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RISK COMPLEX: Preparing the Body for New Hardware

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RISK COMPLEX: Preparing the Body for New Hardware

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ABSTRACT

Today’s citizen navigates a vast society engaged in the explicit production of wealth and implicit creation of risks. Each transaction inherently increases both wealth and risk within the system. In 1986 Ulrich Beck proposed an explanation for this emerging post modern condition. His work, Risk Society: Towards a New Modernity, sketches the outlines of a society driven by the management and reduction of risk. Beck recognizes that a society will reach a point where efforts to increase wealth will be superseded by efforts to avoid risk. The organization of society will shift from the production and distribution of goods and services, to the redistribution and mitigation of risk. Through play activities the RISK COMPLEX will prepare citizens for the risk society.

The RISK COMPLEX seeks to provide a space that empowers the individual within the complicated web of risk connections. Visitors to the RISK COMPLEX learn about methods and technologies that allow them to monitor their individual risk. In the same way a child uses play to simulate danger and overcome it, the RISK COMPLEX uses play to empower individuals within the risk society. Sited on Coney Island the RISK COMPLEX taps into the historical playscape that includes the beach and boardwalk. The architecture links to the existing amusement infrastructure but seeks to carve out a separate matrix of simulated risks that individuals can engage.
RISK COMPLEX: Preparing the Body for New Hardware

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INTRODUCTION

“through the exponentially growing productive forces in the modernization process, hazards and potential threats have been unleashed to an extent previously unknown”

Ulrich Beck
*Risk Society: Towards a New Modernity*
Today's citizen navigates a vast society engaged in the explicit production of wealth and implicit creation of risks. Each transaction inherently increases both wealth and risk within the system. In 1986 Ulrich Beck proposed an explanation for the emerging post modern condition. His work, *Risk Society: Towards a New Modernity*, sketches the outlines of a society driven by the management and reduction of risk. Beck recognizes that at some point efforts to increase wealth will be superseded by efforts to avoid risk. The organization of society will shift from the production and distribution of goods and services, to the redistribution and mitigation of risk. In other words, the sociological milieu will become so risk laden that transactions will focus around individuals who seek to increase their security. Beck terms this new condition reflexive modernism and argues today's society has entered this post-modern state.

At the individual level consumption revolves around issues of health. Groups are defined by their new reflexive behaviors. Some refuse vaccination of their children suspecting a conspiratorial risk, others buy massive SUVs they perceive to protect their children, while others fret about medications, genetically engineered food, nuclear power or illegal immigrants carrying disease. All consumptive behavior centers around reactions to risks generated by the modern condition.

Beck, Ulrich
*Risk society; towards a new modernity*
translated by Mark Ritter.
London ; Newbury Park, CA :
The MODERN PROMISE understands the world as a series of neatly divided zones.

During MODERN BREAKDOWN we recognize that activity zones are not so easily separated. The byproducts of production inevitably penetrate other activity zones.

RISKS

TV, Videos, Internet and other media bring leisure into the living space. By products of modern society invade living space. These include lead paint, air pollution, contaminated water, and radiation leaks. The "natural" is reconfigured as fragile compared to prior understandings of the "wild." Parks become zones for leisure but also conservation zones. Pollutants and physical waste threaten these areas in often unpredictable ways (erosion, climate change, invasive species).

Production modes and byproducts push into all other zones. Pollutants degrade the environment. New products alter living patterns changing eating, sleeping and child rearing. "Themed Shopping" transforms shopping into a leisure activity.

MITIGATION

The RISK SOCIETY can either attempt to restore the zones defined by methods of production via mitigation efforts...

... or concede zonal organization in favor of a heterogenous arrangement.

Overlapping region of risk and mitigation managed at the individual level.
The RISK COMPLEX seeks to provide a space that empowers the individual within this complicated web of risk connections. Visitors to the RISK COMPLEX learn about methods and technologies that allow them to monitor their individual risk. In the same way a child uses play to simulate danger and overcome it, the RISK COMPLEX uses play to empower individuals within the risk society. Sited on Coney Island the RISK COMPLEX taps into the historical playscape that includes the beach and boardwalk. The architecture links to the existing amusement infrastructure but seeks to carve out a separate matrix of simulated risks that individuals can engage.

