The Light idea

Gabe Atiya

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THE LIGHT IDEA
BY
Gabe Atiya

Submitted in Partial Fulfillment of the
Requirements for the Degree
MASTER OF FINE ARTS

MFA Imaging Arts/ Computer Animation
SCHOOL OF FILM AND ANIMATION
ROCHESTER INSTITUTE OF TECHNOLOGY
ROCHESTER, NEW YORK
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Howard Lester, Chair
Professor
School of Film and Animation

Stephanie Maxwell
Associate Professor
School of Film and Animation

Bruce Austin
Professor
School of Liberal Arts
TITOE OF THESIS: The Light Idea

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Thesis Report

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I) The decision to make a film

Although it is not unusual for students of the RIT film and animation program, formerly of the college of Imaging Arts, to produce short animated motion pictures for thesis work, I made a personal choice to undertake this challenge. New programs in the school, for example New Media Studies and Visualization, which have little overlap with motion picture production, appear to encompass parts of what this program originally intended to be. Even though I knew that an animated story was not a requirement for the degree, I decided to create a motion picture because the idea of doing so interested me.

My greatest interest in computer animation technology was the assistance the medium offers to individuals like me in producing independent films. Until now, in both technology and film production, the possibility of making personal films has been largely restricted to experimental formats. People have depended on actors and a wide variety of other accessories and restrictions that made the participation of others necessary to produce a work of visual fiction. Any such work originating directly from the author’s imagination has been in the past limited to the written word. This is strange because the written word is conceived as a means of verbal communication of, whereas visual imagery is more deeply connected to the natural and subjective human experience of life. The process of dreaming demonstrates the visual as the fundamental way we human beings experience the world.

Since I have been socialized to view technology as a means to an end, such as gaining employment in the modern economy or achieving human ends that would be impossible without technology, computer animation suggests a way to use technology toward ends which are more clearly human. The expression of one’s “soul” is an undertaking more traditionally channeled through music or representational painting. I think that the process of dissociating from these human kinds of motivations have often produced alienation within the technical person, and is an effect from which criticism of technology in general frequently arises. As a student of technology, this denial of certain aspects of humanity I felt had negatively influenced me.

Even in the realm of animation, however, the possibility of producing a personal film has generally been out of the reach of ordinary people, as traditional hand drawn animation very much requires the development of an animation trade. Not only does producing hand drawn animation require the development of a skill, but has traditionally been so labor intensive that many people working collaboratively have usually been essential in creating even a short animated film. Finally, the
means of producing films have been sufficiently expensive and removed from ordinary life that few ordinary people, I imagine, have possessed the finances, time, or resolve to create independent films. The development of computer technology helps to achieve many of the most difficult and tedious parts in the process of animation. Computer advancements also make this animation technology available on personal computers. These factors, I felt, truly place the possibility of creating personal films within the reach of the ordinary person.
II) The decision to produce a 3d film

When I applied to the computer animation program at RIT, I had made a firm decision to learn to create 3d animation. Digital imaging had been an interest of mine for some time and I thought that computer graphics was one of the most amazing applications that came with the development of computing machines. Also, a lot of my motivation for learning computer animation stemmed from the rapid proliferation of computer graphics in multimedia CD ROMs, computer games, and the internet. Aside from the pure fascination I had with the seemingly miraculous results that this new technology produced, there were other reasons I wanted to enter this field.

One reason I was especially motivated to create 3d animation was the realism of the medium. I like the 3d visual environment, but until 3d animation developed, I had only been able to experience realism in animation through stop motion photography and claymation. I think that this kind of realism is powerful because it takes the art of animation out of the realm of graphic style and more strongly connects it to live “film” or even to reality. Aside from the graphic film, the other branch of traditional animation that 3d animation stands in opposition to is illustration. Except for certain sequences in Fantasia, every Disney film I have seen presents human problems, stories, and issues in animated form. In terms of story and concept, most of these films are essentially live action-based themes transplanted into an animated environment, which owe their charm and beauty to the old craft of illustration rather than animation. Even though the animation in these films is meticulous and naturalistic, the naturalism of these films demonstrate a strong indebtedness to illustration and to live action theater-film. The realism made possible by 3d animation takes animation out of the realm of illustration and gives the animation artist an opportunity to tell a story in a way that does not rely on either the tradition of illustration or that of the graphic arts.

