3. The Principles of Animation

A new jargon was heard around the studio. Words like "aiming" and "overlapping" and "pose to pose" suggested that certain animation procedures gradually had been isolated and named. Verbs turned into nouns overnight, as, for example, when the suggestion, "Why don't you stretch him out more?" became "Get more stretch on him." "Wow! Look at the squash on that drawing!" did not mean that a vegetable had splattered the artwork; it indicated that some animator had successfully shown a character in a flattened posture.

Some of this terminology was just assigning new meanings to familiar and convenient words. "Doing" a scene could mean acting out the intended movements, making exploratory drawings, or actually animating it; and once it was "done," the scene moved on to the next department. Layouts were done, backgrounds were done, recording was done, and, eventually, the whole picture had been done. Mixed in with these terms were the new names and phrases with more obscure meanings.

The animators continued to search for better methods of relating drawings to each other and had found a few ways that seemed to produce a predictable result. They could not expect success every time, but these special techniques of drawing a character in motion did offer some security. As each of these processes acquired a name, it was analyzed and perfected and talked about, and when new artists joined the staff they were taught these practices as if they were the rules of the trade. To everyone's surprise, they became the fundamental principles of animation:

1. Squash and Stretch
2. Anticipation
3. Staging
4. Straight Ahead Action and Pose to Pose
5. Follow Through and Overlapping Action
6. Slow In and Slow Out
7. Arcs
8. Secondary Action
9. Timing
10. Exaggeration
11. Solid Drawing
12. Appeal

Squash and Stretch

By far the most important discovery was what we call Squash and Stretch. When a fixed shape is moved about on the paper from one drawing to the next, there is a marked rigidity that is emphasized by the movement. In real life, this occurs only with the most rigid shapes, such as chairs and dishes and pans. Anything composed of living flesh, no matter how bony, will
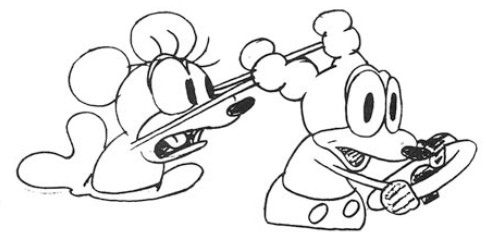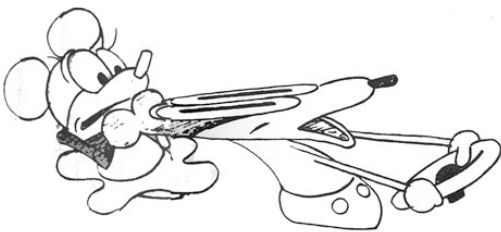
When Oswald chewed, his mouth went up and down, but there was no matching movement in his face or cheeks.
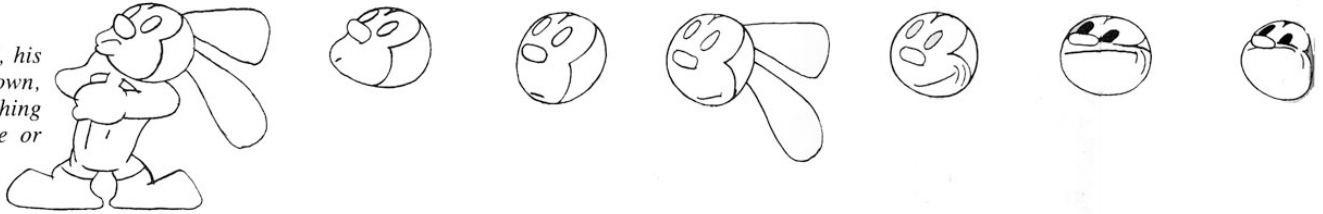
ANIMATOR: *Les Clark —* The Country Cousin.

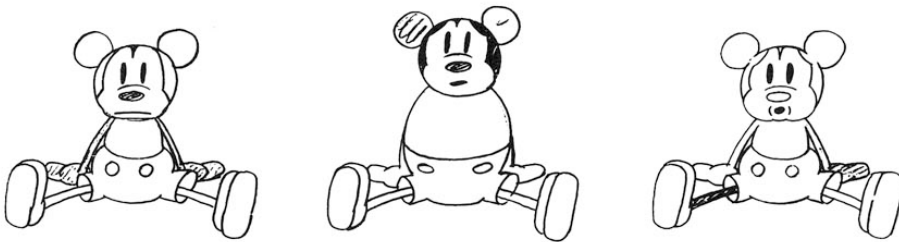*When Abner Mouse chewed just a few years later, everything on the head related to that action.*

show considerable movement within its shape in progressing through an action. A good example of this is the bent arm with swelling bicep straightened out so that only the long sinews are apparent. The figure crouched is obviously contracted into itself, in contrast to the figure in an extreme stretch or leap. The face, whether chewing, smiling, talking, or just showing a change of expression, is alive with changing shapes in the cheeks, the lips, the eyes—only the wax figure in the museum is rigid.

