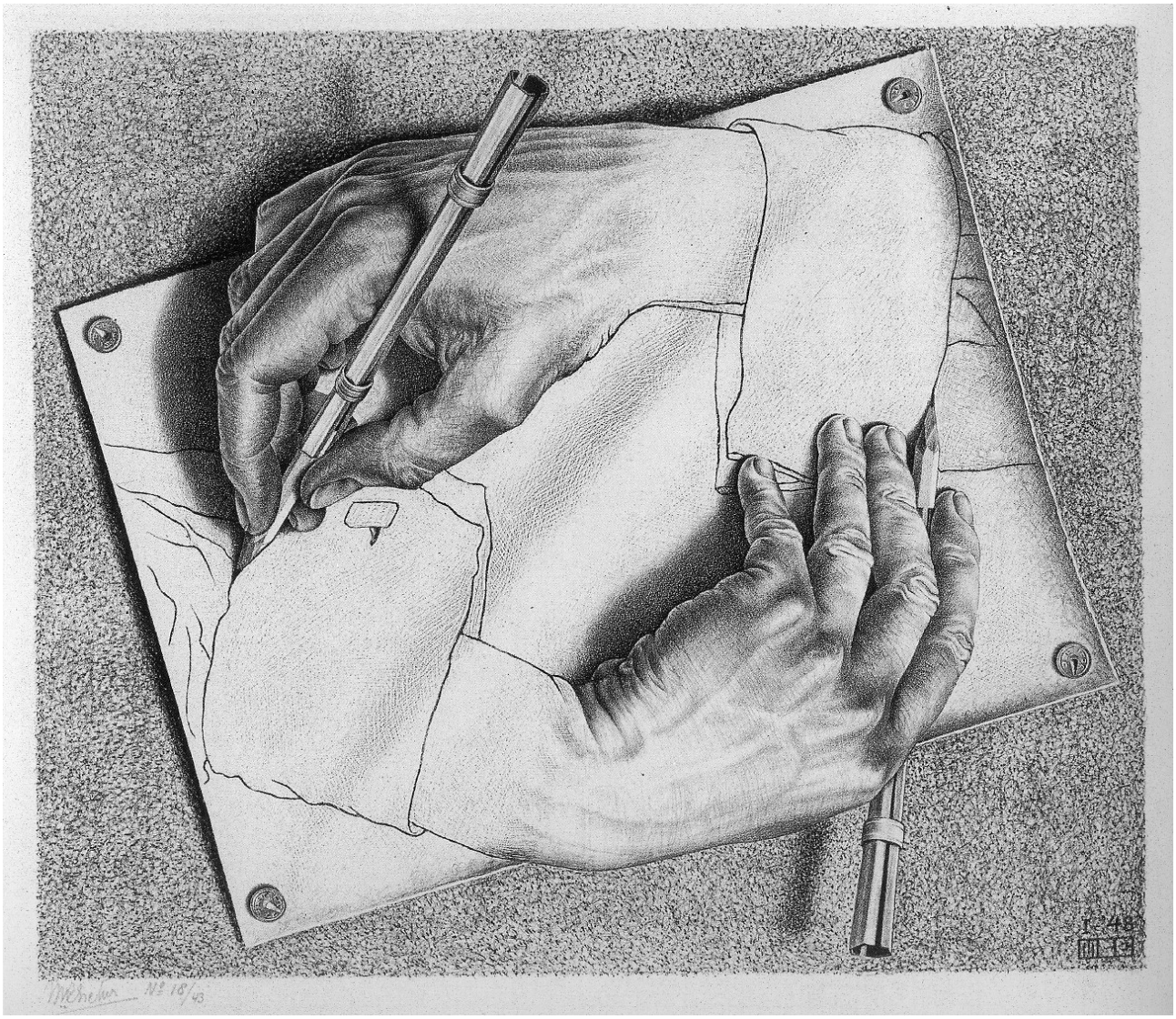
The Animated Index,

The Different Semiotic Ontologies of the Animation Styles



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1- Introduction

In the entire field of film studies animation is somewhat of a strange subject. It would be easy to say that animation has largely been ignored, but the sheer number of people (working within the field of film studies themselves) claiming this does somewhat undercut their argument.[1][2] There have been a lot of studies concerning, for example, the history of the Disney studio, the use and function of sound in animation or the social relevance of animated television shows such as *The Simpsons*. However, those studies (which make up a majority of the material on animation out there) seem to concern themselves more with what animation *does* and less with what animation *is*. In other words, the ontology of the medium of animation is not something as clearly defined as it should be. As, for instance, live-action film is.

The general critical language that has been developed by film scholars has been from a perspective of live-action film and this language has been passed on to new generations of film students. Because of this, these students in general are a lot more familiar and therefore comfortable with using terms like 'wide shot' and 'method acting' than terms like 'keyframing' and 'inbetweening'[3]: film scholars are taught almost by osmosis how live-action film 'behaves', but exactly how an animated film does is still a mystery to many.[4] In very broad strokes this is a problem that I want to approach with this thesis. By looking at the formative aspects of the animation medium (specifically the *semiotics*) I hope to clarify what it is that makes animation tick, leading to a better understanding of the ontology (or rather, *ontologies*) of animation as a medium.

One of the, in my opinion *major*, problems that exist within the general view of animation is that not much attention is given to the fact that animation as a medium is actually made up of a wide variety of different techniques, of different processes by which the final image is constituted. There is not one form of animation. This variety needs to be addressed and this addressing is what I wish to do with this thesis. How do these different techniques[5] differ from each other? What do they have in common? How do they uniquely form their image? By addressing these forms separately I hope to demonstrate just how pluralistic 'animation' is and that speaking of 'animation' as one thing is something of a fallacy.

I will discuss a number of these animation forms: namely the analogue forms of hand-drawn animation, stop-motion animation (also known as 'claymation'), rotoscoping, experimental animation (which will be used as something of a 'miscellaneous' category) and the digital form of three-dimensional animation. This separation is necessary because there does not exist one unifying definition or ontology of animation, as I will explain further on in this introduction. This specific categorization stems from what I have seen as the major, most present forms of animation. I have tried my best to be as inclusive as possible, but it could well be possible that I have neglected some forms or drawn different forms together that actually deserve to be treated independently.

The very first step that needs to be taken in any study that deals with animation from a broad perspective is to ask ourselves just what animation is. While finding the answer to this

1 Pilling, J. "Introduction." *A Reader in Animation.* Red. Jayne Pilling. Sydney: John Libbey & Company Pty Ltd., 1997, ix.

2 Wells, P. *Animation: Genre and Authorship.* London: Wallflower, 2002, 2.

3 Although it should definitely be noted that a lot of the critical language that is traditionally concerned with live-action cinema, for example concerning narrative, can be applied to animation as well.

4 Pilling, xii.

5 I will use the terms "form", "technique" and "style" intermittently, referring to the same concept. Not only should this prevent monotony for the reader, it should also demonstrate that these forms/techniques/styles differ from each other in more than just their formative aspects (even though this is not something I will deal with in this thesis).

question (in other words, a strict definition of 'animation') is certainly not the goal of this study, I will allow myself some space to address it, if only to have some proper theoretical ground under my feet. Unfortunately there does not seem to be a general consensus as to the definition, in part due to it's somewhat ignored plurality. A brief example using some popular, well-known works. It is easy to point to the classic *Mickey Mouse* and *Bugs Bunny* cartoons and proclaim them animated: after all, the basis of these shorts clearly are drawings. But what if we look at other, more recent works? For example the *Wallace and Grommit* shorts. Can they be considered animation? They are not drawn, but rather 'stop-motion' animated, a process using live-action photography. Is this still animation? The Academy of Motion Picture Arts and Sciences seem to think so: several works nominated in previous years have been produced with stop-motion animation.[6] Yet these two techniques vary wildly. What is the commonality between these techniques?

As said, there is not a real consensus as to what animation is, but that does not mean people haven't tried to define it. Charles Solomon did this by naming two basic factors that should, according to him, cover all animation: the imagery is recorded frame-by-frame and the illusion of motion is created rather than recorded.[7] Unfortunately, some forms of what is generally thought of as animation do not contain either or both these factors. The first factor, that the imagery is recorded frame-by-frame (I'm assuming Solomon implies a form a separation between the recording of the separate frames, as live-action is technically also recorded frame-by-frame) excludes three dimensional digital animation, specifically the techniques of motion capture and keyframe animation. I will deal with these forms more in depth in their own chapter, but for now it suffices to say that they both work in a way where the animator does not have to work on each shot on a frame by frame basis: in motion capture animation the movement of a performer is registered and this data is used to puppet a digital object, in keyframe animation the computer calculates the movement between two different poses of a digital object. These techniques do not inherently have to work on a frame by frame basis, yet few if any people will deny that it is animation. However, when looking at analogue animation, this problem does not appear. But the second part of Solomon's definition, that motion is created, not recorded, is something that has problems both in digital and analogue animation-forms.

