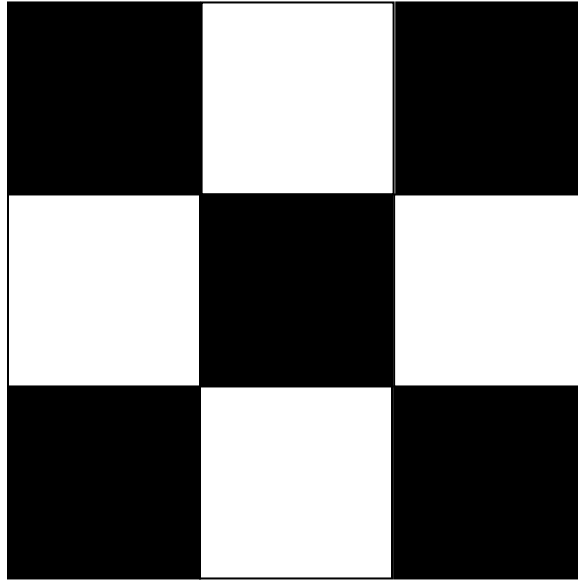


Animation Workshop

So, how do they make those drawings and clay figures move? The answer is by imitating the way live-action movies move. By looking at a live-action film or video one frame at a time, we can learn how people, animals, and other things move. Look at the live video frames of the baseball player on the left and compare them to Bugs Bunny on the right. You can see that Bugs swings a bit faster, yet the basic movements are similar. You can study movement with a VCR or DVD player that lets you view videos frame by frame.



If a movie is made up of still pictures that are flashed on the screen very fast, why do we see movement instead of a bunch of still pictures? Stare at the checkerboard pattern below for a few seconds, then close your eyes very fast. What do you see?



For a split second after closing your eyes, you should still see the checkerboard pattern. This is called “**persistence of vision**”. When you are watching a movie or video, your eye continues to see a particular frame until the next frame is on the screen, even overlapping the next frame for an instant. This slight overlap creates the illusion of movement. Film, which you would normally see at the movie theatre, shows 24 frames (or images) per second, video shows 30 frames per second. You don’t see the film projector blocking off the light to move to the next frame because of “**persistence of vision**”.

Types of animation

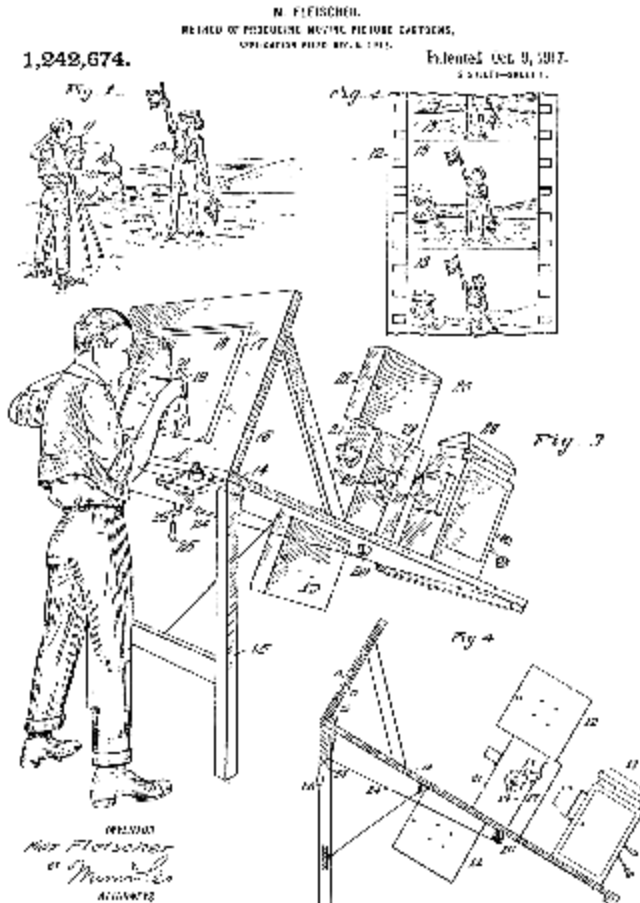
CEL ANIMATION: Characters and objects are painted onto sheets of clear acetate or similar plastic material. Objects or parts of characters that move (arms, fingers, legs, mouths, eyelids, etc.) are painted onto separate cels and stacked on top of each other, so the entire character or object does not have to be repainted for every frame. Most professional cartoons are made this way, but it usually involves a lot of people, and can be very expensive.

CUTOUT ANIMATION: Characters and objects are cut out of paper or other materials. Objects or parts of characters that move (arms, fingers, legs, mouths, eyelids, etc.) are cut out as separate parts. This method is easier and less expensive than cel animation, and has a very different look.

STOP-MOTION ANIMATION: Clay figures, dolls, puppets, or other objects are photographed one frame at a time, moving the figure or any part of it slightly for each shot. Films like the original **KING KONG**, **7TH VOYAGE OF SINBAD**, **JASON AND THE ARGONAUTS**, are classic examples of films containing stop-motion creatures.

Also known as **CLAYMATION** when characters and objects are made of clay, or **PIXILATION** where live action (real people, etc.) are photographed one frame at a time.

ROTOSCOPING: Live footage is projected one frame at a time onto paper and the artist simply traces the image. The tracings are then copied onto cels with ink and paint. The name comes from a device called the “rotoscope” which was created in 1917 by Max Fleischer, who would later produce the first Popeye cartoons. The original invention is pictured below. In this case, the live footage is projected from the rear onto frosted glass. The image can also be projected from the front using an Oxberry Animation Stand (see page __) or a regular projector. A number of computer-graphics programs allow you to do this with digital stills. An example of a rotoscoped feature is the 1978 animated version of **THE LORD OF THE RINGS**.