Beck’s theory presumes a historical progression from a premodern condition through the post-modern “risk society” condition. Viewed through the lens of risk, the modernization of the industrial age simply served to produce material goods that reduced people’s exposure to risk. With the maturing of industrial processes workers and consumers began to recognize that the modern promise was not always kept. Called by many names (side effects, by products, externalities, etc) the risks associated with production become overwhelming. Society begins to reorient itself toward the mitigation of these side effects.
THE MODERN PROMISE
THE PRODUCTION OF MATERIAL GOODS WILL IMPROVE SOCIETY

ARCHITECTURAL DESIGN DRAWN FROM MODES OF PRODUCTION WILL IMPROVE LIVING AND WORKING

MODERN BREAKDOWN
THE BYPRODUCTS OF PRODUCTION CAUSE IRREPARABLE HARM TO SOCIETY

ARCHITECTURE BASED ON NON INDUSTRIAL MODES OF PRODUCTION WILL IMPROVE LIVES.

RISK SOCIETY
THE MITIGATION OF RISKY BYPRODUCTS IMPROVES SOCIETY

ARCHITECTURES THAT REFLECT MODES OF OBSERVATION, TESTING AND MONITORING WILL IMPROVE LIVES.
The characterization of risk can be separated into direct and pervasive risk. Generally direct risk is any risk that impacts the body directly and can be sensed directly. These might include weather, predators, starvation, fire, and flood. The modern promise intends to reduce the impact of these risks through technological means.

Pervasive risks are characterized by their inability to be sensed by the body. These risks require abstract reasoning, sensing and analysis to be understood. Many modern health risks fit this pattern including cardiovascular disease, and diabetes. Environmental concerns including air and water pollution, chemical toxins and global climate change are all pervasive risks.

Through modernization direct risk has been reduced. Yet, this has spurred a growth in pervasive risks.
The MODERN PROMISE attempts to counteract direct risks.

**Direct Risk**
Defined by obvious physical impact. The risk is vector-like, acting in clear paths and avoidance requires agility, quick reflexes and strength. The scale and force of direct risk is easily assessed, but often difficult to avoid.
Examples: Exposure, Predators, Enemies, Starvation, Drought, etc.

During MODERN BREAKDOWN production byproducts create pervasive risks.

**Pervasive Risk**
Defined by impacts felt over time and are difficult to diagnose, locate and identify. Avoidance requires diligence, attentiveness, pattern recognition and specific knowledge. The risk is undefined, dispersed and exists at small and large scales.
Examples: Air pollution, water pollution, tainted foods, global climate change.

In the RISK SOCIETY we actively work to mitigate both direct and pervasive risks.

**Mitigation**
Required persistent, educated individuals to investigate, invent and produce methods to mitigate risks.
Examples: Organic farmers, Green Architects, Environmental Scientists, Policy Makers.

MODERNIZATION HAS CONVERTED DIRECT RISK TO PERVERSIVE RISK
PROBLEM

In biological and evolutionary terms, the conversion of risk from direct to pervasive was almost instantaneous. It can be argued that people are inherently unable to perceive risk in anything but direct form. Any abstraction of risk drastically de-emphasizes its importance, especially in reference to any residual direct risks in the environment. As a result, facts, figures and expert testimony do not impact risk perception.

Our inherent risk perception path travels directly through the body where the senses register a risk or threat and signal the need to react.
In order to close the gap between pervasive risk and the body's sensing abilities researchers have developed sense extending devices. Each of these examples provides the user with direct feedback in response to some abstract, pervasive risk factor.

In the risk society, devices will become increasingly important to the perception of risk. These devices will proliferate and be integrated into our daily lives.
"Drivers who sign up for MyRate will install a small wireless device in their cars that transmits to Progressive not just how many miles they drive but also when those miles are driven and, to some extent, how they are driven: the device measures the car’s speed every second, from which Progressive can derive acceleration and braking behavior. Which means that Progressive will not only be able to charge drivers for the actual miles they consume but will also better assess the true risk of each driver."
"Thighmaster"
ANMNIA RUST- COMPUTING CULTURE GROUP
MIT MEDIA LAB

THE THIGHMASTER MONITORS ENERGY
CONSUMPTION AND APPLIES ADDITIONAL
PRESSURE IF TOO MUCH IS BEING CONSUMED

http://web.media.mit.edu/~rusti/
thighmaster/
RISK PERCEPTION AND ACTUAL HAZARDS

HERTRICH PROPOSES A DEVICE THAT ELECTRICALLY STIMULATES THE BACK OF THE NECK IN ACCORDANCE WITH CERTAIN RISKS. SHE HOPES TO CLOSE THE GAP BETWEEN PERCEIVED AND ACTUAL HAZARDS.

