted, the film strengthens "the fact" of this matter by producing dinosaurs as if it were now possible to

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appear in the movie, a few of us made a really cool poster which we plastered all over stage 28 on the Universal lot." (Silicon Graphics 1993)

engineer them from their own ancient DNA. The gap between the scientific discourse that bases the promise of genetically engineered dinosaurs and the film's fulfillment of this promise is bridged by the film's masterful production. Industrial Light & Magic's (ILM) *trucage* provides a particular kind of rhetorical trope, embellishing the genetic engineering principles, lending visual credibility and verifiability to both the film's narrative and the scientific discourse that undergirds the narrative.

The implosion of the film's narrative content with its production techniques produces such an effective, credible, and self-sustaining fabric because both operate according to the similar technoscientific strategies for producing contained knowledge and matters of fact. Producing knowledge through genetic technoscience employs artifacts that maintain a particular kind of transcendent invisibility, seeing everything from nowhere, depositing statements into the vault of scientific literature where objective fact accrues like bullish interest. The procedures for producing this kind of technoscientific fact rely upon knowledge from the "culture of no culture" wherein the contingency of artifacts is stealthy and imperceptible, remaining unaccountable to their own origins within the socially, culturally, materially, instrumentally and politically charged recesses of the research and development laboratory (Traweek, p. 162; Suchman 1994, p.26). ILM's special effects are created in such a way as to

place a burden on making the visuality of the effects seamless; no where must the contingent artifice of the effects become perceptible. Crafted with utmost care by artisans, engineers, and animators of impeccable abilities, this kind of special effect has the deceptively simple duty of not revealing its means of production during the unfolding of the film's drama.

We should briefly recall Shapin and Schaffer's meticulous historical analysis of Robert Boyle's project to configure the experimental way of life. In *Leviathan and the Air-Pump* Shapin and Schaffer describe Boyle's procedure for producing the appearance of "things as they are" during the public displays of his air-pump apparatus (Shapin and Schaffer 1985). The three-part procedure Boyle employed — the literary, social, and material technologies — are not unlike Spielberg and ILM's machinations to cloak the artifice of "realistic" visual appearances (Shapin and Schaffer 1985, pp.112-115).[9] Through the use of a specially designed and operated experimental apparatus called the air-pump, Boyle attempted two things: first, the production of a vacuum, a state of matter with much consequence in continental science during the 17th century; and, second, an important re-working of the underpinnings of science as it was

9 Shapin and Schaffer make an important point, through Thomas Hobbes' refutations of Boyle's experiments, as to whether or not the "public" experiments were, in fact, public or open only to a certain select group of learned men.

understood and practiced. The stakes involved in the debate were the development of particular ways of producing matters of fact through collective intellectual assurance of belief in empirical evidence.

Much like the burden of Boyle's workers, operating the air-pump apparatus and buried beneath the stage of his experimental theater, the labors of ILM's effects teams are, in several senses, out of sight. They are invisible to the production of the appearance of "reality," yet in such a way as to be vital to the workings of the production apparatus. That is, both Boyle's underground laborers and the ILM computer artists are engaged, yet invisible, agents in the production of technoscientific knowledge. Were we to see these stage-hands, the "wires," as it were, are exposed and the underpinnings of the apparatus become a problematic, a site worthy of critical investigation.

Arguing through Shapin and Schaffer's book, Donna Haraway takes careful note of the particular positionality of the invisible agent somehow responsible for the production of knowledge — yet not quite so in important ways. Referring to Sharon Traweek's suggestive phrase, the "culture of no culture," Haraway states that:

> This is the culture within which contingent facts — the real case about the world — can be established with all the authority, but none of the considerable problems, of transcendental truth. This self-invisibility is the specifically modern, European, masculine, scientific form of the virtue of modesty. This is the form of modesty that pays off its practitioners in the coin of epistemological and social power. (Haraway 1997, pp.23-24)

Curiously though, the artifice of *Jurassic Park* is revealed in the book, *The Making of Jurassic Park*. Here we are shown in extraordinary detail the secret procedures, cloistered and cubicled artists, and the high-tech machines used to sustain the imperceptible special effects. ILM, the normally clandestine, top-secret agency responsible for block-buster special effects production, is cracked open, revealing the wires and pulleys that conjure the *Jurassic Park* magic.

Given the back stage look of how *Jurassic Park* is done, how and to what extent is the film's drama strengthened? Does revealing the artifice of *Jurassic Park* destroy the credibility of the film's drama? I must say that nothing is lost in revealing the contingent artifactuality of *Jurassic Park*'s production precisely because of the particular way in which the film's drama is attached to its moment of production. It is as if film production is aware of its own artifice, of the craftwork that goes into producing appearances of the "really real," so that the film sustains such appearances during its viewing and, afterwards, one may derive enjoyment in finding out how it was all done. But this is not just a strategy to awe the

ardent film buff and further reap the financial rewards attendant to a major motion picture; it must also be seen in this context as a mode of self-criticality, a kind of self-reflexive and ironic attachment to one's work that is nigh absent from the work of technoscience.

This important point is the converse of Lucy Suchman calls "detached engagement" in her analysis of the work of technology production (Suchman 1994, p. 27). Suchman argues that such an engagement with technoscience work establishes the "joint creation of an elaborate social world within which one can be deeply engaged, but which remains largely self-referential, cut-off from others who might seriously challenge aspects of the community's practice" (Suchman 1994, p.27). Such is not the case, I would argue, in the practice of cinematic trucage, where the practice includes a mode of reflexivity that insists on opening up the means of production for close scrutiny. *The Making of Jurassic Park* must be seen in this light as just such a moment of revealing the wires, the contingency, of the film's production.

What I have tried to sketch above, all too briefly, is an instance of a particular strategy for producing the appearance of "fact," of "things as they are in reality" that is that is not closed off to critical interrogation. Through a particularly self-reflexive attachment to the production of a contingent reality, we can see how the possibility exists for holding on to

the notion of reality without the kind of invisible subjectivity whose narratives, Haraway indicates, "lose all trace of their history as stories" (Haraway 1997, p.24). This is a location where from the appearance of reality is only magical for a moment — during the viewing of the film — allowing the establishment of the appearance of fact while also opening up an important moment for contesting such a representation.[10]

It is this localized appearance of reality that is at the heart of my investigation of statements about the "really real" articulated from the objective position of technoscience, alongside of similar appearances of reality produced in the filmic special effect. We may begin to appreciate the gravity of this contestation over who gets to say what about the world and where they may make such statements about reality in the next section on Jurassic Park where scientists take issue with the technoscience practiced in the film.

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10 Haraway states that the modest witness described in Shapin and Schaffer "...bears witness; he is objective; he guarantees the clarity and purity of objects. His subjectivity is his objectivity. His narratives have a magical power — they lose all trace of their history as stories, as products of partisan projects, as contestable representations, or as constructed documents in their potent capacity to define the facts. The narratives become clear mirrors, fully magical mirrors, without once appealing to the transcendental or the magical." (Haraway 1997, p. 24)

Contesting Jurassic Science

In the preceding analysis of *Jurassic Park*, I have attempted to show the collapse of the film's narrative content, its means of production (particularly the cinematic trucage), and the genetic engineering that undergirds the drama of the film. With regard to this last point, it still remains to investigate its reception by "authorized" technoscience practitioners who, it could be argued, stand to loose their footing in their constant negotiations to remain at the helm of technoscientific knowledge production, particularly to the extent that the *Jurassic Park* narrative throws into question the benefits, viability, efficacy, and, somewhat bluntly, the sanity of scientists who work in the ethically contentious world of genetic engineering. Let us then turn to a review of the Jurassic Park book that appeared in, of all places, the house organ of the American Medical Association (Skolnick 1993). Herein I hope to reveal the mild but important furor that sparked around the film's depiction of technoscience work, and the kind of police work the AMA reviewer conducted as he patrolled the boundaries between the "fictional" and "factual" in an effort to reinvest with authority the work of genetic scientists in particular and, synecdochally, the scientific community as a whole. Through this review and other relevant examples of how and how not to contest technoscience,

my central argument will be posed thus: the apparatus of technoscience — the work of authorized practitioners within institutional support structures, the narratives of films and documentaries, jokes and advertisements about technoscience, popular imaginaries about the effectivity, purpose, and meaning of technoscience, the heavily mediated and meaningful instruments, and so on — operates through the deployment of tropes and figurative language that create representations and meanings for its productions more insistently than other possible meanings. This "special effect" of technoscience attempts to make imperceptible the contingency of the apparatus in order to fix technoscience as objective and pure matters-of-fact. By fixing the meaning of technoscience and its production, the technological artifact assumes a kind of autonomy, a self-referentially closed boundedness, where the conditions and strategies for investing it with meaning evacuate the material-social contingencies. Thusly posited as an autonomous entity with no ties to people crafting its meaning, technology *appears* as immutable, impossible to configure in other, more habitable, life-affirming ways.

The crucial significance of this argument is to insist that what technoscience means is produced cotemporaneously with the making, remaking, and use of specific technological artifacts. In the project of refiguring technoscience so as to make more sustainable and habitable

worlds, it must be possible to imagine technoscience as being possibly otherwise in material-social fact. For an engineer, technoscience studies scholar, and avid technophile who strongly believes that technoscience is not evil incarnate, I must refuse both such a condemnation and its typically imbecilic "return to nature" pleas, as well as the politically inept stance that the instrumentality of technoscience makes it a tool whose use is fixed forever more by its currently authorized practitioners. Instead, my position would call for an understanding of technoscience — in both its languages and artifacts — as meaning in the making, a practice of understanding culture in such an intimate fashion that we cannot avoid using the term technoculture.

Recall when the drama in *Jurassic Park* produces dinosaurs-as-genetic-beings. As with my earlier description of the back stage work in the production of *Jurassic Park*, one must move beyond the moment of the theatrics of technoscience (for instance, only the drama of the *Jurassic Park* film), to the behind-the-scenes crafting that insures the object at hand will become a closed, bounded, readily packaged, distributed, and marketed entity.

With this analytic strategy foregrounded, recall that a point of contention arises when the meanings of genetic engineering technoscience clash as Steven Spielberg and Michael Crichton, through their creative

works, take on the task of making knowledge claims that are typically produced by technoscience proper . Producing dinosaurs-as-genetic-beings before the scientists at, for instance, Dr. Leroy Hood's prominent University of Washington biogenetics lab, is bound to cause some ruckus for the science cops patrolling the poorly lit gangland neighborhoods between science-fact and science-fiction, at least for those patrolmen lacking the kind of self-reflexive, critically cynical sense of humor that should be a graduation requirement for all science and engineering students. By employing ILM to produce special effects, Spielberg and Crichton got a jump on genetic engineering work, trespassing within the gated confines of the "true" white house of science, forcing an anxiously panicked call to 911. Let me intercept that call and re-route it through my own trans-analytic circuitry.

Let us proceed to the *JAMA* review, where the boundedness of Jurassic Park is cracked open through the review's pointed critique of the film's scientific and narrative "flaws." Throughout this analysis I have repeatedly mimicked the claim in the film that the plausibility of the genetic engineering practiced in Jurassic Park is based on sound principles, and it was only for lack of various resources that the miraculous feat of engineering a dinosaur has not been accomplished. In this regard, the short didactic movie-in-a-movie hailed me into the Spielberg-Crichton

theory of genetic reanimation, such as it is. This theory's laboratory instruments are developed at ILM and Silicon Graphics, Inc., and tended by the foremost special effects craftspeople. Crichton, known for a narrative style that is significantly undergirded by the literature of technoscience, plots a direct, smoothly flowing fast-lane between science-fiction and science-fact, and I jumped right on. The *JAMA* reviewer, though, wary of Hollywood's speculative impulses, never got to the onramp. The reviewer is quick to condemn the genetic engineering practiced in *Jurassic Park* as flawed and misrepresentative of the current state of bioengineering. Much of the review nit-picks about the apparently implausible design of the park's infrastructure: only one computer with no back-up systems, incompetent and rebellious computer-support staff, no radio with which to summon help, and so forth. Apparently, in the ever-ready, rapid-response community of science-fact, no such oversights ever occur.

Of course, Spielberg-Crichton must be forgiven for leaving the characters of a dramatic story with no choice but to enter upon a heart-racing flight of fear: in 1993 $65 million was an awful lot of money, even by the algebra of a 1993 Hollywood investment, to make a thriller that does not evoke anxiety. So too must allowances be made for Spielberg-Crichton not being biotechnology authorities, although with the $1.882 billion in revenues for merchandise licensing and box office receipts, they might very well be able

to start their own Human Genome Project. The *JAMA* reviewer neglects to consider the turbulent liminality between science-fact and science-fiction in a shoot-from-the-hip attempt to make secure the border between the bioengineering practiced at such places as Dr. Hood's biogenetics lab or the *Jurassic Park* biolab, which used $30 million and 24 Hood automated gene sequencers and several Silicon Valley and Hollywood special effects studios.[11] Such boundary maintenance cannot avoid the implosive impulses of Gene, today's headlining actor in the public's fascination with technoscience. As with most top-billing superstars, type casting Gene so as to assume roles and meanings is to a large extent determined by whose capital is able to woo it in the technoscience talent management game. Spielberg-Crichton, in this case, have the means to make an investment whose magnitude is on par with the most prestigious laboratories in the transnational studio system of technoscience, which manages such luminaries as the chip, gene, and brain, all crowd-drawing, profit-making creative talent.

Ultimately, though, the reviewer takes a position on the pivotal moment of Jurassic Park's drama: the evils that technoscience and its practitioners force upon the world in their own self-interested desires to obtain glory

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11 This is a dollar amount and number of Hood sequences that, according to the reviewer, would not facilitate the synthesis of paleo-DNA in an economical time period.

and profit. It will be recalled that the film concludes with a moral in this regard, specifically that technoscience is to be held accountable for worldly disasters, and it is at the hands of technoscientists that the apocalypse will be realized. Curiously, and somewhat parenthetically, it should be noted that doom in Jurassic Park is orchestrated by genetic engineering, whereas not too long ago, in the cultural imaginary, not to mention in the idiom of dystopic science-fiction from at least the 1950's, it was military technology (typically the bomb or the computer run amok) that fueled fears of the end of the world. I will return to this point below.

Although the reign of terror that is anticipated in Jurassic Park falls short of a Godzilla-like romp of T-Rex through downtown Tokyo (it remains to be seen how the narrative threads left suggestively unknotted at the end of the film are woven into the sequel, already in pre-production), one is almost certainly left with an anxious, if not downright hostile view of technoscience.

The central characters in the drama fit a worst-case scenario for the anti-technoscience crowd: Dr. Hammond, the park's founder, seems just shy of mania; Dennis Nendry is the money-hungry, over-worked, malnourished hacker cum industrial saboteur; Dr. Wu, the park's lead geneticist, callously avoids considering the possibility that "nature will find a way" to allow the all-female dinosaurs to reproduce and, thereby,

become uncontainable. This kind of dramatic type-casting is tantamount to a condemnation of technoscience practice, and allows no way out of asking, regarding technoscience, “are you for it, or agin’ it?” Therein lies the film's fatal flaw.