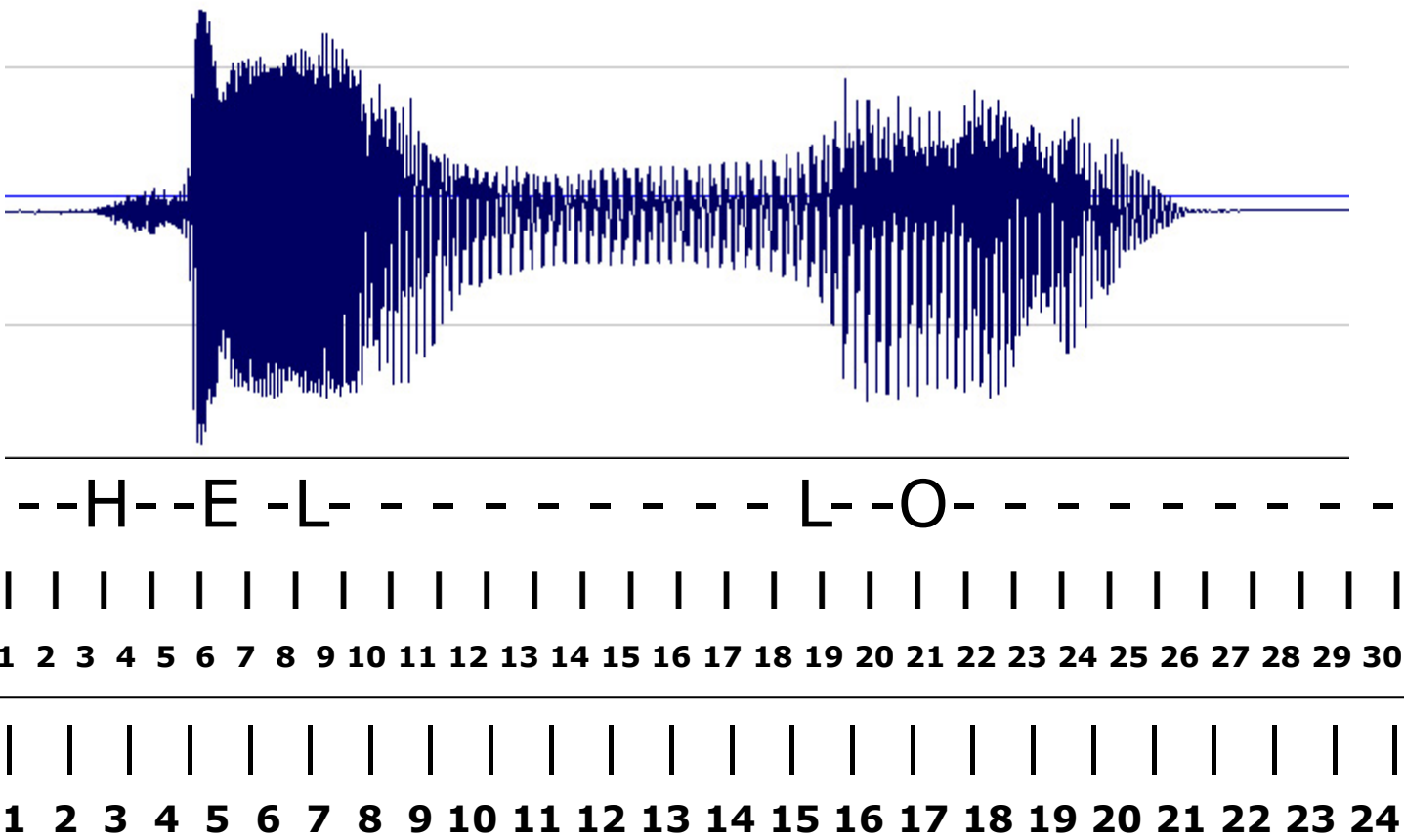
Now the fun begins....

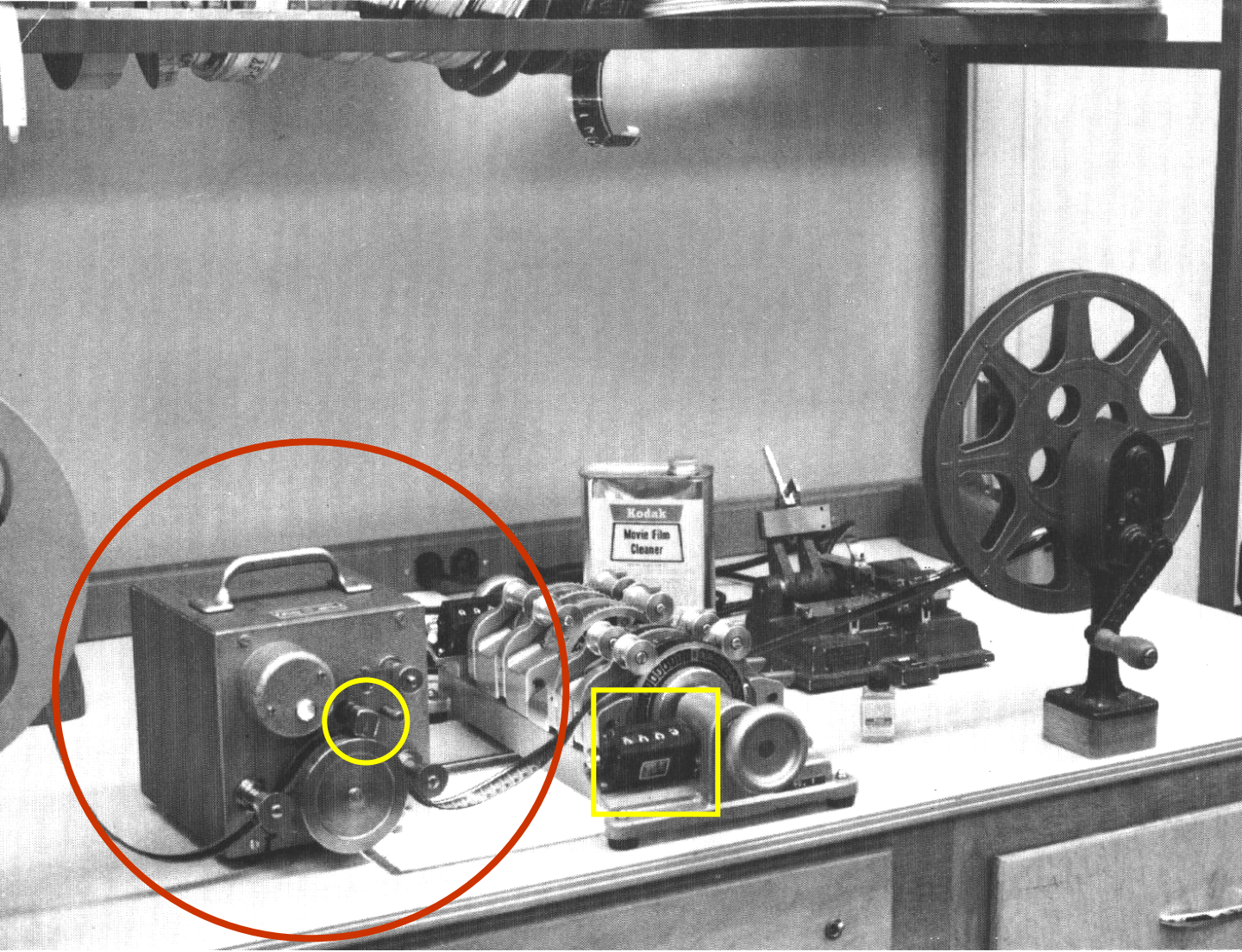
No matter which method of animation you use, if you want to have characters speaking, the voices have to be recorded first. It is too difficult to guess the correct mouth movements of animated characters. You need the recorded voices of your actors to use as a guide.

