Goliath

by

Sean J. Gautreaux

ABSTRACT

A two-minute 3D animation about a surreal interaction between man, nature and mechanical technology from the Industrial Revolution through the future.

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CHAPTER 1

INTRODUCTION

My artwork has for many years been about machines.

The same artistic influences have remained with me for the last 15 years or so. During this time I have been able to be molded by these influences and incorporate that into my own artistic style. It has given me the opportunity to evolve my preliminary understanding of those artworks into my unique vision of the world. The evolution began with pencil and paper, then through pen and ink, lithography, sculpture, paintings and finally 3D animation. It is 3D animation that has allowed me to, over a span of two minutes, address most of my feelings towards technology, the major influence in my work. Previous media, such as paintings, allowed only so much information in one frame, or snapshot. 3500 frames allowed me to visualize what I have been trying to convey, bit by bit, over the last 15 years.

The story of my animation is about the interaction between nature, humanity and technology. I personally see humanity as separate from nature. The technology was created by humanity. In this story, the technology that man has created has overpowered humanity and uses humans literally to build itself. This comes at the expense of nature, whose ground the factory sits on. The surrounding environment is void of life except for a small branch holding a few leaves. This tattered branch is almost completely destroyed from the battering it has taken from technology's (the factory's) expulsion of flame and waste. This is where the story begins, in the early morning hour of a new workday for the factory. The sun rises, a warning sound is heard, and the

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factory begins to take in its prey and breath fire. However, another object has come into

play. A comet, or so it seems to be, races towards the planet that the factory is on. The

top of the factory is under construction, leaving some areas where foreign debris could

enter it. Just by chance, this comet hurls itself into an opening at the top. The comet,

now in the form of a small meteor, bounces though the factory racing downwards. It is

able to find its way most of the way down the factory under its own power until it freefalls

onto moving conveyor belts which allow the meteor to complete its mission. The meteor,

or some kind of object made possibly by intelligence, gets stuck between some basic

gears at the bottom of the factory and the power source is clogged. This shuts down the

entire machine, allowing for nature outside to thrive and eliminating the need for humans

as the factory's sustenance.

CHAPTER 2

INFLUENCES

Oil Refineries

The overall exterior, factory design was inspired by the Louisiana oil factories (plants) that I was accustomed to until my move to Brooklyn in 1996. The contrasts between the two areas were astounding. Oil refineries dot the South Louisiana landscape and the coastline to the South. They operate by collecting, refining, expelling waste and using the end product for its own gain. Every morning the operators come to the factory by mechanical transportation, they drag in materials, separate the useable from the waste, process the useable and expel the waste by burning it into the atmosphere (Figure 1). Not much regard is paid to the surrounding areas containing neighborhoods of people. Less regard is paid to the people who work inside of these giant machines.

Figure 1. Oil Refinery

My father worked in multiple refineries for over 35 years. He began at a plant in Baton Rouge and then moved to work at a plant nearby New Orleans. Here he settled down, got married and raised a family. This project is dedicated to him. He is still alive and lives in Metairie, Louisiana. He retired from Mobil Oil over 10 years ago. I didn't understand for a long time why he worked in such a place. Every night, he would come home from his work, smelling of oil and grit. As a child, I visited his workplace many times where I was forced to wear a hardhat that covered my head and most of my shoulders. Walking through the maze of steel pipes and supports eventually affected my artistic style (Figure 2). That is quite evident in this project.

Figure 2. Refinery Close-up

Refineries have a completely different look depending on whether they are viewed during the daytime or nighttime. During the day, refineries appear as metallic beasts clutching the earth and draining the landscape. During the night they appear as yellow-lit glass

palaces (Figure 3). This dichotomy in appearances also drew me to reflect that in my

artwork. The nighttime yellow color of refineries also affected my color choice in what

sunlight color to use. The innermost areas on the exterior base of my factory were

inspired by oilrigs platforms. I tried to create what looks like an extracting oil pump

surrounded by a support structure for not only it, but also the areas above on the tower.

This time-period of technology represents The Industrial Revolution, the basis for

mechanical technology thereafter. I took this basis and materialized it as the actual base

of my structure. From this point on, the tower's time-periods change from the late 1800's

through a near future. The material used, the placement of them, the symbolic

references all represent the growth and direction of machines and what they will become.

Figure 3. Factory at Night

Goliath, the name of the factory, has several ports exuding flames at intermittent times.

They are most concentrated towards the lower levels of the structure. They expel the

waste by burning it up in the atmosphere, just as the real ones do. In Louisiana oil

refineries the towers are vertical and expel flames at a constant rate. Sometimes they

are bright enough to light up the surrounding area for miles. What are expelled are the waste products from refining the crude oil and producing natural gas and other useable materials (Figure 4). This in turn damages the environment just as the flames from Goliath have ruined and destroyed its surrounding landscape without regard. Little remains, as seen in the small leaves on the twisted branch. I turned the flames off and on in my factory to simulate breathing.

Figure 4. Refinery Flames

The World Trade Center

September 11th, 2001 had a major effect on this thesis project. It not only prompted me to work harder on it, but the tragedy also gave me an overall perspective of life. It also imposed itself on the way I saw my project, as there were similarities between the events of September 11th and this factory tower being hit by a comet. However, at that point, I could not significantly change the story and the scenes because of time constraints and the flow of my story. The World Trade Center also provided inspiration as how to devise

a tall structure that looked structurally sound. Even though the base of my factory

represented the late 1800's, the general structural design of the tall vertical pillars and

the fewer cross supports of the two buildings were incorporated in the I-beam supports at

the base's foreground. This inspiration had come from the fact that I had photographed

the World Trade Center for over two years.

The New Jersey Transit Coal Factory

Though in 1996 I found my new area very different from what I had come from in

Louisiana, once I visited New Jersey, I found some good, old, home comfort. There it

was, the Meadowlands, a vast array of swamp, flat ground, dirty water, rusted bridges,

expensive high-rises, oil pumps, factories of all sorts, highways and birds.   I moved to

New Jersey in 1999. I got to experience this every day as I took the train to and from

work in Fairlawn. One place particularly fascinated me, The New Jersey Transit coal

factory, which supplied power solely for the trains. An amazing device, this factory

pumps out 50-foot high piles of refined, crushed coal. Like the refineries in Louisiana,

this factory has a different look at night, but it is nowhere near as compelling, as it is only

a fraction of the size of the ones I was accustomed to. Nevertheless, winter has quite an

affect on the perception I had of the factory here because I've never seen a factory with

snow. The white snow covering the factory never lasts long. The hot dust from the

stream of coal flowing from the shafts quickly covers the snow, leaving it a gray and

black pile of slush. That factory's outer pipes and storage containers show up in the

lower exterior of my factory. The support structure was also inspired by the real one, as I

tried to mimic a structure with a main blocky core surrounded by concrete and metal

supports. Attached to these supports are intermittent horizontal platforms for the workers

to walk on. Thinner supports are there as added support for only the platforms. This also molded the overall support I designed.

Subways and Trains

Subway systems and other public transit systems were also quite fascinating when I moved here. I had never before ridden on one of these until 1996. Despite the crowds, the pollution and the filthiness, I enjoyed the trips on the G and A trains into Manhattan from Brooklyn. I saw those metal-sided machines as boats pulling into port, depositing and picking up passengers. To me they also resembled whales. Their horns sounded like foghorns on the sea. From my perspective in Brooklyn, these trains brought people into Manhattan and then later in the evening back to Brooklyn, but not out of Manhattan in the morning and then back into it in the evening. Brooklyn was the source of the people, as many more people commuted into Manhattan than out of it. After years of experiencing this, I began to see subway systems in a completely different light. No longer were they looked forward to. They crammed as many warm bodies into their cold hulls as they could, whisked them off work to be used up and then transported back to their homes for recharging (Figures 5 and 6). This concept became the rail system outside of the factory, transporting pink bodies into the factory to be used up. However, these bodies never returned from the factory, as they were used as fuel and supports throughout the factory. Once that idea had been seen, Manhattan itself became a gigantic machine, a New York refinery. The overall appearance of Manhattan is an elongated, gray, concrete and steel structure situated on flat ground with towers peaking in almost every area (Figure 7). This general silhouette and color scheme closely

resembles the shape and color of factories seen in Louisiana. New York became a machine and the subways became its lifeblood.