Here I would have to side with the *JAMA* reviewer, but carefully. While the reviewer argues that the film's drama insists that an anti-science stance is evoked from the audience, I would go a step further and demand that one investigate how, precisely, the *Jurassic Park* technoscience comes to be understood as “bad,” as something to be avoided at all costs. One could sketch a caricature through the dystopic science-fiction film genre of the prime-movers of technoscience-induced anxiety that would certainly include: Colossus: The Forbin Project (1969), autonomous, all-powerful computer threatens destruction of the world; 2001: A Space Odyssey (1968) HAL, the soft-spoken, psychotic artificial intelligence, sends deep-space scientists to their death; Metropolis (1927); Soylent Green (1973); Terminator (1984) and Terminator 2: Judgment Day (1991); Jurassic Park (1993); Outbreak (1995).

Summarizing the deep-seated apprehension evoked in the *Jurassic Park* thriller-drama, I would say that it is the nagging fear that technology, once “released,” acts autonomously and, hence, beyond the control of those who produce it. Today, in this regard, genetic engineering is perhaps the

most insistently anxiety-provoking technoscience practice around. Ethical and environmental issues relating to genetic release — the depositing of substances produced within a laboratory into the environment beyond these controlled confines — have played a large part in fueling often reasonable, sometime raving, always politically and economically charged debates concerning what counts as judicious release practices.

We might extend the anxiety regarding the "autonomy" of technology to act in an uncontrolled, ill-mannered fashion once booted out of the laboratory nest in order to consider that such an understanding is fashioned not by virtue of any inherent autonomy, but by a set of meaning-making practices — deployed by the technoscience apparatus — that craft various technologies as autonomous. This is to insist strongly that autonomous technologies may just as well have been otherwise. We need go no further for proof than to imagine a different *Jurassic Park* narrative, equally dramatic and lucrative at the box office, wherein the park's release of dinosaurs-as-genetic-beings does not come to an ill-fated conclusion. This is not to say that the *Jurassic Park* drama does not reflect a particularly persistent moral regarding technoscience. Rather, it is to assert that this is but one of many possible dramas, some of which are quite habitable indeed.

What I have analyzed above is how facts are produced by certain domains of technoscience. The contestation of the science practiced in *Jurassic Park* suggests that one may contest the fact produced by technoscience. It will, of course, be necessary to discuss an example of such a contestation around technoscience from within technoscience proper, and not solely as it is represented in the fiction of a Hollywood film. The premise of such an investigation will be to argue strongly against technoscience as a closed, bounded, and fixed apparatus. Before embarking on such an analysis, I would like to interrupt the central argument of this paper with an investigation of how film achieves the appearance of fact and reality. That is, consistent with an exploration of the appearance of "things as they are" as created through a closing off of contestation, I need to show how trucage produces the film as, in Christian Metz's words, "an object whose contours remain intact and which cannot...be torn open into an inside and an outside" (Metz, p.94). As this paper concerns the produced artifactuality of such appearances of reality both from technoscience and from the kind of cinema that relies heavily on trucage (as in *Jurassic Park*), my digression is not so much a dividing point between my three examples as it is a theoretical venture into how trucage comes to appear as "reality." Once I provide a vocabulary for discussing how trucage appears as if it were reality, we will be that much closer to

understanding such appearances within cinema, and discerning the important differences between the reality effect of technoscience and cinematic trucage.

Theorizing Trucage

Despite the wide-ranging extant film theoretical literature, theories of cinematic trucage are thin on the ground. Christian Metz's short essay titled "'Trucage' and the Film" is, as near as my research can tell, the only notable work that addresses itself directly to trick cinematography (Metz 1977b).[12] For Metz, trucage refers specifically to those effects that are not only optical effects interceding on the visual portion of a film (as in a fade-out to a fade-in) but those that directly affect the image as seen by the viewer. The distinction is important for Metz, and he takes pains to describe the distinction between the purely optical effect and the optical effect that imposes itself on the image. So, for instance, during the sequence from a fade-out to a fade-in there will be a moment where the screen is blank and no image belonging to the film's narrative is present. Metz describes the distinction between the purely optical effect and what

12 As mentioned in the beginning of this chapter, Stephen Prince has set out a framework for understanding digital imaging tricks that might count as *trucage* through his correspondence theory approach, which deliberately avoids using the more psychoanalytic approach favored by Metz and others I discuss later (1996).

we may now call the trucage in the technical language he develops in Language and Cinema; but we need not go into the complexities nor the precision of his description (Metz 1974). Sufficient for my argument is Metz's condensed series of examples that describe trucage:

> In contrast to the fade-out...the processes of [trucage] are fairly numerous: the iris, the wipe, special lenses, blurred focus, backwards motion, accelerated or slow motion, the use of a freeze frame, dissolves, superimposition, overexposure, split screen...— as many effects as assume (and affect) [the cinematic image-track] (Metz 1977b, p.660)

Writing almost 20 years later, when the availability and economies of scale of computerization and, especially, the infusion of computerization into the realm of image production, we would of course add trucage created through computer graphics techniques to Metz's history. As Stephen Prince has indicated, there exists in the special effects trade, categories of digital techniques that could count as trucage. For instance, "painting" on a frame to add or remove a component to the scene, or the creation of an entire scene within a computer, and then exposing film to that imagery to create the appearance of that scene having been captured as if it existed (Prince 1996).

Although a complete body of film theory concerned with computer graphics trucage does not yet exist, the conditions are ripe for such work. We might begin by recalling that much of Metz's work, and almost certainly

this particular essay, were circulating at a time when Metz and others were grappling with the problem of the "reality effect" in cinema. The problem then was to theorize how the cinema came to be taken as a kind of "reality" in itself, an analog depiction of "things as they are." A whole host of theorists approached this question, arguing from many vantage points and with the resources of semiotics, psychoanalysis, and linguistic theory close at hand. It is not my concern here to replay the debates about cinematic realism.[13] In any case, cinematic realism as it was theorized in the mid to late 1970s was not addressed to the specificity of trucage, but rather to the cinematic image in general with, except for Metz, no emphasis placed on the specific problem of trucage.

The relationship between trucage in particular and the cinematic image in general poses a perplexing problem with regard to cinematic artifice. What makes the trucage — or special effect — notably "special" such that it deserves its own enthusiasts journals and magazines, requires "special" production facilities, intervenes in film production as a "special" problem, and so forth? And, curiously, why does the special effect *not* interest most film theorists, as indicated by the dearth of writing on this now prominent

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13 Let me, though, at least refer the reader to a few works that informs this section, several of which I cite in what follows: (Jay 1993), (Comolli 1980), (Silverman 1988).

component of film drama?[14] If the cinematic image is, in its very textuality, "artifice", that is, always unreal (yet often times attaining to the effect of reality through the artifice of realism) and trucage is always bringing the unreal to the cinematic image, wherein lies the distinction?

I would like to suggest that the distinction can only be understood with recourse to an understanding of the cinema as a social, political, and ideological apparatus with a history in each of these particular realms. For instance, the political-economy of the Hollywood film is such that recognized auteurs are given the means by which they may "push the envelope" of what is technically possible. Such "experiments" in cinematography become notable, that is, special, to the extent that a technique for producing images has never before been attempted. This was the case with *Jurassic Park* the film where Spielberg debated long and hard over the possibility (economic and technical) of using computer graphics to produce images of dinosaurs: a special effect. While the whole film is artifice — a construction of illusory images — there are particular

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14 A side note is worth inserting here. Since the time this section was originally composed in 1994, there has appeared two notable books addressing a particular kind of cinematic reality effect that is a second cousin to the kind of special effect I am discussing. The popularity of dubious "reality" style television and "realism" style drama is discussed in (Black 2002) and (Hallaman and Marshment 2000). The linkages between the digital and mechanical special effects I discuss herein and the realism style drama is suggestive, but will have to be put aside until such time as further analysis becomes possible.

images that have a degree of deliberate, considered construction that surpass that of other images.

This question as to the distinction between the "routine" image and the "special" image remains somewhat unanswered — and cannot be answered simply by referring to brief instances. The question will have to be investigated further in order to obtain a satisfactory explication that will help us consider the larger relationship between the production of the appearance of reality in technoscience and film realism. Nevertheless, I would beg the reader's indulgence in allowing me to proceed with a consideration of how trucage in particular comes to appear realistic. The central point is to correlate technoscience and trucage as artifactual processes that produce the appearance of reality, of the "really real." With regard to the reality effect of cinema, I would like to take the one argument that recurs often enough to be considered the crux of the realism problematic — the defensive mechanism of disavowal — and see how it might apply to the appearance of reality specific to trucage.

The Immanent Ambiguity of Reality[15]

The apparent reality of the cinematic image has been argued with recourse to Freud's notion of disavowal. For Freud, disavowal corresponds to a certain reluctance to cede the meaning of perception over the desire to believe what one sees. Despite the extent to which Freud's notion of disavowal has been employed by theorists arguing on a whole range of topics — from false consciousness in the Marxist sense to, as here, cinematic realism — in his own writings Freud's use of the term was not completely worked out theoretically (Laplanche and Pontalis 1973, p.134). Thus, it is not clear how much is owed to Freud for a full explication of this term, and how much has been more completely theorized by those who would rely on Freud's own work. In this regard, I am in a quandary as to how much of Freud's theorization of disavowal I want to insert here. Certainly Metz and others make a point of recapitulating the theoretical fiction that led Freud to pronounce disavowal as a defensive mechanism that the young boy deploys in order to account for the differences between himself and his mother.[16] Other theorists such as Comolli, who do not

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15 Bazin, as quoted in (Comolli 1980, p.134).

16 See (Metz 1977a, pp.69-71). It seems to be that a recapitulation of Freud's story about the boy encountering the mother's lack is necessary, at least, when the point of the author's argument is to address the gender specificities of disavowal. See Kaja

describe Freud's argument, apparently either presume the reader is intimate with the particulars of Freud's argument, or are concerned only with the way Freud's grammar of disavowal (the familiar "yes-I-know/but-all-the-same") helps them argue about the split between knowing that an image is not "really real" and believing that it is "reality." As my argument does not concern a possible "genesis" of the fetishistic split that results in the defensive mechanism of disavowal, I will proceed under the premise that disavowal exists for human subjectivity — that there is some psychic mechanism that allows one to sustain a belief against the notion that "seeing is believing" — and thus my argument will avoid either conceding or contesting Freud's theoretical fiction.[17]

Starting from Metz's description of the gap between the cinematic illusion and the necessity of believing in it so that one may derive pleasure from immersion in a film's drama, we can begin to gather together the analytic tools necessary to consider a homologous gap with regard to trucage. Metz describes this gap:

Silverman's insightful and compelling point in this regard (Silverman 1988) the chapter "Lost Objects and Mistaken Subjects: A Prologue."

17I am not yet convinced that I can write out the gendered specificities of the disavowal I am dealing with, particularly in light of Haraway's argument about the "feminine-man" as a subjectivity that is encountered by Shapin and Schaffer in their discussion of "modest men" as producers of knowledge and fact.

> It is understood that the audience is not duped by the diegetic illusion, it 'knows' that the screen presents no more than a fiction. Any yet, it is of vital importance for the correct unfolding of the spectacle that this make-believe be scrupulously respected (or else the fiction film is declared 'poorly made'), that everything is set to work to make the deception effective and to give it an air of truth (this is the problem of verisimilitude). (Metz 1977a, p.72)

With this formulation, rhyming Freud's grammar of disavowal, Metz approaches the challenging problem of considering how cinema appears "real" despite recurring interruptions that, on the side of knowing, would insist otherwise. For instance, one presumably knows of the cinema's artifactuality, the imposition of an enormous apparatus between the "real world" (or, specifically, the profilmic) and its representation as captured by camera, director, cinematographer, and so forth. The very process of editing presumes the "madeness" of film. Cutting, montage, jump-cuts, and so forth intercede in such a way as to fragment the captured "real world." One might expect such impositions to produce a "cracked" object, one that cannot contain any semblance of reality because, plainly, outside of the cinema such impositions are not experienced as they are in cinema. There is simply no correspondence to montage or iris dissolve in the "real world," that is in one's day-to-day experiences.

Contrary to what we know very well to be the case, cinema insists on a certain belief as to the "air of truth" of what unfolds on the screen. This believability as to the truth of what one sees on screen that gives the

appearance of a reality. By virtue of what André Bazin calls "the immanent ambiguity of reality," the remarkable malleability of what gets to count as the "really real" as it shifts (tropes) depending on its utility in various contexts, the cinematic image can count as "reality" while it serves to satisfy the enjoyment one expects while watching a film. A good film can count as realistic to the extent that one wishes to derive some enjoyment and satisfaction from the viewing. This statement is on the side of believing against knowledge.

So, there is the side of knowledge, of knowing that the film is artifactual at a multitude of levels — production, editing, authorship, ideology; the entire apparatus intervenes and, depending on the viewer and the skill, ingenuity, and creativity of the production teams, this knowledge may possibly intervene in such a way as to make a bad film, whereupon the viewer is driven to avow the production and declare it shoddy. Should the film count as good, as enjoyable, the apparatus has successfully filled the gap between knowing and believing, collapsing the terms on the side of believability and the attendant pleasure to be derived from not giving way to the knowledge that all is not what it appears to be. This is the basic defensive resolution of Freud's disavowal as it is articulated in film theory.

> This fundamental disavowal is what has guided the whole of classical cinema into the paths of 'story', relentlessly erasing its discursive basis, and making it (at best) a beautiful closed object...an object whose contours remain intact and which cannot therefore be torn open into an inside and an outside..(Metz 1977a, p.94)

Now, arguing that the gap is (at best, that is, in a film a viewer enjoys) filled between, variously, what stood before the camera and what is projected on screen, or perception and desired belief, or the real and the artifice of production, is only sufficient to posit that cinema can appear realistic. This is something that is empirically verifiable. This is an important theoretical step to be sure, but it is similar to pointing out that breakfast exists because there are breakfast menus at restaurants when one might be more concerned with the conditions that make breakfast possible. In other words, what is particularly important to considering is *how* the gap is filled and, as importantly, *what kind of work goes into filling the gap*.

Comolli's excellent investigation of these two points brings us closer to a deeper understanding of resolving the viewer's disavowal. Comolli points out two possible strategies for the resolution. On the one hand is the technical apparatus of cinema, and on the other hand the complete representation of a film's drama (as in the telling of its story, and so forth; all those elements outside of the purely technical production of a film).

Through Comolli, I would like to indicate the way both of these strategies "suture" the divide between knowing and believing.

Comolli indicates, quite correctly, that it was once the case that the silent film, considered in its historical moment, counted as an analog to "life itself." The "delusion" (or disavowal) derived from a desire to see a double of life in the cinematic image, despite, for instance, the lack of sound or, by today's standards, poor image quality. Plainly, there was no better metric with which to judge the cinematic image as, during silent film, one got the best the technology could offer — the state of the art of cinema as a direct correspondence to the "norms of visual perception."