Before digital filmmaking came along, the sound for both live action and animated films was recorded onto magnetic film. Below are examples of 16mm and 35mm magnetic film which are coated with a similar type of brown material that you'll find on audio or video tapes. It would either be coated completely like the 16mm example, or be "striped" as is the case with the 35mm example.



With digital editing, the sound can be "seen" on the computer screen as an **audio waveform**. The example below is a recording of the word "**Hello**". The length of this audio segment is exactly one second. You should remember that video moves at 30 frames per second while film runs at 24 frames per second. Below the waveform are two rows of marks. One row splits the second into 30 parts (or frames), the other into 24 parts. By playing the waveform very slowly, we can see at which frame number the sound of each letter in the word "hello" falls. This information is written onto an **exposure sheet** which you'll find on page 6.





--H--E--L--L--O--

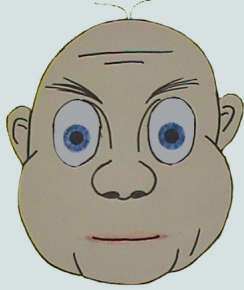
Magnetic film is run slowly by hand over a playback head (circled), much like the head in a typical audio tape player. You hear the sound through a small speaker called a "squawk box", a frame counter (inside the square) helps you keep track of what frame numbers particular sounds occur on. On the 16mm magnetic film sample above, the word "hello" is printed to show where it would be heard as the film is pulled across the playback head. In our demonstration however, we have recorded the "hello" on the computer and will be using the audio waveform (previous page) and the video frame rate of 30 frames per second, rather than the film frame rate of 24 frames per second as in the diagrams above.

On the next page, we have filled out the exposure sheet according to what we found on the audio waveform.

SCENE #	FOLDER #	DIRECTOR	CLIENT	S/B	ROUGH	LAY OUT	PENCIL	P.TEST	APP.PEN	BKGDS	INK	COLOR	CHECK	SHOOT
---------	----------	----------	--------	-----	-------	---------	--------	--------	---------	-------	-----	-------	-------	-------

ACTION/ CAMERA INSTRUCTIONS	DIALOGUE	TRACK 1	TRACK 2	TRACK 3	CEL 4	Mouth	Eyes	Head	BKGD	FRAME DIAL #	ZOOM	N/S	E/W	BOT PEGS	TOP PEGS
						CEL 3	CEL 2	CEL 1							
							E1	HEAD 1	YEL	1					
										2					
	H					H				3					
						H-E				4					
						H-E				5					
	E					E				6					
						E				7					
	L					L(1)				8					
						L(1)				9					
						L(1)				10					
						L(1)				11					
						L(2)				12					
						L(2)				13					
						L(2)				14					
						L(2)				15					
						L(3)	E1			16					
						L(3)	E2			17					
	L					L(3)	E3			18					
						L-O	E2			19					
						L-O	E1			20					
	O					O				21					
						O				22					
						O				23					
						O-CL				24					
						O-CL				25					
										26					
										27					
										28					
										29					
										30					

The **FRAME DIAL #** column refers to the frame numbers. The **DIALOGUE** column shows each letter of the word "Hello". Look across the row from each letter and you'll see the frame number that particular letter falls on. This information comes from the audio waveform on the previous page. The columns **TRACK 1**, **TRACK 2**, **TRACK 3**, would be used if there were music and various other sounds in the scene. You would indicate at which frames music or sound effects begin and end. The columns **CEL 4**, **CEL 3**, **CEL 2**, **CEL 1**, and **BKGD** are layers of animation cels from the top down. **BKGD** is the background which would of course be on the bottom. Cel layers that are changed the least often are closer to the bottom, while cel layers that are changed most often are closer to the top. Only three layers plus the background are being used for this example. The head (**HEAD 1**) doesn't move at all, so it is on the lowest layer (**CEL 1**). The eyes blink only once, so they are on the next highest layer (**CEL 2**). Since the mouth moves the most, it is on the top layer (**CEL 3**). The letter and number codes in the cel columns refer to codes you would give to the cels to keep them organized. In the case of the cutout animation example performed in the workshop, the codes are written on the back of cutout mouths and eyelids. If this example were done with cels, they would look like the samples on the next page.