Figure 5. NYC Subway

Figure 6. Refinery and Train

Figure 7. Manhattan

CHAPTER 3

SCENE BY SCENE

This entire animation was completed using Discreet's 3Dstudio Max v2.5 and 3.1,

Adobe's Photoshop 5.0 and 6.0, and Adobe's Premiere 5.1.

Scene 1

Figure 8. Scene 1

Scene 1 is intentionally ambiguous as to what it depicts. A quick fade from black reveals

blue lights and spherical material streaking past the viewer's eyes. It has not yet been

determined if the viewer is stationary or not. The imagery is meant to evoke thoughts of

peacefulness and also transition through the use of image movement, but the end goal is

to evoke feelings about the bright lights supposedly seen just before death. This main

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idea is central to the theme of the story told. The transition is not a movement from life to

death, but from death to re-birth.

The 3D elements used are particles and a combustion gizmo, a shape that represents

and object's modifier. A great and efficient effect is achieved by using only these two

elements. The similarity in colors of the particles and combustion blend well into each

other, diluting the space between solid and gaseous. Computer memory usage and

rendering times also benefited from this. The central glow seen in the middle of the frame

is not due to a glow effect, but rather an automatic light increase caused by the

overlapping of the particle stream and the combustion gizmo's edges. Adding a glow

effect would have overwhelmed the visibility of the particles directly in front of the

camera.

The scene length is five seconds. A "fade-in from black" effect was used to ease the

viewer into already peaceful imagery. Motion blur was applied to the particles' objects.

Applying motion blur to the cloudy combustion effect as well would have ruined the

cloudy effect. The particle objects motion blur was stretched across the timeframe of two

(2) frames with sixteen (16) in-between images comprising the moving object effect.

Particle emission was set at a constant rate as was the combustion movement. The

particle shape is a sphere, because any non-smooth object would have flashed its

polygonal edges and would have created a sparkling effect, not the desired cloudy effect.

Even though there are only two objects, there are approximately 2.5 million faces

rendered in each frame. This high number is due to the smoothness of each particle

sphere and the fact that each particle is rendered sixteen times. Each frame render took

about one minute.

Scene 2:

Figure 9. Scene 2

The scene opens showing a dry, desert landscape and an early morning sky. In the foreground are a small decrepit tree with three leaves and broken stumps of small plants. A stellar object is seen moving in the distance. Another object is seen near the left horizon. The sun rises and sheds light on the ground and plants. The leaves respond to the sunlight by rising up and unfolding. A faint whistle is heard and the sounds of close-by machinery are also heard. A flame is seen shooting out of the distant structure on the left. A loud rumble accompanies it. A blast is felt from the left side of the camera, rattling the leaves, separating one of them from the branches and shaking the camera. The camera turns to reveal a distant structure connected to a railway system close running close to the camera. The railway system, or train, is carrying hollowed out clamps clutching an organic pink blob shape. The camera rumbling from the fiery blasts subside allowing the viewer to see the structure and its scale. A second later the fire continues once again rattling the camera.

This scene is by far the most complicated of all the scenes. It contains 1000 frames, which are divided into scenes 2, 3 and 5. The entire scene contains 200,000+ polygons, due to the detail needed by the ground, which needs to appear smooth, the train system, which is close to the camera, and the factory structure, which at the bottom is seen very close. I needed to decrease the view port's wireframe rendering so as not to crash the 3D application. On my first attempt at assembling all of the pre-made parts (ground, train and factory), I realized that the train system contained far too many polygons. There were far too many to even see a smooth wire frame animation in the view port. Due to the manner in which the train system was built, the polygon count could not be lowered without reducing the shape into an unrecognizable object. Therefore, the whole train system had to be rebuilt. I decided on a more angular rail support with textures making up the fine details. The clamps were optimized by reducing their polygon count and creating them as instances. The overhead rail support was also created as a series of instances. Grouping all of these objects with their instances helped not only in the view port rendering but also in the actual rendering time. The upper part of the factory structure is a low polygon substitute, which I will discuss in later scene descriptions, but here it was used to once again take a burden off of the view port rendering.

The structure is symbolic of the Louisiana oil refineries that dominate much of the landscape. By day, they resemble giant metal claws digging deep into the ground. However, at night due to the different lighting, they resemble glass palaces, delicate and non-threatening. Since Scene 2 takes place at dawn, the transition between night and day, I tried to convey not only the beauty, but also the ugliness, of refineries. The overall shape of it is organic and natural while the details show rusted I-beams and rivets. The factory has started its workday, pulling in resources and using them. The whistle

signifies the whistle heard at the start of workdays in old factories. The factory's breathing and the intermittent flames are directly influenced by the burning chimneys found in all refineries. I never understood why the excess waste had to be burned off into the atmosphere. The blast from the flames damage the surrounding landscape, leaving only unfertile soil and faint signs of life in the forms of small trees. In the clamps of the train system, a pink blob form can be seen extruding from the sides. Additional details show more organic shapes and possibly a recognizably human object hanging from the bottom.

Scene 3

Figure 10. Scene 3

Scene 3 allows the viewer to experience a few different things. At the beginning of the scene, a close-up of the mechanical clamp is shown with the pinkish material contained inside and the extra material hanging from the sides and bottom. Mixed into this are protruding, bone-colored shapes. What is actually contained inside is not revealed until the end of the story, but this offers the viewer a clue as to what is being hauled to this

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massive structure. After a short pause, the camera whisks the viewer towards the factory along the edge of the train. The camera turns to focus on the factory, but it is halted when another blast of flame explodes. The viewer can now see the base support of the structure, aged but strong. For the second time, I give a rare sense of scale. The first instance was the scale of the leaves. This time it shows up in the size of the bricks. Unlike the somewhat unrecognizable shapes above, the viewer can place a fix on how tall the brick structure is just from relating to real world approximations. Therefore, a sense of the factory size is established, thwarting the idea that is fairly small.

Camera work was very important in trying to convey large scale. The default viewable angle is 45 degrees that I changed to 85-90 degrees for my shots. This gave a sense of a large structure. However, the camera animation in this scene was quite difficult in the timing details. I didn't want the camera to slowly pan along the train section and arrive at the factory. I needed to start showing a sense of urgency and tension. The camera was swift in reaching the factory, gliding over the terrain and abruptly stopped at the base. I chose from 5 different full animations of the camera and picked out the best moves. These were then combined and tweaked into the final camera movement.

The base of the factory seems to have been built a long time ago. The rusted I-beams and solid concrete foundation echo our mechanical and industrial beginnings and is a direct inspiration from the artwork of Charles Sheeler. Much smaller details and rounded shapes compliment simple, yet strong, shapes. An additional brick side support was added to insure stability to the tall structure. It is in the shape of a foot. This also took away from the factory looking like just a cylinder sitting on top of the ground, and literally gave it a foothold into the earth beneath. This foot-shaped symbol is also seen in the

two main concrete supports on the left side, which were inspired by a lion's foot. This idea of the factory having a foot naturally brings up the idea that the rest of the factory may resemble a human being, and I inadvertently incorporated this into the overall shape of this giant machine. It also justified my name for this piece, Goliath.
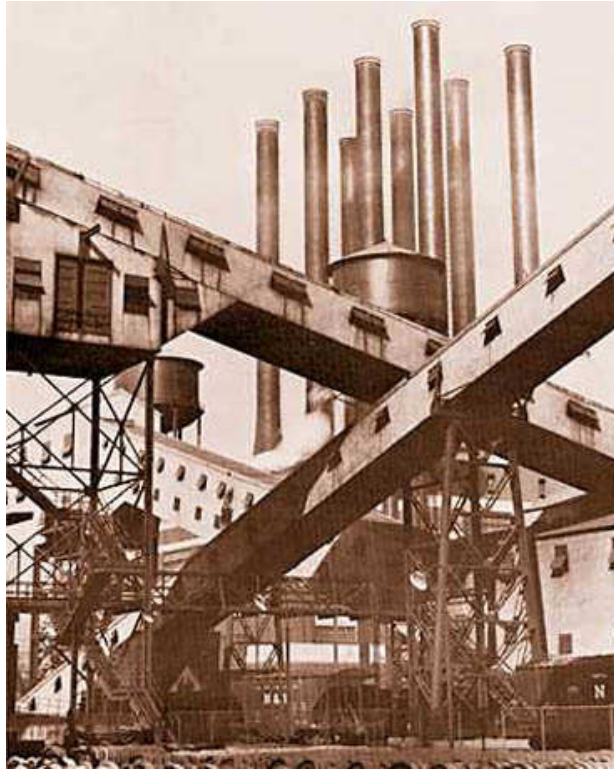
Figure 11. Artwork by Charles Sheeler