Solomon is not alone in considering animation as an art-form of created movement. Preston Blair, a famous animator who worked on Fantasia, amongst other works, defined animation as “the process of drawing and photographing a character – a person, an animal, or an inanimate object – in successive positions to create lifelike movement”.[8] There are several problems with this definition. It excludes every form of animation that does not involve “drawing”, forms such as the aforementioned stop-motion animation and computer animation. It also includes, through the notion of 'lifelike', the ideal that all animation tries to (at some level) imitate life. When looking at the rest of this thesis (specifically when dealing with experimental animation) it becomes obvious that this goal is not an inherent part of the ontology of animation. Even so, it does show the relevance of movement and motion in the essence of animation. To quote another animator, Norman McLaren: “how it moves is more important than what moves … what the animator does on each frame of film is not as important as to what he or she does in between.”[9] Again, motion capture is not covered: the movement in motion capture is not created (in the traditional methods of animation), but registered (using a performer and computer hard- and software). But here there is also an anologue form of animation that does not adhere to this definition: rotoscoping (which can be done both analogue and digitally). This too shall be explained

6 *Coraline, Fantastic Mr. Fox* and *Corpse Bride,* to name a few.
7 Telotte, J.P. *Animating Space: From Mickey to Wall-E.* Kentucky: The University Press of Kentucky, 2010, 29-30.
8 Wells, 3-4.
9 Ibid., 6.

in greater detail further along, but it comes down to an animator drawing over footage that has been shot by traditional cameras. The movement within rotoscoped animation therefore does not stem from the animator. While it is somewhat unfair to criticize Blair and McLaren on a theoretical level (after all, they are no theorists), this does demonstrate the vagueness of definitions.

There is no straight, universal definition of animation. At least not one that excludes some forms that are traditionally considered to be animation. The most we can do without further research is pointing to something and proclaiming it to be animation without any solid explanation aside from it not being live-action.[10] This could not work as a definition as it is a negative definition (it defines animation by what it is not). Yet as a theoretical starting point it can be quite useful, not least of which by testing the claim that all animation by definition is completely different from live-action film. By asking ourselves just how the way a specific animation-style forms its semiotic image differs from (or, as the case may be, is similar to) live-action film, findings almost naturally appear. With these findings we can more easily compare and contrast the different ways animation-forms construct their image semiotically. By this I mean that all of them have their own way by which their image (or signifier) reflects an underlying structure (or signified). This abstract concept of ontology and semiotics as methodology will be discussed, dissected and justified in chapter 2.

This chapter will be followed by chapters dealing with the separate forms of animation: hand-drawn animation (chapter 3), stop-motion animation (chapter 4), rotoscoping (chapter 5), experimental animation (chapter 6), three dimensional computer animation (chapter 8) and movement within computer animation (chapter 9). Chapter 7 will deal with the digital turn and lay some groundwork in order to properly discuss digital animation. In these chapters I will briefly discuss elements such as the history of these forms that may not be directly related to their semiotic ontology, but do make up the wider contexts of these forms. Chapter 10 will conclude this thesis.

2 – Semiotics in Film and Animation

One of the many movements within film studies is semiotics or semiology.[11] As a theory it first appeared in a document by Ferdinand de Saussure, a linguist, collected and published after his death by his students in 1915. In the document he predicted a new science, namely the study of signs. With this he meant a relation between a *signifier* and a *signified*, a sign that refers to something and what it is that sign refers to. Language, for example, has different words that each refer to an underlying concept.[12]

A contemporary of Saussure called Charles Saunders Peirce developed his own system of studying signs, and his too was published posthumously (roughly twenty years after his death in 1914). He saw three different aspects a sign could posses: the iconic, the indexical and the symbolic. An iconic sign means that between the signifier and the signified there exists a bond of similarity: the sign 'looks like' that which it signifies. A drawing of a tree 'looks like' a tree. An indexical sign means a bond of existential relation. The sign is somehow a recording of the physical presence of that which it signifies. For example, a pencil drawing of a tree is a sign that refers to the movement of the graphite over the paper. Finally there is the symbolic sign, which means a bond of convention. The relation between the sign and what it signifies has been 'decided'. For

10 Denslow, P.K. “What is Animation and Who Needs to Know? An Essay on Definitions.” *A Reader in Animation.* Red. Jayne Pilling. Sydney: John Libbey & Company Pty Ltd., 1997, 2.

11 Technically these terms are not synonymous, but they lie close together and are often used simultaneously.

12 Wollen, P. *Signs and Meaning in the Cinema.* 4e ed. London: British Film Institute, 1998, 79-83.

example, a written word has no natural connection to the concept it refers to.[13]

Saussure's semiology was adopted for use in film by, amongst others, Christian Metz. He declared that film is a language and therefore subject to linguistic analysis. Peirce already applied his system to photography, which he considered to be inherently indexical signs.[14] It should be noted that while a photographed image is indeed a registration of light reflected from its subject, through these reflections it also (potentially) registers the three dimensional configuration in relation to the camera. When we see a photograph we can conclude how its subjects were positioned in relation to each other and the camera. A more recent look into the semiotics of photography has been given by Tom Gunning. He describes photographs as being both indexical and iconic: they both record the levels of light emanating from a subject (indexical) and can be visually recognized as their subject (iconical). What is unique about the photographic process is the connection between this indexicality and iconicity. In general these two elements do not mix. Measurement devices, for example, use indexical signs in a very pure way: thermometers, barometers, heart-monitors all have a strong indexical relation to their respective signified subjects, yet their iconicities do not possess such a relation (for example, the sinusoid graph from a heart-monitor does not look like the beating heart it represents).[15] Yet in photography indexicality and iconicity do mix. A photograph both records the light reflected upon a subject (indexicality) and can look like the subject (iconicity). In the past this aspect of the recording of reality and iconicity has been cited as film's specificity, for example by André Bazin and Christoph Metz.[16] While they are more connected than in any other medium, it would be a little too blunt to say that indexicality and iconicity in photography fall in line by definition. Photography is by no means an unmediated, direct imprint of reality. Different lenses, exposure times, filters and printing processes are just a few examples of factors between the subject and the final image that can alter the iconicity of that image.[17] In fact there is a tradition within photography of making things appear different from what they are. One way in which this can be done has recently become popular, namely that of tilt-shift photography. Using a special kind of lens, vast land- or cityscapes appear to be miniature sized, as was recently done in one sequence in *The Social Network*. Yet even without photography's iconicity being inherent, this potential of the falling in line of indexicality and iconicity is relevant when discussing semiotic ontology. After all, when discussing animation (as the previously mentioned definitions illustrate) the general consensus appears to be that an animated image is completely created by one or more animators, implying there is no relation between the image's indexicality and iconicity in the way there is in live-action photography. This all means that looking at the indexicality and iconicity of these animation-forms should demonstrate just what makes them unique.

The regatta sequence in The Social Network. The extremely shallow depth of field make the image look like a miniature.

When we look at live-action film we see that the difference between it and (still-)photography is that extra level that is so relevant within animation: that of movement. If we

13 Ibid., 79-83.
14 Ibid., 79-83.
15 Gunning, T. "What's the Point of an Index? Or, Faking Photographs", *NORDICOM Review,* vol. 5, no. 1/2 (September 2004), 40.
16 Buckland, W. *The Cognitive Semiotics of Film*. Cambridge: Cambridge University Press, 2000, 7-8.
17 Gunning, 40.

make multiple photographs at a constant speed and then show them with the same speed, an image of movement is created (at least if the speed by which the images are shown is high enough to fool the viewer's brain into thinking the image actually moves). While the actual movement is an optical illusion (since we actually only see a sequence of still images), this illusion does correspond to the motion as it appeared in physical reality. Obviously this movement has both an indexical and an iconic element, just as a still photograph has. Again, the way in which the different animation-forms differ from live-action film and each other in this respect (or, as the case may be, don't) should demonstrate just how each of them functions.