The squashed position can depict the form either flattened out by great pressure or bunched up and pushed together. The stretched position always shows the same form in a very extended condition. The movement from one drawing to the next became the very essence of animation. A smile was no longer a simple line spread across a face; it now defined the lips and their relation to the cheeks. Legs were no longer bent pipes or rubber hoses; they swelled as they bent and stretched to long flexible shapes.

Immediately the animators tried to outdo each other in making drawings with more and more squash and stretch, pushing those principles to the very limits of solid draftsmanship: eyes squinted shut and eyes popped open; the sunken cheeks of an ''inhale'' were radically different from the ballooned cheeks of a blowing action; a mouth chewing on a straw was first shown far below the nose, and then it actually was compressed up beyond the nose (which changed shape as well) in showing the chewing action. Through the mid-thirties, everyone was making two drawings for every conceivable action, and by working back and forth between the squash position and the stretch we found we could make each position stronger in both action and drawing.

The inhale before a heavy sigh is portrayed in broad, simple terms by simply inflating Mickey. The resulting increase in volume lost credibility, but in 1928 that did not matter.

In this early animation, the action is well staged but very rigid and stiff. There is no squash and stretch, follow through, or feeling of weight. These actions had a charm and a vitality, but they could not support more than a six-minute short.

SQUASHED & STRETCHED & TWISTED

DEJECTED · JOY · TANTRUM · CURIOUS

COCKY · LAUGHTER · BELLIGERENT · MORE LAUGHTER

CRYING

HAPPY

The famous half-filled flour sack, guide to maintaining volume in any animatable shape, and proof that attitudes can be achieved with the simplest of shapes.

The best advice for keeping the distended drawings from looking bloated or bulbous, and the stretched positions from appearing stringy or withered, was to consider that the shape or volume was like a half-filled flour sack. If dropped on the floor, it will squash out to its fullest shape, and if picked up by the top corners, it will stretch out to its longest shape; yet it will never change volume. We even made drawings of the flour sack in different attitudes—erect, twisted, doubled-over—suggesting emotions as well as actions. That forced us to find the most direct way, the simplest statement, for if we added any extra lines to amplify an expression it was no longer a flour sack. We found that many little interior lines were not necessary since the whole shape, conceived properly, did it all. These lessons were applied to Mickey's body, or his cheeks, to Pluto's legs, or his muzzle, or even to Donald's head.
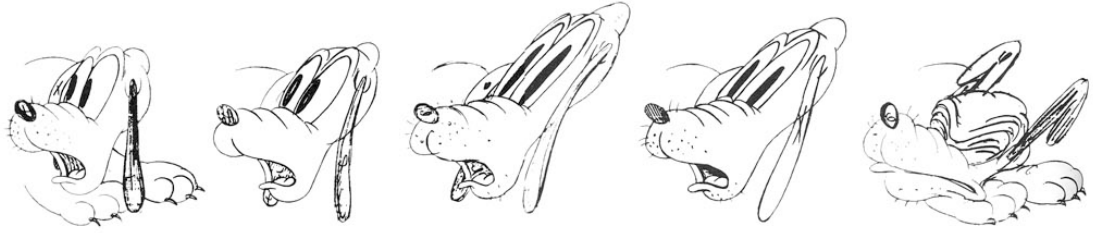
On the sports page of the daily newspapers we found
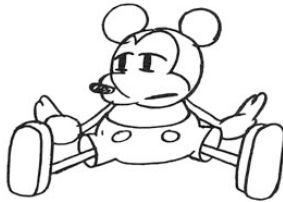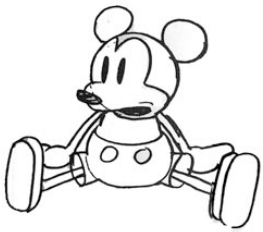
The rigid form of Mickey's body is replaced by a flexible, pliable shape in the first attempts to get squash and stretch in animation drawings.