Scene 4
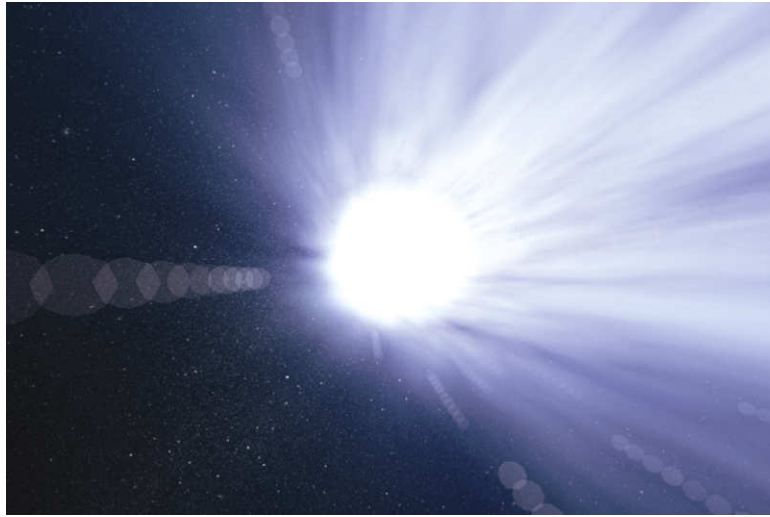
Figure 12. Scene 4

Like Scene 1, this scene utilizes the same two 3d elements plus two other items. The

particles and combustion are accompanied by a star field and a post render effect glow.

Unlike Scene 1 the stars and glow effect were needed for a few reasons. In Scene 1 the

star field was not needed, as the viewer was not shown what was behind the lights. The

glow was not used because it washed out the view of the particles in the middle.

However, in Scene 2, the glow is needed as the camera swings out to show the actually

shape of the object. Using just the particles and combustion did not produce the desired

effect. The speed of the wind affecting the combustion was also increased.

I initially wanted to repeat Scene 1 at this point by not revealing what the object is.

However, the storyline is prompted to reveal it, as the viewer needs to be exposed to the

elevating confrontation about to take place. The scene begins with the camera in the

same position as the camera in Scene 1, but the camera swings outward while keeping

it's viewpoint on the core of the object. It seems to be a comet soaring through outer

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space, but the viewer has not been shown the front of the object fully. The particles were used to show the effect of the comet losing its size by slowly shedding outer layers. This scene also explains what was seen in the background of the beginning of Scene 2.

Scene 5

Figure 13. Scene 5

The camera positioning is just slightly closer to the factory that it was in Scene 3. The camera moves upward revealing the structure slowly. A blast is seen at either sides of the camera's view, which slowly taper off. At this point, all scenes through and including Scene 4 and Scene 10 have been limited to 100 frames, or 3 1/3 seconds. I did this to build up tension between the alternating scenes of the comet and scenes of the factory. I want the viewer to sense an upcoming confrontation. By equalizing the lengths of the scenes, a balance and upcoming imbalance are expected. Colors were also used to achieve this effect. Scenes showing the factory are very orange tinted, conveying a sense of urgency, instability or danger. This color was implemented by using the right

hues with the textures and the effects from the yellowish rising sun. The scenes of the

comet, at this point, use mainly soft blues and blacks. These colors convey less danger

and are more soothing to the viewer. In addition the streaming soft trails of the comet

are a stark contrast to the harsh rusted metal I-beams of the structure. This effect was

carried for a few more scenes, but as the viewer notices, the colors of the comet change

according to its proximity to the planet.

Scene 6
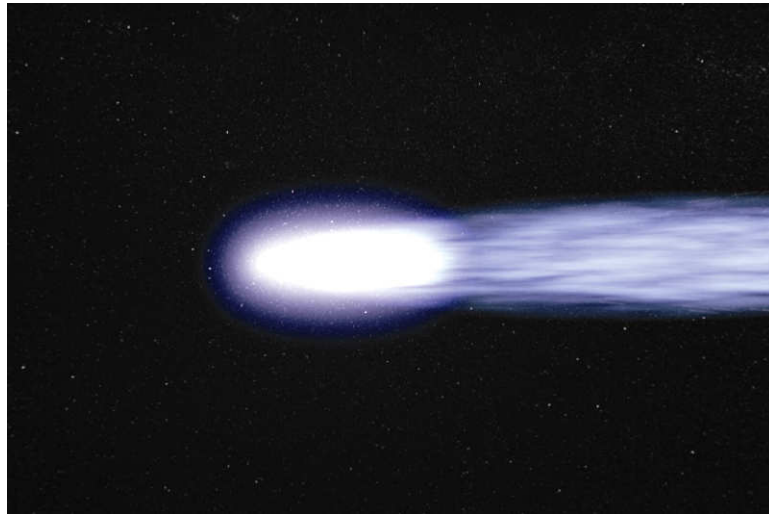
Figure 14. Scene 6

Like Scene 4, this scene uses the same elements, three objects, 680 faces and no lights.

It is frame 100 through frame 200 of the same scene. The scene also uses the same

Video Post effects, a 3D Studio postproduction filter feature. The combustion speed was

once again increased to give a sense that the comet was changing in some way, either

intensifying, meeting a resistance of some sort, or being drawn pulled faster by gravity.

Also, the viewer is allowed to see the full shape of the object identifying it as a icy-colored comet.

Using Video Post for final rendering caused a few problems in numbering the files, which were corrected after the renderings were done. Video Post renders also take longer to render. The additional rendering step of creating and applying the glow to the image adds about 20% to the total rendering time in my images, but that figure can vary greatly depending on the amount of filters used.

The star background also gave me multiple problems, which took many trials and errors to fix. There is a Video Post feature called Starfield. It is simply implicated and is fairly easy to use. In using Starfield, however, it behaved correctly when the camera pivoted around a target point but not when the camera rotated about its local pivot. When the camera panned in any direction, the Starfield image was locked to the camera. So foreground images were rendered correctly, but the background stars did not move. This would have worked well for some scenes, but not all, and a standard background was still needed that would render correctly in all scenes and could be adjusted for the specific uses in each scene. It was decided that a physical object with a star map would be the best way to replicate outer space. So, a large sphere was built surrounding the entire scene. The face normals were flipped, so the sphere could only be viewed from the inside and manipulating the sphere in the viewport rendering was much less confusing. I used a standard 3D Studio star field, but adjusted the image for my needs. The brightly colored stars were muted and the image size was decreased as well. I adjust this image further for later scenes.

Scene 7
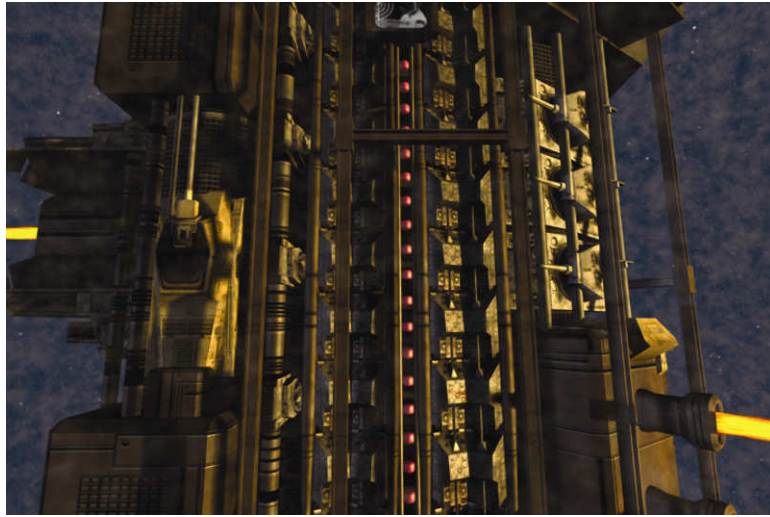
Figure 15. Scene 7

This scene is probably the most rewarding to me in terms of the overall design and the many details of this section of the factory. The scene begins with a clear view of the factory unspoiled by the glaring flames. I wanted the viewer to soak up as many of the symbols as possible in order to get another hint as to the time period of its construction.

