

Hello!

Welcome to The Walt Disney Family Museum! This educator guide provides detailed information for educators and parents about the Multiplane Camera, one of The Walt Disney Studios' most important and influential technological developments. You'll find background information and descriptions of animation techniques that will help you facilitate discussion and inquiry during your visit, at home, or in your classroom.

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FIND IT ONLINE This guide and related activity sheets are also available for download at waltdisney.org/schoolresources



How the Multiplane Camera Works

Imagine you're traveling by car on a long road trip. The road stretches out ahead of you into a wide-open landscape. In the distance you see a range of tall, hazy mountains. As you drive, you see trees and telephone poles whiz past you. At first, they appear tiny in the distance. Gradually, they get larger as you travel closer to them and pass them. Strangely, the mountains still appear to be very far away and hazy. They don't appear to have gotten larger despite being closer to them the way the trees and the telephone poles did. Why? Because the mountains are so large and far away, the change in their apparent size is negligible.

A similar effect occurs in filmmaking. Imagine a video camera pointed at a painting of a landscape. To create the effect of traveling toward or through the landscape, you might use the zoom feature on the video camera, which provides the illusion of moving forward. Rocks, trees, and bushes will appear to grow larger, but so will mountains, clouds, the sun, and everything else on the two-dimensional painting. The illusion of traveling forward in the landscape could not be accomplished realistically using this method.

A Multiplane Camera solves this problem by splitting a **field of view** into different planes or levels. Separate planes are used for the **foreground**, **middle ground**, and **background**. For a forward-motion **tracking** shot, a more realistic effect is accomplished by moving foreground and middle ground planes toward the camera, while the background plane remains stationary.

field of view

the area that is visible as through a camera

foreground

the part of a view that is nearest to the observer, especially in a picture or photograph

middle ground

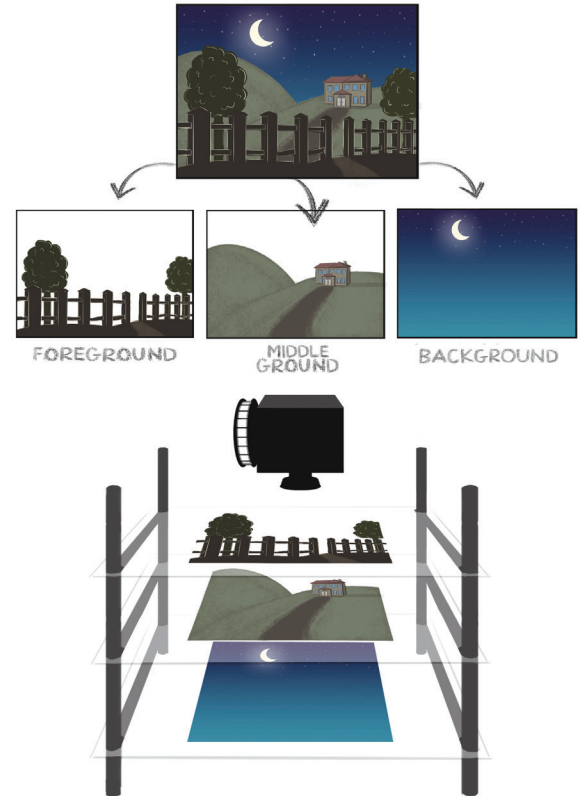
the middle distance of a painting or photograph.

background

the area or scenery behind the main object of contemplation, especially when perceived as a framework for it.

tracking

a shot where the camera seems to move through or alongside the action of a scene



Operating the Multiplane Camera required several technicians to adjust the numerous lights, cel-setups, and plane positions for every single shot. Each shot also required many tests in order to establish the desired perspective, proportion, and timing of the scene.

In the example above, notice the house on the hillside at night. The trees and the fence would be placed on the plane closest to the camera, the house on the hillside would be placed on the middle plane, and the moon would be placed on the plane furthest from the camera. That way, a tracking shot drawing the audience into the scene can be accomplished by moving the foreground and middle ground planes toward the camera while the background plane remains stationary. The moon remains the same size rather than growing unrealistically larger as it would with a simple [zoom](#).

zoom

to simulate movement rapidly away from or toward a subject using a zoom lens



The History & Innovators of the Multiplane Camera

Why was it significant?