I also wanted to learn this new technology because I felt that it melded well with my experience and interests. Having exposure to traditional arts, in drawing primarily, as well as computers, mostly in computer programming, I felt that graphics applications would follow naturally from my training and understanding. Although I discovered that this was not as true as I had hoped, I found that the synthetic interface provided by the computer indeed made working with the computer more intuitive than working with actual cameras, instruments, and props. Good documentation and helpful interface functions were among the features that made the process of investigating the media much simpler. The synthetic camera of the computer provides one example demonstrating the strengths of the computer. Rather than requiring a user to learn all of the workings of a real camera – how to produce depth of field, focus, pans, distortion, camera angle, perspective, and distance – the computer offers all these features in a straightforward menu format with easily entered numerical fields corresponding to the menu options. Another factor making the computer more accessible to me than manual techniques was the automatic feedback that the computer gave. In
stop motion film animation, one has to wait for film to be processed in order to see the results from pictures taken by the camera. On the computer, not only can any change or transformation I create be immediately visualized, but playback can also be produced on the fly via motion capture and playback.

The other major advantage to using the computer for animation is that in the computer environment, time and space are completely elastic. By this I mean that if I want to insert an action (a movement that a character makes, for example) in the middle of the animation and maintain realistic continuity of space and motion, I do not have to start animation over from the beginning. This is impossible in stop motion, where the smallest discontinuity of object or motion always comes out as jarring and abrupt. While this effect can and often is incorporated into graphic style, it works against producing realistic results. Smoothness results from the computer’s ability to graphically synthesize and display action prior to rendering. Keyframing is especially important toward achieving this effect. Animation motion curves are made alterable at any point while retaining continuity of the original animation. This elasticity contributes to an overall effect of realism that is very difficult to achieve in any other form of animation.
III) The Story

The original concept of the story was adapted from an Appalachian folk tale entitled “Fare you Well, Joe Clark.”¹ I learned from Howard Lester, my thesis chairman, that Joe Clark has a history in the lyrics of American fiddle tunes (although none of the tunes he cited included this particular tale). In this story, Joe Clark identifies with birds from the onset. Not only this, but he is himself identified with the birds, and the narrator claims he has a resemblance to birds in physique and movement. The main narrative of the story, cast against the backdrop of the California Gold Rush of the 1840’s and 50’s, revolves around Joe Clark and his quest for gold. One day, while up in a tree hanging out with the birds, Joe overhears travelers talking of the gold they hope to discover. He becomes determined to make his fortune as well, but being poor, he has no ready means of transportation to his desired destination. Again identifying with the birds, he decides to fly there. Pitching pennies, he earns enough money to buy a barrel of tar. He uses the tar to tar and feather himself and to create a pair of makeshift wings. He builds a ladder upon a high tree on top of a hill and uses a high branch as a platform from which he may take off. His final obstacle takes the form of a preacher, who attempts to stop Joe from performing this seemingly unnatural and superhuman feat. This obstacle is surmounted in his merely ignoring the preacher’s warnings; eventually he climbs so high that the words of the preacher are no longer audible. The story ends as Joe jumps off his high platform while townspeople gather below and finally, begin to pray for Joe as he takes his leap into the unknown. The vision of Joe Clark flying over the mountains on his way to California is the final image the first person narrator gives of Joe’s daring effort at flight. According to the narrator, this was the last that anyone ever saw of Joe.

I thought that this story would make a very appealing animation for many reasons. I think that the story recalls the narrative tradition of the tall tale, and as such, provides ample opportunity for exaggeration in content, form, action, and movement. The fact that the story is told in first person narrative underscores the dream like, fantastic quality that the story has. Indeed, the story is structured and functions very much like a fantasy. A poor character, alienated from society, has a secret passion. He uses this passion to develop a special, magical world for himself as a respite from the real world, which he does not understand and which does not understand him. When opportunity finally strikes, he finds himself powerless against the ways of the real world, but is able to turn to his special passion and innate quality in order to make his dreams into a reality. Because the story speaks of flight, of climbing tall objects, and develops an absurd solution to a set of problems rooted in an stylistically identifiable time period, I thought this

made a great story on which to base an original animation. The storyboard for my animation underwent several revisions and the final draft is the result of overcoming many conflicts of interest in concept and theme.

My original storyboard, one of three I created (see Appendix B, page 21), reflects few changes in this story idea. Most of the changes I made were either simplifications of the original or embellishments designed to clarify conflict and motivation. In this storyboard, the main character is introduced to the viewers as a boy, sitting outside his cabin, studying birds in flight. His fascination with birds and flight is made particularly clear when he raises his arms in emulation of the motion of the birds he watches. We see him later on, as a grown man, watching the birds as before, but now poor and shabby. As he stands, feeding the birds, he sees a cart of miners passing by along the road. They stop and begin to dig in the road. He waves to the miners and they wave back as they move on. The next part of the story chronicles Joe’s triumph against the odds. He nails rungs, produced from the pieces of his broken-down house to the side of a exaggeratedly tall tree and begins to climb. As in the original story, the preacher attempts to stop Joe, but fails. Joe awkwardly climbs a plank and prepares to take a final leap. His dizzying height is depicted by a point of view of the ground below. The townspeople, who have gathered to watch Joe, look like ants. He takes the leap and at first falls like a stone, but amazingly, his wings work! The people below are amazed as Joe flies over a mountain and some even try to emulate him in flight. Just as miraculous the flight itself, Joe lands in a gold mine, thus discovering gold and uniting him with the miners as a hero.