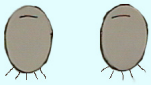
HEAD 1



E1



E2



E3



H



H-E



L(1)



L(2)



L(3)



L-O



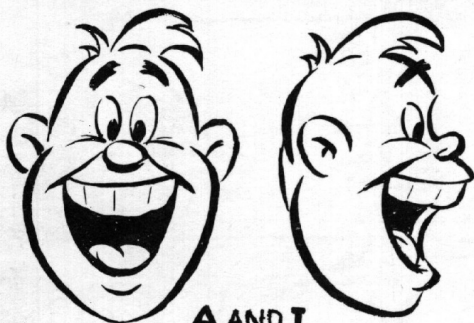
O



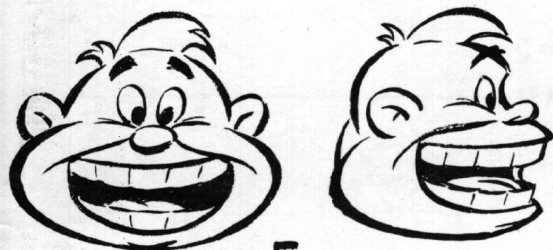
O-CL

Here are some general diagrams of mouth positions for different letter sounds. You will of course have to alter them somewhat to fit the look and the mood of your character.

THE VOWELS



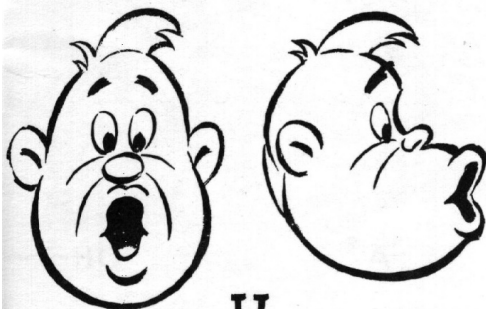
A AND I



E



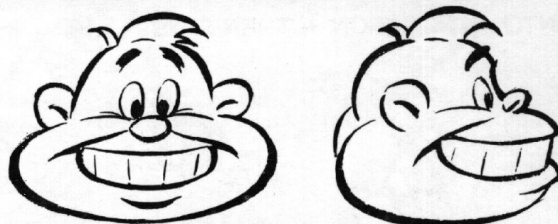
O



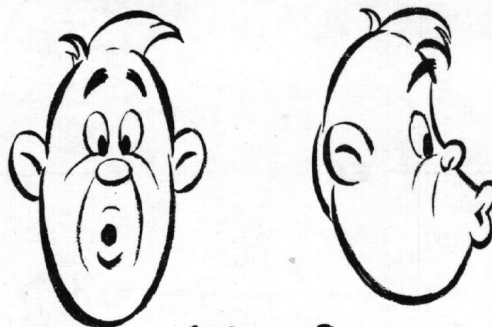
U

ANOTHER THING TO REMEMBER IN DIALOGUE:- WHEN ANIMATING A GROUP OF WORDS, STUDY THE WAY THE WORDS MIGHT BE QUICKLY SPOKEN TOGETHER.. IT'S BETTER TO FOLLOW THIS OVER-ALL MOUTH PATTERN, AND HOLD DOWN OR MODIFY INDIVIDUAL SYLLABLES NOT IMPORTANT TO THE WHOLE.

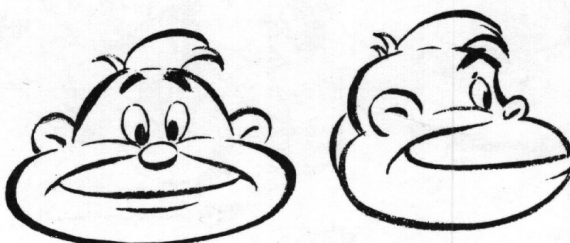
THE CONSONANTS



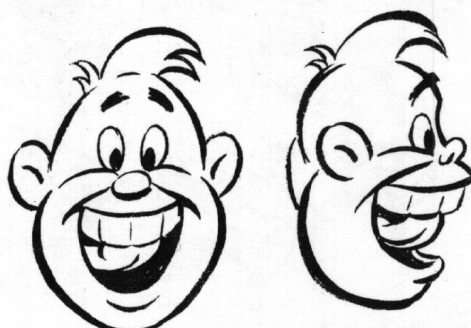
C D G K N R S T H Y AND Z



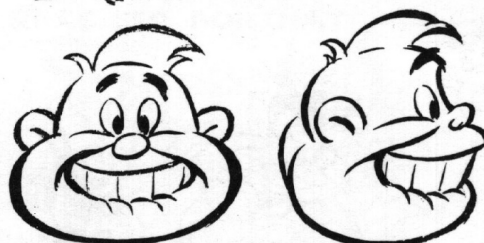
W AND Q



M B AND P



L (SOMETIMES LIKE D OR TH)

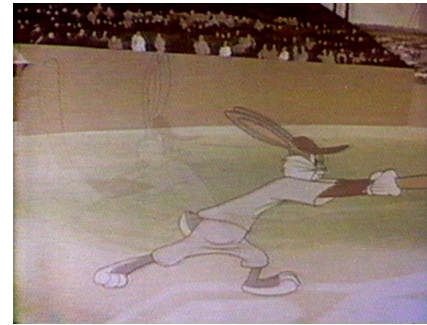
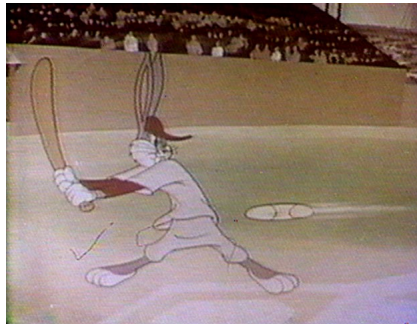
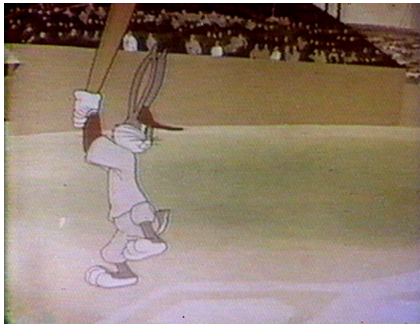