Play has always served as a simulation of reality that enables players to build skills. Physical play addresses direct risks for humans and other animals. Through the modern era, amusement park play served to habituate people to the power of machines. The risk society will involve play with risk sensing devices.
TRAINING FOR DIRECT RISKS

- **GROUND RULES**: ADDRESSING RISK POTENTIAL LOSS
- **NARRATIVE BASED ROLE**: ROLE BASED EXPECTATIONS OF SUCCESS OR FAILURE
  
  **PLAY**
  - TAG, DUCK DUCK GOOSE, HIDE AND SEEK, ETC.
  
  **SKILLS**
  - CALIBRATED TO THE DIRECT PHYSICAL RISKS THAT CAN BE ADDRESSED WITH THE BODY

TRAINING FOR PRODUCTION

- **MECHANICAL RULES**: DETERMINES ROLES AND RISKS BOUNDED TO BODY
  
  **RIDES**
  - STEEPELECHASE, CYCLOMEN, ROLLERCOASTERS, ETC.
  
  **SKILLS**
  - CALIBRATED TO THE DIRECT PHYSICAL RISKS THAT ARISE FROM MACHINE ORIENTED PRODUCTION

TRAINING FOR THE RISK SOCIETY

- **DEVICE SCOPE**: WHAT IS BEING MEASURED, BOUNDED RISK
  
  **RISK BALANCING**
  - GAME SHOWS, VIDEO GAMES, GAMBLING
  
  **SKILLS**
  - CALIBRATED TO THE REFLECTIVE MONITORING NEEDED IN THE RISK SOCIETY

- **OPERATIONAL ROLE**: UNDERSTANDING OF WHAT ROLE ENHANCED RISK EXPOSURES
SITE CONTEXT

“The strategies and mechanisms that later shape Manhattan are tested in the laboratory of Coney Island before they finally leap toward the larger island. Coney Island is a fetal Manhattan.”

Rem Koolhaas
Coney Island: The Technology of the Fantastic
from Delirious New York
SITED ON CONEY ISLAND
Koolhaas finds Coney Island a breeding ground for technologies that would make urban living possible at increased densities. In *Coney Island: The Technology of the Fantastic* he writes, “The inordinate number of people assembling on the inadequate acreage, ostensibly seeking confrontation with the reality of the elements ... demands the systematic conversion of nature into a technical service.” Koolhaas argues that a desire for sun, wind, sand and water combined with sheer human density produced new uses for technologies. These include electrical lighting, ventilation, air conditioning and elevators which would become the building blocks for Manhattan’s new skyline. And, “within a decade they [had] invented and established an urbanism based on The Technology of the Fantastic: a permanent conspiracy against the realities of the external world” (Koolhaas, 61).

Ever more productive and effective technologies propel this urbanism through the “modern” period creating the vast urban zones that most humans now inhabit. Concepts of efficiency, standardization, “economies of scale,” and segmentation infect the heterogeneous urbanism identified by Koolhaas in turn of the century Coney Island. Not only does Coney Island serve as a urban laboratory, incubating and fostering new technologies and modes of living, but the island also served to habituate the populace to the new power of machines.

Coney Island's myriad amusements entertained and taught visitors about the developing relationships between the body and the machine.

The human roulette wheel and other amusements revealed the extent of centrifugal force that machines could produce. The Loop the Loop design was so misunderstood that it produced an extremely dangerous twelve times the force of gravity on riders. Many riders were seriously injured prompting the closing of the feature.

The Steeplechase amusement used mechanical horses that travelled around a metal track. Each of these amusements habituated the public to the power of machines in a developing industrial society.

The RISK COMPLEX seeks to use this precedent, learning and habituation through play, to teach and empower people within the risk society.
Human Roulette Wheel, Steeplechase Park
Image from Library of Congress Digital Collection
http://hdl.loc.gov/loc.pnp/cph.3c15623

Loop the Loop
Image from Library of Congress Digital Collection
http://hdl.loc.gov/loc.pnp/det.4a05650

The Steeplechase
Image courtesy of history.amusement-parks.com
http://history.amusement-parks.com/Steeplechase/Steeplechase%20Ride/steeplechaseride3.jpg
The millions of visitors who flooded to Coney Island on summer days packed the beaches, bath houses and amusements. The sheer density of the seething crowd drives Koolhaas’ thesis.