Although my idea was approved, many people saw some fundamental problems with the story that inclined me to drastically change the direction of the story. Most of these problems, I believe in retrospect, may in part stem from the fact that the story was somewhat too complex for a short animation, and may stem from the fact that the story was very unrealistic. Perhaps not being fully aware of this at the time, these factors made it a great challenge to produce a final storyboard acceptable to everybody involved. One committee member protested that realistically, miners who are mining gold would pan for gold to discover it. They would not dig, and certainly, diving headlong into a mountainside would not uncover unearthed gold. Since the whole nature of this storyboard was somewhat tongue in cheek, however, I was not sure how seriously these disagreements were to be taken. After having written stories and created films in which a main character did not achieve his goals, I wanted to create a story in which the character did. This is why I chose to give my character a chance to get what he wanted by altering the end of the story.

Another issue of dispute with the proposed storyboard concerned plot complexities. One problem cited was ambiguity over the character’s goal: was the character really trying to fly or really trying to get the gold? This was a difficult problem to resolve, because in the original story, gold provided his main motivation, but from my perspective as an animator, his flight and invention of
wings interested me the most. One solution to this problem was to focus exclusively on the character’s goal to learn flight. However, creating an animated film about the character’s simply learning to fly was difficult without re-invoking the Wright brothers narrative. Without the motivation of discovering gold there was no longer any apparent conflict established in the story – there were no real obstacles in the way of his goal, if flight was his only goal. Nothing was risked, nothing was lost, and therefore audience identification with the character was weakened. As one my committee members suggested there is no special reason to like the character or identify with his struggle.

In my second storyboard draft I decided to return to the theme of the main character’s dissonance with the working community in order to provide the story with needed conflict. In this storyboard, the character is depicted as an estranged member of the mining community to which he belongs. He is set apart from them because while they are working, he is studying birds in flight. His identification with birds is made clear when he raises his arms in emulation of the birds he watches. It is also made clear from a conglomeration of bird like contraptions and flying paraphernalia, suggesting previous efforts at flight. Finally, the miners of the community discover gold, and decide to leave with their loot, abandoning the main character – either out of greed, or, in my own interpretation, simply because they have forgotten about this person who plays no active role in their undertakings. The main character’s goal therefore changes. He seeks to reunite with his community, and flight becomes his way of achieving his goal. His flying endeavors prove to be a process of trial and error. When he fails, he sees a group of scattering birds and reaches for them. In doing so, he finally realizes the potential of his wings, which lift him upward and over the mountainside. The final shot of the storyboard showed the people of his mining community emulating Joe in his flight, just as he had emulated the bird at the beginning of the animation.

I felt that this resolution would show the possibility that Joe’s passion, commitment, and courage could bring the miners out of their materialistic ambitions and their meaningless and repetitive pursuit of wealth. This, in effect, would be the payoff in Joe’s risking his life and affiliation with his community in order to pursue his dream. Although, again, there may be certain realism problems involved with this poetic, rather than mechanical, discovery of flight, I believe personally that this storyboard satisfied the basic requirements of a story and solved the problems with the original. From my perspective as an animator, this was, to me, a much better version for relating my interpretation of the original story. The Joe Clark character achieves his goal. He learns to fly. He also overcomes his conflict, namely the callousness of his fellow workers. Unfortunately, since this was a period in which I was changing my thesis committee members, I did not feel as if I had much ground to stand on in defending what I felt was a good solution to my idea. Perhaps this is why this storyboard did not get full approval either. This is the stage of the approval process that remains confusing, mysterious, and frustrating to me.
The final version of my storyboard solved the aforementioned problems in a couple of ways. First, this storyboard suggests a revision of the character’s goal, namely that he wants only to find an acceptable way out of his community and his work (see Appendix C, page 28). He needs an excuse to quit his job, at least for himself. He finds a “way out” through the discovery of beauty, presented in the motif of a beautiful and graceful shadow that flirts past him as he is working. Next, the storyboard suggests a revision of the conflict, specifically his inability to get his co-workers attention and persuade them to follow his lead. The realization of beauty alone is not enough. He needs some affirmation of this discovery and in the end he gets it, though through artificial means. He constructs a machine that performs the same action as the bird that casts the beguiling shadow in the beginning. It is a shadow projector, and the birds gather to assist him in projecting shadows onto a local schoolhouse. And (lo and behold) he finds an audience as well, a group of school children playing in their playground. The kids love it! So, in the end, the main character gets what he wants – he finds acceptable grounds to leave the group of workers with which he is struggling and he also gets some personal affirmation of his concept of beauty. This is the final storyboard and the idea upon which I ultimately based my animation.