While the exact strength of the argument that all animation is inherently different from live-action film has yet to be tested, we can carefully state that the animation-forms may not have as strict a relation between their signs and the physical reality as live-action film does. This means that animation can either try to reach the goal of lifelike movement (as the quote by Blair in my introduction entails) or, by embracing the liberties this weaker relation gives, move towards a more experimental, avant-garde form.[18] A side-note should be made that, through elements such as exposure time, filters and lab-processes, photography (and therefore film) does have a potential for abstract, avant-garde execution. An interesting example of that avant-garde form in animation comes from the *Felix the Cat* cartoons from the 1920s. Quite often Felix imitated the mannerisms of movements of Charlie Chaplin. In *Felix the Cat in the Cold Rush* Chaplin was once again parodied by putting Felix in a similar position as his in *The Gold Rush*, but Felix finds solutions to problems impossible for Chaplin, because of the limits he faced being trapped in the physical world.[19] To quote Lisa Simpson: “Cartoons don't have to be 100% realistic.” Besides attempting lifelike movement, there also exists a trend towards photo-realistic animation. Because this trend is now mostly limited to computer animation, I will briefly address this modern version of Blair's ideal in chapter 9.

In the past semioticians have looked at animation, but merely to show it as an example of a medium wherein the world to which it refers is completely stylized.[20] While this is true (up to a point), as mentioned before there is still some quite interesting interplay between the indexical and iconic signs within animation, an interplay that is different in each different animation technique. Because of this, I find that the semiotic structures of these techniques is a significant part of their ontology, even though ontology and semiotics have at times been described as mutually exclusive methods of study.[21] After all, a photograph and a painting behave in very different ways to produce their image and this also includes very different ways in which they work as signs. In fact, part of the way they work as signs is a defining aspect of these different media (and therefore their ontology). In this same way each animation technique has its own unique way of forming the image semiotically. This means that semiotics are a good way of approaching the different ontologies of these forms. By studying these semiotic ontologies we will not only see just how the different animation styles work (in their own unique ways), but also gain a better understanding of the medium of animation.

My first specific look at the semiotic ontology of animation styles will be the one that has the most cultural dominance and has, for the time being, the most familiarity with a general audience: hand-drawn animation.

18 Wells, 16.
19 Leslie, E. *Hollywood Flatlands: Animation, Critical Theory and the Avant-Garde.* London: Verso, 2002, 15.
20 Wollen, 96.
21 Gunning, 46.

3 - Hand-drawn Animation

Examples: *Gertie the Dinosaur, Fantasia, Spirited Away.*

One could argue that the most recognized form of animation has a history stretching back as far as the history of film itself. After all, the zoetrope (one of the most often named 'early forms' of cinema) is nothing more than a series of drawings shown in rapid succession. In the early days of cinematic animation these drawings were often presented as being drawn by a (live-action) artist, after which they would move and change in a wide variety of methods. This style had a precursor in certain vaudeville acts where an artist would quickly make and then change a drawing (for example, an artist would draw a face and then add to it in order to make it appear to age).[22] An early example is Emile Cohl's 1908 short *Fantasmagorie*. First his hand (live-action) uses a paintbrush to paint a clown. When his hand leaves the frame, the clown and other characters move around in a stream-of-consciousness of events. At the end the artist's hands briefly reappear to assemble the pieces of the clown, who has fallen apart.[23] Another example is *Gertie the Dinosaur,* a short 1914 film by Winsor McCay. McCay himself (live-action) is shown as drawing a dinosaur, after which he orders the dinosaur to move, raise her feet and so on, to which the drawn dinosaur (animated) complies (or, at times, refuses to). During the 1920s the slash system and the cel system (which I will both briefly describe in the next paragraph) for hand-drawn animation were invented. These techniques made it possible to have several people working on one shot simultaneously and therefore made the animation process a lot quicker so that the increasing demand could be filled. This led to hand-drawn animation becoming the dominant animation-form from the 1920s on (at least until the 1990s when computer animation inherited this position).[24] During this time animated films began to stand on their own as a film-form, as for example in the works produced under Walt Disney. Those works were almost exclusively hand-drawn and their popularity has also cemented this form of animation as being the one most recognized (again, until the 1990s).[25]

The patent for the multipane camera system...

So then what exactly is hand-drawn animation? A series of sequential drawings is made, each one differing slightly from the next. They are all photographed (either by a camera or a digital scanner) and projected. Just like in live-action film, the viewer's mind fills in the blanks between the separate pictures, creating the illusion of motion. There are several specific exact ways of doing this. A technique invented in 1914 called the 'slash system' involves cutting and separating the fore- and background elements so that the entire frame did not need to be replicated for every single frame. However, another technique created in the same year quickly became dominant (and still is, at least for analogue hand-drawn animation): cell-animation. It also involves separating the fore- and background, but does this by drawing the foreground elements on clear sheets that overlay the background.[26] Many other technological developments improved the potential for images to be created. I will briefly describe one of them, as I will refer

22 Telotte, 25.
23 Leslie, 1-2.
24 Frierson, M. "Clay Animation Comes Out of the Inkwell." *A Reader in Animation.* Red. Jayne Pilling. Sydney: John Libbey & Company Pty Ltd., 1997, 88.
25 Wells, 19.
26 Frierson, 83.

to it two paragraphs down. The multiplane camera system was invented by Ub Iwerk and later improved upon at Disney in 1937 (for which the studio would win an Academy Award). The system was simple: by placing multiple transparent surfaces behind each other in front the camera one could easily animate different planes simultaneously, creating the illusion of depth (for example: by moving the foreground, midground and background from left to right at different speeds, the illusion of a character running through a forested area is made more realistic).[27]

...and it's resulting effect. The fore- and background images lie different distances away from the recording camera.

But what about the semiotic structure of hand-drawn animation? Just as in live-action film the image has an indexical aspect: the drawings indicate the movements made by the animators' paintbrushes (or pencils, or whatever tool they happened to use) and the camera (or scanner, or whatever specific machine used) registers specific light levels that are put in front of it. However, the iconicity of the sign does not fall in line with the indexicality. Whereas a photograph of an object both looks like the object (iconic) and registers the light reflected of it (indexical), a drawing may look like a certain object (iconic) but what it registers is, through different paint-strokes on paper (or whatever the material used), the motions the artist made while producing the drawing. Furthermore the iconicity of a drawing is not inherent (as it is in photography). A drawing can refer to a physical object, but by no means does it have to (think of the action paintings of Jackson Pollock, which are all completely indexical signs).[28] In hand-drawn animation the same structure applies. Take the first sequence of *Fantasia*, for example. *Fantasia* is a collection of animated shorts all based on and accompanied by a different classical piece of music. The first sequence has Bach's Toccata and Fugue as its musical inspiration. The sequence consists of abstract representations of the different elements of the musical piece. These representations do have an indexical connection (the paint indicates the motion of the animators), but they lack a specific visual iconic elements. The blurs, lines and colour-splashes do not look like anything in physical reality, nor are they meant to. Furthermore, the movement in hand-drawn animation has no indexical element. Whereas in live-action film both the speed and specific motion of a physical moving object are registered, in hand-drawn animation both are completely in the hands of the animator. In conclusion: in hand-drawn animation the indexicality and the iconic aspects of the sign do not inherently overlap and movement is completely created by the animator.

Fantasia's abstract first sequence.