This scene was fairly easy in that the camera animation was simple, and the flames were brought in from another scene. I was therefore allowed more time in perfecting the model itself.

It represents the technology during the middle of the 20th century, especially the World War II years. World War II forced the world to enhance and develop its industrial technology to create killing machines. This conflict and its results further fed the need for a growing military might eventually growing into the Arms Race and rapidly advanced inventions of new mechanical technology. If the viewer looks closely at this section of

the factory, he/she can see that that almost the entire facade is made from World War II combat vehicles of varying sizes. Their size and placement is symbolic of a victory. Starting at the bottom, small Axis vehicle point upwards in a stationary parade. Included are the Sdkfz. 234/3, the Panzerkampfwagen IV, the Hetzer and the Jagdpanther. Support structure is also made from these vehicles. Waiting at the top of this section on the right, are three large Allied Sherman tanks, positioned to destroy the columns of Axis vehicles. Just above this are hints of the introduction of television, as two black and white monitors are seen in the final frames. Additionally, a stream of small pink objects are seen streaming upward directly in the middle of the structure.

Scene 8

Figure 16. Scene 8

Scene 8 once again uses the same elements of the previous comet scenes with the addition of the planet. The planet is a medium to high poly shape, with its hidden side removed for improved viewport frame rate and final rendering calculations. This scene

introduces the planet for the first time in its relation to the comet. The planet's gravity has been pulling the comet closer and faster in each scene. In this scene, the speed of the combustion was once again increased. The color was shifted from a cooler blue to a warmer red tone due to the friction imposed by the gravity. The color had to be shifted from a soothing blue at the beginning to a hot, fiery yellow orange later. I had two ways to get from blue to orange on the color wheel - through purple and red or through green and yellow. I chose the immediately warmer color path through purple and red. One downfall of this decision would be that the color would sometimes appear purple and pink, which doesn't necessarily convey heat, but are warmer colors than green nonetheless.

The camera was also rumbled a bit to convey the increased friction and the comet's battling with the atmosphere. At first the camera shakes a little but as the comet get closer the rumbling was increased immensely. The width of the combustion area was also widened to convey a feeling that the comet is taking a greater resistance to the atmosphere and the area of contact is widening.

There were several technical problems in this scene which took time to overcome. For the planet to appear large in relation to not only the comet but also the camera, several things had to be done. When the camera shakes, it tends to reveal the distance between itself and other objects. It gives the viewer a reference point from which to judge relative distances. Therefore, the original smaller planet sphere had to be significantly larger in size in the 3D application, because it looked like a small ball about to be impacted by this comet. In doing this, the viewport rendering could no longer display the foreground comet particles and shapes. All of these components had to be animated in the front,

top, and left view ports and the actual scene had to be guessed in terms of what the

camera captured. It was only through rendering did I realize what went right and what

went wrong. By rendering these images, another problem was revealed. The first

camera I had created had an animated viewing area using a noise function. This did

unpredictable things to the combustion gizmo shape. At some points it was rendered out

of place, either before of far behind the core of the comet. After trial and error I was able

to realize that the camera's animation needed to be replaced by a different method.   I

then applied the noise to the camera object and not to its viewable area, which resolved

the problem.

Scene 9

Figure 17. Scene 9

Like Scene 7, this scene allowed me to focus of the model and texture details of the

factory, as the other animations and combustion effects were borrowed from other

scenes. I am pretty satisfied with the visual results here too. The camera pans up

revealing another upper section of the factory. This time the visual clues are different as to when it was built. Everything seems a little more modern with the lack of rust and the bright and shiny construction materials.

Technically, this was a good challenge in trying to coordinate what the viewer will be drawn to visually, what is needed to happen in the scene and what time period and feel I wanted to convey. I used flashing objects in the foreground to grab the viewer's attention and draw it to the right side with similar bright objects, more television sets. I then wanted to draw the attention to the back of the structure through the columns, where I placed tiny details to give a sense of large scale. Finally at the top of this section are more televisions, but the images flashing on them are symbolic of what the factory's function is. I also placed the rhythmic bursting flames at the back of this structure so not to obscure the view.

Here I introduce a lot of more of the pink shaped objects and their integration into the factory's walls and mechanisms. On the left pink shapes are situated in a rack and plugged into the support structure. In the middle column, a similar theme is seen. The televisions at the top show quick images of a pink surface being divided by an increasing number of lines. The time period is relatively the present and the immediate future. The beginning of the scene shows more black and white televisions, but then the next set of televisions on the right side and in color. The shape of the color televisions in the same shape of a very early personal computer "Lisa," but I certainly don't expect the viewer to recognize this. There is a pause in the middle of this scene void of flashing objects so that the integration of the pink blobs and machines can be realized.

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Scene 10

Figure 18. Scene 10

Scene 10 is the last time we see the comet in the outer atmosphere. At this point its color is a fiery yellow/orange from the effects of gravity and friction. The stationary camera is locked on the comet as the comet rapidly passes the viewer towards the planet's surface. The objects are basically the same as the ones in Scene 8 with the adjustments of colors, the lack of camera turbulence and the changing of the particle stream properties.

The visual results were not as expected at the beginning of the scene, as the change of rendering size from 320x240 to 720x480 severely affected the Video Post glow filter on the particles. In the small renders the yellow particles seemed small and flowing from the center, but in the larger final renderings, the particles seem too bright and they sparkle instead of stream from the core of the object. Rendering every tenth frame did not catch this undesired effect either. However, after the comet passes the camera, the

particle rendered as expected, still flowing from the object and being brought down to the

planet's surface by gravity.

Since this scene was completed after September 11th, 2001, I decided to add a symbol

of the world situation in the texture map of the planet's surface. I found some satellite

photos of Afghanistan and heavily altered them, using only snippets of each image and

combining them into an original texture. It is at this point that the viewer definitely knows

where the comet is heading and the relation between the two objects.
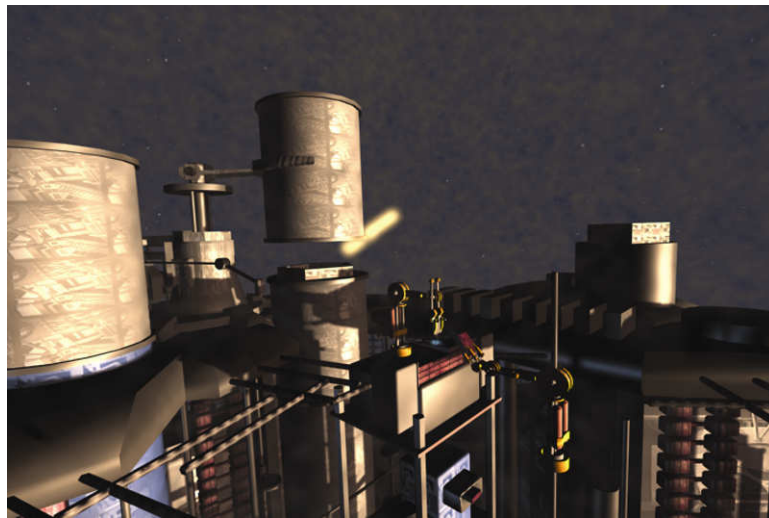
Scene 11

Figure 19. Scene 11

This scene of the very top of the factory has more animation sequences than any other

outside factory shot and the timing was absolutely crucial. The camera lifts up towards

the top of the factory, then moves closer and tilts its angle slightly downward. The comet

is seen coming in from the background angling downward towards the factory. This area

of the factory is under construction and has left itself open to debris from above. This

mimics modern building construction, as the inner support structure is built first and the

walls later surround that. All lower areas are solid and impenetrable. The viewer may

expect the comet to smash into the factory, destroying it, as I intentionally did not

establish scale between the comet and the factory. I also emphasized the downsizing in

mass of the object using the particle systems to represent breakaway material. Instead

the comet is small enough to fit inside the shafts being constructed. The camera turns

downward to represent the descent of the comet, which will now be referred to as a

"meteor".

As mentioned above, the timing was very important to allow the viewer to clearly see the

meteor arriving, the top of the machine being constructed and the meteor bouncing into

the shaft. I used Photoshop to enhance the point of impact, as otherwise it may have

looked like the meteor had hit the opposite side of the factory. The mechanical devise

that caps the open shaft was duplicated on the left side and its animation was moved up

slightly allowing it to happen and finish before the meteor hits. It also was used to

convey a rhythmic construction method and to draw the viewer's eye up the left side of

the screen and then towards the middle, making sure the viewer recognized the object in

advance.