ANIMATOR: Norm Ferguson —Mickey's Elephant.

Principles of squash and stretch when applied to Pluto's head give strength to the action and a feeling of moving flesh.

a gold mine that had been overlooked. Here were great photos showing the elasticity of the human body in every kind of reach and stretch and violent action. Our animation principles were clearly evident in the bulges and bumps that contrasted to long, straight thrusts. Mixed in with these contortions were examples of the whole figure communicating joy, frustration, concentration, and all the other intense emotions of the sports world. These examples opened our eyes and started us observing in a new way.

The standard animation test for all beginning artists

was to draw a bouncing ball. It was quickly rendered, easily changed, and surprisingly rewarding in terms of what could be learned. The assignment was merely to represent the ball by a simple circle, and then, on successive drawings, have it drop, hit the ground, and bounce back into the air, ready to repeat the whole process. We could have either a forward movement progressing the ball across the paper, or have all the action take place in one spot, allowing us, through a cycle of the drawings, to make the ball bounce continuously. It seemed like simplicity itself, but through

1928— Oswald shows determination by lifting his chest with one hand in front and one in back. While the gesture is easily recognizable, it is little more than a diagram of the action.
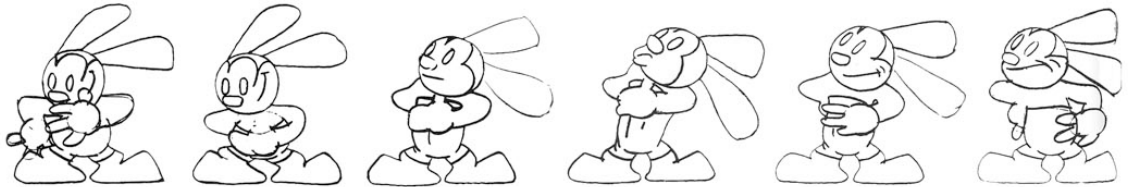
ANIMATOR: Norm Ferguson —Shanghaied

*1934— Peg Leg Pete does the same gesture, only now there is more belly than chest involved. This broader action gave the impression of a round solid character with a combination of life and spirit—and fat.*

ANIMATOR: Jack Campbell —The Riveter.

1940— The gesture has been done so often by this time that it is almost a gag in itself. An action this broad loses realism, but gains a type of comedy.
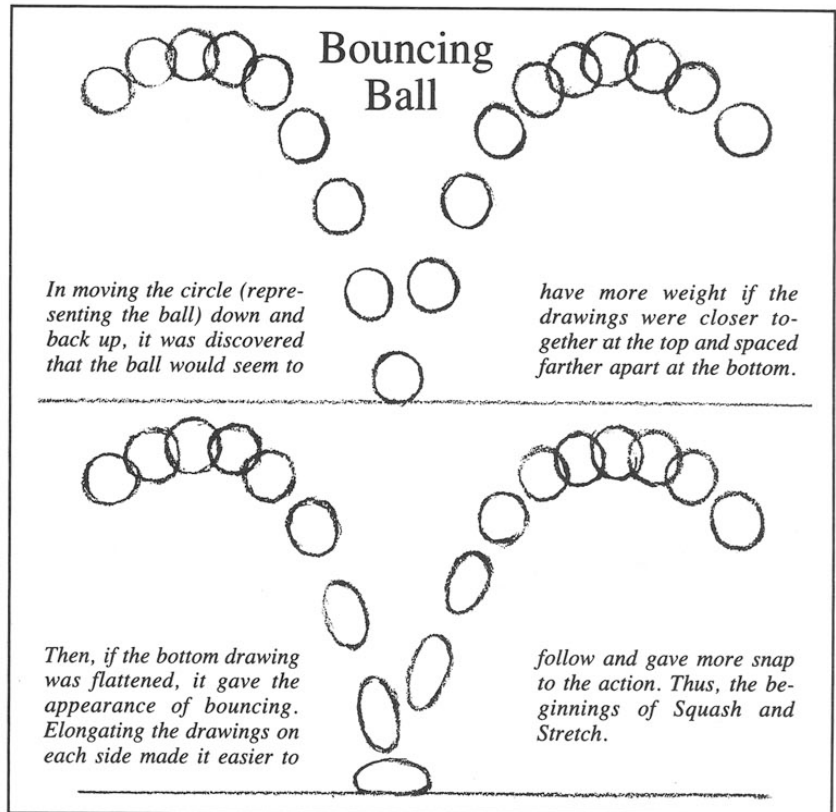