Walt Disney Studios' technician Bill Garity developed the Multiplane Camera during a time of great experimentation and growth at The Walt Disney Studios. The camera created the illusion of depth, which helped make animated films look more interesting and realistic.

The Multiplane Camera was first used as an experiment in the production of the *Silly Symphony* "The Old Mill" in 1937. The film was planned to follow a traditional narrative structure that would begin with a forward tracking shot, drawing the audience into the idyllic setting of mill and its surroundings. The final shot of the film was planned as a reverse tracking shot, moving away from the mill for a sense of closure.

Previously, there was no way of creating a successful tracking shot using traditional animation methods and the act of animating the forward motion was costly and time consuming. The Multiplane Camera answered this problem by creating a realistic sense of three-dimensional depth in a cartoon setting.

The innovative use of the Multiplane Camera was recognized in 1938, when The Walt Disney Studios received a Scientific and Engineering Academy Award® for its development. The same year, "The Old Mill" won the Academy Award® for Best Animated Short Subject.



"The Old Mill" © 1937 Disney

FIND IT ONLINE To better understand how this works, see "What is a Multiplane?" at waltdisney.org/multiplane

With the advent of feature animated films such as *Snow White and the Seven Dwarfs* (1937), *Pinocchio* (1940), and *Bambi* (1942), the Multiplane Camera became a key asset in establishing a more believable space for the increasingly skilled artwork and character design produced by Disney artists. As humans and animals became more naturalistic and the scenery became increasingly detailed, a photographic-style depth of images helped create a more believable world for these objects and characters to inhabit.

The Multiplane Camera also allowed for the use of new types of special effects in animated films. The movement of water and the flickering of stars or lights were made possible by the layering capability of the device.

Ub Iwerks (1901–1971)

Animator and special effects producer Ub Iwerks was Walt's creative partner for many years, beginning in Kansas City and spanning the length of each of their careers. Iwerks co-created Mickey Mouse in 1928 and set an animation industry record for creating 700 drawings in a single day.

Iwerks left The Walt Disney Studios in 1930 to found his own animation studio. During this period, Iwerks created such characters as "Flip the Frog," and he designed his own version of a Multiplane Camera in 1933. Iwerks's design included several layers on which animation cels were positioned and photographed before a horizontal camera. His original design implemented mechanisms from a Chevrolet automobile. Iwerks used the camera for his Willie Whopper series in the mid-1930s.



Top (left to right) : Alfred Werker (seated), Fred Moore, Ub Iwerks, Walt Disney and Ward Kimball © Disney, Bottom: Ub Iwerks © Disney

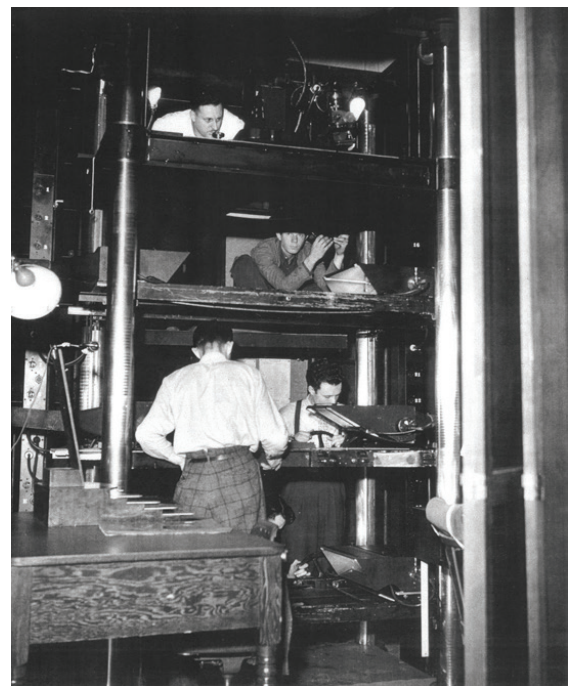
Iwerks returned to The Walt Disney Studios in 1940, and thereafter primarily developed visual effects, including the optical printer for combining live-action and animation, the Xerography process for photocopying drawings directly onto cels, and the effects on a number of classic Disneyland attractions. Iwerks earned two Academy Awards® for merit and technical achievement and was inducted as a Disney Legend posthumously in 1989.