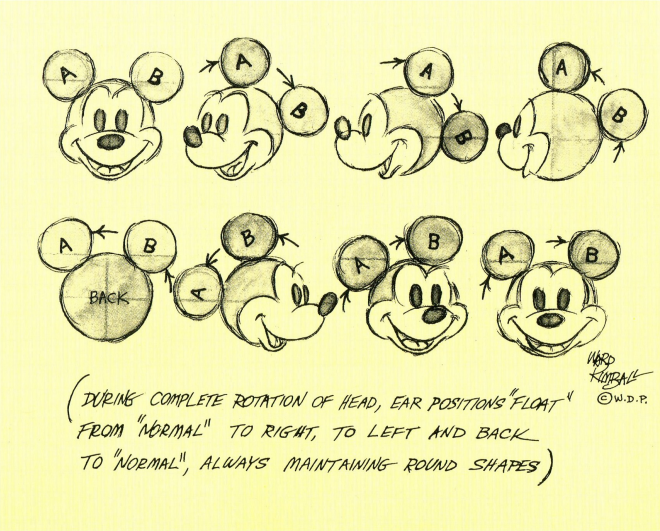
What does all this mean? For starters, the camera as it is physically involved in the process and the camera as it appears in the final animation are two entirely separate elements. The physical camera does not move. All it does is show exactly what is on a plane a specific distance away from it. There is no relative movement between the camera and what it is shooting. Yet within the animation we often see pans, tilts, lifts and whatever other changes in position a

27 Telotte, 131-133.

28 It would of course be possible to lock down a camera aimed at a painting resulting in a live-action film behaving semiotically like a painting, but this would mean that the photographic signs signify the signs of the painting, meaning the semiotic structure of the painting would not be affected.

physical camera can make. When a physical camera makes these movements, they stem from a change in the position of the camera in three dimensional space. However, in hand-drawn animation camera-movements stem purely from a difference between the drawings that are captured. That means that there is an implied camera. In return, this means is that any three dimensional effect in hand-drawn animation is no more than a two dimensional approximation. Using the aforementioned multiplane camera does potentially introduce some semblance of physical motion: changing the distance between the different planes and the camera on separate scales could make an effect as though the camera moved 'through' the foreground, as was done in *Snow White.* This shows that the separation of the physical and implied camera is not absolute, yet even in that system most movement comes from a change in the images in front of the camera.[29] An interesting side-effect of this disconnect between the two dimensional reality of this animation-form and the attempts to imply a three dimensional reality can be seen in that most legendary of animated characters: Mickey Mouse. As the illustration on this page demonstrates, if we were to see Mickey turn from front to back, his ears would switch positions.

The reason that so much hand-drawn animation does try to approximate a three dimensional image can be found with Walt Disney: he believed that in order to have the audience be able to sympathize with the animated characters the world they inhabited needed to have some grounding in reality.[30] This tendency also justified the use of the multi-plane camera system in order to have the animated world seem more three dimensional and therefore more real. Siegfried Kracauer was critical of this animation ideal. After all, why would a medium that is not inherently naturalistic attempt any realism as a goal? Especially if live-action film could reach the goal of realism more easily and effectively?[31] These questions lead me neatly into my next subject: an animation-form that, unlike hand-drawn animation, has its basis in photography, namely stop-motion animation.



In two dimensional space, Mickey's ears defy conventional three dimensional rules.

4 - Stop Motion Animation

Examples: *Jason and the Argonauts, The Nightmare Before Christmas, Wallace and Gromit, Coraline.*

Stop-motion animation was a somewhat popular animation technique during the 1910s and 1920s. The animation-method was used in a variety of different ways, including the Russian artist Starewicz animating dead insects and the Fleischer Brothers using clay animation in one of their Koko the Clown shorts.[32][33] Unfortunately stop-motion animation resisted a division of labor such as

29 Telotte, 133.
30 Rafaelli, L. "Disney, Warner Bros. and Japanese Animation." *A Reader in Animation.* Red. Jayne Pilling. Sydney: John Libbey & Company Pty Ltd., 1997, 115.
31 Telotte, 133.
32 Ibid., 37-38.
33 Frierson, 82-91.

was possible in hand-drawn animation and lacked that forms multitude of trained artists: while many artists were trained to draw, only few were trained to sculpt. Because of this, stop-motion animation never became a dominant animation form.[34] However, the technique did find a home for many years within live-action film. When for logistics reasons a certain element could not be shot live-action, stop-motion animation (due to its inherent three dimensionality)[35] could often help out. Think of King Kong in the 1933 version or the monsters in *Jason and the Argonauts* (animated by Ray Harryhausen, one of the most famous and respected animators of all time). Unfortunately in the 1990s, starting with *Jurrasic Park*, computer animation all but completely replaced stop-motion animation as effect-work in live-action film. While there are still stop-motion films being made, they make up only a small part of the entire animation field.

But just what is stop-motion animation? It is a photographical process in which an image of movement of inanimate objects is created. The first step is to create a three dimensional composition. This means simply posing different objects (be they specifically molded clay, puppets, dead animals or even people standing still)[36]. Then, one photograph is made, recording the composition from a fixed position (which is exactly what a live-action camera does). Then, the composition is changed slightly, be it by moving the objects around, rearranging certain joints, resculpting a clay object or a combination of factors. Also, the position of the camera can be changed. Then, another photograph is made, and so on. By projecting the resulting images in succession, the illusion of motion should result (if the changes between the frames are small enough to fool the mind of the spectator).

2009's Coraline, a completely stop-motion animated feature film.

Unlike with hand-drawn animation, stop-motion animation uses a physical camera to construct its image. This means that there is no disconnect between the physical camera and the implied camera, as there is in hand-drawn animation. This puts stop-motion animation semiotically closer to live-action film. However, there is still an important distinction between the semiotics of live-action film and stop-motion animation. Where live-action film shows movement that has taken place in physical reality, movement in stop-motion animation is completely implied: the puppet-characters in *Coraline* never physically move around, Stareqicz's insects are dead. The disconnect between the indexical and iconic elements of the signs in stop-motion animation is in a significant part due to movement. J.P. Telotte defines stop-motion animation as “giving life or spirit to otherwise lifeless objects, such as dolls, manikins, models, or clay figures.”[37] Through the animated movement seemingly lifeless objects can become living characters.

This aspect of 'life' has results for the iconicity of stop-motion animation, which is another aspect where the technique deviates semiotically from hand-drawn animation. Whereas hand-drawn animation has the possibility of being completely abstract without any semblance of iconicity, stop-motion animation always has to comply to the rules of three-dimensional space. Whatever is placed in front of the camera will look like what is placed in front of the camera. However, as with hand-drawn animation, an element of anthropomorphisation is often introduced.

34 Ibid., 83-84.
35 Wells, 96.
36 Ibid., 138.
37 Telotte, 37.

While this is by no means inherent (stop-motion animation could easily stop at making inanimate object move around), many (if not all) stop-motion animated films involve characters that behave human. Yet in reality these characters are nothing more than inanimate objects (be it clay, puppet or another form altogether) set in artificial motion.

Although neither hand-drawn animation nor stop-motion animation have an inherit iconicity this does not mean that there is no inherit iconicity in any animation. This is where rotoscoping becomes relevant.

5 - Rotoscoping

Examples: *Koko the Clown, Snow White and the Seven Dwarves, Garden of Regrets, A Scanner Darkly.*

The cinematic history of the rotoscoping-technique can be traced back to 1915 with the release of the first *Out of the Inkwell* short by Fleischer Studios.[38] In order to have this series' protagonist, Koko the Clown, move more naturalistic his movements were directly based on live-action footage. Later Disney used this technique as well, as it worked perfectly for the semi-realistic aesthetic the company adopted for their feature films, as for example *Snow White*.[3940] However, even in that film rotoscoping was not used for all character movement and the technique was never widely incorporated as more than a tool to be used to help more traditional animation techniques. Nevertheless the technique was still used sporadically, as for example in several music video's of the band Aha in the 1980s and in *Waking Life* and *A Scanner Darkly*, two fairly recent films (2001 and 2006, respectively) by Richard Linklater that are completely rotoscoped. It should also be noted that rotoscoping is used as a tool in visual effects to separate different areas of a live-action frame. While from a technical perspective this is very close to rotoscoping as an animation-technique, the goal and use of this form of rotoscoping has little to do with animation.

Rotoscoping can be done both analogue and digitally. Because the differences between these two methods is more or less limited to the use of keyframes (as will be discussed in chapter 8), I will not discuss these methods separately. Rotoscoping starts out with live-action film. Using a form of projection (be it printing out frames, projecting unto a transparent surface or doing it digitally) an animator draws over a frame, producing a two dimensional image. This way he or she can follow along the contours of the shapes of the live-action film and therefore the live-action elements. Furthermore, because every frame is treated this way, the live-action movement is also copied. Even though the live-action element does somewhat limit the possibilities for the animators, there is still plenty of room for deviation from the filmed image. For example, in *A Scanner Darkly* at one point a monster appears, yet on the set this was an actor without any special make-up. The result of all this is “a simultaneous

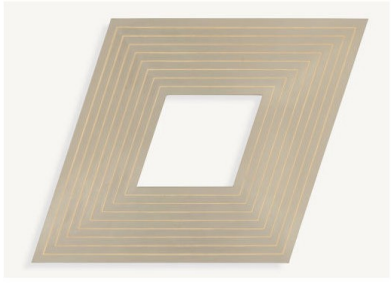
A Scanner Darkly. Top: an actor on set, performing the action. Bottom: the final image, where animators have drawn over the shot footage.