> If the photographic illusion, as later the cinematographic illusion, fully gratifies the spectator's taste for delusion, it also reassures him or her in that the delusion is in conformity with the norm of visual perception. The mechanical magic of the analogical representation of the visible is accomplished and articulated from a doubt as to the fidelity of human vision, and more widely as to the truth of sensory impressions...I wonder if it is not from this, from this lack to be filled, that could have come the extreme eagerness of the first spectators to recognise in the images of the first films — devoid of colour, nuance, fluidity — the identical image, the double of life itself. (Comolli 1980, p.124)

And further:

> It is at the cost of a series of blindnesses (of disavowals) that the silent image was able to be taken for the reflection, the objective double of 'life itself': disavowal of colour, relief, sound. Founded on these lacks...filmic representation could find its production only by working to diminish its effects, to mask its very reality [of production]...The work of suturing, of filling in, of patching up the lacks which ceaselessly recalled the radical difference of the cinematic image was not done all at one go but piece by piece, by the patient accumulation of technical processes. (Comolli 1980, pp.132-133)

By referring to the "mechanical magic" of cinema, Comolli is specifically citing the technical apparatus and a kind of correspondence to knowledge of the visual sense. Comolli speaks to this point in the context of the development of color film stocks:

> ...it is a matter not simply of a gain in the sensitivity of the film but also of a gain in faithfulness 'to natural colours', a gain in realism. The cinematic image becomes more refined, perfects its 'rendering', competes once again with the quality of the photographic image which had long been using the panchromatic emulsion. The reason for this 'technical progress' is not merely technical, it is ideological: it is not so much the greater sensitivity to light which counts as 'being more true'. The hard, contrasty image of the early cinema no longer satisfied the codes of photographic realism developed and sharpened by the spread of photography. (Comolli 1980, p.131)

This is the argument that the reality effect of cinema is, at least, on the side of visual perception and its normative metrics limited to a given historical and ideological moment. So, to the contemporary cinemaphile — whose home entertainment system includes high-definition television, DVD players, Dolby™ surround-sound — a copy of an early silent film would not

count as realistic when considered alongside the rendering capabilities of modern technology.

This point is important, and reflects perhaps a flaw in Metz's arguments around how the gap of disavowal is bridged in cinema. Metz devotes an entire section of his treatment of belief in cinematic reality to the ability of the technique of cinema to overcome the gap between knowledge and belief. Metz insists that:

> ...in its cinematic manifestations, who could fail to see that (overcoming the gap) consists fundamentally of the equipment of the cinema..? It is no accident that in the cinema some cameramen [sic], some directors, some critics, some spectators demonstrate a real 'fetishism of technique'...(Metz 1977a, p.74)

What Metz suggests is that technique *by itself* is able to overcome the gap, as if the employment of technical devices and skill suffices. Comolli, while not directly addressing his argument to Metz, proposes another strategy, one that works at the level of the telling of a story in such a way as to fill the perilous void. This would be accounted for both by the technique of the cinema and by strategically telling a story so as to insist that the viewer read the film in a particular way. Returning briefly to Freud, I think that it is necessary to construct a story as to where that absent object might be, thus finding a surrogate that functions as the fetishistic prop. The fetishistic prop serves to present a presence where there was once an absence. By analogy, in the cinema disavowal operates

at the level of perception, at the level of "reading" the meaning of sequences of images, while at the same time the story creates a narrative that accounts for the lost object. That is, the technoscience of special effects *alone* does not determine perception. The far more ambiguous craftwork of creating a narrative to go along with the visual spectacle is required.

It is important to point out that both Metz and Comolli are correct, although putting their two explanations together will help in explicating the trucage. Film, it should be emphasized, tells a story through images: the stitching together of images, creating images through techniques — whether special or routine — is what creates the filmic narrative. For my consideration of trucage, though, I would like to artificially separate the special effect from routine technique, such as deep focus, pans, tilts, dissolves, and so forth. Special effects will count as those kinds of trucage that are outside of routine film production techniques proper, requiring innovative strategies of production, which stand apart from conventional film making. Metz makes this point:

> ...technicians consider as special all those effects which they must create specially and which demand, in addition to the normal working of filming, a... particular technique. (Metz 1977b, p.659)

We might say that what is "special" about this kind of film technique is its ability to be distinguished from conventional story telling through film

images. Here the special effect stands out for the important way in which the trick imagery becomes necessary to overcome the gap between belief and knowledge.

We now have two strategies for overcoming the gap between knowing and believing in cinema; this is the gap that must be surmounted for cinema to appear realistic. One is at the level of production, the other at the level of reading and story telling. Let me now try to insert the trucage into this schema in order to see if I can describe how trick imagery counts as realistic. I would like to attempt this through a sequence of scenes in *Jurassic Park*.

Recall that visiting scientists have been dispatched to *Jurassic Park* in order to ascertain the park's safety. Crossing a wide valley, the scientists see their first living dinosaur, a huge brachiosaur. In this scene the paleontologists are obviously overcome by disbelief and shocked, quite viscerally, at the phenomenal sight. In this state of reverant awe, Grant, one of the paleontologists, asks Dr. Hammond, the park scientist, "how did you do this?" whereupon the party is rushed to the park's central facility and shown a film-in-a-film that explains the genetic engineering work that went into reanimating dinosaurs from paleo-DNA. As the film-in-a-film is played for the scientists, they begin to make serious, chaste — that is, scientific — commentary on the engineering work described in the didactic,

high school genetics film. The scientists become decidedly more believing as their demeanor and language move from awe to the unembellished, interrogative prose of scientific knowledge making. Excitedly, they leave the film viewing room and enter the genetic engineering control center where we pan across several computer graphics terminals displaying the ubiquitous DNA double-helix and technicians busy at the somber, virtuous work of doing science. We then cut to a dinosaur incubation table where a baby dinosaur hatches. The paleontologist makes his final move away from awe and disbelief, to incredulousness when he finds out the species of dinosaur just hatched is the dangerous and violent velociraptor: an incredulity based on knowledge of the species' formidable threat to life; this is a fact previously established in an earlier scene (Franklin 2000, pp.200-201).

At the level of the technical production (the degree that Metz takes pains to insist is largely responsible for overcoming the gap between knowledge and belief), there is the computer graphics-rendered brachiosaur in the first scene to which I refer. The series of moving images are suggestive insofar as they represent the state-of-the-art in depictions of dinosaurs on screen. One can imagine them as *becoming* realistic once inserted into an appropriate narrative of images: the object alone does not suffice to count as realistic. New special effects techniques are employed

over the now insufficient clay animation one sees in "old-fashioned" dinosaur movies, or clunky stop-motion as in *King Kong*. Thus the dinosaurs are still unbelievable, although compelling at the level of technical imagery. There is then an absence of technical production (notoriously costly to sustain for very many scenes) while the story telling takes over (described below). In the final scene around the hatchery, an animatronic baby velociraptor that moves and coos (to the extent that baby dinosaurs coo) anchors our belief in the reality of dinosaurs.

Even had we seen the computer graphics brachiosaur outside of the context of *Jurassic Park*, I would maintain that it is futile to talk about its realism outside of a particular discourse or imaginary space within which the dinosaur image counts as realistic. Without a comparative context to insert the image, it has no meaning and certainly could not be considered "realistic." (*Realistic of what*?) Of course, such an image — any image really — cannot exist context free. We would have had a reason to be looking at the dinosaur: say, because a paleontologist friend invited us to see a new computer model she had built based on the findings of her latest dig. We would then know that our paleontologist friend was seeking a "realistic" correspondence between what appears on the screen and what hypothesis she is working on based on empirical data from the field. Whether or not we believe the hypothesis is another issue, but it is entirely

related to how well we are able to give ourselves over to the "reality" effect derived from the image. The point here is to work carefully on separating "reality" from "believable": the former is used here as a technical term achieved through technical means; the other has less to do with technical production, yet is derived from it, but must also be accompanied by a good story.

At the level of story telling, we remain unbelieving (as do the scientists who stand in for the viewer) during the first scene as we and the scientists in the film know very well that dinosaurs are extinct. The story telling guides us along the path from knowledge to belief as we move to the park's central facility and into the film-screening room where we see the film-in-a-film, which explains the possibility of reanimating dinosaurs. After seeing this film the viewer (and characters) are in the middle ground between knowledge and belief. We (the viewers), even if we do not get the science explained in the film-in-a-film, begin to move with the scientists toward belief as their demeanor suggests the validity of the didactic film's science. Finally, the story telling takes us to see the hatching of a baby dinosaur and, through the various characters gathered around the hatchery, the viewer is compelled to believe the existence of dinosaurs as the scientists' awe and disbelief is replaced by the sober prose of scientifically grounded "reality." This final shot intertwines technical

production (the animatronic baby dinosaur) with the final punctuation to the story telling in the form of the paleontologist's serious look and demeanor.

It should be clear from this example that the suspension of disbelief as theorized in film theory works as well when considering trucage as it does for considering film drama in general. Overcoming the gap between knowledge and belief is facilitated by the technical aspects of film and by the film's narrative, two elements intimately intertwined with each other, but fruitfully considered separately when film technique — in this case, trucage — is foregrounded to clearly identify its role in moving the viewer to the side of belief.

The important consideration here regards the strategies film production employs in establishing and maintaining the appearance of "reality" or "things as they are." Mere technical savvy by itself does not suffice; the telling of a story annealed to the technical elements must narrate their role in the unfolding drama. We might consider this strategy similar in structure to the establishment and maintenance of matters of fact constructed by technoscience. As I suggested with the RealityEngine™ — and as Shapin and Schaffer emphasize in *Leviathan and the Air-Pump* — technical prowess alone makes no sense. One must also make an effort to

insert the technical apparatus into a set of discussions that invest the machinery with meaning.

In the next chapter I would like to investigate just such an example of folding a technical artifact into larger meaning-making discourses that negotiate the gap between knowledge and belief. In the case of the RealityEngine™, the negotiation is about making and breaking the closure that surmounting the gap implies.

Getting The Reality You Deserve

After a decade of idleness, it is useful to contrast the similarities and differences of the cultural and political markers relevant to the topics of this chapter — video gaming, the city, and representation of racial, ethnic and class-based conflict therein — over the time between when this chapter was first researched and written in the early 1990s and the early post-millennium of "now" — around 2004. In the next several pages, I would like to provide an introductory framework for this chapter by briefly sketching out what I see to be relevant changes apropos of these topics.

I have two reasons for doing this. The first is to note the ways both video games and the city have become expansive, growing in significance and consequence over this period of time. It is generally well-known that the city has grown, most obviously in terms of population densities and the sheer volume of people migrating into them on a daily basis. It is also well-known that video games have become an enormously popular and economically prodigious cultural artifact. More relevant in the context of this chapter, video games have also become a mechanism for critical cultural expression and scholarship that scarcely existed if at all when I

first researched and wrote this chapter. Writing this chapter now would result in a dramatically different approach that is only possible because of the introduction of critical scholarship devoted to video games. At the time of the original writing and publication in 1995, it felt necessary to move toward a critical analysis of a video game by way of film criticism, hence the sections on dystopic science-fiction films that have as their backdrop an urban setting (Bleecker 1995). Today, critical studies of video games are a growing cottage industry for academic publishing houses, and there are curriculums within many university critical theory, film theory and media studies departments worldwide where video games are analyzed with the rigor of other credible cultural artifacts.[18]

My second reason for this introduction is to help contextualize the core of the chapter in the odd case where an anachronism may appear. Rather than making extensive revisions to bring the material "up to date", I think

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17 cf (Newman 2004; Gee 2003; Wardrip-Fruin and Harrigan 2004; Wolf and Perron 2003) and the Ludologica series of books that take as their theme an individual game for critical commentary: http://www.ludologica.com/pages/11/. Digiplay, a broad-ranging research initiative into the culture and commerce of video gaming based at the Universities of Manchester and Central Lancashire in the UK, lists a bibliography of computer and video gaming articles, scholarly essays, books and related literature that at the time of this writing numbers in the low hundreds: http://www.digiplay.org.uk/books.php. Of the universities containing relevant curriculums, include, to name only a few: University of Southern California Interactive Media Division and Critical Theory program; The University of Melbourne; Monash University; IT University of Copenhagen; University of California, Berkeley; Carnegie Mellon University; New York University.

it is useful that there remain certain political and cultural signposts that serve as useful reminders as to the writing's original milieu.

Introduction — The City and Video Games, 1994-2004

With the fall of the Berlin Wall at the end of 1989, the city in the United States was just emerging from fear of nuclear destruction by missiles fired from Communist Russia. In 2004, the kind of fears that shrouds cities worldwide are best represented by the image of jumbo jets repurposed as high-speed fuel-laden missiles, drastic degrees of personal surveillance eroding civil liberties, suicide bombers exploding in public markets, and jerry-rigged, portable nuclear devices detonated in city centers. A constant between the early 1990s and 2004 has (always) been destructive rioting and skirmishes arising from tensions surrounding race, class and social identity. In the U.S. in 1992 this was the uprising in South Central Los Angeles after the verdict exonerating the Los Angeles Police Officers who beat Rodney King. Today, the Gaza Strip and too many other locales underscore an inability to mitigate the violence that arises from racial, ethnic or class-based conflict.

In the early 1990s, the image of the city in popular science-fiction films such as *Blade Runner* (1992), and *Demolition Man* (1993) was dystopian,

barren and ridden with criminal elements. This image resonated with a general sense of urban despair and decline. The keyword that captured this urban decline was “white flight” — the exodus of financially comfortable white workers from cities to the suburbs. Now, the population flow moves markedly in the opposite direction. A 2003 report from the UN’s Human Settlements Programme indicates that people are flocking to cities at extraordinary rates (The Challenge of Slums: Global Report on Human Settlements 2003). From the perspective of an optimist, this trend could be interpreted as a revitalization of the city in a way that indicates a cyclical move away from the dystopian image of from the early 1990s and towards a lively, flourishing urbanity. The video game SimCity2000™, as I argue in what follows, represents such an optimistic interpretation of a modestly utopian game/simulation of the near-future city. A less optimistic, perhaps more realist interpretation of the population growth of cities indicates that the trend will result in tragically strained physical and social infrastructures that will not withstand the enormous needs of large numbers of people living in a constrained physical space (Davis 2004).

In the early 1990s, the United States military was involved in a major war against Iraq at the orders of President George H.W. Bush that stopped short of the capital city of Baghdad. In the early years of the second millennium, the United States military is involved in a major war against

Iraq at the orders of President George W. Bush, and quickly entered the capital city of Baghdad, where it remains entangled at the time of this writing. This problematic historical symmetry is noteworthy at many levels, but what is particularly relevant is the fact that the former engagement stopped short of the city, whereas the latter is situated almost exclusively in the city — Baghdad as well as others major urban centers in Iraq. According to a recent report, urban warfare is expected to become consequential in the new millennium. In part this due to the fact that the operational mode of the United States military had been to win conflicts in which armor — tanks, artillery and so forth — were the mechanism for establishing superiority (Press 1999). Such weapons are designed for engagements in the open terrain not the tight, confined quarters of a city where these weapons are difficult to maneuver and prove indiscriminate in their lethality. This point, together with the increasing urbanization of the world, have elevated the significance of the city in an altogether new and frightening way. The city has become the only viable battlefield for those who would engage in a military conflict with the world's only superpower.

> There are reasons to believe that America's future conflicts will involve more urban operations than those in the past. First, the world is becoming more urban. About half of the world's population lives in cities today; 70% will live in urban areas in 25 years. As the number and size of cities grow, so will the frequency that overseas wars involve urban fighting. Second, cities are the political and economic centers of modern countries. Whatever America decides to fight for in future decades, the chances are good that it, and the people who control it, will be located in cities.
>
> Finally, Americans will frequently be drawn into cities because no enemy's military can compete with U.S. forces in open terrain. Urban terrain, for reasons described below, negates many U.S. advantages and capitalizes on America's unwillingness to kill non-combatants. Enemies will put their forces — conventional or guerrilla — in cities to fight on the most advantageous ground possible *(Press 1999)*.