My own feelings about this final version are generally positive because I feel it solved the problems with my initial storyboard. I think that I achieved my goal of producing a good animated motion picture. The attempts that the character makes at flight are interesting to me for he visual appeal of the motion of the character. I think that the character is still an interesting character to animate, as far as his bird-like look and action is concerned. Likewise are the motifs of the shadow and the motion of the miners, each of which are dynamic visual symbols representing beauty and work. Also, as described in detail above, the final storyboard resolves problems of conflict and motivation quite well. My only personal uncertainty with the final solution, with which I give members of my thesis committee credit with myself, is that the solution is ultimately an existential solution to an existential problem. Nothing has clearly changed or progressed at the end of the story. The happy ending is more for the children than for the main character. The main character has simply moved from one somewhat repetitive task to another, even though one is inspired by beauty, and the other, by a lack of clear inspiration! I am not positive what is wrong with the character in the first storyboard having two goals, one to learn to fly and the other to get the gold. Perhaps his attempt to get the gold is a materialistic one. In my final storyboard, however, his turning to a non-materialistic goal does not produce any clear changes in the situation at large, but only possible change within the minds of the children.
IV) Character and Set Considerations

In designing the look of the characters and environment, puppet style animation was my major reference. Little is fancy or elaborate in the design of the characters I created. I kept the geometry of design simple, and I created nearly all elements of the characters from primitive spheres. The attire of the characters is simple, and I aimed at producing the impression of 19th century miners. The main character wears a simple white shirt, gray flannel or denim pants and suspenders. The suspenders are not actual geometry but a ramp texture mapped on the clothing surface of his torso.

When I designed the main character, I aimed at making him look bird like. The nose on the character’s face is intended to resemble a beak. His legs are long and his body is lean, to resemble a stork. The character has a wide arm span. He has a tuft of hair atop his head, to resemble the comb of a bird. He has a long, slender neck and a prominent Adams apple. The main character’s eyes are large and wide and his features are delicate, also intended to depict a childlike quality. In animating the character, I tried to exaggerate his motion. I wanted to depict his motion as somewhat stuttered and awkward, as if land were not entirely his element. Like a bird, his motion when walking is somewhat sharp and abrupt, not especially smooth and graceful. The other characters are represented as somewhat more human in their appearance, though without as much personality as the main character. Their bodily proportions are more accurately human, and their movement is smoother and steadier.

Most of the sets used throughout the animation make consistently use a few sparely designed elements. The surrounding environment is composed of forms that I also tried to make as simple, organic, and natural looking as I could. Green hills roll across the horizon of the landscape. A single piece of slightly warped geometry creates the plane representing the earth. All surface planes representing these natural forms were created from primitive planes with evenly spaced isoparms, designed so that the fractal surface maps I created would produce even textures across all surfaces. Other elements in the natural environment simulate this sparse organic model. Tree trunks and branches are created from single pieces of NURBS geometry, which I bent and rotated in order to produce flowing lines. When I did not use a single color environment shader as an attribute of the rendering camera, I used a sphere with a gentle ramp texture as a backdrop to convey the gradations of sky color. These elements, along with the cabin, schoolhouse and mining equipment, comprise all props used in the animation.

The few non-natural forms in the animation were also created with simplicity of design in mind. Architectural structures, such as the cabin and schoolhouse, are simple box shaped structures. Iconic components, including a tower and bell for the schoolhouse and Lincoln logs for the cabin, I tried to make consistent use of. All non-natural objects have simple, repeating texture maps, whether they be wood, bricks, or rust, to suggest material properties. Because of texturing
properties of Maya, which I discuss in more detail later, I felt that the simple, repetitive, and organic appearance of sets and characters, rather than hard lines and synthetic materials, were most greatly enhanced by Maya’s rendering program.

The exception to my simple and sparse use of props is the complicated contraption that the main character uses to create the shadows. This is a fairly complicated device geometrically, and is designed to look somewhat like a lantern, somewhat like a projector, and somewhat like an engine. Black metallic tubes coil around the device. Rotating gears move continuously within the bowels of the machine. A glowing, shining, and shimmering beacon of light emanates from the center of the contraption, the most glaring of all features. This glowing light, which was animated by manipulating the options within the Optical FX lighting feature, is dissimilar to all other lights in the environment, since all other environmental lights are spot lights, with clear directional properties and shadows.
V) Aesthetic and Technical Issues, Problems and Solutions

The digital creation of my thesis animation took over a year to accomplish, and is certainly one of the most substantial undertakings I have ever ventured. The first issue I dealt with, naturally, was learning to use Maya, which I have heard, when introduced in 1998, was the largest commercial software application ever created. Having worked previously only with Alias|Wavefront’s first software package, Alias, beginning to deal with Maya alone was a challenge. Though Maya had many similarities with Alias, it also had many differences and many new features that, although proving to be powerful animation tools, also posed technical challenges.