Rem Koolhaas identified Coney Island as a zone of technological innovation that produced the driving forces for Manhattans skyline in. With the fires that consumed many amusements in the early 20th century, Coney Island suffered a slow decline. Though recognized for it’s history, the decrepit run down state of the area suggests a new thinking is needed. Recent zoning changes (November, 2007) proposed by the NYC Department of Planning seek to spur development of several high rise towers surrounding a revamped amusement park on Coney Island.

New York City Department of City Planning
Coney Island Comprehensive Rezoning Plan

An analysis of risk on the site reveals a pocket devoid of the typical urban concerns. The analysis was gathered from census data from 2000.

The RISK COMPLEX benefits from being sited in a low risk environment. Learning via play requires a safe place.
RISK COMPLEX

SITE

ACCIDENT/FIRE RISK

CRIME RISK

ECONOMIC RISK

ENVIRONMENTAL RISK

HEALTH RISK

BASED ON AGE AND CENSUS

LOWEST AGES = HIGH RISK

HIGHEST AGES = LOW RISK

COMPOSITE RISK ZONES

RISK COMPLEX SITE

ACCIDENT/FIRE RISK

CRIME RISK

ECONOMIC RISK

ENVIRONMENTAL RISK

HEALTH RISK
The state and city plan $2.5 billion in investment in collaboration with private developers over the next ten years. The process will begin with a rezoning plan. An official entertainment district will be codified and developed in conjunction with new retail and residential development.

The RISK COMPLEX is sited within the new entertainment district.
Available from NYC Department of City Planning

Coney Island Comprehensive Rezoning Plan

As the government assumes more responsibility for insuring people's health, knowledge of risk behavior becomes vital. This thesis presumes the State of New York has instituted a universal health care plan similar to Massachusetts'. Though a private insurance company could play the same role, the existing public investment in the redevelopment of Coney Island makes the State a logical client. The state would be able to improve their understanding of the insurance pool by owning the RISK COMPLEX.

The risk complex will deploy the most advanced monitoring technologies to understand people's behavioral attitudes toward risk. At the same time an exciting amusement center will help revitalize the area.

Play activities not only teach, but through monitoring devices, allow for a deeper understanding of risk behavior.
Jumping
- complete exposure
- weightless
- vertical orientation
Running
- frontal exposure
- asymmetrical contact at discrete point
- vertical orientation
Climbing
- one sided exposure
- asymmetrical contact at discrete points
- vertical orientation
Swimming
- complete exposure
- contact across body surface
- horizontal orientation
Multipurpose
dance, sparring, jumping, walking
- three sided exposure
- symmetrical contact at discrete points
- vertical orientation
Virtual Reality Games
- complete simulated exposure
- symmetrical contact at discrete points
- simulated contact
- vertical orientation
DESIGN SEQUENCE

The RISK COMPLEX seeks to build both the physical skills needed to counteract direct risk and the device oriented skills required to meet today’s pervasive risks. This is resolved programmatically by two major spaces.
PLACE PHYSICAL AND DEVICE PLAYSCAPE ON SITE

MATCH PHYSICAL PLAYSCAPE WITH EXISTING BEACH AND BOARDWALK
CONSIDER CIRCULATION FROM BOARDWALK AND SUBWAY FOOT TRAFFIC WHILE PLACING ELEMENTS

SUBDIVIDE DEVICE PLAYSCAPE
DEFORM SUBDIVISION TO ACCOMMODATE STRUCTURAL AND SPACE VARIATION NEEDS
The physical playscape and device playscape are linked both conceptually and literally by three themes. The elevation of the device playscape plays several roles. Not only does it serve to separate the two spaces, but it also creates a visual spectacle that attracts visitors from across the island. Also, the elevated plane of ‘pods’ lends a monumental quality to the building that harkens back to Rem Koolhaas’ semi-utopian understanding of Coney Island. If the island can be seen as a broadcasting force of urbanism, then the new urbanism of the risk society deserves an emblematic icon.

The ANALYSIS leg of the building houses the scientists and analysts who work to better understand risk behavior.

The BODY leg houses all program functions related to servicing the body.