38 Leslie, 13.
39 Telotte, 80.
40 Leslie, 148.

presence of the drawn and the photo-indexical, in which the rotoscoped […] body is not so much fused with the human body as it is mapped over it."[41]

Semiotically rotoscoping obviously works in a matter close to live-action: after all, the image is directly traced over from live-action footage. This means that here the iconicity and the indexicality of the image behave differently from the forms of film previously discussed. The signs of the live-action image become fully incorporated into the animated image. While the indexical aspect of the drawn image is in part simply contained within the brushstrokes on the canvas (or whatever the material used), the indexical aspect of the live-action footage is also incorporated. The live-action image has an indexical aspect of registering the light that shoots through the lens and in return the final rotoscoped image registers that image. Yet we cannot simply state that rotoscoping semiotically behaves the exact same way as live-action photography.

André Bazin described photography as being a process without human intervention. Light reflected upon a subject moves through a lens and falls on photosensitive material, all without a human being influencing the process.[42] Yet the human intervention in rotoscoping cannot be denied. The semiotics of this human intervention are a little more explicitly noticeable in the iconic aspect of the rotoscoped image than in the indexical. As with the indexical aspect the iconic is anchored within the live-action image. A rotoscoping animator does not have the complete freedom a traditional hand-drawn animator has. The image has to relate to the live-action image (after all, if the animator were to completely ignore the live-action image the resulting image would be exactly the same as traditional hand-drawn animation). An extreme example would be a painting by noted minimalist Frank Stella. The painting is a portrait of his friend Carl Andre, yet looking at it we only see a series of concentric parallelograms. However, as it is a portrait, some level of iconicity remains, if not for every single observer. Similarly, a rotoscoped image is based upon a photographic image which, as explained earlier, often has an iconicity which the rotoscoped image cannot escape (only obfuscate by abstraction). Obviously this all means rotoscoping behaves in a significantly different semiotic way from the previously discussed animation-forms. Specifically in the aspects of movement and camera.



Frank Stella's minimalist portrait.

In both stop-motion and hand-drawn animation the illusion of movement is created (which is partly how Solomon defined animation). Both work on a frame-by-frame basis and movement is completely created by changes between those frames added by an animator, meaning that that movement has no indexicality. While rotoscoping also works on a frame-by-frame basis, the movement has already been recorded. This means that there is no implied movement: the movement in rotoscoped animation contains indexicality. But where rotoscoping is completely different from hand-drawn and stop-motion animation in the semiotics of movements, in the semiotics of the camera rotoscoping more or less lies in between those two forms. Because live-action footage is incorporated into rotoscoped animation, camera-movement is not completely implied, as it is in hand-drawn animation. Yet because of the two dimensional nature of rotoscoping the actual camera (or scanner or, when dealing with digital rotoscoping, a renderer) used to register the final image does not move. This means that, like in stop-motion animation a physical camera is present within the semiotic process of rotoscoping, yet the disconnect between the camera used to actually record the final image and the camera responsible for the visible camera-movements

41 Langer, M. "From the Guest Editor: The Rotoscope and its Discontents," *Animation Journal* 12, 5-6.

42 Bazin, A. "The Ontology of the Photographic Image." *What is Cinema?* Vol. 1 Berkeley: University of California Press, 1967, 15.

within the shots is very similar to the disconnect between the physical and implied camera within hand-drawn animation. The only difference between these two disconnects is that, just as with movement, the implied camera in rotoscoped animation has an indexicality.

All in all rotoscoping can be seen as an animation-form that has one of the strongest semiotic connections to the live-action form of all analogue animation-forms. One of the results of this is that somehow most, if not all, viewers can recognize a rotoscoped image as being somehow different from more standard animation-forms.[43] Hand-drawn, stop-motion and rotoscoped animation are not all the (analogue) forms of animation that exist. There are many ways to make an image move on film without filming something live-action. However, to find and discuss each and every one of them would take more time and resources than I have at my disposal. Instead I will focus on a few of these other forms, forms that, because of their lack of use in any mainstream projects, can easily be called experimental.

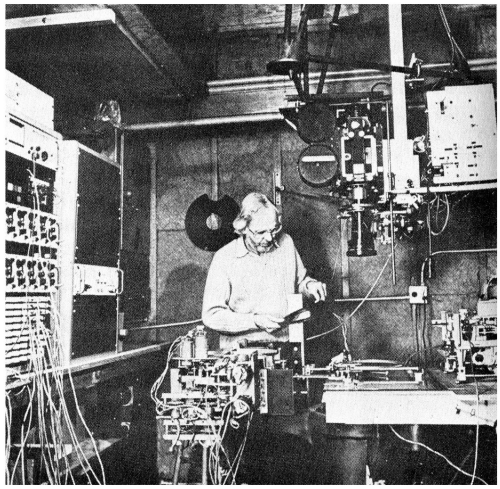
6 - Experimental Animation

Examples: *Lapis, Gaia's Dream, cows & cows & cows.*

The animation techniques discussed in the rest of this thesis all represent a major part of animation as a whole. Yet this does not mean these are all the techniques there are. There are other techniques, techniques that differ from these others but have often only been used by a single animator. This chapter will briefly deal with a few of those other forms in order to demonstrate the number of different animation techniques is not a constant, but a potentially ever expanding number.

The phrase “experimental” can refer to a large number of different things. In this instance it refers to animation techniques that have never been a major part of animation, usually because there are only few people executing the technique, and that differ semiotically from the forms that are a more a fundamental part of animation. It should be noted that this excludes some forms of animation traditionally seen as experimental. For example, Lotte Reiniger's cut-out silhouette style is semiotically no different from stop-motion animation (the only difference being an aesthetic one).[44] Instead I will briefly discuss three different techniques and their respective semiotics. First James Whitney's completely abstract *Lapis,* secondly the direct on-film animation of Rose Bond's *Gaia's Dream* and finally the weird and alien digital animations of Cyriak.

John Whitney was a pioneer in building and using early, analogue computers to animate during the 1950s and 1960s. The system they produced was a form of an optical printer, a device by which film could be rerecorded (and potentially changed, for example by adding filters). It should be noted that the optical printer was used much earlier (for example, *Citizen Kane* has several shots in which a printer was used), but Whitney did improve



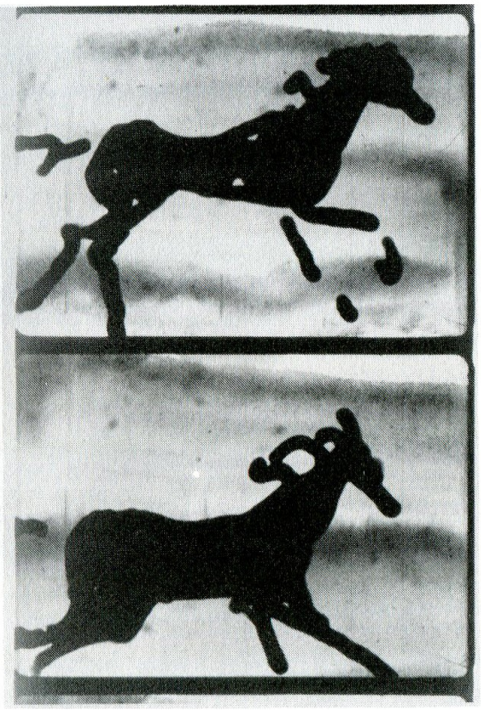
John Whitney working on his optical printer.

ping and the I
w York: Da Capo Press, 1976, 75.

Lapis.

upon the ability of the device. One of the many films made with this optical printer was *Lapis* (made by John's brother James from 1963 to 1966). The film is a nine-minute flow of a changing abstract mandala image. It was made by making multiple cards covered in dots. Using the optical printer he photographed and rephotographed them, many times over, overlaying them with each other and adding color and movement. [45] Semiotically the first thing that should be obvious when watching *Lapis* is a complete lack of iconicity. The image is too abstract to be recognized as anything other than itself. Indexicaly the story is a little more complex. By using the optical printer as much as Whitney did, the final image signifies signs signifying other signs (and so on), the image is a copy of a copy (and so on). On the most basic level this means that all we are watching are the painted dots from the original image. Yet if we look at the final film we see more than that. We see color and movement. Both these elements were added in the optical printer and therefore during the actual copying. So what do these elements signify? They signify the color-filters added during the copying or the relative movement between the projector and camera within the printer. Yet one could also argue that, because of these elements being completely added during the rerecording process, what is signified is the indexicality of the image itself. An image's indexicality is the relation between it and some part of the physical world leaving traces on it. This relation is what is seen in *Lapis*, more than the actual physical aspects an indexical sign signifies.