F AND V

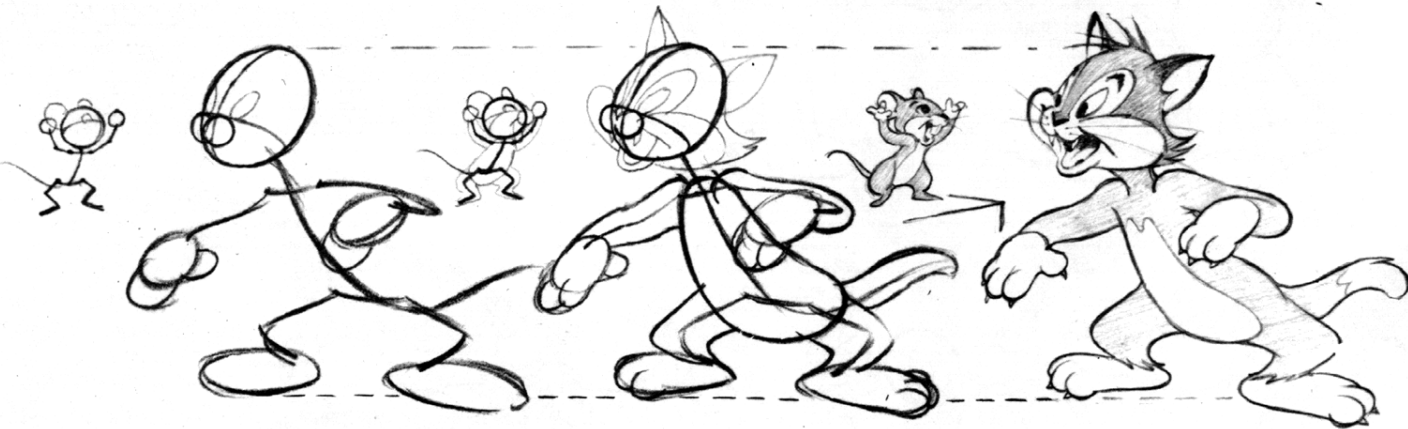
(SOMETIMES LIKE D OR TH)

While our workshop exercise was with cutout animation, most professional cartoons are done with cel animation. This is a process with a lot of steps which are outlined below.

The **Key Animator** makes a few drawings of the character showing only the extremes of motion. For instance, if we look at our images of Bugs Bunny swinging the baseball bat, the animator might draw only the frames shown below. It would however be only a quick pencil drawing. The key animator may have a few assistants working with him.



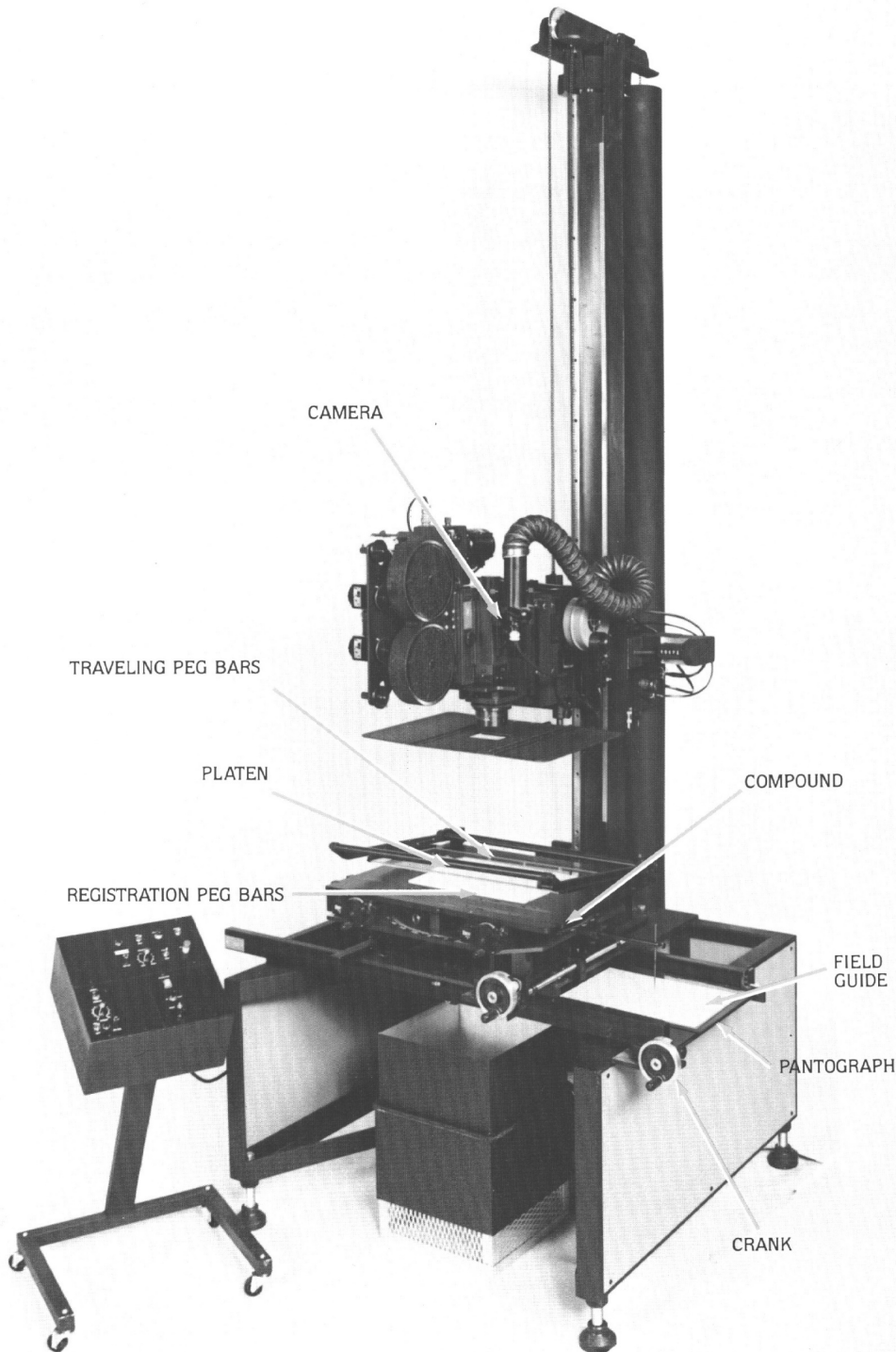
The **In-Betweeners** do exactly what their name suggests, they draw the frames in-between the frames the animator provides, according to his instructions. They too make only quick pencil drawings. The **Clean-Up Artists** neatly retrace the drawings of the animators and in-betweeners eliminating any extraneous lines. The images below show a character being created in steps from basic shapes. You can see how there would be a lot of extra lines that need to be “cleaned up”. Before the clean-up artists start work however, a **Pencil Test** is shot of the rough drawings to make sure the movements and facial expressions are correct when seen in motion.