DEVICES provides a circulatory connection to the device playscape.
GAME BOUNDARY

ANALYSIS

OFFICES
LABORATORY

DATA STORAGE

BODY

LOCKERS AND
REST ROOMS

EATING

DEVICES

DEVICE SALES

DEVICE ISSUED/
RETURNED

DEVICE PLAYSCAPE

PHYSICAL PLAYSCAPE

CLIMBING TERRAIN

WAVE POOL

BODY

LOCKERS AND
REST ROOMS

EATING

DEVICES

DEVICE SALES

DEVICE ISSUED/
RETURNED

DEVICES PLAYSCAPE
### PHYSICAL PLAYSCAPE

<table>
<thead>
<tr>
<th>Feature</th>
<th>Dimensions</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave Pool</td>
<td>220' x 80' ~20,000 SF</td>
<td>400-500 people</td>
</tr>
<tr>
<td>Climbing Terrain/Wall</td>
<td>220' x 35' high</td>
<td>20-30 people</td>
</tr>
<tr>
<td>Sunbathing/Artificial Beach</td>
<td>230' x 80' ~15,000 SF</td>
<td>800-900 people</td>
</tr>
<tr>
<td>Open Plaza</td>
<td>220' x 130'</td>
<td>800-900 people</td>
</tr>
</tbody>
</table>

### DEVICE PLAYSCAPE

#### SINGLE USER PODS
- VR flight/space flight games
- Immersive environment games (Doom, Grand Theft Auto, etc.)

#### SMALL GROUP PODS
- Family and Friends
  - 2-5 people
  - Group VR games (submarine/ship's crew)
  - Eating
  - Karaoke
  - Wii type games (bodily interaction)

#### LARGE GROUP PODS
- Institutional/Educational Visitors
  - 5-20 people
  - Small performances
  - Educational presentations
  - Health training
  - Hologram games
  - Magic shows
  - Robot demonstrations/training

### BODY

<table>
<thead>
<tr>
<th>Facility</th>
<th>Dimensions</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concessions</td>
<td>50' x 25'</td>
<td>400 hotdogs/hr</td>
</tr>
<tr>
<td>Changing Facilities</td>
<td>4' x 7'</td>
<td>50 units</td>
</tr>
<tr>
<td>Public Toilets</td>
<td>3' x 7'</td>
<td>50 units</td>
</tr>
<tr>
<td>Public Showers</td>
<td>3' x 7'</td>
<td>40 units</td>
</tr>
<tr>
<td>Destination Dining</td>
<td>50' x 25'</td>
<td>150-200 people</td>
</tr>
</tbody>
</table>

### DEVICES

<table>
<thead>
<tr>
<th>Device</th>
<th>Dimensions</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device Sales</td>
<td>70' x 100'</td>
<td>~7000SF</td>
</tr>
<tr>
<td>Device Distribution</td>
<td>60' x 100'</td>
<td>~6000SF</td>
</tr>
</tbody>
</table>

### ANALYSIS

<table>
<thead>
<tr>
<th>Facility</th>
<th>Dimensions</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory/Pod Assembly</td>
<td>35' x 170' ~6000SF</td>
<td></td>
</tr>
<tr>
<td>Research Office Space</td>
<td>35' x 170' x 3 ~ 18,000 SF</td>
<td>40-50 researchers</td>
</tr>
<tr>
<td>Data Storage</td>
<td>35' x 170' ~6000SF</td>
<td></td>
</tr>
<tr>
<td>Game Administration</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PHYSICAL PLAYSCAPE TRAINING FOR DIRECT RISK

Direct Risk

Defined by obvious physical impact. The risk is vector-like, acting in clear paths and avoidance requires agility, quick reflexes and strength. The scale and force of direct risk is easily assessed, but often difficult to avoid.

Examples:
Traffic, excess speed, violent crime, exposure, predation.

BODY MUST BE PREPARED TO ACT

- No barriers to social/physical interaction
- Gradual level change allows easy movement
- Open air and permeable enclosures allow for increased visibility and interaction
- When enclosure is required, highly transparent glass used
- Open layout encourages long sight lines

DEVICE PLAYSCAPE TRAINING FOR PERVERSIVE RISK

Pervasive Risk

Defined by impacts felt over time and are difficult to diagnose, locate and identify. Avoidance requires diligence, attentiveness, pattern recognition and specific knowledge. The risk is undefined, dispersed and exists at small and large scales.

Examples:
Air pollution, water pollution, tainted foods.