Bill Garity (1899–1971)

Special effects and sound technician Bill Garity created innovative sound and camera effects for the Studios beginning in 1928 when he developed the sound technology that produced their first synchronized sound cartoon “Steamboat Willie.” In 1940, Garity and his team developed Fantasound, the stereophonic sound system for the Studios’ concert feature, *Fantasia* (1940).

Garity developed a new version of the Multiplane Camera for the Studios for the 1937 *Silly Symphony* “The Old Mill” as discussed in this guide. This design was the largest and most sophisticated model developed, and was the first to feature a vertical orientation of camera and planes instead of a horizontal one. In 1938, “The Old Mill” won the Academy Award® for Best Animated Short Subject, and The Walt Disney Studios were awarded a Scientific and Engineering Academy Award® for the development of the camera itself.

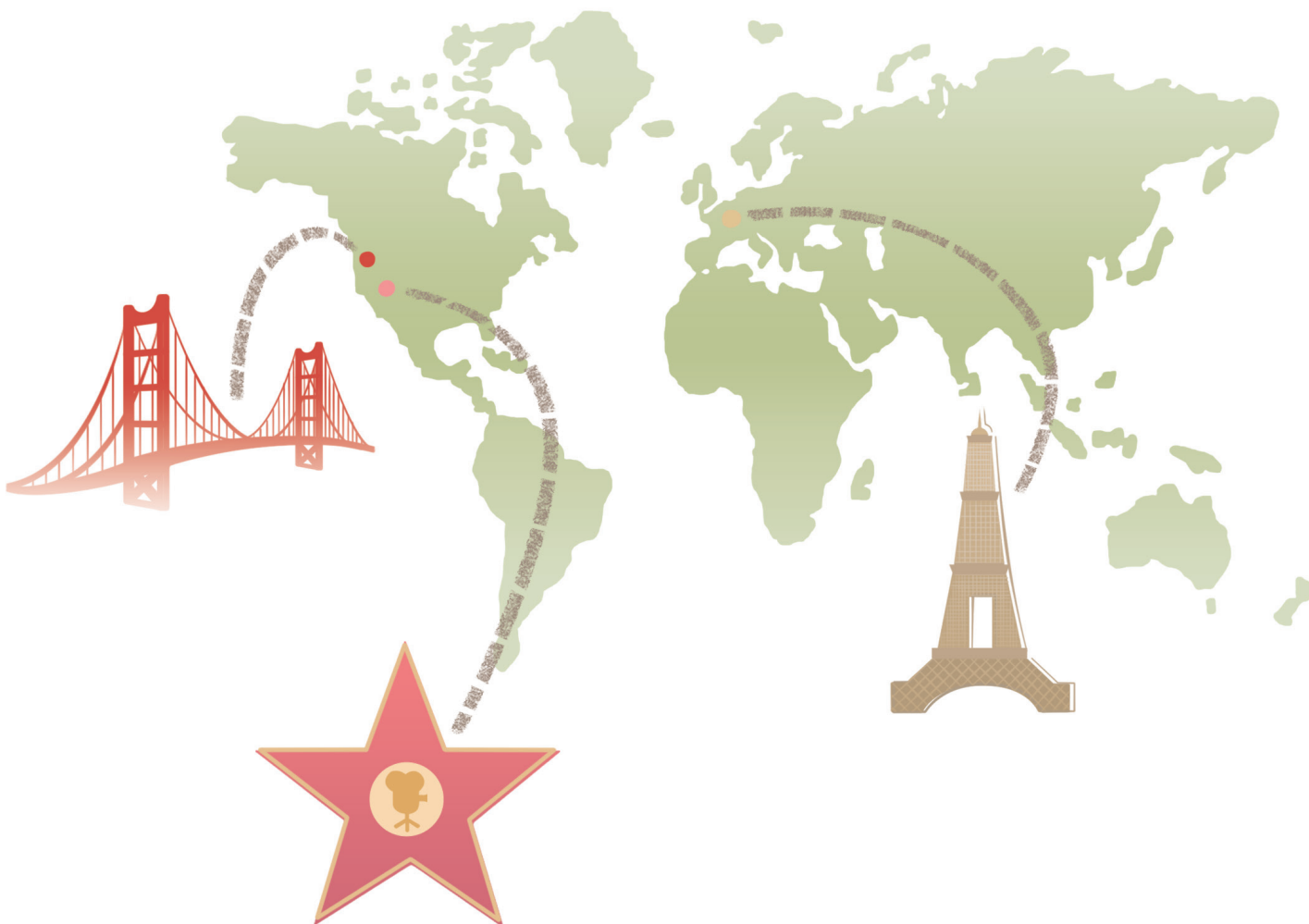
The Walt Disney Company was issued a patent for Garity’s design of the Multiplane Camera in 1940. The same design was used for several decades until digital technology replaced the original Multiplane Camera. The last Disney film on which the camera was used was *The Little Mermaid* (1989).