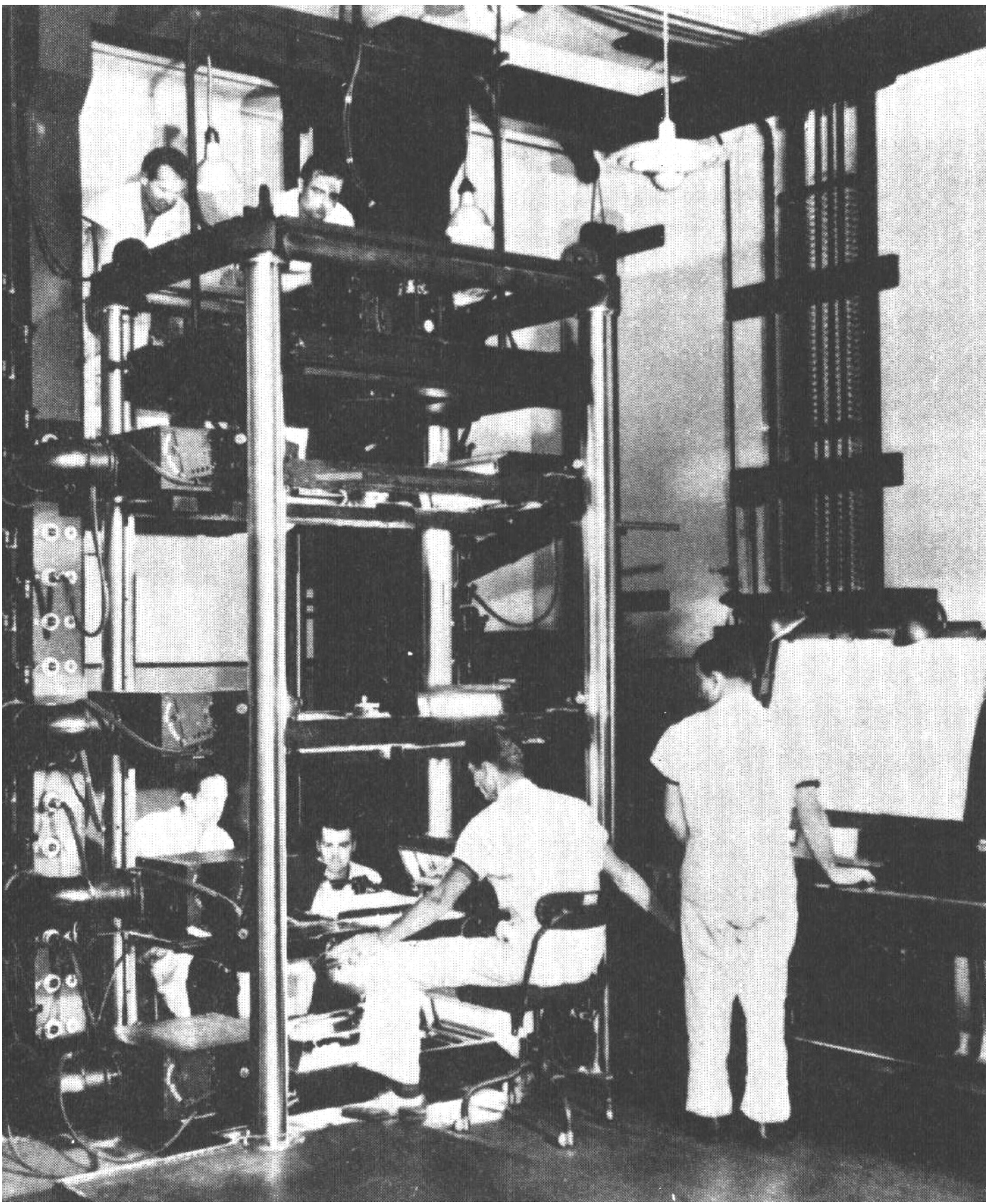
After the cleaned-up drawings are made, they are copied to the clear acetate cels using ink and paint. The **Inkers** lay the cel over the cleaned-up drawings and trace them in ink. In many cases cels can also be electrostatically printed, a process similar to a copy machine.

The inked cels are given to the **Opaque** or **Colorist**, who colors in the cels using **Cel Vinyl** paint. The painting is actually done on the back of the cel. This saves a lot of time because you don't have to be as exact about staying inside the inked lines. When you flip the cel back to the front, the paint will appear to be perfectly inside the lines. By painting on the back, you can also be a little sloppy about overlapping different colors since the overlap won't show on the front. Paint the darker colors first since there is less chance of an overlapped lighter color showing through. Also, the colors appear more even and glossy when viewed from the front.

Finally, the animation is shot. An **Oxberry Animation Stand** is the device used by professionals. The background and cels are all punched at the top and / or the bottom with a special precise set of three holes as in the image below. You'll see that the oxberry camera has a lot of controls to move the artwork and the camera in different directions. Backgrounds can be moved separately so that a character or a vehicle can appear to move across it. Moving backgrounds will be several cel-lengths in size.