First, were modeling concerns. Maya, I found to generally be an inferior modeling package to Alias. Functions that were simple in Alias, such as trimming and rounding surfaces, were quite difficult in Maya, and many of my models I built in Alias and transported to Maya when they were finished. Other than this, I became accustomed to using primitives. In fact, all of the major components of my character are built from primitive spheres, including head, torso, legs, and shoes. By using insert and remove isoparm functions, geometry was actually fairly simple to extend or simplify. I chose to keep everything as simple as possible, partly for fear that making geometry too complicated would lead to complications with animating and maintaining files. I also wanted to keep models spare in part because I thought it would give me greater control, in part because I thought it would make rendering easier, and in part to challenge myself. I think that ultimately, this objective of simplicity was a good choice in the Maya environment, because Maya is not as precise geometrically as Alias, but is more flexible and yields better organic forms. Also, since I found Maya not as powerful in shading or rendering as Alias, I think it was important to maintain geometry as simple, clean, and clear as possible for the viewer’s eye.

Many of the features in the Maya package specific to character animation were very helpful to me for designing and animating characters. Among these features included lattices and flexors. The feet of the characters are attached to the legs with lattices, and are bound to these lattices rather than joints. I made use of flexors at all major joints, and these flexors worked very well in making the characters bend more smoothly. The greatest problem with requiring all this scaffolding for my characters was that it made changing characters, which I frequently was forced to do in the modeling and binding process, very difficult. I had to unattach geometry, rebind it, and re-create deformers. There was no way to preserve lattice and flexor positions once joints were unbound. One neat trick I found was using flexors for holding characters waists together. Creating a relatively seamless bind between upper and lower body could have been achieved using another lattice or using a blend. However, by editing the membership of CV’s on the top half and bottom half of the belt to respective joints (spine and pelvis), the character would bend quite a lot without showing seams. Finally, I made frequent use of Maya’s parenting function in order to associate an object
with a particular joint. This method made the specific binding of surfaces unnecessary.

Shading, rendering, lighting functions in Maya, though I found fine for what I was trying to achieve, did not measure up to Alias’ standards. Textures were not usually a problem. For many of the textures, I simply used those made available through Wavefront over the Internet free for public use. The 3d shader conform feature was useful for creating a 2d texture for a specific object based on an existing 3d texture. I made use of this 3d to 2d shader conversion process, for example, converting a 3d rust texture used for 3d objects to 2d for flat planes on objects such as the shovel. This shader conversion process was necessary to permit textures to move in syncopation with an assigned object. One difficult task I had to deal with was shading other objects, such as the roof, which was very simple geometry, to look as if it had shingles. This was difficult because in Maya there is no displacement feature under shader options. Nonetheless, I was able to accomplish fairly convincing results using a bump map. I mapped this to a grid pattern and manipulated coordinate variables to slightly warp the roof’s pattern.

Creating realistic shaders for stylized clouds was another challenge. The clouds in my environments are obviously simple spheres, which I varied in size, shape, and displacement in order to convey an impression of motion. I derived my final cloud textures from a MEL script that can be found on Alias’ home page via its Online Assistant tutorials. Though I do not understand the specifics of how this script worked, when I executed the code, a realistic smoky looking shader resulted. I had to transparency map the black portion of the ramp used to create the cloud shader to give the clouds transparency in hue and texture. Finally, to achieve greater transparency of my cloud forms, I disabled the double-sided option under rendering options for the spheres that represent clouds in my environment.