The video game industry works in symbiosis with the military industrial complex. It would take another research project to reveal with precision the linkages between militarism and video gaming, and to understand how and why the two industries are tied together. In 1994, while conducting research for this project, I went to the 76th annual trade show for the International Association of Amusement Parks and Attractions. Here I was only somewhat surprised to see companies that are part of the military industrial complex selling entertainment products, such as Hughes Aerospace a major defense contractor. In the case of Hughes, they had simply repurposed their military jet flight simulation apparatus and changed the content from a practice bombing run to a fast, entertaining

sluice down a ski run.[19] Conceptually, the instrument — a simulator that can either be at the service of the military, or of entertainment — is able to make the translation from military to entertainment context nearly effortlessly. I would argue that this is possible because armed conflict and entertainment are such that they intersect in ways that are historically, culturally, politically and ideologically similar, even identical. I have suggested elsewhere that the fundamental ideology at work in both armed conflict and the popular genre of action-themed entertainment is death-defiance. This is at least one consequential aspect of the ideology that bridges these two idioms and blurs the boundaries between the entertainment industry and the military.[20] So inextricably entangled are they that it makes more sense to refer to the pair as a single cultural idiom best captured by the neologism, *military industrial light and magic complex*.[21] Perhaps the most blatant indication of the way these two cultural idioms are inextricably entangled is the case in 2003 when Sony's entertainment division trademarked the phrase "shock and awe" on the eve of the bombing of Baghdad for the purpose of employing it in a now abandoned video game project (A war of words over Iraq video games

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18 cf 76th Annual IAAPA Convention – Review: http://www.techkwondo.com/publications/iaapa_review_1994.pdf

19 ibid.

20 cf http://www.techkwondo.com/publications/dissertation_prospectus.pdf

2003). The reader will recall that “shock and awe” was the phrase the U.S. military used to describe their intensive bombing campaign on the night that the 2003 Iraq war began.

Figure 3 SimCity2000™ Retail Box (bottom)

For this ideological cohesion, video games in the 1990s were more likely than not to have a violent, militaristic theme, as they are today, in 2004. SimCity™, SimCity2000™, SimCity3000™ and SimCity4™ are notable and successful exceptions. In part, this was my reason for identifying the game as a stand-out worthy of cultural critique.

My original inquiry was made using SimCity2000™. Since the time of my original research, the game has continued its extraordinary popularity. The latest version of the game is SimCity4™ and its range of features is significantly beyond that of SimCity2000™. The most notable distinctions between SimCity4™ and SimCity2000™ are the level of detail provided, particularly visual detail. SimCity4™ gives the player the ability to navigate the visual world of the city down the scale of an individual "sim-citizen." For instance, you can track a sim-citizen as they drive to work, or not if they're unemployed.

Figure 4 SimCity4 Box (top)

Figure 5 SimCity4 Box (interior)

SimCity4™ offers an impressive array of structures which include animated details, such as kids playing basketball at the park. SimCity2000™ was impressive at the time and, in my experience, equally compelling to play, but SimCity4™ significantly raised the bar of visual, animated and simulated detail. SimCity4™ includes the ability to manage multiple cities linked by ports, roads and other transportation networks. It also has the ability to create custom buildings and other structures as well as share

cities on the Internet, which has encouraged a burgeoning network of enthusiasts.

In the early 1990s, video games were just barely considered to be a credible topic of scholarly inquiry. Marsha Kinder's *Playing with Power In Movies, Television and Video Games*, and Eugene F. Provenzo's *Video Kids: Making Sense of Nintendo*, both published in 1991, were two of the earliest book-length inquiries into the ways in which video games represented a distinct kind of cultural idiom with a new kind of media literacy worthy of close, scholarly investigation (Kinder 1991; Eugene F. Provenzo 1991). In the years that followed the publication of these books, the enormous, multi-billion dollar economies that flow alongside and through the video game entertainment industry had such momentum that they made it credible to study and researching video games, game players and the cultures that surround them.[22] Now, there exists a hearty buffet of video game related books, mostly related to game strategy or design, but

22 Hard numbers are tricky to come by, particularly as there is a cottage industry of research companies who sell industry economic reports for exorbitant fees. A January 2004 Press Release announcing just such a report gives away some rough indications as to the scale of the industry when it says that "video game sales break $7 billion in 2003." http://www.connectedhomemag.com/HomeTheater/Chapters/Index.cfm?ChapterID=41565

increasingly one is able to find credible scholarly books from media theorists, cultural critics, anthropologists, and cinema and film theorists.[23]

Video games have creatively moved beyond the province of coin-operated entertainment games found in pizzerias and shopping malls, and the home gaming console in the family room, into the realm of establishment art museums and galleries. The 2004 Biennial at the Whitney Museum of American Art in New York City included *Velvet Strike* (2002) by Anne-Marie Schleiner, Brody Condon, and Joan Leandre. *Velvet Strike* is a modification to an extraordinarily popular networked shoot-em-up video game that is notable for its vivid violence and the visceral character of the first-person point of view one assumes while playing. In the *Velvet Strike* modification, one "shoots" mostly anti-war graffiti that, rather than killing other players. This graffiti decorates the walls of the game's virtual world. The authors of the game note that they were particularly motivated to counter President George W. Bush's "War on Terror" when they conceived and developed the game.[24]

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23 A few examples include (Newman 2004; Gee 2003; Wardrip-Fruin and Harrigan 2004; Wolf and Perron 2003).

23 See http://www.opensorcery.net/velvet-strike/about.html

Figure 6 Schleiner, Condon and Leandre — *Velvet Strike*.

Cory Arcangel was another artist featured at the 2004 Biennial with his piece *Super Mario Clouds* (2003). He and other members of the "Beige" art-technology collective modified the popular Super Mario Brothers™ (c. 1985) game from the original Nintendo Entertainment System™, erasing all graphics elements except for the clouds, resulting in a very pacific reinterpretation of an otherwise frenetic action game. This piece was also exhibited at the Guggenheim Museum in New York City as part of the "Seeing Double: Emulation in Theory and Practice" exhibit in 2004.

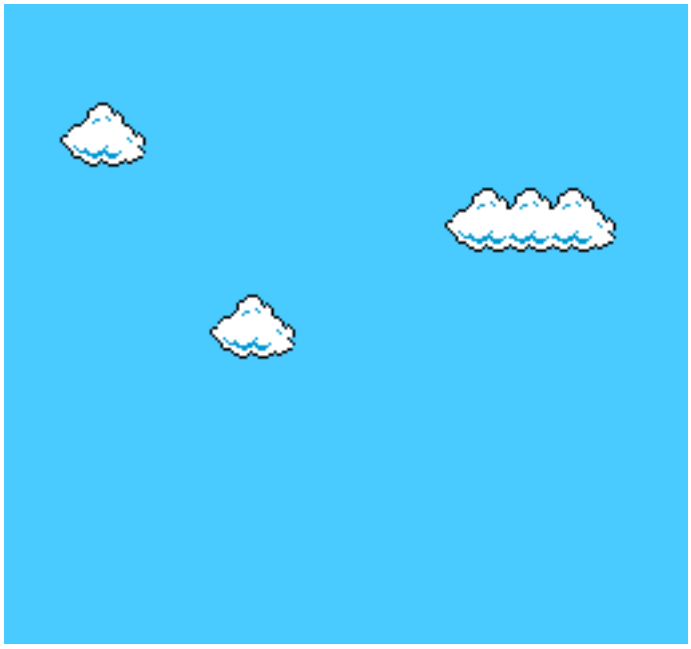

Figure 7: Cory Arcangel / Beige — *Super Mario Clouds*

Other artists have appropriated video games to shift the political and emotional point-of-view by re-narrating the games' "original" story. Eddo Stern is a Los Angeles-based artist who, with the C-Level art-technology collective, has developed a series of such appropriated games.

Figure 8 Eddo Stern — *Sheik Attack* (1999-2000).

In “Sheik Attack” (1999-2000), snippets from several video games — Settlers III™, SimCity™, Nuclear Strike™ and Red Alert™ — were recorded on video and pieced together to create a fictional documentary about the formation, utopian idealism and, ultimately, the heavy militarization of Stern’s Israeli homeland.

> The projected sequence of short vignettes, linked by graphics that make each scene clear as a historical phase (or a different "level" in a game), provides visual metaphors for real events. In opening scenes, for instance, construction workers erect a single building in an empty landscape, representing the nation's folk origins; later, a seemingly boundless cityscape signifies a burgeoning Tel Aviv. Yet nothing is now so intuitively correct about the piece as its episodes circling violence. One gorgeous scene depicts a single assault helicopter lifting off the desert floor before drifting behind a dune; Stern incorporates cinematic dissolves to underscore the poetry of the machine's turn ing blades. In the final moments we're presented with cold-blooded shootings in a domestic habitat *(Griffin 2003)*.

Cultural producers like the "Velvet Strike" team, Arcangel and Stern have channeled their enthusiasm for video gaming by appropriating and modifying the original context in which these games were designed to be played and re-authored the narrative point-of-view. Others have gone in the direction of creating their own games, developed from scratch to sit within an ideological framework that is decidedly against the grain of most commercial video games.

The growing ease with which it is possible to author games since the early 1990s — a result of access to inexpensive and relatively easy-to-use tools to create video games — has spawned a growing cottage industry of art-technologist and academics who create games that are themselves a form of didactic, critical inquiry into various political and social arenas. For instance, Rafael Fajardo, a professor at Denver University, has created a game called *Crosser*™ (2003), a serious yet tongue-in-cheek reworking of the hit video game *Frogger*™ (c. 1981). In *Frogger*™, the challenge was to

help a frog cross running rivers full of all manner of adversaries and pitfalls including hungry snakes, quickly moving logs, and amicable turtles that just might accidentally drown you when the submerse. As described in Fajardo's critical essay that accompanies the game he developed with his students:

> Crosser™ puts the player in the position of attempting to cross the Rio Grande from Mexico into the United States. The path is obstructed by detritus floating down the shallow river and by Border Patrol agents of the Immigration and Naturalization Service (known in spanglish as "la migra"), both of which move with uncompromising regularity. If a crosser should meet up with any of these obstacles, she will be sent home — most of the time. Occasionally a migra-man will turn a blind eye to the crosser and allow her to pass. The challenge is to get across unscathed and to reach the green card at the other side. Can you make it? (Fajardo 2003)

Figure 9 Fajardo — *Crosser* (2003)

Crosser™ is paired with *La Migra*™ which positions the player as a US Border Patrol agent determined to prevent illegal aliens from entering across the Rio Grande in a Space Invaders™ style shoot-out. Together the pair of games simulate the reality of the US/Mexican border, but do so for

the purpose of developing an instrument of informed, critical inquiry, not primarily an entertainment product.

> [Crosser™ and La Migra™] deal with the (il)legal human traffic at the most densely populated international boundary point on earth. The games exist as two complete works which provide a broader insight when played/experienced together. They present a concrete effort to deploy video games as vehicles and venues for cultural commentary and criticism. The reality at the US/Mexico border is a game. The game is one of chance, where the stakes are survival. The author of the games intends to present the development and context for the games, in particular, the novel strategy of repurposing old school digital video games to the ends of commentary and criticism *(Fajardo 2003)*.

Other of these critical, didactic style of games include *UnderAsh*, in which one assumes the role of a Palestinian youth in the West Bank, positioning the Isreali's as an occupying force that one must oppose (Kasmiya 2003). *Escape from Woomera* depicts the plight of an asylum-seeker in Australia held in a detention facility modeled on a problematic real-world facility (Escape From Woomera 2004).

What I have attempted to describe in this brief introduction are certain relevant considerations as to how the cultural meaning of the city and video games have changed over the last 13 or 14 years. When the chapter that follows was originally written and published, the video game had little critical, theoretical or research-based scholarly material with which to bolster my arguments. The advantage I hope to offer the reader through these introductory remarks is a better sense of my inquiry into the complex

manner by which a video game is able to represent a racially and ethnically fraught social space such as the city. At the time of the original writing, addressing this topic and putting it in the form of a critical argument was a challenge. I am thankful that the conditions for this kind of scholarship have improved.

Urban Crisis: Past, Present and Virtual

What possible relationships could there be between racial tension and virtual reality? This question was nearly impossible to ask in the spring of 1992 when the uprisings in South Central Los Angeles gave my studies temporary pause by forcing me to consider how my scholarly work - cultural studies of the virtual reality phenomenon - could speak to this seemingly unrelated problem.[25] The answer came shortly and indirectly from a computer graphics industry trade journal reporting on a South Central redevelopment project at UCLA's School of Urban Planning:

> In the aftermath of [the spring 1992] riots, there's no question that things in south central Los Angeles haven't been working, and a new set of [computer] graphics boards is playing an important role in shaping the area's economic and social recovery.

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25 See Julian Bleeker, *Coherent Light: Virtual Reality, Cultural Politics, and the New Humanism in Science*, MS Engineering dissertation, University of Washington, 1992.

These computer graphics worlds are compelling for their technical virtuosity; who would not want to visit the future of South Central on a computer?[26] These worlds also knot together a formidable network of social meaning — computer graphics, urban rebellion, computer-mediated representation of space, the declining city, Rodney King, virtual reality, Daryl Gates — that gave some denotation to my search for connections between racial tension and technoscience; these connections are made apparent by the vivid and productive explorations conducted in the study of science, technology, and society.[27]

Through these computer graphics visualizations meaning is made of social spaces like South Central LA. Computer graphics visualizations of these sorts create a linkage between engineering as a social practice and

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26 Which is almost the same as asking *who* would visit South Central without the vicarious aid of a computer? I do not mean this question rhetorically or facetiously. I might hazard a speculation that South Central is equated easily with the threat of violence and harm in the minds of many. This equation renders South Central particularly suitable for computerized (i.e., virtual) urban planning in the safe, cloistered labs at UCLA. The threat of South Central can be generalized to include the urban inner-core in the abstract. This was the threat operating when, in an oral reading of the representation of the perilous side of the city's inner-core through *Bad Lieutenant* (1992), a critic made two suggestive slips of the tongue when describing urban despair, criminality, and the omen of the inner-city: "Black Lieutenant" and "Bad Lieu-tenement." Both of these slips reveal the way the discursive field of general fear, paranoia, and decrepitude surrounding the inner-city are marked racially and spatially.

27 The rich literature on the intersections of science, technology, and the social — with which this essay is in conversation — makes an explicit investment of social meaning into the technoscientific object. Thus, herein, technology means much more than a box composed of a collection of parts; rather, it is presumed that a complex understanding of technology as a social artifact reveals the intricate manner in which it shapes, and is shaped by, the world wherein social relations matter.

the lived world of South Central Los Angeles.[28] The technical instrument ("graphics boards") become semiotic, meaning making devices through its ability to discursively invoke the social, political, and mythical space called South Central without missing a beat (Haraway 1992).