Top: © Disney, Bottom: Multiplane Camera © Disney

Where can I see one today?

Today, three original Multiplane Cameras from The Walt Disney Studios survive. One resides at The Walt Disney Animation Studios in Burbank, California. One is located in the Art of Disney Animation attraction in Disneyland Paris. The third is on view at The Walt Disney Family Museum in San Francisco, California.





Do-it-Yourself Multiplane Camera

The Multiplane Camera developed at The Walt Disney Studios was large, sophisticated, and required several trained technicians to operate. However, you can construct your own Multiplane using simple materials. Follow the instructions below for the do-it-yourself version (see the diagram map on the last page).

Supplies

- 12 disposable cups (preferably thick, compostable cups)
- Three square or rectangular pieces of plexiglass or plastic toy box covers
- A painted or printed background, or a piece of plain white paper or poster board

Instructions

STEP 1: First, place a painted or printed background onto a flat surface such as a table or desk (a piece of plain white paper or poster board may be used instead of a background). Place a piece of plexiglass or plastic over the background.

STEP 2: Place four cups upside down on top of the plastic, one at each corner. Stack another piece of plastic on top of the four cups to create a second layer above the background.

STEP 3: Create the next layer by placing four cups upside down on top of the plastic, one at each corner. Stack the third piece of plastic over these cups to create a third layer.



Do-it-Yourself Animation

Once you have built your Multiplane, create an animation using the following material:

Supplies

- DIY Multiplane Camera
- Construction paper (assorted colors)
- Scissors
- Computer or tablet
- Animation software, such as iStopMotion
- Webcam and microphone stand, or a down-shooting camera

Instructions

STEP 1: Position the camera and mic stand over the Multiplane so that it shoots downward at the background. Connect the camera to your computer and open iStopMotion.

STEP 2: Cut a simple character or object out of construction paper.

STEP 3: Place your character on the bottom plane of the Multiplane, furthest from the camera. Animate the character by taking a series of pictures of it in various poses. Using iStopMotion, press the number 2 on your keyboard.*

STEP 4: Make a small adjustment to part or all of your character. For example, to make your character wave or move slightly to one side. Take another picture. Move the hand back to its original position. Take another picture.

Instructions continue on following page

Instructions

Continue with the process of making small movements and taking pictures every time a change is made. When you play back your animation, your character will appear to be moving.**

STEP 6: Add elements on levels closer to the camera, such as a cloud passing overhead or a ball flying up into the sky. Experiment with how objects on different levels might interact with one another.