Most of the lighting in my scenes relies on a fairly simple three point lighting scheme, comprised of a main light, a back light and a fill light, which I varied in color and degree of intensity. In almost all of my shots I used only spotlights because I felt that spotlights gave me the puppeteer style of lighting that would most effectively compliment my simple, organic models. I wanted my sets to look like sets, so extreme realism was not something that I was especially aiming for. I worked quite hard to achieve convincing shadows, also important to me for this aesthetic effect. I wanted to obtain shadows with clean, clear edges that would remain sharp for a distance. I achieved this effect by increasing depth map resolution and depth map focus. One result of having clear shadows, however, was that it exposed a problem in Maya’s handling of shadows, namely that shadows would not always meet the objects that cast them. Decreasing depth map bias, a feature that exists in Maya exclusively to cover for this problem, to about 0.001 seemed to help most of the time.
Creating the animated shadows that are cast by the birds and by the projector was also occasionally a challenge. These shadows, distinct from the environment shadows discussed above, were cast by individual spheres with animated CV’s, one to produce each shadow, illuminated by a backlight. In many scenes, I made use of light linking so that I could separate the light casting the shadows on ground surfaces from the lights used to light the general scene. One of the problems I faced was creating shadows that were clean and possessing clearly defined edges that would not fade or become fuzzy. In those shots in which multiple shadows were cast, I had to light all objects casting shadows from a single main source so that I would get an even lighting effect across the scene. Obtaining crisp shadows, in, for example, the scene depicting the schoolhouse from afar, required me to place shadow casting objects very close to the illuminating light source. This meant shrinking these objects to very small sizes, since their respective shadow volume increased as they approached light source. To hide objects casting shadows, I turned off their renderable variable for rendering. For the ground shadows that pass by the workers as they dig, I had to create a specific light to cast main shadow to make it darker than the other shadows in the scene. I linked this light only to the object casting the shadow and to the ground, and decreased the intensity of the other lights to compensate for the intensity of the new light. Shadows obey Light Linking must be turned on and Object Visibility must be turned off under the Render Globals menu for this to work. Another approach I found useful to create overlapping shadows was to take an ordinary rendered shadow into After Effects, sharpen all blurred edges by decreasing the feather effect, and then use motion blur to add subtlety after compositing the shadow with a previously rendered shot.

Though I took a fairly straightforward approach toward animation, the animation of some objects and characters provided a few noteworthy challenges that I want to discuss. One of the most difficult motions to animate was the complex motion of the digging men. The man who is shoveling was a particular challenge because I was forced to find a way to ensure that his hands would stick to the shovel. Since the shovel could only be parented to one joint, parenting alone was not an adequate solution to the problem. One temporary solution was to parent wrists together. Although this was adequate, this action entirely removed joints connecting wrist to elbow, and therefore produced some odd looking distortions on the shoveler’s hands and wrists. The best solution was to parent locators to the shovel so that these locators would always move regularly with the shovel. Next, I constrained the IK handles on the character’s arms to these locators, so that smooth motion between the shovel motion and the character’s wrist and arm joints would result. Sometimes it was necessary to move one of the arms independently of the shovel, for example when the shoveler reaches to brush off the glaring light. To accomplish this, I parented another locator to the IK handle of the arm and toggled its weight from zero to one, to toggle on the IK handle of the arm off of the shovel locator and on to the new one.
Parenting was a big help to me in using IK for most purposes as well. Parenting handles to joints allowed me the benefits of using IK handles, but also made it possible to animate a character through various motions and contortions while preserving the position of IK handles relative to those joints. Animated IK handles creating flipping of joints and bodies was frequently a problem as well, often, for example, when characters were animated to gesture in large sweeping motions. A good solution was usually grouping the IK handle and then pivoting the grouped node at the root joint of the arm. I then used this group exclusively for arm rotation, and used the IK handle itself strictly for flexing motions. This method for controlling the rotation of IK handles proved an effective alternative to using the IK manipulator tool provided by the default menu, which I found to frequently not work well enough to produce smooth motion. Attaching IK handles to motion paths was another technique I used to create sweeping movements in the arms of characters in, for example, the scenes involving the running children.
VI) The Learning Experience

As is probably clear from above, I had to learn a great deal of material to accomplish the goal of creating a personal, independent work of computer animation. I was greatly surprised, in fact, at how much there was to learn and how much work was involved in creating a six and a half-minute piece. Even though the computer was able to assist me in many aspects of the animation process, the process of all animation, I feel now, is largely the same in any kind of animation, and that process is extremely labor intensive. I am not entirely sure that I feel the same way about animation as I did before I undertook this task. I am inclined to feel that computer animation is as much an art and a skill as any other kind of animation. Perhaps the most significant difference between computer animation and other animated forms concerns the fact that, in so far as the computer is able to produce superior results to other animated forms, the standard has been raised and will continue to be raised. I also found that whatever past experience I have, whether it be drawing or computer, I believe had little direct influence on what I accomplished, although I also suspect that had I no experience at all, I would not have been able to accomplish what I did accomplish.