The newness and color of the construction materials are once again different from below,

in that they are even shinier and more colorful. The pink color is no longer confined to

use in just small parts, but now comprise some of the major factory support. The pink

material is the most integrated at the top. The shapes are somewhat more organic or

biomorphic now with the inclusion of spheres. Many thin structural objects were placed

sticking out the walls to show that other pieces need to be added. Mechanical arms are

multiplied inside the structure. In the middle, one mechanical arm lifts a brick-shaped,

pink blob while the other mechanical arm then welds it into place. Many of the factory's

objects contain just a specular map made from the pictures of my paintings. Other

objects contain no mapping at all, just the material color within the 3D application.

Scene 12
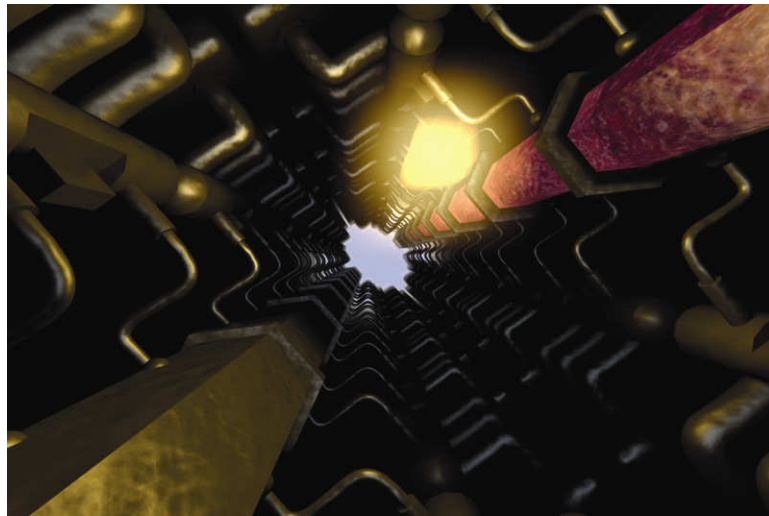
Figure 20. Scene 12

This scene depicts the meteor now racing through the inner shaft of the factory. The

object flies past the viewer's side and disappears into a light blue fog below. This scene

was made some time ago and contains a lot more geometry than one might think. The

shaft's walls once again do not have any mapping on them. I allowed the light from the

meteor to illuminate them completely. On the right side is a tube channeling a pink liquid

upward.

Aside from getting the fog to display correctly, this scene was quite simple to make and animate. The parts of the walls are just copies of themselves. Since the meteor is falling so fast, I had to adjust its timing down its path to make sure it appears close to the camera in the first frame that showed it. Video Post was used for the glow and an attached omni light provided the light from the glow.

Since the meteor entered the factory at its most central and formed upper support, and I do see this factory as a symbol of a human being, I decided to get inspiration from the human spinal column for modeling. Each layered shape is identical and the contours of a single shape reflect the contours of a spine vertebra.
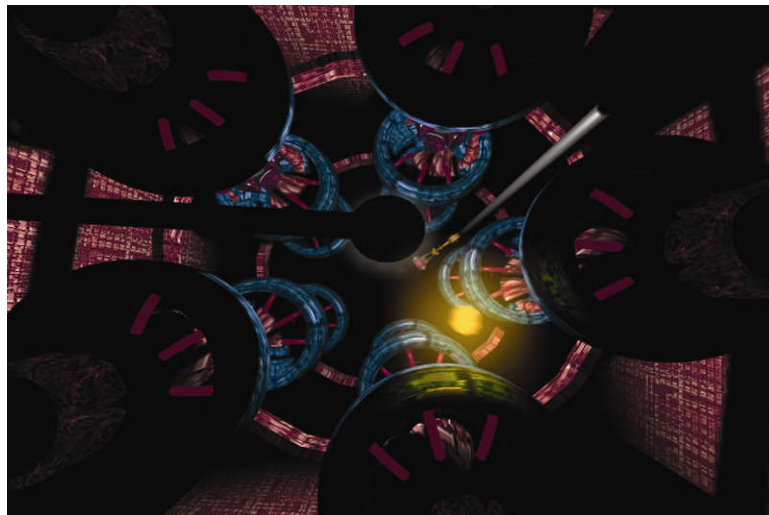
Scene 13

Figure 21. Scene 13

Objects from this scene were salvaged from the original outside top section of the factory, which was way too organic and colorful. With the camera looking downward, the

meteor once again flies past the viewer, but this time begins to make contact again with the walls of the machine, slowing it down slightly. A mechanical arm lifting a canister containing the pink liquid is seen. In the five columns are networks of tubes and supports channeling the liquid as well.

This is one of the only scenes containing NURBS surfaces. With the additional use of Video Post and fog, the rendering times were surprisingly slow. Again the path animation had to be adjusted so that in the first frame the meteor is seen, it is close to the camera. Lighting had to be precise as to not show the ends of the models and some of the texturing flaws.

The pink liquid and material coming from below is the main focus of this scene. Not only is pink used for the walls of the structure, but it is also seen being transported upwards in 2 different methods. Since this interior of the factory represents the inside of a human being, pink was an appropriate choice for conveying the inner linings of a human's insides. I also reiterated another symbol in this scene, the use of numbers. The upper sections of the factory are based on odd numbers and the lower sections' structures are based on even numbers. The odd number of five is used make the column supports and the overall shape of the space in cylindrical, not rectangular.

Scene 14
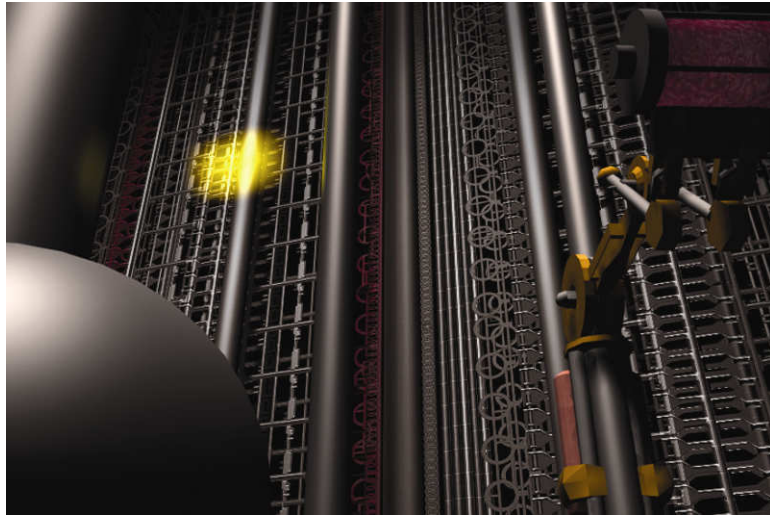
Figure 22. Scene 14

The scene shows a very sanitary, steel walled space with a moving mechanical arm in the right foreground. The meteor slashes through the space, bouncing twice from a support column and the mechanical arm. It then swooshes past the viewer.

This scene is comprised of very few polygons. The only 3D objects in the scene are the foreground ones. The background wall is a still render of the original scene, which was lost due to a hard drive failure. The original render was salvaged and used as a environment background, fixed to the view field of the camera. Since the background would appear at an angle, the foreground 3D objects had to be tilted to be parallel to the background. The overall scene is quite simple. The original scene from which the render was taken contained only a six-sided, twelve-polygon box, with a complex map placed on it. The map was created with custom Photoshop brushes with an adjusted stuttered spray. A black image was painted onto a white background, which would serve

for the basis of the diffuse, bump and specular maps. Two lights were placed near the

box, one spot light and one omni light, to affect the bump and specular maps correctly.

The animating was done along a path of 3 lines. Because there were so few frames to

work with, thirty frames, the object was difficult to animate because it had to hit the

impact points exactly, or the effect would be jeopardized. To accommodate these

problems, the speed of the object along the path was adjusted as well as the end points

of the motion path. The original scene length was longer, but to give the feeling of fast

moving motion and expediency, the scene was shortened to one second.