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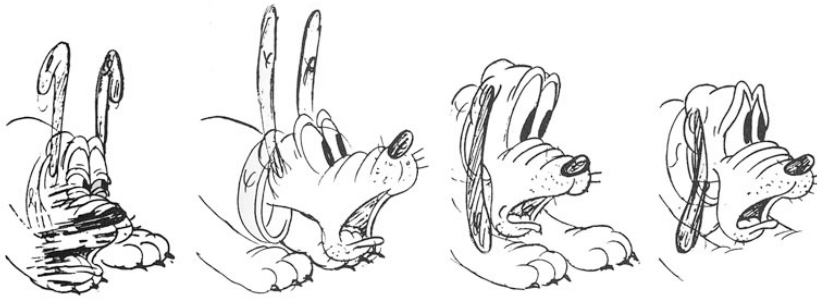
the test we learned the mechanics of animating a scene while also being introduced to Timing and Squash and Stretch.

We were encouraged to change the shape of the ball in the faster segments of the bounce, making an elongated circle that would be easier to see, then quickly to flatten it as it hit the ground, giving a solid contact as well as the squashed shape of a rubber ball in action. This change at the bottom also gave the feeling of thrust for the spring back into the air, but if we made an extra drawing or two at that point to get the most out of this action, the ball stayed on the ground too long, creating weird effects of hopping instead of bouncing. (Some tests looked more like a jumping bean from Mexico than any kind of ball.) If we misjudged our arrangement of the drawings or the distance between them, we created apparitions reminiscent of an injured rabbit, or an angry grasshopper, or, most often, a sleepy frog. However, many of the circular forms just seemed to take off as if they had a life of their own.

The beginning artists were an inventive group, and all manner of variations were tried, each revealing something about the man who had done the animation and what he considered important in the scene. Some men added distinction by starting with a big bounce, followed by shorter and shorter ones as the ball gradually lost its spring. Some put the action in perspective to show how well they could figure a complicated assignment, or they added a stripe around the ball to show how much it turned during the whole action. These men were grabbed quickly by the Effects Department, which specialized in a mechanical type of animation. Those more interested in a livelier type of entertainment preferred surprise endings: the ball exploding on contact, or crashing like a broken egg on the second bounce, or sprouting wings and flying off.

Bouncing Ball

In moving the circle (representing the ball) down and back up, it was discovered that the ball would seem to

have more weight if the drawings were closer together at the top and spaced farther apart at the bottom.

Then, if the bottom drawing was flattened, it gave the appearance of bouncing. Elongating the drawings on each side made it easier to

follow and gave more snap to the action. Thus, the beginnings of Squash and Stretch.

Anticipation

People in the audience watching an animated scene will not be able to understand the events on the screen unless there is a planned sequence of actions that leads them clearly from one activity to the next. They must be prepared for the next movement and expect it before it actually occurs. This is achieved by preceding each major action with a specific move that anticipates for the audience what is about to happen. This anticipa-

Donald draws back with raised leg in anticipation of the dash he will make out of the scene.

tion can be as small as a change of expression or as big as the broadest physical action. Before a man runs, he crouches low, gathering himself like a spring, or, the reverse, he draws back in the opposite direction, raising his shoulders and one leg, as he aims himself at the place of the next activity. Before Mickey reaches to grab an object, he first raises his arms as he stares at the article, broadcasting the fact that he is going to do something with that particular object.

This is the oldest device of the theater, for without it, the audience becomes nervous and restless and whispers, "What's he doing?" The anticipatory moves may not show *why* he is doing something, but there is no question about *what* he is doing—or what he is going to do next. Expecting that, the audience can now enjoy the *way* it is done.

The opposite of this is the "surprise gag," which only works when the audience is expecting one thing to happen, and suddenly, without warning, something entirely different happens. The surprise gag cannot work if a different action has not been anticipated by the audience. Similarly, no action on the stage can be anything but a series of meaningless surprises without anticipation.