One of the most overwhelming aspects of the process in creating an independent motion picture, especially when part of this process requires accepting and synthesizing input from other people, regards dealing with complexity. Each step, from concept to storyboard, storyboard to technical issues, technical issues to aesthetic issues, aesthetic issues to animation, animation to editing, and so on, creates a new level of complexity. If an extremely clear vision was not firmly rooted in the mind of the creator, effectively and efficiently developing an animation, I believe, would have become far too complicated for me, the creator. Each level of creation became still more complicated with the variety of viewpoints I was challenged to consider, because I had to decide which to filter in or out of my production. Only because the computer has the ability to simplify masses of information did the material finally become plastic enough that I was able to handle this level of complexity. It genuinely was not until I had outputted the work to digital video format that I was able to envision my work in good form and in its entirety, and was able to consider it a finished work and envision it as such in my mind.
Appendix A: Original Thesis Proposal
Proposal for an MFA Thesis

The Day Joe Clark Took Flight  
by  
Gabriel Atiya

MFA Imaging Arts/Computer Animation  
SCHOOL OF PHOTOGRAPHIC ARTS AND SCIENCES  
ROCHESTER INSTITUTE OF TECHNOLOGY  
ROCHESTER, NEW YORK  
May, 1999

Maria Schweppe, Chair  
Associate Professor  
Film/Video/Animation Department

Stephanie Maxwell  
Associate Professor  
Film/Video/Animation Department

Howard Lester  
Professor  
Film/Video/Animation Department
A boy named Joe Clark is looking up into the sky, wistfully. He runs off the porch of his cabin home and sees a flock of small birds feeding. He runs up to the birds but they do not fly away. Joe looks and walks like a bird. He takes a handful of crumbs out of his overalls and throws them to the birds. A shadow passes over him. He looks up and sees a magnificent bird circling overhead. Joe looks up and flaps his arms as if he were the bird in flight.

Dissolve to Joe Clark as a grown man. He is still feeding the same birds, but his house is a wreck, and he and his clothes are in shabby shape as well. He sees a group of gold miners traveling along the road in a cart. He waves to them and they wave back. Again, he flaps his arms as if he could fly.

A picture of Joe atop a hillside. He is putting the final nail in the rungs of a ladder he has built to a huge tree. People gather as he attaches his hand built wings to his arms. A preacher begins to preach to Joe. Joe ignores and begins to climb the ladder anyway. The ladder stretches upward seemingly infinitely. The rungs creak at Joe’s every step. One even breaks along his way. The gathering townsmen continue to watch Joe as he reaches the top.

Joe awkwardly walks the plank he has built and looks down over the edge. The people all look like ants. The wind blows and Joe sways, almost falling off as he is getting up the nerve to jump. Finally, he hesitantly does jump. He at first falls like a stone, but finally starts flapping his arms and begins to fly. The people below are amazed as they watch him fly over the mountainside. Some of them flap their own arms in emulation.

Joe lands in the mine of the miners he saw earlier. Gold dust flies out of the mine. He scoops up a handful of gold dust, and is amazed by what he has discovered. He heroically lifts his arms and again pretends to fly. His dreams have paid off in the end.

THE END.
## Budget Proposal:

<table>
<thead>
<tr>
<th>Item</th>
<th>Estimate (Total cost)</th>
<th>In Kind (Donations, facilities)</th>
<th>Actual (own expense)</th>
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</thead>
<tbody>
<tr>
<td>Research:</td>
<td>$600</td>
<td>$100</td>
<td>$500</td>
</tr>
<tr>
<td>Storyboard:</td>
<td>$1200</td>
<td>$600</td>
<td>$600</td>
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<tr>
<td>Script:</td>
<td>$1200</td>
<td>$600</td>
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<tr>
<td>Animatic:</td>
<td>$1200</td>
<td>$600</td>
<td>$600</td>
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</tbody>
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**Total production time**

| Character Design      | $3000                 | $600                            | $2400                |
| Animation             | $8000                 | $2000                           | $6000                |
| Modeling              | $3000                 | $1000                           | $2000                |

- **Rented computer time** (SGI with software)
  - $200@$100/hr = $20,000
  - $0

- **Purchased computer**, leased software
  - $4,000
  - $1000
  - $5,000 (if used...)

- **Render time**
  - for 3-5 minutes of animation x
  - $0

- **Rented editing equipment** (Media composer)
  - 20@$100/hr = $2,000
  - $0

- **Sound Editing**
  - 40@90/hr = $3,600
  - $3,600
  - $0

- **Music and composition**
  - $1,000
  - $0
  - $0

- **Other sound work/recording**
  - $500
  - $0
  - $500

- **Dubs and recording**
  - 10 @ $5 each = $50
  - $0
  - $50

- **Media and supplies**
  - $500
  - $0
  - $500

**TOTAL:**

- $31,800
- $13,100
- $13,700-18,700

+rendering
Timeline proposal:

End of Spring Quarter, 1999:  Have completed storyboard  
                          Have completed animatic

Summer Quarter:  (0 to 1 credit hour)  
                   Preliminary: research and characters  
                   Research and design models  
                   Begin modeling on computer if possible

Fall Quarter:  (four credit hours)  
              Have models and sets approved  
              Begin animating

Winter Quarter:  (four to five credit hours)  
                 Finish animating  
                 Begin rendering animations  
                 Do research for sound  
                 Begin working with sound

Spring Quarter:  (two to four credit hours, for 12 total)  
                Finish rendering  
                Rough edit by beginning of quarter  
                Finish sound by midquarter  
                Finish film  
                Write paper  
                Show film
Marketing proposal:

All listed are festivals, and were taken from the asifa.org web page. I am still looking into this part of the process, so it may change in time.