This area is used to represent the transition in materials from the multi-colored materials

used above to the non-saturated high-tech steel/plastics down below. This area

represents our current mechanical technology advances using metal and plastic. The

shapes are also void of any rust, showing that they are fairly new. H. R. Giger, who for

many years painted greyed repetitious images, inspires this scene's repetition of small

shapes. His "NYC Portfolio" especially inspired me.

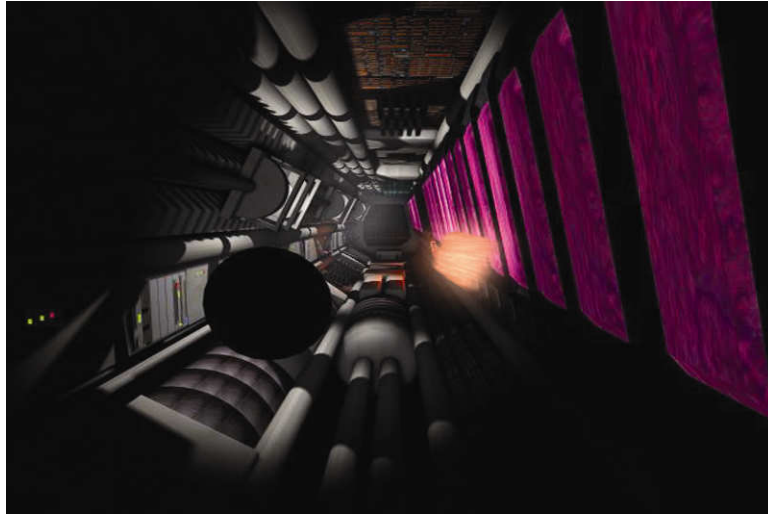Figure 23. H. R. Giger's *New York City*

Scene 15

Figure 24. Scene 15

The scene starts with the camera looking downward down a shaft. The object comes from behind the viewer and jets down the space, disappearing into the distance.

Scene 15 is also comprised of very few polygons. There are 4 objects in the scene, 2 lights, one rock and one line that the rock is animated on. The final renderings took just seconds. Like Scene 14, this was the result of a salvaged scene that was lost in the same hard drive failure. I had taken some sample renders of it in advance, and those renders were not on the corrupted partition of the hard drive. Instead of rebuilding the scene, I once again used is as the environment background, fixed to the camera's view. The Jeffries tubes seen in the Star Trek series inspired this scene's imagery. They are cluttered access channels that carry electrical wiring and tubing. I made the walls, however, by reintroducing recognizable current shapes, such as computer cases, motherboards and heat sinks. This is to show the viewer that this section represents the present, just like its outside counterpart scene.

Scene 16
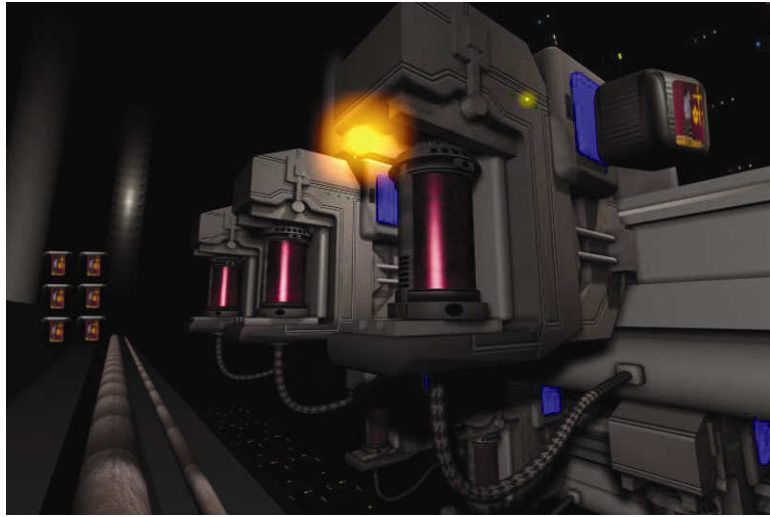
Figure 25. Scene 16

Yet another scene constructed from salvaged renders from a lost 3D file, scene 16 was

too valuable visually to scrap and too time-consuming to rebuild. The background image

is a snapshot of that original scene and it contains everything but the meteor, the

televisions, and the horizontal beam. It shows the meteor bouncing in from the

background, along a horizontal beam and right past the viewer's viewpoint. I refer to this

scene as the "coffeemaker scene" since the devices holding the 3 pink canisters

resemble coffeemakers.

Technically it was the most difficult of the scenes that use a background image. The

render was taken at an angle; so all added 3D objects had to correspond to that

perspective angle. Moreover, I had to animate the meteor as if it was coming from a

background space and entering the foreground without allowing the viewer to recognize

the illusion. The televisions were added at the last minute to further associate the scene

with the outside scene containing the televisions and to establish a time period of construction.

The intent of this scene was to show the pink material being processed somehow. The viewer sees three canisters containing pink liquid inserted into a device that affects the top and bottom of the canister. It is symbolic of inserting a battery into a slot for power. These devices then are supported by, and connect to, the main horizontal rail in back. Behind this are computers and more coffeemakers.

Scene 17

Figure 26. Scene 17

This scene is comprised of 59 objects and just over 10,000 polygons. Initially this scene was supposed to look completely different in terms of the camera's viewpoint. Originally, I had a camera placed just outside the cylindrical structure, following the path of the object as it bounced down the shaft into the blackness below. This scene would have

taken about three seconds. However, to expedite the flow of the story, it was decided

that the scene had to be shorter. On top of that, I had an interesting problem. Two

scenes later, the camera's viewpoint would be no longer as spectator, but participant, in

that the viewpoint would be tied to the object itself as it hits the conveyor belt. There

seemed to be some confusion as to what happened to the view in this latter scene, as

the viewer might not instantly recognize that the view is now from the object itself. To

condition the viewer for this, I decided to use Scene 17. So the camera was then

attached to the object and animated down the shaft. Therefore, two scenes later, it was

easier for the viewer to recognize his/her new point of view. The scene is a departure

from previous scenes in terms of the viewpoint and its hectic action.

This scene begins to introduce the lower areas of the factory. It also contains some of

the feeling of the above areas. It is a transition point between the new metal and plastic

of above and the rusted metal of down below. The time period is supposed to reflect the

1940's or 1950's.

Scene 18

Figure 27. Scene 18

Scene 18 is where the viewer sees the slowdown of the object. After being thrashed

around the small space in the previous scene, the meteor has lost much of its

velocity. It is now a free-falling object. In this scene the meteor casually glances off

a wall and pipes, as if making a dive for the end below. The rusted walls and

machinery contrast with the pink canisters in the foreground. Also, the color and

glow of the meteor have faded to a cooler and less bright glow, signifying that the

object has released a lot of its heat in the fall from above.

This was the last scene to be animated, as it seemed to be quite a task. I had to

capture not only a realistic bounce but also maintain the simulated weight of the

object. After a few tries, I decided to use a gravity push on it pointing downwards to

the wall. I then animated the direction of the gravity more towards the ground, which

allowed the object to hover for a second. The meteor object rides along a spline

path, which was heavily adjusted to make the speed correspond to the bounce. The back wall, which looks like tanks tracks, is a flat polygon with a render of a very high polygon scene mapped on top. The foreground support columns containing the pink canisters is a model I salvaged from an older scene when I was making objects inspired by spinal columns. The brightness of the pink color was increased drastically right before the final renderings. A few more horizontal and vertical pipes were added at the end to make the space more interesting, as it seemed a little too open. I wanted to give the illusion that the spaces in the machine were getting more and more cramped towards the bottom.