The movements in early animation were abrupt and unexpected; too often the audience was not properly alerted and missed a gag when it came. This was one of the first things Walt started to correct. He called his remedy "aiming" and acted out just how an action or gesture could be made clear so that everyone would see it. If Oswald the Lucky Rabbit is to put his hand in his pocket to get a sandwich for lunch, the whole body must relate to that hand and to the pocket. When the hand is aimed, it must be "out in the clear" so everyone can see it and anticipate what is going to happen.
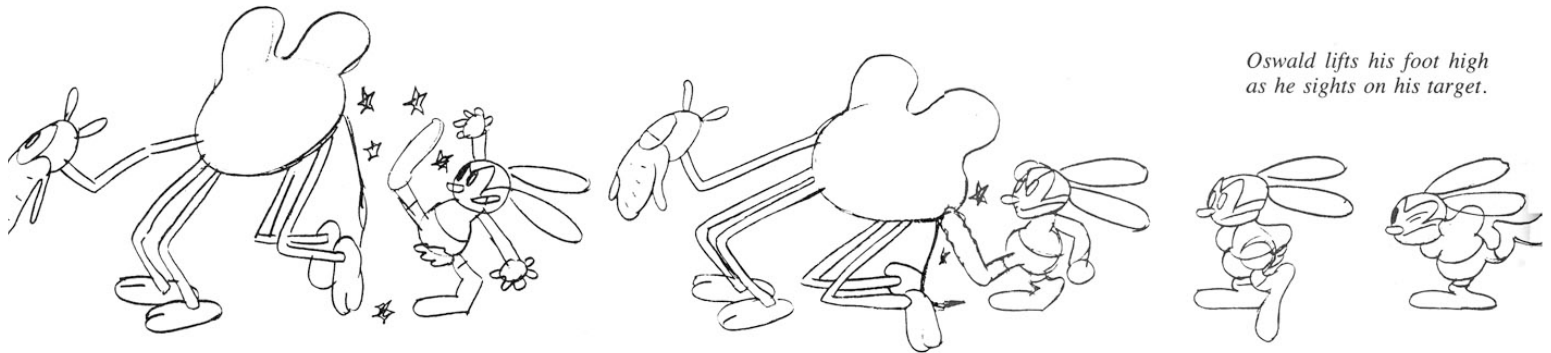
Oswald lifts his foot high as he sights on his target.

In the early days, Walt referred to anticipation as "aiming." Here Oswald aims his hand at the sandwich in his pocket. No one in the audience failed to see the gesture or the action.
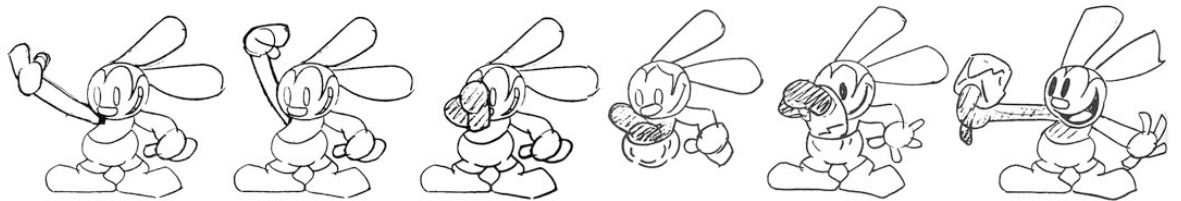
he head cannot be looking off somewhere else—the mportant action is Oswald's reaching into his pocket. t is not a gag, it is not a laugh, but it must be seen. No ne should need to ask, ''Now where did he ever get hat sandwich?'' As Walt demonstrated how it should e done, he exaggerated the action and made it far nore interesting than the animator was ever able to apture. As Les Clark said years later, ''Today it may ook simple to us; at the time it wasn't. It was some- hing that hadn't been tried before or proved.''

Few movements in real life occur without some ind of anticipation. It seems to be the natural way for reatures to move, and without it there would be little ower in any action. To the golfer, it is the backswing; o the baseball pitcher, it is his windup. The batter repares himself with a whole series of anticipatory ctions, but the one that gives the clout is the final wist and the step forward as the ball approaches the late. Without that move the mightiest swing is no nore than a bunt.

Staging

'Staging'' is the most general of the principles because covers so many areas and goes back so far in the heater. Its meaning, however, is very precise: it is the resentation of any idea so that it is completely and nmistakably clear. An action is staged so that it is nderstood, a personality so that it is recognizable, an xpression so that it can be seen, a mood so that it will ffect the audience. Each is communicating to the illest extent with the viewers when it is properly aged.