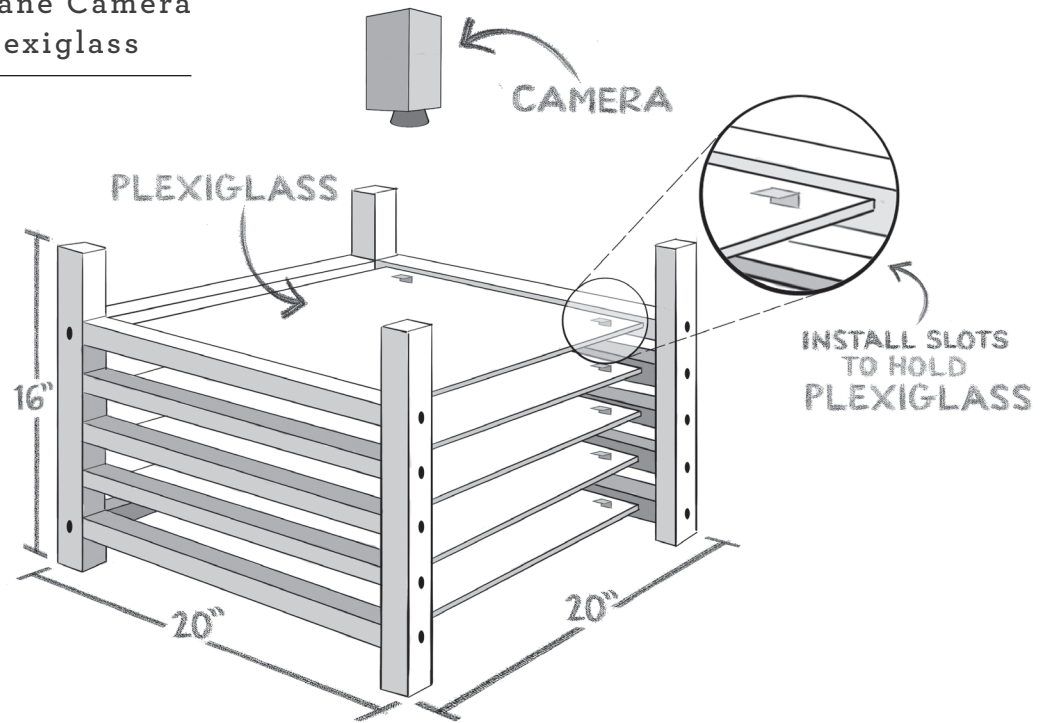
STEP 7: Once you feel comfortable with the process of animation using simple paper shapes, try branching out into other craft materials. Experiment with felt, pipe cleaners, images from magazines, drawings, ribbon, clay—whatever strikes your imagination.

Notes

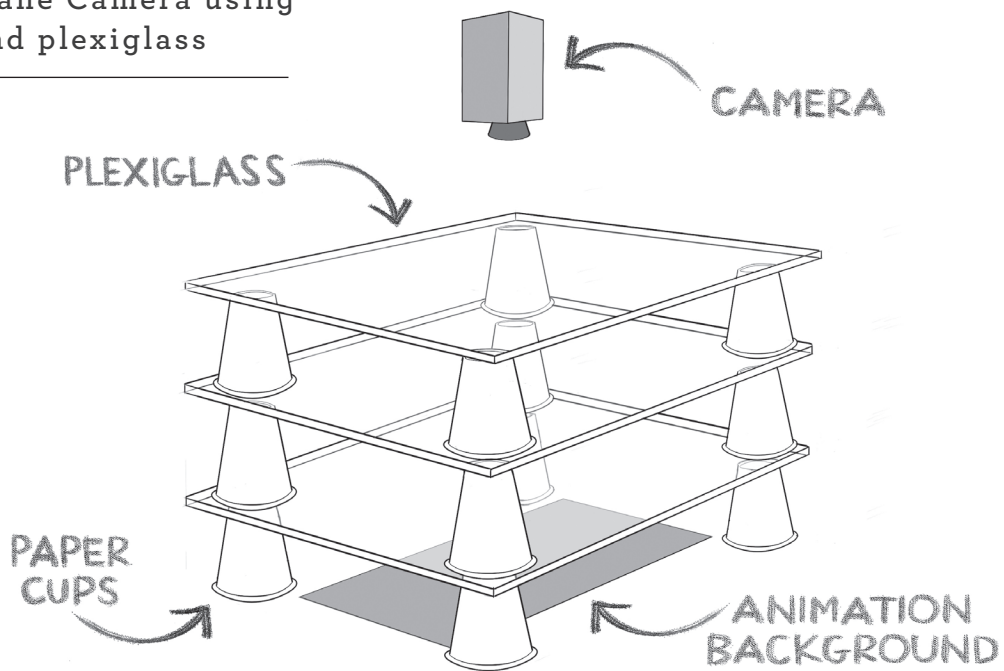
*If using iStopMotion, pressing the number 2 captures two pictures rather than one, and will make the animation process move along a little bit faster. In the industry, this is what is referred to as “shooting on twos.” Your character’s movements will be relatively fluid, while still maintaining a “cartoony” feel.

**Small changes in between each frame will result in slower movements, while larger changes will result in faster movements.