How does a computer graphics workstation congeal seemingly disparate nodes of meaning into a cohesive network that is neither "just" engineering nor "just" social practices? What I would like to do in this essay is to make some sense of the network of meanings between technoscience visions of the urban future and the question of race within these future visions.[29] My contention is that many virtual visions of the urban future,

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28 By "technosemiotic" I am referring to the complex network of social meanings that corporate signifiers such as RealityEngine™, SimCity™, SimLife™, SimEarth™, SimHealth™ and SimFarm™ all program. These signifying elements are persuasive catalysts for the simulation of worlds of the (virtual) past, (virtual) present and (virtual) future. In the chapter, "Virtual Reality Effect", I introduce the RealityEngine™ as a technosemiotic node among this network of world-building for it means both technological artifact *and* meaning-making apparatus; it renders the problems of South Central LA bare fact through its hardware and on its computer monitor. The awe-inspiring power of its technology gives these renderings the air of believability. Technosemiotics is a rich conceptualization of artifice to the extent that it is about cleverly maneuvering technological objects to touch upon, and give meaning to, questions of race, gender and class, imagination, play and fantasy, the military, industry and media. As I describe in "Virtual Reality Effect", by naming their technological artifact "RealityEngine™," the Silicon Graphics® corporation ingeniously allows it to encompass a wide and varied network of influence that includes South Central LA and all its heated particulars. This particular corporate signifier implies the engineering of reality (or, a bit more provocatively, an engine for producing or manufacturing reality.)

29 Haraway makes sense of what counts as "technoscience" and the meanings of technoscience worlds. Technoscience is meant to suggest a hybridization that is neither science or technology, nor simply both as a single fused entity. Technoscience transcends science and technology, both in their historical construction and in their separate epistemological and ontological grounding. It is, as Haraway puts it, "a kind of visual

such as that constructed through SimCity2000™, cannot but be intimately bound to a racially marked, present day urban inner-core, at least insofar as they respond to the contingencies of racial tension.

The Ghetto and Representations of Urban Decline

"Urban decline" is a key phrase that describes the state of the city both in the United States and throughout the world. Before the early 1960s, debates about urban problems were imprecise and lacked a cohesiveness. Dilapidated housing, blight, crime, and exodus to the suburbs were variously singled out as evidence or provocations of the city's declining state. Since the early 1960s the "ghetto" has been the locus of attention for describing the crisis of urban decline. The pivotal year, according to Robert A. Beauregard, was 1963, when racial uprisings in Birmingham, Savannah, Chicago, and Philadelphia brought together the previously vague arguments on urban decline and centered the problematic on questions of race and racism (Beauregard 1993).

Images of the urban ghetto as a burnt-out, riotous and crime-ridden zone, marked distinctively by thick masses of people of color, were

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onomatopoeia" that is carefully designed to disrupt the binarisms between nature and society, the natural and the artefactual, subject and object. c.f. (Haraway 1997).

employed profitably by Hollywood during the early 1990s. If ever there is the need for a bleak, blighted backdrop to add a dingy and exotic edge to a film, a ghetto is fabricated on some studio backlot. Hollywood designers for near future science fiction films have also found the ghetto to be a fruitful source of inspiration for dreary urban images. One would only have to attend Hollywood's offerings of the late 1980s and early 19902 — *RoboCop* (1987), *Demolition Man* (1993), *Batman* (1989), *Blade Runner* (1982), *Terminator 2: Judgment Day* (1991), to name but a few — to catch a glimpse of racially marked, "ghettoized" and criminal image of city living at the end of the last millennium.

Far fewer images of livable and hospitable urban space have made their way into the circuits of popular consciousness. In the 1990s, that dystopia was the viable framework for describing future urban worlds. A notable exception to the prominence of urban dystopic visions has recently appeared in the form of a computer game, SimCity2000™. SimCity2000™ is a simulation technology that allows game players to build custom virtual city spaces. This game provides a way to imagine and author distinctly utopian possibilities for urban futures partially, I argue in what follows, by evading the contingencies of urban racial tension. SimCity2000™ presents an enticing and compelling alternative to the more insistent bleak images of urban decline. The game suggests an answer to a problem that, for over

a quarter century, has seemed insurmountable. SimCity2000™ provides its challenge within the more or less general state of crisis that the city connotes, the impossible task of creating a hospitable urban environment. Such is its lure; who would not want to take a crack at solving such a formidable problem as urban decline?

SimCity2000™ might be applauded for providing a response to prevailing dystopian images. But I cannot help wondering *how*, specifically, the game is able to articulate its response. I am wary of the binary operating between the Hollywood film-inspired urban dystopia and the response articulated by this simulation of a utopic city. Which is to ask what, alongside the narrative logic of Hollywood's blighted urban future, produces a utopic urban future in SimCity2000™? How does the choice between dystopia and utopia get to be posed as the dominant one? What, precisely, is the distinction? Upon what categories does the binary "dystopia versus utopia" pivot?

Admittedly, the terms "utopia" and "dystopia" have been thrown around somewhat carelessly. They are not in any sense timeless categories, and have particular meanings in the context of late twentieth-century urbanity that needs to be explored closely, particularly if we are to escape from their impoverished, unidimensional binarism. For the purposes of this work, the distinction pivots on the contingencies of race in the urban context

where what counts as utopia or dystopia hinges on associations between people of color, poverty, and the squalor imagined as proper to the ghetto. This inscription distinguishes itself through a white racial imaginary in which a vision of an ordered social structure eradicates the possibility of difference and situates racial otherness as an absence, as something to be overlooked or dismissed as aberrant. To specify the terms of this distinction, I will describe the distinguishing characteristics of urban utopia and dystopia through near future science fiction film. From an understanding of how this binary becomes meaningful in these films, it will be possible to make sense of the utopic response given by SimCity2000™.

There are many ways to discuss the future of urban space and the ways it is imagined. For instance, one could look to urban planning discourse to see the ways in which city spaces are reconceived, debated and discussed. For the purposes of this chapter I am more interested in the future of the city as an imagined space rather than a particular goal to be achieved through rational planning. Thus, examining a less specialized, more popularly articulated vision of what counts as the urban future will be appropriate. What is of interest are the imaginary visions of urban futures, the ones that create popular conceptions of what urbanity might become. Given that near future science fiction film provides one of the more conspicuous, imaginative, and dystopic visions of urban space, it will serve

as one source of future conceptions of the city. Thus, one node of the network I am navigating will be science fiction film and the way it constructs knowledge and understanding of the city; virtual worlds technologies will be another node. Other nodes are race, urbanity, utopia, and dystopia.

With this network topology I can phrase my argument bluntly as an equation: if near future science fiction film creates its dystopic edge by extrapolating from the racially tense present day inner city, then a *utopic* simulated virtual reality of the near future city is one that necessarily refuses to acknowledge the question of race.

This, then, is an chapter about the ways in which technology is employed to make social worlds and how these worlds get to count as either utopic or dystopic. It is also an chapter that argues that technology should provide other kinds of inhabitable social worlds not on the flat continuum between euphoric splendor and dark purgatory.

The Dystopic Future: How The Future Came To Be

Many visions of "how the future came to be" have pervaded the circuits of the popular imaginary through science fiction film. On the one hand are images of the post-apocalyptic landscape made popular during the anxious

years of Reagan's reign, perhaps best exemplified by the post-nuclear war scenarios narrated by the *Mad Max* series of films. On the other hand are visions of the near future in which some untold events - ecodisaster, economic collapse, moral decay - leave us with a blighted and festering world, as in the Los Angeles depicted in *Blade Runner*.

Pessimistic visions of the future such as *Mad Max* and *Blade Runner* garnered a fair portion of the popular cultural market place at a time when the threat of nuclear annihilation became an apropos signpost of a more or less general state of international sociopolitical emergency. Even if the threat of nuclear war was not always tangible in the 1980s, ecodisasters, urban unrest, recession, immigration, hate crimes, domestic violence, micro wars, and so on certainly created a profound paranoia.

Outside the cineplex, the contemporary social problems that gave these future visions some meaning were certainly salient. While the specter of nuclear annihilation contributed to this paranoia, the zones of urban space were experiencing their own potent blend of localized apocalypse, as racial tensions were abetted by federal and municipal governments', that systematically ignored the economic and social status of the city and its inner core.

Soon enough, the post-nuclear film became tired; science fiction has cast aside the story of The Bomb quite noticeably. Science fiction author

Bruce Sterling in an op-ed piece in the *New York Times* entitled "Get the Bomb Off My Back" suggested that science fiction had become bored with the post-nuclear scenario and begun depicting a more realistic near future vision (Sterling 1991). Popular film quickly turned its attention to the blighted urban core. Nuclear apocalypse — since the Cold War a favorite narrative prop — was given up in favor of vaguer catastrophes that brought about slow decay, decadence, and ruination in a racially marked urban setting (Sponsler).

There is an important distinction to be made between the films that narrate a post-apocalypse story and the films that leave the audience with a more ambiguous description of what disaster has left the world in decrepitude. Claire Sponsler describes the indeterminacy of the bad near future succinctly:

> In cyberpunk, angst and ambivalence are replaced by acceptance of the ruined state of the landscape; destruction of the natural environment and decay of the urban zone are givens that are not lamented but rather accepted. There is no reflection on the past that caused the apocalypse and little on the future that lies beyond it. *(Sponsler,p.253)*

As Sponsler describes it, the lack of specificity given to the blighted urban backdrop strips the destruction of any moral or epistemological import; rumination derives from "off-stage cataclysms" of "profound indifference."

A response to the impreciseness Sponsler identifies would be to consider the specificity of present day urbanity extrapolated into the "non-nuclear scenario" near future science fiction film. What, precisely, makes it possible to use urban blight as a plausible setting for near future film?

Representations of present day racial turmoil create the backdrop for decrepit urban settings in film. Conversely, one could argue that the problem of racial tension is the largest challenge to imagining a hospitable future urban space. It is not racial turmoil presented explicitly as such, but rather implications of this tension that can be read through poverty, decadence, and decay, which signify anxieties around the problem of racial difference in an urban context. Notably, little attention has been paid to interrogating the racial economy of near future science fiction film.[30] This is surprising given the disposition of science-fiction to extrapolate contemporary living to the future; it would seem that the implied critique of contemporary urban space would draw some attention. Science fiction is a valuable discourse that helps to make sense of present conditions and, possibly, to put things on the track *away* from cybernetic gloom. A race-conscious theorization of science fiction would then allude to ways out of

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30 For the purposes of this paper I have limited the scope of my analysis to film which, of course, does a great disservice to the contributions of science-fiction literature that respond to the ideological, political, social and economic specificity of race. I am specifically thinking of Octavia Butler and Samuel Delaney's works.

the purgatory it depicts as the urban future. If, as some theorists maintain, science fiction film operates “instrumentally," “operating within a network of meanings...which extends beyond the films themselves” in the expression, enactment, and production of ideologies, then it is crucial to theorize how race is constituted in the fictional urban future (Kuhn 1990). Which is to say that it is high time for a cultural critique of science fiction that audits the representation of people of color in a way that responds to the challenge of imagining urban futures that run against the current grain of despair and racism.

Such a comprehensive critique is of course beyond the scope of this chapter. At this point I am interested in asking more formative questions about race as it figures in the representation of urban dystopias and utopias. Much recent science fiction film, including the two films I include in this analysis, include components of both utopia and dystopia, thus making the inquiry problematic. A grounding feature, though, is that they similarly articulate apprehension of particularly racialized social identities (Wolmark 1994). Given this, I will look — all too briefly — at recent films that represent urban and world purgatory as contingent upon questions of race and ethnicity.

Demolition Man

Marco Brambilla's film *Demolition Man* (1993) begins in Los Angeles in the year 1996—a criminally-infested urban hell with para-military law enforcement. Simon Phoenix (Wesley Snipes) is a maniacal criminal sentenced to a deep freeze incarceration of indeterminate duration. In the year 2032 he is reanimated, only to find himself in the Los Angeles of the future, now known as San Angeles—a benign, albeit fascist, "New Age" society where foul language is ticketed like illegal parking, violence is indescribable, and advertising jingles from the 1980s and 1990s are a favorite "retro" musical genre. Through these narrative features, San Angeles is presented as an ironical incarnation of the utopic future.

In the first few moments of Phoenix's post-incarceration parole hearing, he manages to unshackle himself from his restraining harness and to commit three homicides, the first in 16 years. Here we see the corruption of the "perfect" — if fascist — future urban space at the hands of the African-American criminal. Thus, Phoenix brings the most racially marked notions of criminality to the mid-twenty-first century, disrupting the totalitarian and technocratic utopic urbanity of perfect order and efficient similarity.

As the drama unfolds, we find that San Angeles' ordered polis is threatened by a cadre of underground rebels who defy its strict codes of morality and proper conduct. Even in this (outwardly) heavenly vision of the urban future, the menace to society is the differentiated element: in *Demolition Man* represented mostly as people of color, living in the catacombs of San Angeles that were once the streets of Los Angeles. The rebels' style, desires, and sensibilities are flatly incommensurate with the predominant ideology of San Angeles' surface world; as such, the rebels are marginalized to the city's sewers.

Demolition Man's depiction of what counts as dystopia obtains in the threat posed by a differentiated Other which cracks through the orderly surface of a white suburban fantasy. This is the ever present problematic of orderly social structures insofar as it cloaks the symptomatic contradictions lurking liminally below the surface. In the end of the film, the order of San Angeles topples upon its own inherent fissures, and the underground rebels rise to the surface in celebration, promising to whoop it up with cold beers, festive gunshots, and plenty of graffiti—back to the good old bad times of the 1990's. Such a jubilant return to the comfort of our historical present runs against the grain of such science fiction films as *Blade Runner*, in which the future returns to the present only in the form of a commentary on the destructive force of racism.

Blade Runner

Ridley Scott's vision of the future Los Angeles in *Blade Runner* read into the threat of a nightmarish urban space, rooted not in the threat of nuclear annihilation, as was familiar in early 1980s science fiction dystopias, but in the threat of nonhomogenous communities. Far too little attention has been paid to the dense polyethnic hybridity of the street zones below the Tyrell Corporation.31 These zones that are the salient determinants of future technodystopia, determined by what must be read as a fear of nonhomogenous ethnic and racial markers.

In order to capture an othered backdrop for the *Blade Runner* street zones, the production team relied on top-notch consultants and advisors.32 The texture the film sought to convey was one of cultural hybridity, exoticism, and dark regions splashed with burning neon light. Mixing these elements allowed the designers to extrapolate a compelling and plausible depiction of contemporary Los Angeles into the future. In order to achieve this pessimistic vision of LA, the design team situated their imaginative skills over the “Third World":

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31 Mike Davis makes this point in *(Davis 1992),* specifically with respect to the polyethnicity represented in *Blade Runner*.

32 Designers of the filmic ambience included Ridley Scott (besides being a film director he is also an artist and graduate of The Royal College of Art), Lawrence G. Paull, and the industrial designer Syd Mead (credited as the film’s “visual futurist”).

> It was sort of an exotic, technological interpretation of a Third World kind of country, in a way. So everything looked sort of junky because you had to add things to it constantly to make it work. [33]

As represented in the film, then, the future urban purgatory is precisely the place a white imaginary would associate with people of color—the "Third World.". An "exotic" space — with the marks of ethnicity suggested by the Third World — is one that is often attributed to the dilapidated inner city. It is a space that evokes a sense of nervous tension, claustrophobia, and fear for one's life and property. It is also a space that often counts as dystopic, particularly from the vantage point of a white outsider who would read the imagery as exotic and unfamiliar. This is not a new image of urban despair; its representation as the plausible future of urban street zones is, though, flatly nihilistic This dystopic space of panic and nihilism is precisely the effect orchestrated in the street scenes of *Blade Runner*.