In 1982 Rose Bond made *Gaia's Dream*, an animated film made by painting directly on clear 16 millimeter film. It is only 3 minutes long and primarily involves a horse running.[46] The technique of direct-on-film drawing is similar to that of that discussed under hand-drawn animation (in fact, it technically is hand-drawn animation), safe for one thing: there is no camera used for recording. This has no consequence for the iconic aspect of the image (the fact that the drawing in *Gaia's Dream* looks like a horse is not inherent, just as it wouldn't be in more traditional hand-drawn animation), yet it does have consequences for the indexical aspect. The lack of a camera make the image unmediated. All other animation-forms as well as live-action film have a step between the subject (be it a drawing, a live-action composition or something else) and the final artifact (be it analogue film or a digital file). This step is recording (be it with a traditional camera, an optical printer, a digital scanner, a computer program or some other device). Yet in painting on film the final image and the image created by the artist are one. This actually places this form of animation closer to traditional painting than any other. The Mona Lisa that hangs in the Louvre is the exact same object that Leonardo Da Vinci created in his study, just as the version of *Gaia's Dream* shown on festivals is the same as the one where Rose Bond painted on.



Gaia's Dream, the image has been painted straight on film.

A more recent piece of experimental animation is *cows & cows & cows* by internet-personality Cyriak. Cyriak Harris (at least, that is what Wikipedia claims to be his last name)[47] is a freelance animator living near Brighton. His

cows & cows & cows

work consists of using software (specifically Adobe After Effects and Photoshop) to alter photographs or videos.[48] *cows & cows & cows* consists of a video of a cow in a field. This cow is duplicated many times over, shown as the camera pans right. Suddenly the multitude of cows start moving their heads in rhytm to the music. They move more and more and transform into a variety of different shapes, including (but not limited to) cows without limbs bouncing up and down, a large snakelike creature and spiders made up of the cows.[49] I have not yet discussed digital animation, yet Cyriak's work is different from both three dimensional keyframe animation and motion capture, which should be clear after those two forms have been discussed. The animation in *cows & cows & cows* takes an existing image and alters it. Because of this there is a divide within the indexicality of the animation. On one hand the indexical nature lies within the photographic basis. The cows and the field of grass have been photographed and as such behave indexicaly as photographs do: they register the light as reflected off the subject. On the other the indexical nature lies within the alterations Cyriak has made to the photographed images. Not only is the movement almost completely made by the animator, many of the shapes the cow-creatures have are a result of the animator's hand. This means last element has somewhat of a painterly aspect. Only instead of paint, Cyriak uses existing photographs. The way he uses photographs is similar to how electronic musicians sample sounds, only with images. The iconic aspect of *cows & cows & cows* lies somewhere between the complete arbitrariness in hand-drawn animation (which does not have to look like anything) and the anchored nature in rotoscoping (where the live-action element can never fully be denied). While *cows & cows & cows* does have a photographic element, the technique Cyriak uses could distort the image in such a way that that element would be rendered unrecognizable. However, this would mean many alterations to the image would need to be made. In other words, while it does not have to be recognizable as whatever the original image represents, it naturally does. Finally, from an aesthetic perspective the iconic aspect of *cows & cows & cows* has somewhat of a dual nature. Part of what Cyriak does in it is making the cows look like other things, while still being recognizable as cows.

Animation is not really one thing. Yet a summation of a few different techniques would still not properly define it. After all, there is no limit on the number of different ways an animated image can be constituted.

7 - Intermezzo: the Digital Turn

When looking at the western cultural shape of the latter half of the twentieth century it's impossible to deny the increased importance of digital technology within. The grand shape of this change (the 'digital turn') can be seen in many layers of society, including art and specifically animation. This change can be summed up by saying that computers (using a digital format instead of the analogue format of, for example, books) played an increasingly larger role within the societal layers. The effects of this change within animation are important, as the problems with the Solomon's definition of animation in my introduction should already have demonstrated. However, before dealing with the specifics of digital animation forms (or CGI, computer generated imagery), I need to discuss, however briefly, just what the implications of this shift towards digital technology (as relevant to the subject) are.

Pinpointing the exact moment of the digital turn is difficult, as these forms of cultural shifts do not take place overnight. What can safely be said is that a major part of this shift was due to, in the 1980s, technologies being developed making computers smaller and more affordable, moving

48 http://www.cyriak.co.uk/

49 http://www.youtube.com/watch?v=FavUpD_IjVY

them away from sole use for scientific and military uses.[50] It's no coincidence that Pixar, a leading production studio creating animated films (the very first feature length fully digitally animated film was Pixar's *Toy Story*) started in this decade, producing its very first digitally animated short film in 1984.[51] But just how do processes change by using computers?

In *The Language of New Media* Lev Manovich describes digital technology (or New Media, a term with a very loose definition, but one that does certainly incorporate the use and effects of digital technology). He does this by naming several principles, or "general tendencies of a culture undergoing computerization".[52] These principles are: *numerical representation* (any digital object is made up of numbers and can be altered by changing those numbers through algorithms), *modularity* (one digital object can contain within itself other digital objects, without any of these contained objects being changed), *automation* (different steps within a process can be made by a computer instead of by a user), *variability* (a digital object can be changed much more easily and drastically than a physical object) and *transcoding* (the most complicated of Manovich's principles, this basically means that computers work by their own rules, rules that are often quite different from the rules human culture works on).[53]

These elements all apply to digital animation in different ways. *Numerical representation* influences all other principles. It does so in a somewhat abstract and complicated, but very important way. The indexicality within all digital imagery signifies the code that makes up an image. This is not completely different from physical reality: a similar argument could be made in regards to live-action photography. The different light levels registered by a live-action camera signify the shape and therefore molecular (and atomic) structure of the object. The difference here is between the smallest possible element (remember that the word 'atom' has its etymological roots in the Greek word for 'undividable') in physical reality and in virtual reality: atomic particles and numerical code. I could dedicate an entire separate thesis towards this difference, but it would not be that relevant or interesting in regards to this thesis. All that matters is that code (and therefore virtual reality) can be altered and changed much more completely and easily than atomic particles (making up physical reality). This is the deepest, most essential difference between physical reality (as in live-action film) and virtual reality (as in digital animation).

Modularity has a less abstract, complicated purpose within digital animation. When discussing hand-drawn animation I mentioned cell-animation, a process by which different elements are animated separately. This is an analogue form of modularity: one element can be changed without directly influencing any other. The way this impacted hand-drawn animation is the same way it impacts digital animation, but even moreso. Whereas cell-animation could merely have different animators working on different layers within a shot, modularity within digital animation can separately treat even more elements. For example, the shape (its three dimensional configuration) and texture (what makes up its surface) of an object can be created by different people. This also means that they can be changed without influencing one another. In effect, modularity means that computer animation is inherently a hybrid medium: it consists of many separate elements combining to form a whole.

Automation influences the specific role of the animator in a variety of different ways. Most importantly it allows for keyframing, a technique by which an animator no longer has to work frame-by-frame. This will be dealt with in the next chapter. Another way in which *automation* influences animation works is the delegation of animating specific movement, either in part or completely. One example of the former can be found in Disney's 2010 computer-animated film

50 Lister, M. et al. *New Media: A critical Introduction*. New York: Routledge, 2003.
51 Telotte, 181.
52 Manovich, L. *The Language of New Media*. Cambridge: MIT Press, 2001, 49.
53 Ibid., 49-65.

Tangled. The protagonist of the film (based on the Rapunzel fairytale) is a princess with very long and flexible hair which moves in a variety of complex ways. Rather than having animators spend many hours animating the hair themselves, Disney hired a group of computer scientists to program the way the hair moved, resulting in the work spend on that aspect of a shot going from days to mere minutes.[54] What this means is that, unlike with analogue animation, movement in computer animation need not be directly created by an animator. Another, more extreme example of an automated form of animation can be found within the *The Lord of the Rings* trilogy (2001-2003). When preparing to make these movies their director, Peter Jackson, quickly realized that it would involve large scale battles with many thousands of combatants. Instead of manually animating each and every one of these characters, his team developed a program called Massive that would give all these characters (or agent) a primitive set of instructions to follow. As a result large battle-scenes were made without any manual, frame-by frame, character animation.[55] What this means semiotically will briefly be discussed in the following chapter.