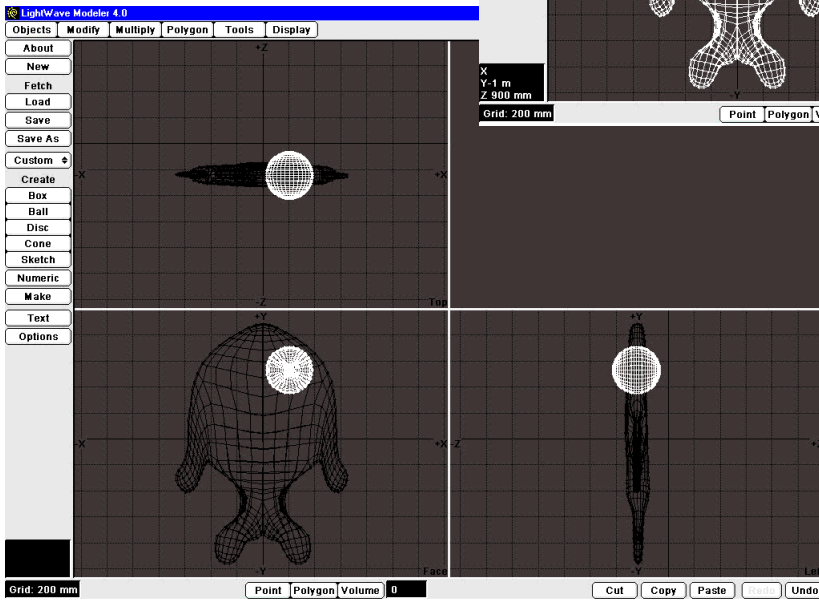
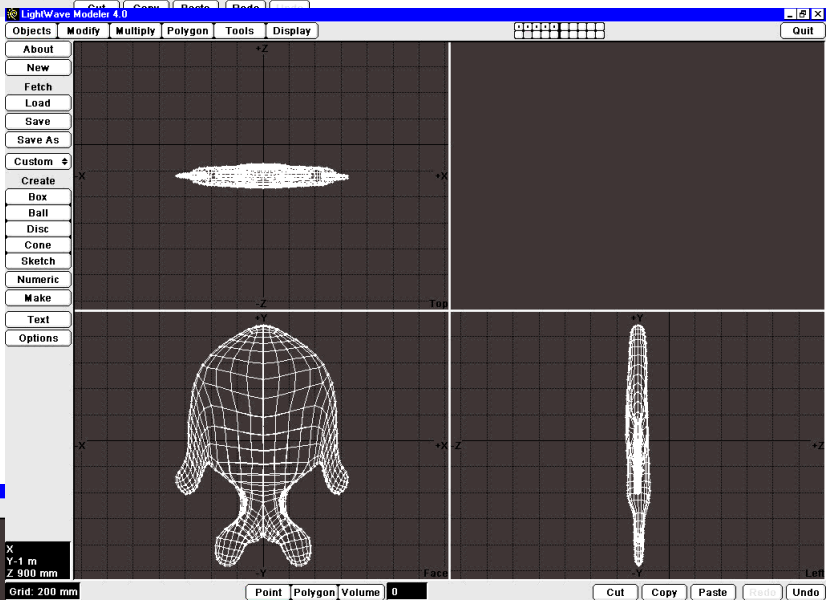
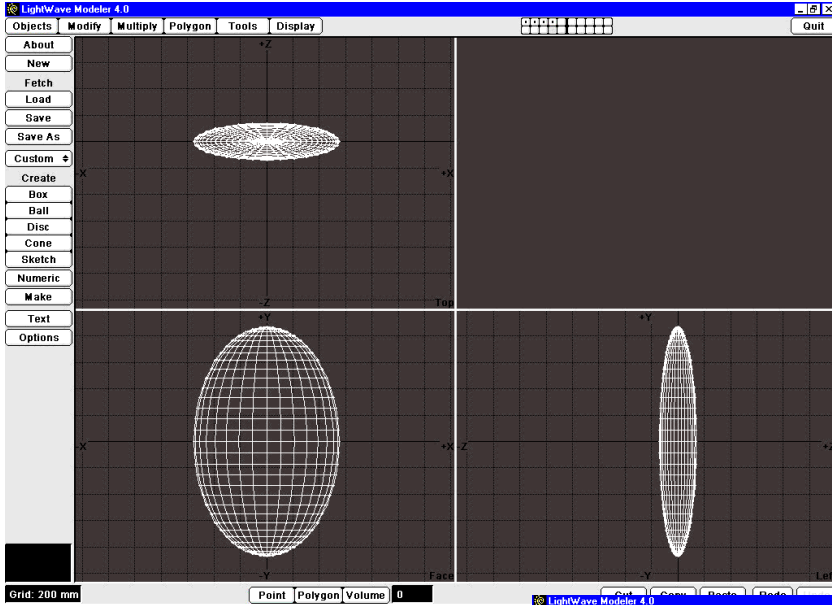


The **Multipane Camera** was developed by Disney in 1937. It allows cels to be placed several feet apart and away from the background for a 3-dimensional effect. **The Old Mill** was the first animated film to be shot with this camera.