Advanced Multiplane Camera using wood and plexiglass



Basic Multiplane Camera using paper cups and plexiglass



Walt's Biography

Early Life

Walter Elias Disney was born in Chicago on December 5, 1901 to Flora and Elias Disney. Walt had three older brothers and one younger sister. Due to growing crime in the area, the family moved to a farm Marceline, Missouri in 1906 where Walt enjoyed an idyllic childhood. When the farm proved unproductive, the family moved to Kansas City where Elias bought distributorships for two Kansas City newspapers. City life introduced Walt to Vaudeville and early motion pictures. Walt drew constantly, even earning free haircuts for cartoons that the local barber would post in his shop.

Introduction to Animation

In 1920, Walt was introduced to stop-motion animation while working for the Kansas City Film Ad Company. He was inspired by the magic of animation and began studying and experimenting on his own. Walt started his own animation studio, Laugh-O-gram, in 1922. Unfortunately, Laugh-O-gram's distribution company went bankrupt and failed to make scheduled payments. As a result, Laugh-O-gram closed shop, and Walt turned his sights towards Hollywood.

Hollywood and Mickey Mouse

Upon arriving in Hollywood in 1923, Walt developed a series called the Alice Comedies featuring the adventures of a young actress in an entirely animated world. Then in 1927, Walt created Oswald the Lucky Rabbit to star in an all-animated series. After disputes over the content and production of the cartoons, Oswald's distributor, Charles Mintz, hired away Walt's animation staff and drastically changed the terms of Walt's contract. Refusing to sign the new contract, Walt lost all rights to the character Oswald the Lucky Rabbit.

Mickey Mouse was born after the fateful meeting with Mintz in 1928. The first Mickey cartoon to be seen in wide release was "Steamboat Willie," which featured a new and exciting innovation, synchronized sound. Walt himself provided Mickey's voice, and music and sound effects accompanied the animated action. Audiences were impressed by the novelty and loved the character of Mickey. For the first time, Walt had produced a major hit.

Silly Symphonies

Following the success of Mickey Mouse, Walt's Silly Symphonies series became a testing ground for advancements in the art of animation. Between 1929 and 1939, The Walt Disney Studios experimented with color, depth, personality animation, music, and story development, resulting in the most popular and acclaimed cartoons of the day. The series earned several Academy Awards® and produced such classics as "Flowers and Trees," "Ferdinand the Bull," and "Three Little Pigs."

Features

The production of the Silly Symphonies provided Walt and his studio with the necessary tools for producing animated features. The first, the 1937 classic *Snow White and the Seven Dwarfs*, was a huge success with critics and audiences alike. Walt earned a special Academy Award® for its production, and was finally able to build a state-of-the-art studio in Burbank. More features were produced, and in 1950, Walt realized the longtime dream of producing fully live-action films. The first was the adventure film *Treasure Island*, followed by dramas, fantasies, comedies, musicals, and westerns.

To: Creative Staff of Everyday Imagineering
From: Retlaw Yensid
Date: 12/5/34
RE: Challenge – We Need More Depth!

I am very proud of the work we have done together in producing innovative and imaginative cartoons – in recent years, the characters have become more appealing and well-rounded, the colors more vibrant, and the full scope of music and sound certainly draws audiences into the cleverly crafted storylines.

Now, I have a new challenge for you. I really want to add a greater sense of realism to the pictures, the sense that the audience is right there in the action. I want to draw people into the films, as if the cartoon is taking place all around them in a space that feels like it has dimension and depth.

I am not sure how we are going to accomplish this, but I want to put my very best people on it – the first people that came to mind were of course you folks from Everyday Imagineering. Your team members have the most creative minds and the sharpest innovative spirits in the business. I have no doubt that your team of Imagineers will be able to come up with a way of making animated settings look more realistic and engaging.

I want you to focus on a project we have coming up, one of the Silly Symphonies called "The Old Mill." I want the opening shot to move forward, approaching the scene of the Old Mill and the plants and animals that inhabit the space around the structure of the windmill. The effect should be a tracking shot forward, like those that are used on live-action films. What do you think: are you up for the challenge?

Yours sincerely,
Retlaw Yensid
Chief Executive Officer, ETAVONNI Animation Studios

P.S.: If we can come up with something for "The Old Mill," I want to use the same technique on a new project we've got coming up. I don't want to say what it is, but it is going to be big! That is to say, the project will be big, even though a half dozen or so of the characters will in fact be quite small.