Variability influences animation in a very direct way. Because the basic particles in a virtual world are code and more malleable than the basic particles within physical reality, objects within a virtual reality can be changed much more easily than in a physical reality. While this malleability is something that from an iconic, visual point already defines much animation (think of the squash-and-stretch aesthetics of classic Warner Bros animation, where for example a character breathing in actually becomes larger), analogue animation is still somewhat limited by physical boundaries. Once an image is drawn (or positioned, in the case of stop-motion animation) and recorded, it becomes incredibly difficult to alter the content of the image.[56] As long as we remain in the digital realm, the image remains incredibly malleable. Just like with *modularity* this means computer animation is, in part, a very economic process.

Finally *transcoding* has an interesting effect on realism within animation. The laws by which elements within a digital system exist differ from the ones of physical reality. In part this is nothing new. In hand-drawn animation one of the challenges is to make objects appear to have some semblance of weight and other relations to the physical world in order to make them appear somewhat 'real'. Yet while hand-drawn animation in essence has none of these laws, meaning these simulations have to be made from the ground up, computers do. So not only do they have to make their objects appear to behave as though they exist within physical reality, they have to do it while working within a system that 'wants' to do something else. In 2004 Pixar's *The Incredibles* was released. This was its director's, Brad Bird, first foray into digital animation, having previously only worked within analogue animation. One of the problems he found was that the computer almost seemed to have a will of its own:

> "One of the biggest problems on this film was the problem of scale. For some reason the computer, it seems to me, wants to make everything look small. So we had to think things through in order to get it... Things to look as big as they were supposed to be on screen. I often felt that the computer had an agenda almost like HAL 9000 in *2001*, y'know. And the agenda was it wanted everything to be small, weightless, plastic, rigid and clean. And we had a whole movie where we needed things to be big, heavy, lots of textures, pliable and dirty. So we were

54 Cohen, P. "Perfecting Animation, via Science."

55 "WETA Digital", DVD *The Lord of the Rings: The Fellowship of the Ring, Appendices.*

56 There are some possibilties, fo example airbrushing or using an optical printer, but these techniques can only alter the final image, the recording rather than that which was recorded.

> fighting it every step of the way. And it was like 'Dave, I want things to be small and weightless, Dave. You're endangering the mission, Dave. I don't think you know how to direct this movie, Dave'."[57]

Now that we've seen what the effects of the use of digital technology in animation are, it's time to take a look at computer animation an sich. What do the different elements of the digitial turn exactly mean for the semiotic ontology of computer animation?

8 – Three Dimensional Computer Animation

The history of computer animation starts many years before Pixar's *Toy Story*, the first feature film that was fully computer animated, was released. One of the earliest examples of a feature length film using computer animation is Disney's *Tron* from 1982. In this film characters are absorbed into a computer and computer animation (appropriately enough) was used to visualize this fantasy world. Yet the combination of computer animation with live-action film was something that would not become the standard in film until roughly a decade later. As previously mentioned the 1980s were also the decade in which Pixar was founded and started its work on short films. Later, from 1986's *The Great Mouse Detective* forward, Disney used computer animation within their more traditionally animated films. Think of the ballroom scenes in *Beauty and the Beast* or the lava-cave in *Aladdin*, for example. In the early 1990s computer animation within live-action films (like with *Tron*) got used more and more, most notably in *Terminator 2* and *Jurassic Park*. But it wasn't until 1995 that computer animation got used to create an entire movie with the aforementioned *Toy Story*.[58] But how is a computer generated image formed? Just how and what does it signify?

Toy Story

In the previous chapter I discussed in general terms just how the different principles of new media influence computer animation. I briefly touched upon semiotics, but now it is time to delve deeper into the semiotics of computer animation. Computer animation can be both two dimensional and three dimensional. In fact, two examples of two dimensional computer animation have already been discussed: *A Scanner Darkly* and the works of Cyriak. But what is the difference between two and three dimensional animation? Of course the final image in both cases is two dimensional (ignoring the current fad of three dimensional cinema and television whereby the illusion of depth is forced even more strongly than the well known effect of Alberti's window), the images are flat. Yet within three dimensional animation the image is formed by simulating a three dimensional world and having a camera behaving like a physical camera placed within (the virtual camera even has parameters to change its virtual shutter angle or lens-size), whereas in two dimensional animation no such simulation inherently takes place.[59] Just like with hand-drawn animation, in two dimensional computer animation there is a divide between the 'actual' camera (the renderer which compiles all the data into an image) and the implied camera. In three

57 DVD-Commentary *The Incredibles.*
58 Telotte, 206.
59 Ibid., 210-211.

dimensional computer animation this divide does not really exist. There is no implied camera, as the virtual camera used within the process is as real (or unreal) as the simulated world created within the computer. I will focus on three dimensional animation, because the semiotic ontology of two dimensional animation is, for the most part, a simpler version of the ontology of three dimensional animation. This is because the defining aspects of two dimensional animation are virtuality (the image has no direct physical aspect) and keyframing (the automation of 'inbetweening', something I will discuss in the next chapter), two aspects that also significantly define the ontology of three-dimensional animation.

As previously mentioned, three dimensional animation works by creating a simulated three dimensional world and placing a virtual camera within. The simulation aspect means that this world is built to behave according to the laws of physics and dimension present within the physical world. While this is part of the ontology of three dimensional animation (meaning it would not be three dimensional without this aspect), it should be noted that simulation is not a part of the inherent ontology of computer animation in general. Manovich's principle of transcoding is at work here too: computers do not inherently behave according to three dimensional logic and therefore it is by no means necessary or natural (if that word is appropriate in this context) for them to behave like that. That being said, simulated three dimensional animation is a significant part of computer animation (when looking at released feature films, it is clearly the dominant part of computer animation) and it behaves in a unique semiotic way.

So when we see a three dimensional computer animated image, what do we see? From an indexical point of view it would appear to be very similar to a photographic image. After all, three dimensional animation is built to simulate three dimensional physical space. A three dimensional computer animated image registers the configuration of a series of objects from a single perspective, just like physical photography does, only in a virtual, simulated space. But Manovich's principle of transcoding rears it head again. Three dimensional animation simulates the laws of physical space, but does not follow them. For example: whereas a physical camera works with reflected light, three dimensional animation does not. The computer calculates where every object is and how it looks to a virtual camera, a camera that registers the three dimensional configuration of objects without registering light, skipping this step a physical camera takes to register three dimensional configuration (as described in chapter 2). Computer animation can (and often does) work with light and dark, simulating it like it would work in live-action photography, but it does not have to. For example, an animated image can ignore light and show the objects it represents constantly lit, or have a light's 'source' be invisible (by which I mean that in physical reality a lightsource is both a physical object and a producer of light, in computer animation it can be programmed to be only the latter). But what about iconicity? Usually a three dimensional animated image does look like something, just how does that work?

Because of the principles of new media, computer animation has an inherently painterly aspect. What this means is that in a physical photograph one is somewhat bound by the indexicality of the machine (as discussed in chapter 2). In analogue painting this bind is a lot less strong. Sure, the laws of physics mean there is only a certain amount of paint an artist can attach to a canvas, but the created image does not have to look like anything the way

Beowulf, a motion captured film with a realist esthetic, as opposed to...

that a photographed one does (up to a point). The painted image is built starting from nothing. While three dimensional computer animation reminds us of a photographed image, digitally objects too are built from the ground up. This means that, like a painting, a computer animated image does not have to look like anything and therefore no iconicity is inherent.

An interesting aside (and something quite relevant to the semiotics of computer animation, if not quite its ontology) is something which happens to the animated image involving the iconicity when the animators attempt to make an image appear photo-realistic. Theoretically this is possible in any form of animation, but in practice this has yet to truly happen. However, due to three dimensional computer animation being built to behave like live action film, photo-realism has arguably become something of a goal to some animation studios (mostly ones dealing in hybridization that need to create digital versions of physical actors, but this goal is still apparent in several animated films, like *Final Fantasy* and *Avatar*). The closer an artificial image gets to looking exactly like something real, the more off-putting the image is to an audience. This effect is called the "uncanny valley" (referencing a downwards movement within the graph representing this effect).[60] One possible explanation for this effect is that we are intimately aware of the most minute details in which a human body behaves, whether it be the most subtle of facial twitches or the slight shifting of weight.[61] Because of this, at a subconscious level we constantly judge visual stimuli as to their veracity.[62] However, even though the uncanny valley is a very interesting semiotic aspect of animation, it is an aesthetic one, not an ontological one. After all, photo-realism is a goal only to some three dimensional computer animation. In fact Pixar has always consciously shifted away from photo-realism, preferring instead an aesthetic style more caricature in nature.[63]

...Pixar's The Incredibles, which goes for a more caricature esthetic.