The plight of the replicants provides the central thread that weaves the film's narrative. Replicants, built by the ominous Tyrell Corporation, are genetically engineered androids designed as a supplementary compulsory labor force for dangerous work on the "off world" asteroid-mining sites. We learn that they are seen as a threat to life on earth and are hence banned as "illegal aliens" and restricted to their work zones. The illegal status of

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33 Audio tape transcript of an interview with Syd Mead, distributed by Marco Barla and Associates, Inc. to promote the film, cited in (Deutelbaum 1989).

the replicants is a curious allusion to the problem of “illegal immigration,” particularly in the context of the film's setting in Los Angeles. That *Blade Runner* raises the specter of a different sort of illegal immigration is interesting by itself; that these future illegals are represented as Anglo, even Aryan, is far more provocative. It is also a reminder that invoking the rhetoric of “illegal alien” only thinly veils fears of difference through the threat imposed by an integrated, ordered social body.

An analysis of the whiteness through which an illegal immigrant acquires meaning in *Blade Runner* must take note of the mechanism by which distinctively othered signifiers — the notion of the illegal immigrant and the differentiated social element — are grafted onto an apparent whiteness. What sticks out oddly from the replicants is the manner in which these signifiers of otherness graft onto replicants who have characteristics distinctive of such otherness, notably, their remarkably white features. The replicants are slave labor, sent to interstellar outposts to perform menial and dangerous work, fight wars and perform the services of sex workers. In this way, their social and class status marks them as non-white in the context of colonialism and slavery.

A peculiar tension is invoked when the audience is simultaneously reminded of these sort of signifiers while, at the same time, the replicants we see in the film are all white. This, is the mechanism by which race is

invoked through the presence of an absence. First there is the invocation of some distinguishing signifiers of otherness (illegals, rebels, slave laborers) which is then veiled by powerful visual signifiers of whiteness. We will see this same sort of mechanism of eliding race in the analysis of SimCity2000™.

What I have tried to show is how many popular images of the future of urban space pivot the distinction between utopia and dystopia on the category of race. What counts as urban dystopia is represented by a kind of tension, hatred, and criminality that is heavily racialized. Similarly, utopia is that which excludes the possibility of considering racial and ethnic difference as a salient characteristic of urban experience. Although always, as suggested in *Demolition Man* and *Blade Runner*, lurking absent-mindedly below the narrative structure of such utopic aspirations as, for instance, a Los Angeles free from the contingencies of urban racism, or a race of beings designed as a compulsory labor force, is the presence of race as a social category; an absent presence that acquires meaning through the long history of discriminatory practices. The absent mindedness of such a logic refers to the inability to summon forth a coherent articulation of the place of racism in an urban context. Such is the difficulty of talking about an urbanity free from racism, as racism has become an integral and necessary component of urbanity itself. In its specificity, racism in an urban context

neither preceeds the urban experience, nor stems from it, but has become, in complex ways, a force of coexistence of urban social relations.

SimCity2000™ and the Virtual City

Urban dystopias as represented in science fiction film provide a plausible, if discouraging, extrapolation of contemporary urban conditions and lend credibility to the narratives. The dystopic urban backdrop provides a compelling filmic setting for the rough edge of these films because the contemporary urban inner core has been represented in the discourse of urban decline as a tense and threatening space. What makes the films so plausible and compelling is the discourse of urban decline, which suggests that racial tension, if left unchecked, will only increase and bring about these dystopic images. The "Negro problem" is the harbinger of the bad, dystopic future (Beauregard 1993). Racism runs deep, particularly in the US, and might indeed count as an institution with a firm grounding that will not soon be uprooted. As Beauregard notes, the city is often represented as condemned and beyond the point of saving:

> Not surprisingly, given the great alarm and fear generated by inner-city riots, fiscal instability, and the combination of federal governmental inattention and local government ineffectiveness, numerous commentators went beyond merely representing the cities as simply decayed. For them, the cities were doomed (Beauregard 1993,p.198)

Precisely because of its dogged unsolvability it seems certain that the problem of racism and urban decline will bring the city to the decrepit vision depicted in science fiction film.

What makes the simulation game SimCity2000™ so attractive is that it presents the player with the opportunity to address urban decline, albeit with only oblique references to the racial dynamics of this crisis. Players, when aware of the general representation of cities as a site of profound predicament (and scarcely anyone would be unaware of this representation), are able to boldly face a challenge that has thwarted the strategies of urban planners, politicians, civil rights activists and presidents. SimCity2000™ allows players to confront this threatening, doomed social space from the comfort of their own home computer. The game is also an experiment that involves analytic thinking, strategy, ingenuity, creativity, and savvy aesthetic design. SimCity2000™'s compelling graphics allow players to build dazzling cityscapes that can be whimsical, outlandish or practical depending on the player's preference and skill.

Finally, then, SimCity2000™ is a technosemiotic workstation that provides good fun in the form of a puzzle that complexly articulates the contingencies of urban social space through technology. But, in order to remain true to the form of the puzzle, a solution must reside somewhere.

Which is to say that whether or not the puzzle can be completed (in the plain sense), there must be the opportunity to reach some sort of closure — a state of the puzzle where some useful meaning about the situation being pondered may be extracted, thus revealing some previously unknown insight apropos to the epistemological context proper to the puzzle. A precise analysis of the ways in which players make meaning of their engagement with the game will have to wait for a richer ethnographic analysis. Nevertheless, through SimCity2000™'s various features it is possible to draw attention to the meanings of urban space that are offered with more urging than other possible meanings.

SimCity2000™ manages to construct a set of features, such as managing a budget and building an infrastructure of industrial, commercial and residential regions, through which the player may articulate a personal response to the impasse posed by the larger and more general discourse of urban decline. What is curious about SimCity2000™ is that it does not explicitly address the contingencies of the racial dimension of urban crisis; but my argument here is that the game need not do so to still count as challenging. The discourse of the racial dimension of urban decline since the early 1960s has been so far-reaching that city management is *about* managing this decline, whether the racial context is explicit or not.

In what follows I will consider the way SimCity2000™ is able to make possible a utopic urban space in its explicit erasure of the category of race. I should say from the outset that I am not interested in criticizing the game *per se*. Rather my intent is to use SimCity2000™ — a notable popular cultural artifact — as a lens through which to see what might count as an urban utopia and how this utopia is articulated through the discourse of urban decline.

This is also a project about making some sense of what are loosely called "virtual worlds" technologies. As I mentioned earlier, SimCity2000™ is a simulation technology, one that provides worlds that may be inhabited and created by the imagination of the game player. For many players this is an accurate, robust and realistic simulation of the contingencies of urban space. The larger question, and one that this chapter will orbit, asks how a simulation like this comes to count as "realistic" despite its explicit denial of a crucial category of the object it purports to simulate.

The Challenge of the Virtual City

Playing SimCity2000™ is somewhat of a challenging task, although familiarity with what counts as urban space makes it less than daunting. Indeed, from my own experience and from insights of other players, the

game is quite engaging. There are two ways to start a game: one may either start from scratch, “terraforming” a terrain, adding forest groves, waterways, lakes, and hills, or one can start with a predesigned game—either one of those included with the package or one exchanged from another player. In the former case the stage of terraforming is followed by constructing initial “zoned” regions that will sprout loosely or densely packed commercial, industrial, or residential areas. As with the other elements that create the infrastructure of the city, zoning costs money and is paid for out of the city's municipal budget. Some of the prepackaged cities, including ones found archived on computers throughout the Internet, give the players the opportunity to try their hands at managing (or decimating) real cities such as New York, San Francisco, Tokyo, Seattle, London, Philadelphia, and Chicago.[34] These cities are designed carefully to replicate the terrain and building clusters of the actual cities.

34 These cities and others are available in the form of expansion packs that can be downloaded or purchased and opened from within SimCity2000. Many players also create their own fanciful cities and make them available in such ways.

Figure 10 SimCity2000 — Detail of a London Simulation

Visually, the game is notable for its compelling detail. Buildings, roads, cars, even small figures representing citizens of the sim-city are all visible and animated. The point of view that the player has is what's refered to as "isometric," which is as if a god's eye view originated at the location of the sun at 2pm. This angle gives structures in the city a sense of three-dimensional depth, while also making it possible to represent the various layers of infrastructure of a city, such as underground sewers and subways.

Travel is particularly important in SimCity2000™. After zoning a few initial regions, the player must lay down some means of transit. Typically,

roads are built as the principle means of transit, although railways and underground subway systems provide alternative forms. These transportation modes must be designed carefully and with some foresight as a haphazard knot of roads spells only disaster for traffic.

After an initial network of roads or rail is constructed, the next stage is to build a power grid. The player has multiple options for the sorts of power plants to be constructed, including coal, hydroelectric, oil, gas, wind, solar, nuclear, with microwave and fusion being the two speculative, science fictional power sources. The variety of power plants allows the player to experiment with possible powering schemes and to express his or her ecological sensibilities. Constructing the power grid entails placing (and paying) for a power plant, then weaving a network of power lines that feed into each of the previously zoned regions.

At this stage of play the city is simply a terrain with a transportation system, a functioning power plant, and a power grid. If all of the main, initial infrastructural challenges have been met, residents will start building houses and apartment buildings; factories, warehouses and office buildings will be constructed; and shopping malls, movie theaters, bed and breakfasts and churches will appear.

Although the city is now “alive,” so to speak, keeping it contained in this modest state is not nearly as exciting as pushing it to see where its limits

lie. The player will almost certainly want to explore the myriad possible game elements. At the infrastructural level, building a bus, rail, or subway system can be a quite rewarding (and quite expensive) means to meet the challenge of commuting efficiency and combating pollution from private cars. There are also the options of building a high-speed freeway; opening an airport or seaport; installing a water system complete with pumps, desalinization plants and water towers; and constructing parks, stadiums, marinas, schools and colleges, hospitals, museums, libraries, and zoos, all appropriately priced. These optional elements open up the possibilities of investigating possible urban designs, with the experimental results indicated by the prosperity of the city and its residents.

From the perspective of the player, who is given the title of mayor — but is more properly an autocrat — building an elaborate and prosperous infrastructure determines how successfully the city avoids the perils of urban decline. If the residents are employed, healthy, and well-educated, and have venues for leisure, the mayor's popularity ratings only increase, an indicator that the player has averted decline. Should the categories of prosperity be deficient, decline is imminent—ratings drop, the population becomes restless and complains, and, in extreme cases, residents will take to the streets and riot.

The player has a large catalog of surveys and indicators to determine the degree of prosperity for the city and its residents. Indeed, a significant portion of play can be spent sifting through the many tables, charts and maps that register the levels of particular social and economic indicators, which include GNP, unemployment, average education levels, population, traffic, pollution, employment in industry or commerce, land value, and prime lending rates, among other metrics. Throughout engagement with the game, the players receive feedback on their accomplishments, or lack thereof, through avenues other than graphs and charts of the city's status. Newspapers give the players feedback on their progress and reveal various goings-on in the city, including unemployment, status of the educational system, complaints on traffic, crime and taxes, weather, disaster reports, and so forth. Adding to the realistic nature of the game, the newspapers also include “international” reports that, finally, have no direct bearing on the affairs of the city. "Extra!"s also appear in case of a suitably newsworthy event, such as a “natural” disaster or crime wave.

Economic viability is measured not only by the size of the municipal budget, but also by the amount of money garnered from taxes. This, like the detail provided in the aforementioned graphs and tables, is quite extensively determined. The player must decide individual tax rates for residential, commercial, and industrial property, as well as for specific

industries such as aerospace, electronics, petrochemicals, steel and mining, finance, travel and many others. This can be tricky business, as over-taxing any particular industries can result in their failure or departure from the city, with a consequent increase in unemployment. There are also the usual alternative means of financing the city, including the issuing of bonds, which, of course, must be paid back with interest.

Funding and budgeting the city is complex, but even more so when it soon becomes obvious that in order to grow, add zones, and develop novel infrastructural objects, plenty of money is required. Notably, not too long after the game was released players found a cheat function (called an "Easter egg" in the idiom of computer game aficionados, for the elaborate and sustained "hunt-and-find" computer hacking required to find it) that adds $500,000 to the budget each time it is engaged. Considering that a typical SimCity2000™ game begins with a budget of roughly $50,000, this extra cash leverages the game in the player's favor quite significantly.[35] The cheat is also a way to insure that the city is never challenged by fiscal burdens and easily meets the demands and needs of the population.

35 As with most cheats, a discourse of "purity" has developed with players complaining about others "cheating" to construct elaborate cities—a form of censorship that restricts "cheat cities" from being entered in contests.

Managing the city can be an arduous task, not just from an infrastructural and economic perspective, but also from a policy standpoint. Referendums and ordinances can be introduced that either directly enhance economic viability (e.g., legalized gambling, sales tax, and parking fines), increase the welfare of residents (nuclear bans, literacy campaigns, smoking bans, free clinics and neighborhood watch groups), or promote the city (annual carnivals, city beautification and travel advertising.) Each has its cost and it is up to the players to determine how the introduction of an ordinance might make sense in their own particular gaming strategy.

Figure 11 Detail of a "Monster Disaster" in SimCity London

Another challenging and "realistic" feature of the game is the occurrence of disasters, which range from fires, floods, air crashes, tornadoes, hurricanes, earthquakes, nuclear meltdowns, riots, to the occasional destructive romping of a godzilla-like Monster. Players must respond accordingly, such as by dispatching the police to round up rabble-rousers, in the case of riots. Each disaster is prompted by appropriate and specific conditions partially or wholly out of the payer's control. For instance, climatic disasters are determined by the weather, which the player has no influence, while riots may be precipitated by high crime, unemployment, or a heat wave. Once the disaster has subsided or been appropriately responded to, the player must rebuild the infrastructure of the disaster area.

As this description suggests, playing SimCity2000™ can be a challenging full-time job. There is seldom the chance to merely sit back and watch things happen, as budgets must be balanced, disasters contended with, and residents appeased. This constant burden is an integral part of SimCity2000™'s challenge; in order for the game to realistically simulate city management it must, in one way or another, emulate its salient aspects—in this case, its laboriousness. As will be described in the latter part of this chapter, other far less mundane challenges — such as

addressing oneself to the problems associated with racial difference in the city — are expressed through nervously suggestive traces of their presence. Much as the signifiers of racial difference graft absent-mindedly onto the replicants in *Blade Runner*, SimCity2000™ invokes the possible presence of people of color through the *presence of an absence* of such a possibility, whereby signifiers of otherness are thinly veiled by a particular whiteness that constitutes and structures the possibility of otherness. In the case of SimCity2000™, otherness is that which lies outside of the whiteness evoked by suggestive middle-class imagery, like bed and breakfasts, shopping malls, and marinas.

SimCity2000™'s Utopia

What counts as the "ideal" urban environment? An idealist dream might make the assumption that, soon enough, the latent possibilities of technology would realize its full potential and individual needs, wants, and desires would be satiated. These dreams of a technological delight would have erased the contingencies of class and racial conflict and the roots of competition for material needs.