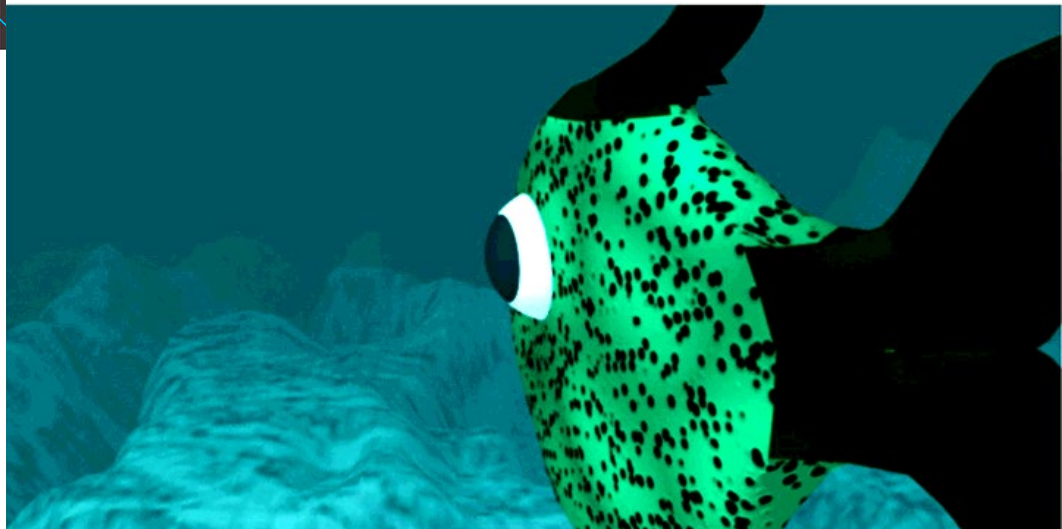
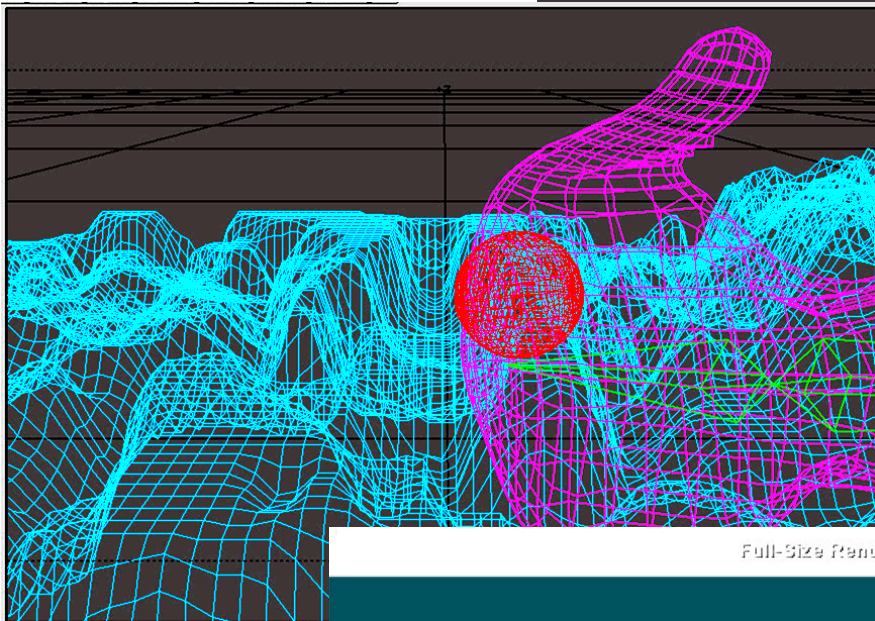
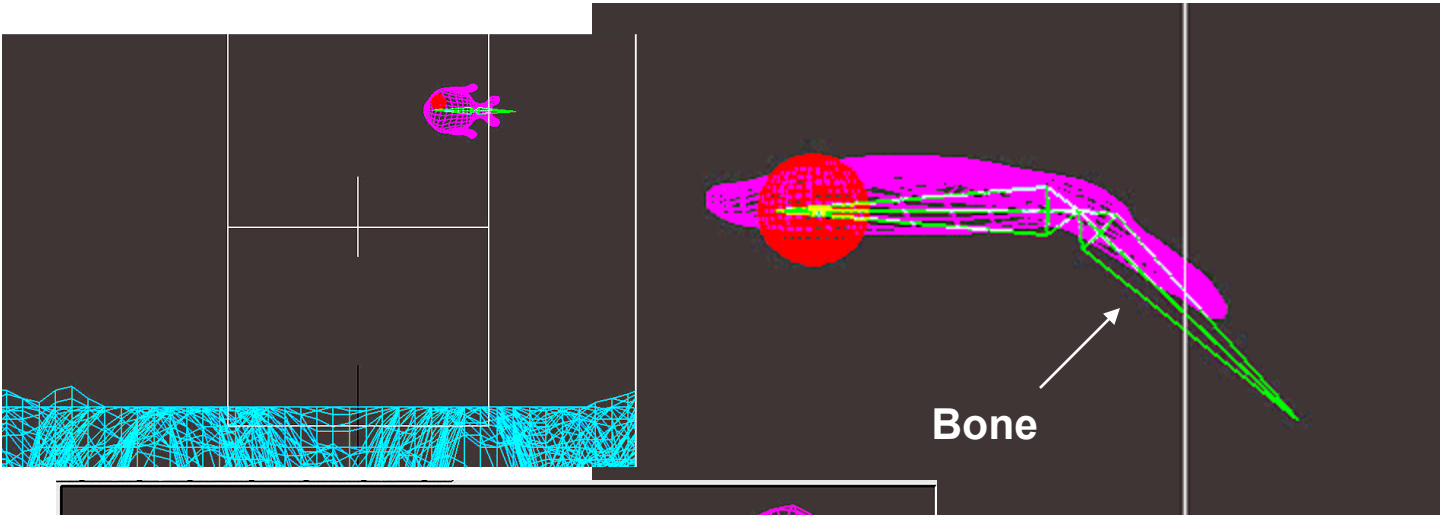


COMPUTER ANIMATION

Computer Animation is not unlike claymation or stop motion with models. You are creating virtual characters and objects and placing them in a virtual universe. Look below as we create a fish from a simple “squashed ball”, much like molding one from clay.



The fish is assigned color and texture through tools in the animation software. We then set the fish and the virtual seabed in the scene and set **keyframes** for the fish's motion. We move the fish's tail with virtual **bones**. This is similar to what the key animator does for cel animation, only in this case the computer software does the job of the **inbetweener**. Instead of a pencil test, we have the software generate a **wireframe preview**. When we are satisfied with the preview, we set the computer to **render** the frames. We can then go away and enjoy ourselves until it is finished.



Please visit my website: <https://earlyfilms.net>

and my animation workshop page with helpful information and video links:

<https://earlyfilms.net/animworkshop.html>

Or view my YouTube Animation Workshop Playlist directly:

[Animation Workshop Playlist](#)

You may contact me, Bruce Bertrand at **EARLY FILMS** by phone (973) 361-5817, or e-mail info@earlyfilms.net

Recommended books:

OF MICE AND MAGIC - Leonard Maltin
CARTOON ANIMATION with PRESTON BLAIR