Symbolically, there is not much information here. It is primarily a scene to show the rock falling and bouncing. The lofty effect is enhanced by placing this scene between the hectic action of the last scene and the freefalling view of the next one. The colors are a lot more rusty and the shapes are becoming more cubic and a lot less organic.
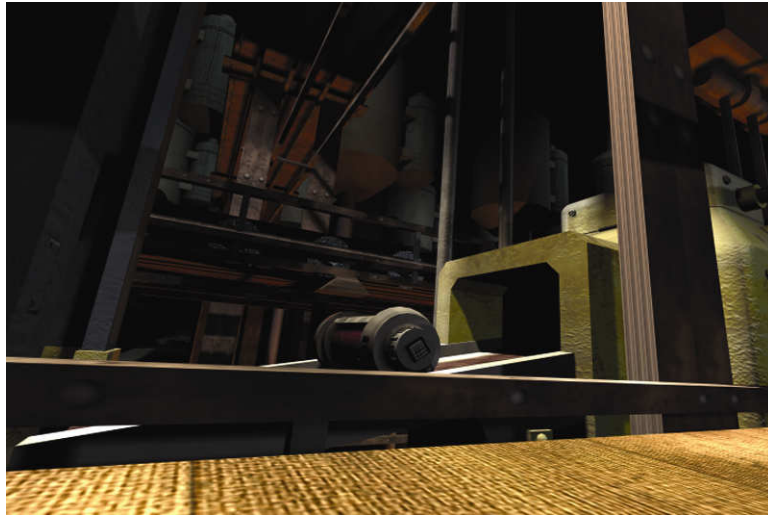
Scene 19

Figure 28. Scene 19

This scene was a nightmare all the way through beginning to completion, but the desired effect is achieved. It is also one of the longer scenes. The view is now attached again to the object itself. The viewer does not see the object. The meteor free-falls and lands on a conveyor belt. It is at the end of a production line, with the conveyor traveling in the opposite direction. Canisters containing a pink material are seen rolling out the end and being hoisted upwards. The machine behind the canister assembly machine is dicing up a pink material into small pieces and shooting them out onto a chute. Behind this machine are where the original pink blobs are dropped for processing. Some of the clamps first seen on the outside train are above the landing area. Two of them have dropped their cargo and are stationary in the background. Another one drops off its cargo as the meteor reaches the end of the conveyor belt. What is dropped is a largely cubic object with various light-colored slivers sticking out, 2 hands in the front and a what seems to be a

human head towards the end of it. It falls on the chute and slides down into the machine that dices it. The meteor then falls off into a dark space below.

As mentioned, this scene was quite difficult in all aspects. Delicate modeling, texturing, lighting, timing, animation, CPU speed, video card power all played important factors in creating this scene. On the first attempt at finishing this scene last year, my computer experienced some major problems in displaying the scene in the viewports and rendering the scene. Shortly after my computer's hard drive became over-stressed and corrupted. I was able to save only portions of the scene after the hard drive failure, minus some important animation and environmental effects. Later the scene was imported into a later version of the 3D software, which presented its own problems. For example, the bump map effects were greatly over-exaggerated and the objects were not linked together like they were before. The final object that drops was replaced with an object that more resembled a human body.

There is plenty of symbolism and visuals in this scene. First, the viewer is now definitely the meteor, watching the entire process unfold. The blood stained conveyor belt drags the viewer slowly past every step of the pink blob's conversion, and then dumps the viewer and meteor over the edge. Pink canisters are being prepared and hauled upwards for use in the factory as fuel, power, and construction material. The materials stuffed into the canisters are small chunks of pink material being spit from another machine. This machine takes in the pink human forms, dices them up for consumption. I am trying to show the dominancy of mechanical

technology in our world. The machines have taken full control of humanity, its

maker. The machines are self-controlled, but need the human forms for

nourishment, power and information. This process does not start years in the future,

but had begun long ago. The date relating to the original construction of this area of

the factory is about the beginning of the 20th century, when we allowed machines to

integrate themselves into our daily lives in the forms of cars, subways, building

construction devices, household items, etc.

Scene 20

Figure 29. Scene 20

The viewpoint is still on the meteor which bounces around and stops abruptly. Gears

are seen in front of the viewer slowly stopping. Sounds of heavy machines slowly

halts as well, leaving only a faint rumble.

This was the first scene to be completed containing all modeling, texturing and lighting. The original viewpoint for this room is actually seen in the next scene, which shows a much better angle of the complexity of the geometry and lights. This scene was, however, recently animated and with ease. The only tricky part was the slight turn of the camera once the object stops.

There is not much information given to the viewer at this point. The viewer only knows that the object has finally stopped for some reason, and that reason may be related to the gears stopping in the foreground. The earth's top layer can be seen at the base of the machinery. This is the bottom of the factory.

Scene 21

Figure 30. Scene 21

The revelation of what the object is and why it has stopped is depicted here. Crammed among the teeth of two rusted gears is a small shiny object, the shape of

which is maybe not what the viewer expects. The loud sounds of the machinery has ceased and all mechanical activity comes to a halt.

The geometry makeup of the scene comes from various 3D applications which were merged together. It began with the area of the gears and grew outward to make up the full room seen. Because the scene was done when I did not know enough about modeling and texturing, the 3D scene is overburdened with non-optimized geometry and poor texture mapping. Lighting was used to hide the mistakes and enhance the good quality areas. Therefore, this scene took much too long to render.

The final shape of the "meteor" was decided on just before final renderings. Even in my original story idea writings and storyboard creation, I was undecided as to the origin of the object. At first, I wanted to make it an object made by a higher intelligence, splitting open at the end and displaying some type of alien artifact. This seemed a little too hokey for some people who advised me, so I then considered making the shape follow that of an actual meteor. However, this bothered me somewhat, as the symbolism changed drastically. I didn't want a symbol of nature to stop the consumption of humanity, even though the factory was damaging the surrounding, natural area (the small branch with leaves at the beginning) and nature did have a stake in preventing this. I did want the object to have been made by intelligence, either human or extraterrestrial. This also lessened the chance that a naturally occurring effect stopped the machine, and heightened the possibility that it was a long-range shot from outer space that hit its target, planned meticulously

through the atmosphere, towards the machine and into the heart of the machine that gave it energy, the simple and ancient mechanical gears.

Could there be a backup supply of power in the machine? It is possible, but that doesn't last forever. Could the power supply stored in the pink canister sustain the machine? No, that does not last forever either and the transport machinery, such as the yellow mechanical arms, no longer receives power. Another strange symbol of September 11th, 2001, can be derived from the object just behind the gears in the form of an aircraft engine mounted inside the factory. I am fascinated by turbine engines and their strength.   I chose not to remove this model. Finally, the power has been instantly drained sufficiently enough to cut power to the lighting system. It is also a symbol of this area of the machine's death.

Scene 22

Figure 31. Scene 22

This scene shows us television sets shutting down. First, the power to the screens are cut and then the lights shut down as well. Flashing images are seen on the screens, meaning a lightning fast transfer of information, either extracted from the human forms or programmed into them.

This scene was fairly easy to make. A light with a animated strength was placed above. I had a few problems in getting the monitors to seem to turn off. I tried to animate its .avi file, but that resulted in undesired effects. Instead, I reduced the opacity of the .avi over time and allowed the base, black color of the material color to come through.   The glow was created with Video Post and animated as well. The avi file's still scenes were collected a while ago, but has to be reconstructed due to the newer applications did not read the old codec used to compile the avi.

Here the viewer sees the middle, inside section of the factory once again. The monitor itself was modeled after the 1982 Lisa computer system. These televisions are symbolic of information exchange, either to humanity or out of it. They are supposed to correspond with the color televisions seen in Scene 9 and Scene 16. The final burst of power traveling up the factory's wiring has come and is followed by nothing but silence.
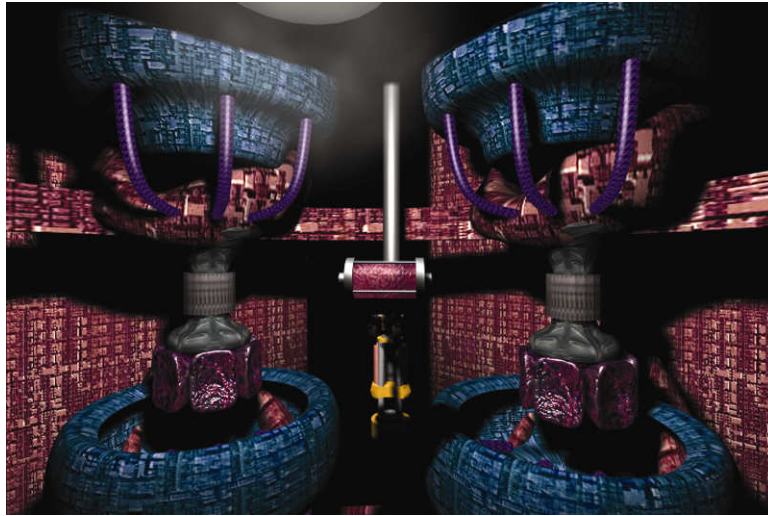
Scene 23

Figure 32. Scene 23

Revisiting the upper section of the factory, the viewer sees the results of the power

loss once again. A different angle of Scene 13, another mechanical arm holding a

canister rises from above but does not complete the journey. The lack of power has

affected the workings of the top of the machine, shutting it down completely.