Like most of the other Maxis™ games — SimLife™, SimEarth™, SimAnt™, SimFarm™, SimHealth™, and SimCityClassic™ — SimCity2000™ is pitched as

educational. Unlike in the typical shoot-'em-up computer game, there is no pre-determined goal to capture a homicidal maniac or kung fu one's way to a martial arts championship. Playing SimCity2000™ is meant to be an instructive experiment, a study in strategic thinking, or simply good fun (Abate 1994). Nevertheless, despite the game's lack of an explicit goal, it seems clear that the players' implied objective is to create the most fantastic and beautiful city possible.[36]

As stated earlier, SimCity2000™ does not suppose that urban spaces of a plausible future will be without their points of contention, but that these contingencies do not construct a dystopic urbanity. According to the narrative logic of SimCity2000™, the city of the future will be fraught with the problems typical of urban living. In the game, such problems are representative of what one might expect in a city context. For instance, it simply does not seem plausible that a future urban space will be free of such things as traffic jams, mediocre education, unresponsive emergency services, water shortages and unemployment. Indeed, it would be hard to take SimCity2000™ seriously if it did not force the player to labor with just these sorts of contingencies, particularly for how they help narrate a sense

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36 There have been worldwide contests for the most beautifully designed and elaborate cities and more are sure to come. In one book on SimCity2000™, color photographs feature some truly amazing designs — see (Dargahi 1994).

that one is really simulating the contingencies of the city. This is not to say that SimCity2000™ does not offer the player more challenging crises to handle Although traffic, a problem that is actually impossible to solve in the game, is one of the more perpetual emergencies that occur; a whole menu, literally, of potential disasters haunt the player.[37,38]

Although the last time a monster invaded a city might be hard to document, it can still be safely argued that the disasters in SimCity2000™ round out a seemingly full imaginary of urban living and provide a degree of realism that makes the game that much more engaging.

Disasters also serve to delineate the absent-minded invocations of race with respect to the white imaginary, which obtains explicitly in SimCity2000™. For instance, the intractability of traffic problems might be thought of as a stand-in for racial tension; traffic thus provides an incessant, nagging dilemma that resists the most determined player's efforts to derive a solution. In SimCity2000™, traffic is arguably an acceptable proxy for the incessant, nagging problems that arise because of

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37 It may be that the problem of traffic is the more insistent crisis and, indeed, unsolvable in *SimCity2000*™; players must simply try their best to stay one step ahead of a general infrastructural failure. This speaks to the sort of verisimilitude I am addressing. The representation of traffic congestion as simply something that must be handled, not eradicated, is a more or less accurate representation of how traffic problems are understood.

38 When disasters are turned completely off—one of the advantages of playing city mayor in a computer simulation—growth of the city continues unfettered by annoying riots or floods.

many peoples' inability to accept those others who are racial or socially different from themselves. Disasters draw a line between elements outside of the order of human social life — most plainly, the eventualities of phenomena proper to nature, like floods, tornados, and earthquakes — and elements tightly bundled to the social experience of a smoothly functioning urbanity invested heavily with a white urban imaginary: industry, commercial business, and productive, prosperous residential lives. From this perspective, airplane crashes and nuclear meltdowns fit more comfortably under the menu of natural disasters insofar as they belong *outside* of an ordered, efficient social structure, which necessarily situates such calamities as contradictory to the desire for an efficient and prosperous urban life. Similarly, riots firmly organize the boundary between the white imaginary and the other. Falling in alongside those eventualities coupled resolutely to nature-as-outsider, riots are carefully and expediently oriented outside the fold of an ordered urban social lifestyle. Monsters, perhaps the most telling disaster, serve as a catalyst for the constitution of otherness in SimCity2000™ to the extent that they suggest both a wrathful supernatural response to the evils of humanity and the wickedness associated with deviation from the norms that structure an ordered social fabric.

Although SimCity2000™ manages a carefully articulated distinction between what counts as a component of the ordered urban experience and what lies outside it, certain contradictions to this order stick out conspicuously. Notably, the apparently white urban imaginary that undergirds the possible SimCity2000™ worlds — complete with bed-and-breakfasts, shopping malls, and private automobiles — belies the experience of anyone who has explored a city, which typically involves a melange of cultural, ethnic, and racial diversity. In this regard, what proves most paradoxical is the simultaneity of such an unrealistically homogenous account of urbanity and the impressions of many players who describe the game as one of the more realistic simulation games they have experienced.[39] Invoking certain key signifiers of salient urban features — features considered too controversial for an explicit accounting — without categorically acknowledging them, the game laminates the connotative aspects of these features onto itself; thus SimCity2000™ invokes traces of a richer, more complete and realistic image of urbanity. Although there are a number of aspects of the game that, when subject to analysis, constitute

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39 In the early 1990s, there was a dialogue amongst players on the Usenet Newsgroup *comp.sys.mac.games* and the electronic newsletter *sim-list* about discussions of the full line of Maxis simulation games. The extent to which SimCity2000™ is accepted as a compelling and utilitarian simulation of urban space is undergirded by its use by some urban planners, both as an experimental and pedogogical tool.

this kind of paradox or contradiction, riots serve as a clear and revealing example of the presence of racial difference through its very absence.

The Virtual Riot

In its constitution of an urban imaginary anchored to a perceivably homogenous, utopic, racially unmarked whiteness, SimCity2000™ distinguishes itself from recent and prominent representations of the city. SimCity2000™ proved an exception to the dearth of habitable visions of urban life in the early 1990s. Following decades of federal neglect, topped off by 12 years of Reagan-Bush, visions of urban living were decidedly bleak. SimCity2000™'s utopia, complete with New Age background music, is simply at odds with the images of urban space produced in popular representational mediums such as near future science fiction film.

Given that most of the constituent elements of what a city means must necessarily be addressed by a simulation that counts as realistic, it is important to consider the peculiar ways in which race figures into SimCity2000™. This is to say that SimCity2000™ does not (and could not and still appear realistic) deny the saliency of racial difference in an urban context, but rather that it apprehensively suggests the contingencies of

race through the possible occurrence of such racially marked contingencies as riots.

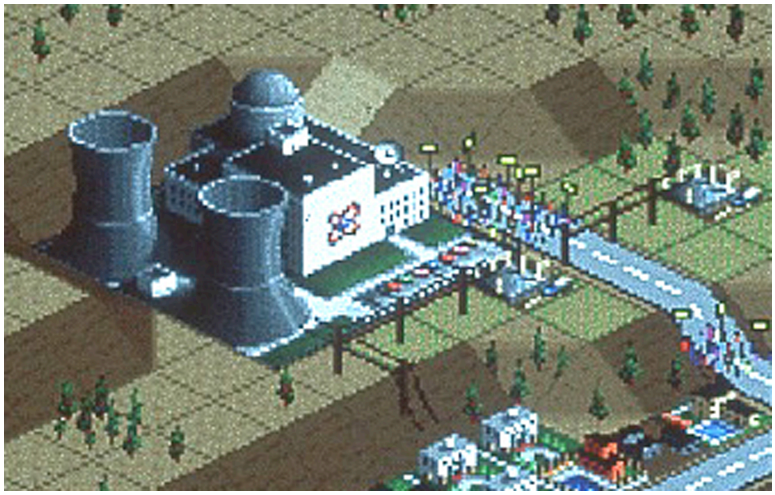

Figure 12 SimCity2000 Detail of a Protest/Riot

When considering the realism of each of the disasters offered in SimCity2000™, riots stand out as particularly dependent on a social and, in the dim shadow of the LA uprisings, a racial contextualization.[40] SimCity2000™, though, offers no explicit acknowledgment of race or ethnicity. Despite the complex associations between race, ethnicity, class and the phenomenon of urban uprisings, riots in SimCity2000™ are explicitly

40 It should be noted that the decision to introduce riots as a disaster was a last-minute one, perhaps, I might speculate, in a suggestive response to the contingencies of the uprisings that flashed across the United States in response to the not-guilty verdicts of the LA police officers accused of beating motorist Rodney King.(Dargahi, p. 282.)

"raceless." It would seem then that in SimCity2000™'s utopian idiom, riots, as long as they are not "race riots," are one of the plausible artifacts of a "realistic" utopia. Of course urban riot *implies* a riot due to racial, ethnic or class strife. This implication is leveraged in the simulation — the explicit acknowledgment of the origins of urban riots need not be made. Such an implication summons forth the rich history and meaning of urban unrest without having to map such meanings directly onto the game.

Presenting riots as divorced from a racial context performs what Kimberlé Crenshaw and Gary Peller call "disaggregation", a "narrative technique that narrows the perception of the range of illegitimate racial power by divorcing particular episodes from their larger social context"(Crenshaw and Peller 1993). Disaggregation, as Crenshaw and Peller describe, was the technique employed by the defense when the video tape of Rodney King being beaten was shown as a sequence of freeze-frames or "isolated stills" that could be "reinterpreted through a benign narrative of justification." In SimCity2000™ a similar sort of re-interpretative strategy is made possible when the riots are given no explicit racial context. The conditions that trigger a riot include high heat, high crime, and high unemployment, all desperate allusions to life in the inner city ghetto. Through the disaggregation of race, the player is able to

construct a more “benign” narrative justification, all the while the specter of a racial context remains implicit.

The meanings of a riot are themselves constructed through ideology, politics and power, all of which are threaded together in a narrative that, for each individual player, invests riots with particular meanings. In the context of SimCity2000™, riots must not mean “race riots” in order that the city simulation count both as pleasant and as a puzzle unhampered by such “insolvable” problems as racial tension. Indeed, when one looks closely at the rioters marching about his or her sim-city, it becomes apparent that the placard-carrying agitators are more properly *protesters*, which suggests remonstrative liberal democratic display, rather than the spontaneity associated with civil unrest in an urban setting. Although the protesters become intemperate and can only be disbanded with the aid of police and fire services, even under the racially marked banner of Riot one must note the manner in which the game insists on anchorage in particular ideologies and values exclusive of an explicit audit of racial difference.

What is important to consider is that the simulation provides a compelling ground upon which to fantasize a hospitable urbanity, and anything that might intervene in the fantasy may be absent-mindedly ignored. So, for instance, if imagining one’s sim-city as harboring a disenfranchised, angry, tense throng of people of color disrupts the

fantasy, the reinterpretation of what the riots might mean (e.g.as simply the outcome of a non-race-specific unemployment) allows the fantasy to continue unabated. This is to say that a specifically utopic fantasy of urban space is precisely that which demands racial and ethnic homogeneity. The most troubling insight is that riots in SimCity2000™, stripped of an important social contextualization, get to count as realistic.

As I have described, part of the uneasy tension around questions of race and ethnicity is precisely that explicit depictions of these categories are avoided. The game yields to *implications* of the racial and ethnic predicament of urban space. Riots in the game, for instance, cannot but be considered as a response to the uprisings following Rodney King, not to mention the long history of urban riots contingent upon the problem of class-based, racial and ethnic strife. Relying on the player's recent experience and knowledge of the racial and ethnic specificity of urban riots allows the game to avoid an explicit acknowledgment of these categories much less than their interaction. This is the situation where the uneasy and nervous tension I am discussing manifests itself. An explicit acknowledgment might be deemed too risky for the designers of SimCity2000™; *implying* the specificity of race and ethnicity allows for simulated riots and, hence, a realistic virtual city.

The Virtual City: Conclusion

Few twentieth century artifacts are as able to cloak the turmoil around race as well as technology, particularly simulation technologies. Revealing the ways in which technology is always already a question of the manufacture of social relations like race, gender, and ethnicity is no easy task as, conceptually, technology is not often understood as one of many analytic tools employed in the interpretation of the very worlds within which these social relations inhere. This interpretive mechanism proper to technology might be understood as "making meaning" insofar as certain technological tools like SimCity2000™, produce renderings of the world that are then interpreted in complex ways by the technology user. These meanings graft onto the user's knowledge about the rendered worlds and, at the human-machine interface where interpretation and meaning-making occurs, the user constructs new and developed stories whose narrative orbit is elliptically bound to the seduction of technology. At the same time that SimCity2000™ restructures the player's knowledge and understanding of city dynamics, the player's prior knowledge of urban space becomes an integral part of shaping the structure and meaning of the simulated city.

In a player's entanglement with a SimCity2000™ simulation, meaning is produced that beyond that which can be created by the logic of a

computer's program. The player's prior assumptions, experiences, understandings of the city are intricately and inextricably weaved amongst the computer code and its "output" manifestations — visual, aural, experiential. My argument has been that *race happens amongst the entanglement of computer code and the player* — this is the place where the city simulation takes on meaning.

In a 1994 article in the *Village Voice*, Mark Schone describes SimCity2000™'s instrumentalized logic as ignoring the contingencies of race (Schone 1994). Although Schone provides a compelling analysis of the ideology that inheres in the game, he does not consider that playing SimCity2000™ might produce other interpretations (or what it might mean to have contrasting interpretations) even as he acknowledges the enormous number of people who play the game. Schone's analysis only considers the logic of the game's programming. In contradiction to this particular point, my argument is that SimCity2000™ only takes on full meaning at the user interface, in the player's engagement where his or her understanding of what the city means fills out the shallow SimCity2000™ narratives of urban riots.

There is an important and necessary mechanism by which race and ethnicity are evoked that requires a particular absent mindedness on the part of the player; a rich analysis of this mechanism would yield important

insights as to the manner in which technologies kin to SimCity2000™ facilitate self-evidently realistic renderings of their virtual worlds. As I have suggested herein, such a mechanism relies on a particular illusion operating between the player and the game, at the interface between the human and the machine. The crucial illusion facilitated by these kinds of technologies is *not* their ability to render the object of analysis in a sufficiently complex and hence "accurate" or "realistic" manner. Rather, the illusion proper to the technosemiotic workstation consists in a mechanism of displacement, for instance, the displacement of racial markings onto other things in such a way as to present race, a necessary component of the city, through its absence. In SimCity2000™, this is the illusion that undergirds the simulation's verisimilitude.

It is from this perspective that one can fruitfully determine the ideological stakes of the technosemiotic workstation. Too often in the analysis of virtual worlds technologies criticism focuses on the way a kind of "false consciousness" is constructed, whereby the virtual world represents a masked and mediated version of "real social relations." Schone's analysis of SimCity2000™ is an example of this kind of analytic tack, wherein the problematic proper to virtual realities is their ability to insidiously mask the "real" world. Although this approach reveals the apparent contradictions in the gap between what the virtual world

describes and what we “really” know to be “true," what remains wanting is an analysis of why, specifically, people rely on, actively engage in, and, particularly in the case of SimCity2000™, enjoy such virtual worlds. What is suggested in this essay is the manner in which SimCity2000™ provides a space that accommodates the fantasy of a living space free of the contradictions that inhere in the city. These contradictions and inconsistencies may be explicitly overlooked in the interests of expediently organizing the enjoyable experience of imagining a city unhindered by the complexities associated with racial difference.

Herein lies the ideology that undergirds the “reality effect” of SimCity2000™: despite the fact that the game avoids a *denotative* nod to racial or ethnic difference, there exist enough game elements to compel the player to absent-mindedly *connote* the existence of racial difference such that the game appears to be an accurate and “realistic” city simulation. In other words, the game avoids a direct confrontation with the issue of urban racial problems, yet maintains its urban verisimilitude by oblique references to the possibility that such problems lie latent within the structure of the game. The fatal flaw in analyses of “virtual” technologies occurs in Schone’s chapter: an emphasis is placed on the machine side of the human-machine interface, the moment before a player is allowed to make some sense of the game. Such analyses highlight the

ideology of a purely artifactual structure — that of a piece of computer code — rather than the content of thought that leads the player to produce meaning. In SimCity2000™ it is the player's engagement with the program that reveals the ideology supporting the game's realistic qualities. While Schone maintains that the game is incomplete for its failure to account for race, I would hold fast to the argument that the game must be complete, if only because it appears so to an enormous number of those who play it. Still, and despite the compelling verisimilitude of the game, SimCity2000™'s completeness lies on fissured ground to the extent that it does not address racial difference in a manner as forthrightly as many of us would desire. But one can *not* say that it simply and plainly *misses* the category of race; race is misplaced, yet latent.