Asifa East Festival
Blue Sky International Film Festival
Chicago International Children’s Film Festival
Hiroshima Festival
Los Angeles International Film Festival
LA Short Film Festival
New York Animation Festival
New York State SMPTE Festival
Ottawa Animation Festival
Rochester International Festival
Appendix B: Original Storyboard
1) Joe Clark as child, sitting on porch

2) Joe walks up to birds, begins to feed them

3) Shadow passes over Joe, he looks up

4) Magnificent bird passes overhead
5) LS: Joe flaps arms in imitation

6) LS: A later time. Joe is still feeding the birds. He is dressed shabily

7) MS: Joe sees a horse and cart pass by.
Miners emerge from the cart and begin digging in the ground.
9) LS: The miners wave to Joe and Joe waves back.

10) MS: Joe waves his arms again in the air, as he watches the miners travel away.

11) LS: Joe picks up a piece of his broken house and mulls over the situation.
12) LS: A later time. Joe is nailing rungs of a ladder to the side of a tree. With him is a barrel of tar and a pair of wings.

A preacher walks up to Joe and begins preaching to him. Joe begins to climb the ladder he has built.

13) MS: Joe's point of view of the apparently endless ladder on this enormous tree.
15) MS: The townsmen gather around the tree. They look up and point.

16) LS: Joe teeters atop the precarious branch at the top of the tree.

17) Joe's point of view of the villagers far below.

18) LS: Joe leaps, and at first, falls like a stone.
19) MS: Joe flaps his arms. Miraculously, the wings work!

20) MS: The villagers watch Joe ascend over the hillside. Some of them flap their arms in emulation of Joe.

21) LS: Joe lands head first into the mine in which the miners are digging. Gold dust flies all over the place.
Appendix D: Color Stills
Appendix C: Final Storyboard
1) L.S. Three workers digging in the ground

2) L.S. Strange objects and occurrences begin. Clowns in fire engines pass by. No response from the workers.

3) L.S. Bees pass by. No response.

4) L.S. Three breasted women pass by. No response.
5) C.S. A shadow passes over the ground where the pick-axes fall.

6) M.S. One character attempts to point out the shadow to another worker.

7) C.S. The shadow.

8) The character begins to pursue the shadow on his own.
9) M.S. Character does not see where he is going. He crashes into a tree. A bird flies overhead.

10) M.S. He gets up and for the first time, looks up.


12) Character flaps arms, in imitation of the bird’s flight.
13) L.S. The workers continue to dig, still not noticing the bird or the shadow.

14) Character exits and re-enters with a pair of hand built wings. He begins nailing planks to side of tree.

15) L.S. Nails planks into tree as he climbs higher and higher. Finally, he climbs out on a branch.

16) M.S. Birds gather on limbs to watch what is going on.
17) M.S. Climbs out along branch, using wings as a tightrope.

18) L.S. (POV) Looks down at workers below. They continue to work and pay no attention.

19) L.S. Birds continue to watch as he sways back and forth, preparing to dive. Finally he jumps off branch.
20) L.S. Character falls on ground, tumbling to a stop.

21) M.S. He turns back to workers, bowing after his feat.

22) L.S. The workers, continuing to dig.

23) M.S. The character scratches his head, looks down. Finally, a light bulb appears above. He dashes off screen.
Construction noises off screen.

24) L.S. Returns on screen with mechanical device. Begins to climb tree once again.

25) L.S. Brick schoolhouse

26) M.S. Two school girls walking. They stop. One points in the sky.
27) M.S. Boy playing ball. Is distracted and drops ball.

28) L.S. The school house. Shadows dance all over premises.

29) M.S. Man is up on same tree branch, with machine, hanging out with the birds. Bright light shines from the machine.

30) M.S. He suddenly turns machine around and points it in opposite direction.
31) M.S. Shadows now begin to dance around the workmen, who continue to dig in the ground.

32) M.S. Shadow passes over one workman. He momentarily stops digging and looks up. He tries to brush off the shadow as if it were a bug.

33) L.S. The man and the birds joyously jump up and down atop their branch, in celebration.