Another easy scene to finish, it was just a matter of timing the arm movement to get

it correct. The lights do not turn off as the darkening effect was achieved through

postproduction. The parts are identical to the ones in Scene 13.

The remaining power that had been traveling through the electrical wires of the

factory has been exhausted. The pose of the mechanical arm, when it shuts down,

is like an offering being made to a god above.

Scene 24

Figure 33. Scene 24

The view is placed where is was in the second scene, away from the factory and
near the small branch. The factory has completely shut down, including the train
system that fed it with humans. The flames that once shot out of the sides have
ceased. Three, surviving, bright-green leaves are seen on the tree branch, with the
smallest leaf replacing the one that was blown off in the beginning. They are growing
and thriving. The sun has come above the horizon even more.

This scene was somewhat of a problem in terms of lighting. Since I used few and
very large lights, their shadow mapping had to encompass the entire scene to
achieve even lighting. The mapping samples could not go over 2000x2000 pixels
without experiencing memory problems during rendering. Therefore, the small
branch did not have enough mapping samples affecting it to create a shadow. I

created the shadow as a layer in Photoshop and processed all of these frames as a batch process. This technique was used in other scenes too.

The death of the machine has come. The huge, flame-belching beast, which consumed flesh and destroyed the landscape, has been killed by a very small object flung from afar, just like David and his sling in the Biblical story killed Goliath. No longer does it rumble, burn, turn, process and annihilate, but it just stands as a symbol of a horrible past and new hope for nature and humanity.

Chapter 4

AESTHETIC ISSUES

Paintings

The paintings I made from undergraduate school through graduate school were not only a source of inspiration from previously designed machines, but also their images showed up as diffuse and specular maps throughout the scenes. The walls of some early scenes, that were eventually scrapped, were molded from displacement maps created from scans of my original acrylic paintings.

Color

As mentioned throughout this paper, the color pink played a major role in conveying a message, the eventual use of the pink material. I laced this color through many scenes in canisters, chopped bits, wall construction, bricks, and fleshy blobs. Colors were also used to show the temperature of the comet crashing through the atmosphere and landing in the gear. At first it is a cool blue during unperturbed flight. It then warms to a pink and red glow while encountering the atmosphere, and finally turns a hot yellow/orange when it burns up and enters the machine. Inside the machine, while cooling off, the meteor shows a waning orange glow. The colors of the different stages of the factory were also carefully chosen. At the base of the factory, the textures are rusty yellows, oranges, browns and reds. In the next section above, the textures are made of less rusty metallic

colors and patinas, mostly dull grays. In the next section above, the textures convey the

merging of metal and plastic with shiny steels and dingy plastic colors. In the top

section, the colors have expanded even further outward in the spectrum showing

reflective blue and red materials among the newly produced, shiny, gray metals. Light

colors were carefully considered too, as I had to convey a morning sun and a softly

reflecting blue sky in the outside scenes. Most direct lights were warm colors and most

indirect lights were cool colors.

Textures

Textures are my specialty. This comes from a fine arts background. The wide variety

and quality of the textures in my thesis were collected in various ways and from many

different sources. When I began this project, I started with texture collection. I used a

borrowed Sony digital camera and captured parts of Pratt Institute's campus and my

apartment. The texture that I got the most use from was the texture made from my wall

heater, which shows up in many scenes. Many others were created directly in

Photoshop without a reference. After I purchased a digital camera, the final textures

were captured from local, dilapidated buildings in Jersey City, NJ. The textures are in

targa and bitmap formats and range in size from 32x256 pixels to 1000x1000 pixels.

Lighting

For most of my scenes I tried to keep the lighting simple for several reasons. I noticed

that in early scenes, shadow sampling had to be greatly increased from the default of

256x256 pixels so that shadow edges would not appear with jagged edges. Choosing a

sampling rate above 2000x2000 pixels on multiple lights rendered nice shadows but also

bogged down my computer to an almost standstill. As a result, I eliminated unnecessary

lights from the scenes and kept the shadow sampling to an acceptable minimum. So in

many scenes, only two lights are used, a main warm direct and a cool blue omni. Many

of the omni lights only affect an object's specularity and do not cast shadows.

Sound

The soundtrack actually brought together the individual scenes and made them into one.

I knew from the beginning that this movie could not succeed without excellent sound. I,

therefore, turned to Charles Schaefer, a professional sound designer who had done the

soundtrack from Junghwan Sung's thesis project. Charles had the idea of recording live

sounds of heavy machinery. His friend's factory was the best place to record. He

brought with him a high quality-recording device and spent an entire day recording the

sounds made by large machines that assemble boxes. These sounds were then

tweaked, shortened, repeated and enhanced to create a majority of the soundtrack of my

thesis. I am quite happy with the results.

Time

I tried to escort the viewer through many different time periods in this movie. In the first scene, the bright flashing lights were there to give a sense of the lights seen at death or even at birth. The rusty, old mechanisms at the base of the factory give a sense of the late 1800's. The top of the machine is made from futuristic materials, dating this event in the future. The camera is literally dragged from the past of the Industrial Revolution through the present and into the future, then inside the machine from the future to the past, and finally dragged upwards back into the future as the camera examines the failing sections of the factory. The last scene is both a symbol of the death of the factory and the rebirth, or salvation, of the small branch and its leaves.

Scale

I was looking to have the environment seem quite large in my piece. There were only a few ways of doing this without the use of many recognizable objects. My past artworks lack a sense of scale for the same reason. The viewer rarely recognizes an object in my artwork that will relate the size of the subject matter. There are only a few things in my thesis that could convey scale. One is the leaf, while others are bricks, the foot hanging from the clamp and the head seen at the end. I knew that the viewer would expect that the comet would come in and demolish the factory, but not relating a scale between the comet and the factory until the very point of impact achieved the desired effect. It created an interesting turn in an otherwise seemingly predictable story.

Numbers

Using numbers to design various parts of the factory allowed the factory, which is

one connected whole, to seem like it was changing as it grew. For example, the

bottom areas of the factory's supports are rectangular or square and are based on

even numbers, as we would expect from our observation of building foundations.

However, more and more towards the upper parts of the machine, the overall shape

and supports were made from cylinders in groups of odd numbers, conveying less of

a mechanical form and more of a biomorphic one. Scene 13, with its five rounded

and organic columns, and Scene 19, with its makeup of 90 degree angled squares,

are perfect contrasting examples.

CONCLUSION

Distractions

Along the entire process of making this project, many distractions pulled me from accomplishing this movie in a timely manner. When I first began this thesis, I was going to school full-time in Pratt Institute's graduate program and working for the department. In July 1999, directly following my first thesis semester, I took on a part time job at a game development company while I continued to work for Pratt's CGIM department and at Pratt's SPAN project as a designer. By November of 1999, I had left Pratt's employment and had become a full-time employee at Cyber Warrior in Fairlawn, New Jersey where I am currently employed. These were mainly responsibilities, while the real distraction was gaming itself.

Delta Force by Nova Logic is an online game that took up a lot of my free time. My discovery of playing against other human beings, rather than always-faulty artificial intelligence, captured my attention every day thereafter. Day of Defeat, a Half-Life modification, also dragged me into its game play and continues to. With playing these online games, I made some online friends that also distracted me from this project.

My Career

I am an Art Supervisor at Cyber Warrior, Inc., currently. Working at this company has

only helped me with this project. The techniques and methods learned there in making a

game have allowed me to make my environments in this thesis more complex than I

originally thought possible. A glance back at my original storyboards verifies this. My

employers have been very accommodating in allowing me the time and patience to finish

this project.

The Message

I have been continually concerned about clearly conveying the message of this story.

There are a lot of ideas I tried to get across either blatantly or subtlety. Some methods I

had to clearly avoid without being downright distasteful in the imagery. I chose colors to

show the integration of the pink material into the machine's structure while being forced

to show a crunched human body dropping from a container. I had hoped to get enough

of the message across though symbolism and color without the need to show violence.

The use of 3D imagery and the machines powered to create it have allowed me in two

minutes to fully express a message that has existed in my artwork for many years. It is

also ironic that the machines I used to create this movie are directly addressed in the

thesis storyline as what we should avoid being engulfed by.

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