In conclusion, what we can see is that three dimensional computer animation has a unique and complicated semiotic ontology. But all this has not yet incorporated the concept of movement into computer animation. The reason for this is that there are different methods of creating this movement, differing wildly in their semiotic structures. I will go into two of these methods in detail: namely keyframe animation and motion capture.

9 – Motion in Computer Animation: Keyframe or Motion Capture?

Keyframe Examples: *Toy Story, Shrek, The Incredibles.*
Motion Capture Examples: *The Polar Express, Avatar, Beowulf.*

As mentioned in chapter 1, many sources define animation as an artform of movement and one wherein this movement is completely created by the animator(s) on a frame-by-frame basis. However, in computer animation this definition becomes problematic. Movement no longer by definition needs to be done on a frame-by-frame basis, nor does it have to be completely created

60 Telotte, 208.
61 Canemaker, J. "A Part-Human, Part-Cartoon Species."
62 "The Curious Birth of Benjamin Button", DVD *The Curious Case of Benjamin Button*.
63 Canemaker.

by the animator. I will discuss keyframe animation and motion capture, two major methods of creating movement in computer animation. Between them I will discuss the previously mentioned Massive, a program written to fully automatize movement in computer animation, only briefly, as fully automated animation has, to the best of my knowledge, yet been the basis of any completely animated film.

Keyframe animation uses the principle of automation discussed in chapter 7. An animator positions his digital object (note that the virtual camera is also a digital object and is also manipulated this way) in a certain position and 'locks' it to a certain point in time, creating a 'keyframe'. Then he or she alters the shape, position, rotation or any other parameter that makes up the object and changes it and locks the new values to another point in time with another. The computer than interpolates the values in between those points. Because in essence keyframing boils down to simply specific parameters getting changed, it can be used in both two dimensional and three dimensional computer animation. In fact the two dimensional *A Scanner Darkly*, discussed in chapter 5, used this system to save time.[64] So what are the effects of this system? For one it means animation using it no longer has an animator working on a frame-by-frame basis. Semiotically this movement does somewhat differ from previously discussed forms of animation. Whereas in stop-motion and hand-drawn animation the movement in the final image has no indexical connection to anything, movement in keyframed animation does have some indexicality. It refers to the changing values within the animated scene. Compare it to a more traditionally indexical system, that of scientific measurement. A voltmeter has a small pin that moves (or changes its position) according to the electrical values measured in a system. The only difference between the relations within these two systems is that within keyframed animation the values are altered in order to have the object change. Yet this difference of intention has nothing to do with the semiotic structure of keyframed animation.

So what then of Massive, or any other system by which movement is fully automated? In essence the indexical aspect of the image is the same: values are changing. The only difference is what has changed those values. In keyframe animation the values are altered both by animators and through interpolation by the computer. Does this change the indexical aspect of the sign? In my opinion it does not. A thermometer measures the temperature in a room, regardless of whether this temperature is altered by human beings or not. But what the movement within both keyframed animation and fully automated animation signifies is something that still lies within the virtual system. An indexical relation to the physical world is something that we find within motion capture.

Motion capture[65] is a technique that has some similarities to one described by Lev Manovich, namely that of universal capture. Universal capture works by filming physical objects and then 'mapping' (a process akin to projecting) the resulting footage on a digital object, creating a virtual simulation from a physical object.[66] Motion capture also incorporates physical elements in its virtual world, but does so in a different way. By using a system involving multiple camera's at different angles capturing light in a traditional way as well as merely

Top: actor Andy Serkis performing the actions of his character. Bottom: the computer rendered character following Serkis's movements.

64 http://www.ign.com/blogs/newpathtp/2006/06/15/scanner-lead-anim

65 It should be noted that 'performance capture' is a term used more and works the exact same way as motion capture. The only difference is face in more detail than what is traditionally considered motion captu

66 Telotte, 242.

capturing infrared light, multiple infrared light-sources and suits covered in dots reflecting this infrared light. All the data the cameras capture is then fed into a computer where it is interpreted into data corresponding to the movement of the points an used to move virtual objects. For example, an actor moving his or her arm will move the dots on his or her suit. That movement is then transferred to a digital arm by have certain points on the digital arm move just as the physical arm does.[67] The digital objects that are moved by this process can even include virtual lights or cameras. So what does this technique mean? Well, similarly to rotoscoping, a live-action, physical referent lies at the base of this animation-form. Only where in rotoscoping an animator needs to paint over every frame, the animator's function in motion capture lies in cleaning up or adjusting the data and creating the models that will be moved by the recorded data. In this aspect motion capture lies closer to puppetry (which is, on film, live-action). In fact when the virtual camera is directly moved by physical movement and virtual characters are steered by physical actors, the indexical nature of motion capture comes very close to that of live-action film. As previously discussed a physical camera registers both light and the relative positions of physical objects. Motion capture indexicaly does the exact same thing as live-action film, only it does it without light. Where it differs is in the iconic aspect of the sign. While, as explained before, a photograph 'has' to look like its subject, in motion capture only the movement of the digital object has to conform to reality. The digital object itself could be anything. By no means does the digital object have to look like the actor that moves it. An example can be seen in *The Polar Express*, wherein the actor Tom Hanks plays many different characters, including a child (while the physical actor Tom Hanks can easily be iconically recognized as not being a child).

So is motion capture even animation? As explained in the introduction there is not one strict definition of animation, meaning it is impossible to answer this question in any satisfying, conclusive way. Yet the question of the place of motion capture within animation is highly debated under animators. Many (if not all) motion captured films contain a considerable amount of keyframe animation,[68] but many keyframe animators have a negative position towards motion capture. When animating the partially motion captured character of Gollum in the *The Lord of the Rings* films, Randy Cook, the head of the animation department, was wary of overuse of motion capture, as it anchored a character capable of superhuman movement to the limits of human movement:

> "Because Andy [Serkis's] movements on Gollum don't look like Gollum movement necessarily. Sometimes they do, sometimes they look great. But sometimes what [Andy] is doing is not as agile as Gollum could be."[69]

Pixar has even gone as far as to put a proclamation that no motion capture was used in the credits of *Ratatouille*. But from a theoretical point of view it is difficult to see any proper foundation in these divides of one technique being somehow better or worse. How can any form of animation be somehow a better form of animation when we don't even know exactly what animation is?

Pixar's promise of no motion capture having been used in Ratatouille.

67 Ibid., 244-5.
68 Ibid., 245.
69 "Gollum", DVD *The Lord of the Rings: The Two Towers, Appendices.*

10 - A Conclusion, of sorts

By now it should be clear not only that there is no such thing as one animation form, but also how the different animation styles differ from each other and how they each uniquely form their image semiotically. Yet we can also see certain similarities. What may be somewhat surprising to some is that the animation styles following the digital turn do not form a strict break from the analogue styles (or at least not semiotically). For example, just like with rotoscoping, motion capture takes physical movement and bases its animation on it. Just like with stop-motion animation, three dimensional computer animation has no implied camera, arguably placing the ontology of stop-motion animation closer to three dimensional computer animation than to hand-drawn animation. And in broader terms, live-action film is not quite as removed from certain animation-forms as it might seem on first sight.

So what it the use of all these findings? For one, they demonstrate clearly that a proper, single definition of animation incorporating all these styles is difficult if not impossible to make. If we want a strict definition we either have to deny some of these forms to be animation, or make due with a definition with little practical use, namely 'any form of film that is not live-action'. But why would we even want one fully inclusive definition? If all these forms are so dissimilar, what would be the use of putting them all under one larger denomination?

In fact the only uses would be economic and conventional. When people go to watch a film, they are used to it being live-action. With the arguable exception of films with young children as their target audience, live-action film makes up a large majority of all film. Yet for film theory this should have no consequence whatsoever. In other words, there is no good reason for film theorists to treat all these different styles as being one thing. Doing this would be akin to treating all films not made in the United States as being unified (which the Academy Awards do annually, but they are no theorists). In short, the division of different animation-forms is something which film theorists have no excuse not to do.

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