BODY MUST WORK WITH RISK SENSING DEVICE TO REACT

- Separation
- Level Change
- Permeability
- Transparency
- View

- Segmented spaces create private experiences intended to enhance device use.
- Abrupt level changes further isolate the user with their devices.
- Limited air and sound movement further isolates user.
- Limited transparency (one way, screens) narrows user focus.
- Twisted grid of pods blocks view lines forcing users to rely on device or map for navigation.
SECTION B 1/16"=1'}
SECTION C

1/8" = 1' WAVES GENERATED BY GRAVITY DRIVEN RECIRCULATING SYSTEM.
STAINLESS STEEL FITTINGS ANCHOR DECK. WAVES FROM POOL PASS THROUGH DECKING TO CREATE DELIGHTFUL SURPRISE.
DEVICE PLAYSCAPE
STRUCTURAL SYSTEM

POST TENSION CABLE BALANCES CANTILEVER LOAD AGAINST CENTER SPAN LOAD
SYSTEM OPERATES BIDIRECTIONALLY TO CREATE PERFORATED DECK
ASSEMBLY SEQUENCE

1. PRECAST SECTIONS ASSEMBLED AT GROUND LEVEL

2. TENDONS ARE TENSIONED AT GROUND LEVEL

3. TEMPORARY SUPPORTS WITHIN POD HOLES ARE USED TO LIFT DECK

4. FINAL SUPPORTING WALLS ARE BUILT UNDERNEATH COMPLETE DECK
RESEARCH AND DEVELOPMENT

Several topics were explored through the process of creating the RISK COMPLEX. Some were manifest in the final scheme and some were not. This section contains a sampling of some of the ideas that were developed throughout the process.
READING RISK

Real Time Composite Risk Profile

Risk Processing

Profile modulates exposure to mitigating elements through a responsive skin.

Responsive Skin

Circulation Path

Risk Profile Determines Training Regimen
For example, if a visitor lives in an area of high particulate air pollution then moderate exercise that improves lung function will be recommended. Strenuous activity that could cause acute distress will be discouraged.

Interior Sequence

NYC Pervasive Risk Map

Metro Card Reader Registers geographic origin of visitor.
Tension applied through the system increases or decreases permeability of the system. Each unit expands to meet its neighbor. When tension is applied to one row the rest expand to accommodate the gaps.
EXPOSURE REFLECTS RISK

DIRECT EXPOSURE corresponds to direct risks of the beach and ocean

with "skin"

INDIRECT EXPOSURE corresponds to pervasive risks of the city

Sectional Relationship

Virtual Reality Booths
Wave Pool
Rock Climbing/Ropes Course
Multipurpose Space
Circulation
Function = function (surface,int num,spacefac,spacefac2)
{
    for (int i = 1; i < num; ++i)
    {
        double U= Sin(spacefac*i);
        double V= Series(0,1.5,(spacefac2)/Sqrt(i)*2);
        Point pt01 = new Point(this);
        pt01.ByUVParametersOnSurface(surface,U,V);
    
    }
    FunctionArguments = {bsplineSurface02,24,u_s,v_s};
Sources

Journals/Periodicals

Blowup
Malcom Gladwell
The New Yorker Magazine, January 22, 1996.

Coney Island: A Case Study In Popular Culture and Technical Change

Disneyland and Coney Island: Reflections on the Evolution of the Modern Amusement Park

"Not So-Free Ride"
The New York Times Magazine
Stephen J. Dunbar and Steven D. Levitt
April 20, 2008

Post-modern Urbanism
Michael Dear, Steven Flusty
Books

Beck, Ulrich
*Risk society; towards a new modernity* translated by Mark Ritter.

Cross, Gary,
The playful crowd: pleasure places in the twentieth century

Davis, Mike,
*Ecology of fear: Los Angeles and the imagination of disaster*

Denson, Charles.
*Coney Island: Lost and Found*

Gilden, Bruce,
*Coney Island, 1969-1986*

Koolhaas, Rem,
*Delirious New York: a retroactive manifesto for Manhattan.*
Lilliefors, James.  

Louv, Richard,  

**Websites**

Amusement Park History  
http://history.amusement-parks.com

Annina Rust  
“Thighmaster”  
http://web.media.mit.edu/~rusti/thighmaster/

Library of Congress Digital Image Archive  
http://lcweb2.loc.gov/pp/mdbquery.html

New York City Department of City Planning  
Coney Island Comprehensive Rezoning Plan  

Susanna Hertrich  
“we are animals after all”  
All images and drawings created by Luke Voiland unless otherwise noted.