Thus, the ideology that undergirds the almost pernicious "reality effect" of SimCity2000™ is such that the game "presents" a totality set on effacing the traces of its own possibility, rather than, as Schone contends, a flawed or incomplete partiality that overlooks the totality of social relations, including those introduced by racial difference. In other words, SimCity2000™'s avoidance of a direct and forthright articulation of race in an urban context would seem to precipitate its own failure as an accurate

simulation of the city.[41] Yet for many it does count as an accurate simulation and, hence, maintains its structural completeness. From this perspective the deleterious side of the game, the aspect that turns its back on the struggles against racism, is its ability to quietly and effectively erase the category of racial difference while still appearing realistic.

Finally then, the ideology of SimCity2000™ resides within its mechanism of making a city that facilitates the *possibility* of its own unmaking while still appearing to be an accurate and realistic portrayal of the city. Such an unmaking would obtain were basic social "antagonisms" truly not featured in any guise or representation (e.g., if there were no traffic, riots, disasters, no police to combat crime, etc.) Were no social antagonisms present, the game would collapse upon itself as there would be no challenge; indeed, it would be impossible to describe such an antagonism-free structure as a city. If, according to Schone's analysis, SimCity2000™ is structurally distinct from what one knows to be the "real" city, why do players engross themselves with it as if it were like a "real" city? Why doesn't SimCity2000™ fall apart under the weight of its own flaws and inconsistencies? Because of the symptomatic traces of antagonism—the

41 Schone takes to the extreme the game's *possible* failure and argues that its attempt to simulate a city fails. Adding some precision to his analysis, I might say that it is not the *game's* failure (as any discussion of a game must necessarily take stock of the player's engagement), but the actual program code that fails to compile the feature of race.

traces of racial difference invoked through their effacement, through their absence; thus, through the long shadow cast by riots, the player absent-mindedly maintains the structure of the sim-city in such a way as to make it appear homologous to the antagonism-fraught "real" city.

Throughout this chapter, a distinction is implied between those technological artifacts that are limited in the scope of their cultural import and those that intervene resoundingly in important debates where such antagonism puts lives on the line. Hidden within this analysis is an argument stating the impracticality of considering technology as a disinterested window through which objective interpretation of the world may be produced. Through the trope of the technosemiotic workstation, technology must be thought of as a weaving together of the technology user's knowledge — one's experiences, politics and desires — that, finally, creates worlds. But it is not simply the large-scale "big science" technologies — such as the Space Shuttle, Biosphere II, or the Stealth bomber — that must be considered as producers of worldly meanings. To a significant extent cultural artifacts like video games, which have become *de facto* trappings of the living room entertainment center, are both technologies *and* producers of cultural meaning. Which is to say that video games, of which SimCity2000™ is but one example, cannot be considered as simply diversions or, in more normative terms, just toys. Video games are

complex cultural artifacts consumed by huge numbers of people from an incredibly large range of socioeconomic backgrounds.42 To consider video games as artifacts that produce culture is to acknowledge that they exist alongside other important sites of cultural production, including the large percentage of homes that have televisions, lobbies of movie theaters, shopping malls, and neighborhood hangouts, to name but a few sites. All of these sites have been considered worthy of sophisticated cultural analysis, although at one time they were seen as less than "sophisticated." But when what counts as a video game is a "realistic" simulation of the city, or when we see video games authored by Daryl Gates, the ex-Chief of Police of Los Angeles, it no longer makes sense to consider such things as mere toys unable to produce worldly meaning.[43]

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42 While scholars of popular culture rushed to assess the latent meaning in the Hollywood movie mega-hits of this decade, they evidently missed another contender in the prize fight for the world's entertainment dollar: the video game industry quietly lapped the movie box office take by a cool $1 billion, cresting at a 1993 year-end gross of $6.5 billion in the Unites States, fully one quarter of the entertainment industry's revenues.

43 I am referring to a game put out by Sierra™ called "Daryl Gates: Police Quest IV, Open Season" which is the focal point of another analysis I have done on violence in video games. In Police Quest™ the player assumes the role of a homicide detective investigating a series of homicides against police officers. Gates was actually an instrumental member of the development team in several respects. He helped author the narrative of the game, along with a producer from the reality television show, "America's Most Wanted." Gates also coached the video game's actors and actresses (the game includes actual video recordings integrated in the various scenes) in proper police stances and so forth. Also, and perhaps most interesting in the context of the analysis of SimCity2000™'s realistic qualities, Gates submitted the full meaning of his name as the brutally pragmatic champion of the burdened officer of the law.

Conclusion

There's a cartoon scene involving a zealous, wily Coyote and a far more clever Road Runner. It is the Coyote's nature to chase the Road Runner, presumably to eat him for dinner. But, despite all his efforts and all his machinations, the Road Runner eludes his grasp, often with the gravest of consequences leveled upon the Coyote. In one funny scene, the chase approaches and continues past the edge of a precipitous desert cliff. So caught up are the two in the chase that they hurtle forward, out in mid-air, suspended hundreds of feet above the ground. Gradually, they loose their forward momentum and come to a dead stop. The Coyote screws his face in a look of miserable inadequacy, plummets like a rock, and crashes with a distant thump on the canyon floor. But the Road Runner remains suspended. For his seemingly magical abilities, he explains that he never learned about gravity.

There is one comment relevant to this dissertation to be made about this clever sight-gag, which is the suggestion that *not* having learned a fact-of-nature results in the complete evaporation of the reality of that fact. The

punch line is that the matter-of-fact and its consequences attain their reality effect only through an accumulation of knowledge about it, perhaps learning about the matter-of-fact through school or an article in a science magazine. Had the Road Runner paid more attention in his high school science class, he would know the potential hazards of standing in mid-air. Of course, this is the joke. But, had the Road Runner fallen, at least he would be relieved of the Coyote's humiliation who, knowing about gravity, must suffer the indignity of losing the chase again.

The Coyote's humiliation is that he should have known better. This alludes to the serious side of this joke. Of course failing to know about some technoscience fact — like gravity — does not mean it and its effects do not exist in reality. What *is* important to appreciate is that *not* knowing about some fact means that it can take no part in other kinds of social endeavors. This is what technoscience is, and what it does quite wonderfully. It has the remarkable ability to materialize speculation, make real what is a mere idea, and introduce what was once unknowable into the world of other social beings. This is the Reality Effect.

I might describe the Road Runner's clever ruse as the inverse of the Reality Effect of Technoscience in that he manages to de-materialize an already established "fact-of-nature." His lack of knowledge erases the effects that would occur had one only known. This little bit of cartoon

silliness pokes fun at the key question in this dissertation: how does techno-scientific knowledge become materialized social, cultural and political reality? I set out to address this question through three technoscientific artifacts in which I had some familiarity and that offer the appropriate scholarly rigor while still offering some fun for the task.

The three artifacts — the computer-based simulation game SimCity2000™, the special effects in the film *Jurassic Park*, and Virtual Reality technology — served as points of entry for working through and discussing the significance of this question in specific contexts.

The chapter titled *Getting the Reality You Deserve* relates SimCity2000™ to the representation of urban space and the racial politics therein. It arose from a research project on which my dissertation chair and mentor Professor Donna Haraway was embarking during the summer preceding the first year of my doctoral work. Computer-based simulation games held a particular fascination for me for quite a long time, which I can identify by two distinct projects in which I was involved.

The first was one of the first computer program I personally authored when I was 13, programming on a computer called the TRS-80, manufactured by the Tandy Corporation and sold by RadioShack in the late 1970s and 1980s. The program I wrote was what can only be referred to as a battle simulation game that pitted myself as the human player against

the computer, where outcomes of “engagements” were determined by a network of *if*/*then*/*else* logical decision points, seasoned with random factors to account for the vagaries of the real world. For me at this time, a computer represented an instrument in which an entire world could be represented, even if one had not significantly mastered the art of computer programming. But it was more than just the capacity of a computer to store lots of information, or to handle very many variables with ease. The computer language with which I was able to direct the flow of a simulation created a context for authoring a world. I was crafting, narrating and building a world for which I was the owner. It mattered little that all worldly variables were not accounted for, nor that my crude algorithms ham-handedly calculated rough probabilities that, for instance, decided whether the computer-controlled enemies would mount an attack in the virtual simulated world. These “deficiencies” in taking account of the incalculable subtlety of the “real” world were gaps filled in by what my imagination provided based on my own boyhood preoccupation with playing an army general. Of course the TRS-80 is directly involved in this process of world building, as an agent that makes such an activity possible, as well as an agent that constrains the realm of possible worlds that can be built.

The second project occurred at a time when I was part of an engineering team at a company called Data General in the late 1980s. The task of this

team was to help support the software-based simulation of a piece of hardware — a new computer microprocessor. The engineering problem we addressed was one of verifying that the microprocessor design would perform as it was specified "on paper." In other words, prior to actually manufacturing the microprocessor hardware, it was the task of the simulation team to "author", using a special software language, the design of the microprocessor in such a way as to test that its functionality would be as specified. The practical necessity of this was to make ourselves as certain as we could be that when it came to the very expensive task of physically fabricating the new microprocessor, design flaws would be minimized to the greatest degree possible. In hindsight, we were working through an ontological problem. How could we be sure that this microprocessor was itself as defined by reams of engineering specifications? Simulation was our protocol for this ontological verification. This simulation consisted of using a software language running on a computer (which itself contained a microprocessor), in order to verify the *new* microprocessor as correct and itself as defined by the engineering specifications. That is, we and our software tools were to verify that it would be what the engineering specifications said it was to be.

These experiences represent two of the more provocative motivations behind computer-based simulation. In the case of my modest computer

strategy game, simulation became a way to articulate the actions, experiences and semantics of a world I myself authored. For the engineering problem of verifying the claims on paper we were trying to make about a microprocessor, whose very first batch of test units would cost many millions of dollars to produce, simulation tools became a kind of technological inquisitor, probing the machine to fess up about who it would be, and prod it to behave correctly according to the edicts contained in our engineering specifications.

Investigating SimCity2000™ was a means for me to make some sense of these two important aspects of computer-based simulation. Even in the early versions of the SimCity™ line of games, it was clear that, more than anything, it was an authoring palette for the player to construct a visual story that represented the kinds of lived environments a player imagined. This ability to render what one imagines proves to be a significant draw for the game's enthusiasts. In more recent iterations of the game, the range of opportunities to author worlds has expanded with the addition of software that allows one to actually design the visual look of buildings and other structures that appear in the game, and share the simulated city-worlds that one creates through an exchange network made available on the Internet.

Through SimCity2000™ one learns about the composition and nature of a lived space like the city and other habitats. This capacity of computer-based simulation to provide insights into the essence of the thing the simulation represents is a marvelous aspect of the technology. Both the wonder of seeing a working simulation — particularly one as visually stunning and nuanced as SimCity2000™ and its later incarnations — and the rewarding and sometimes frustrating challenge of managing that simulation are what drew me to study this game.

Various kinds of authoring practices are the motivating themes of all three chapters. In the chapter *The Special Effect of Technoscience* my goal was to research the ways in which various human and non-human agents operate amongst each other so as to produce a technoscience world in which the existence of dinosaurs is a reality. My intention was to do so without resorting to an approach that dismisses technoscience as mere story telling, which would elide its important, rigorous and challenging work of knowledge making. Rather, I meant to reveal the significant and hard work undertaken by many sophisticated, clever, well-trained intelligent agents — cutting-edge computers, visual artists, scientists, revolutionary software algorithms, laboratory and museum technicians, editors of scientific and popular journals, gene sequencing devices,

marketing executives, science writers — that goes into establishing the reality of genetically re-animated dinosaurs.

Part of what motivated this investigation was my own captivation with both film special effects and technoscience for their stunning world-making capabilities. It was an opportunity to talk to special effects artists and engineers, review the history and literature pertinent to the field, and so forth. Much like the chapter on SimCity2000™, I found I could use something that was not too esoteric as a point of entry for describing, in this case, the hands-on craftwork that goes into making a fictional or factual technoscience reality.

In these two chapters, I was drawn to the aforementioned authoring practices. Each behaves as a kind of technological affordance through which it becomes possible to produce and experience representations of two sorts of worlds: in one case, cities, and in the other, a fictional science park island populated by spectacular dinosaurs. In both cases, my attention was focused on how meaning was made through the authoring tools. What did one learn or discover about them? How did one's prior knowledge shape and alter the meaning making process? How does the backstage work — whether programming a computer simulation or making a science-fiction film — enforce a context within which certain knowledges are produced over others?

All of these questions relate to the specific kinds of knowledge and meaning making practices that obtain within these two idioms. The subtitles of these chapters could be "Learning About Cities Through Simulation Technology", or "Popular Understanding of Genetic Science as Authored by the *Jurassic Park* Film Production and Marketing Teams." If I were to give my third chapter, *The Virtual Reality Effect*, a subtitle it would be something closer to "A Field Guide for Keeping It Real."

In *The Virtual Reality Effect* I sought to understand how a technology becomes "real" as indicated by its "entanglement" in the knotted, messy, contingent web of the world in which social beings exist. I also investigate how a technology sustains the effect of its reality. As a counterpoint to the epistemological questions of the previous two chapters, *The Virtual Reality Effect* investigates an important ontological question: how is it that a technology becomes a real, bona-fide social artifact? As a technology moves from the spark of an idea into the realm of public discourse, what is it becoming, how does it become what it is, and how does it sustain or loose its social, political or cultural significance?

In this chapter, I came to appreciate technoscience as something that is fully dynamic. *Technoscience* came to mean knowledge, insight, practical craftwork, expertise, and the capacity and power to bring about change and create useful representations, and such moving through networks in

which ideas were exchanged, conversations took place, and concerns and accusations were leveled. Technoscience is all of this occurring amongst agents both human and non-human.

My Master's Thesis from the University of Washington (Bleecker 1992) is a precursor to *The Virtual Reality Effect* chapter. In that earlier project, I made a broad review of the popular representation of VR, surveyed its technological antecedents, and addressed the way the technology and others closely related were employed in the "first" Gulf War, which occurred during the time of I was writing my master's thesis. Although I was involved in performing technical duties at a lab developing VR technology, it felt as though it were the ideal test bed through which to survey the questions it raises pertaining to visual representation. Most of that project was concerned with presenting ways in which certain practice cultures were using, or hoped to use, VR or related technologies specifically for its novel imaging and visualization capabilities. For instance, for the "VR artist" it became a way to author a world in which a visitor to that world would feel immersed in the artist-built experience. Or, the modern fighter pilot in the "first" and "second" Gulf War could train and practice their missions using VR and similar technologies. *The Virtual Reality Effect* revisits VR 10 years later and asks a different question — how did VR become what it was? What is the technoscience of VR? How does its

social, cultural and political meaning and consequences change shape through institutions of power and influence?

That project was my primary motivation for this dissertation, and for my ongoing desire to understand the thick, complex, multivalent, social, political and cultural character of technoscience.

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