The most important consideration is always the story point.'' It has been decided, for example, that certain piece of business will advance the story; ow, how should it be staged? Is it funnier in a long ot where everything can be seen or in a close-up aturing the personality? Is it better in a master shot ith the camera moving in, or a series of short cuts to fferent objects? Each scene will have to fit the plan, d every frame of the film must help to make this int of the story.

If a ''spooky'' feeling is desired, the scene is filled ith the symbols of a spooky situation. An old house, ind howling, leaves or papers rustling through the
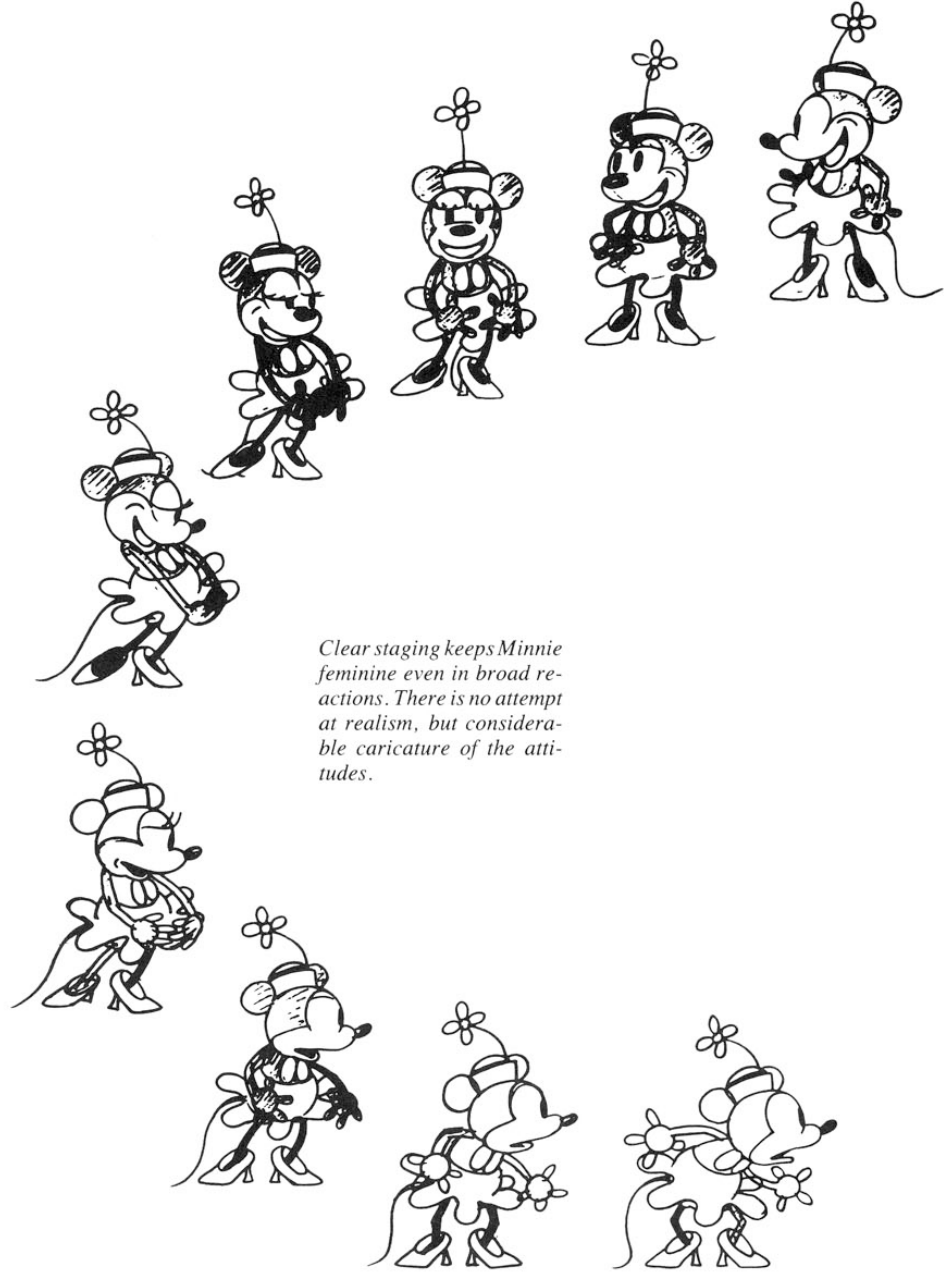
Clear staging keeps Minnie feminine even in broad re-actions. There is no attempt at realism, but considera-ble caricature of the atti-tudes.
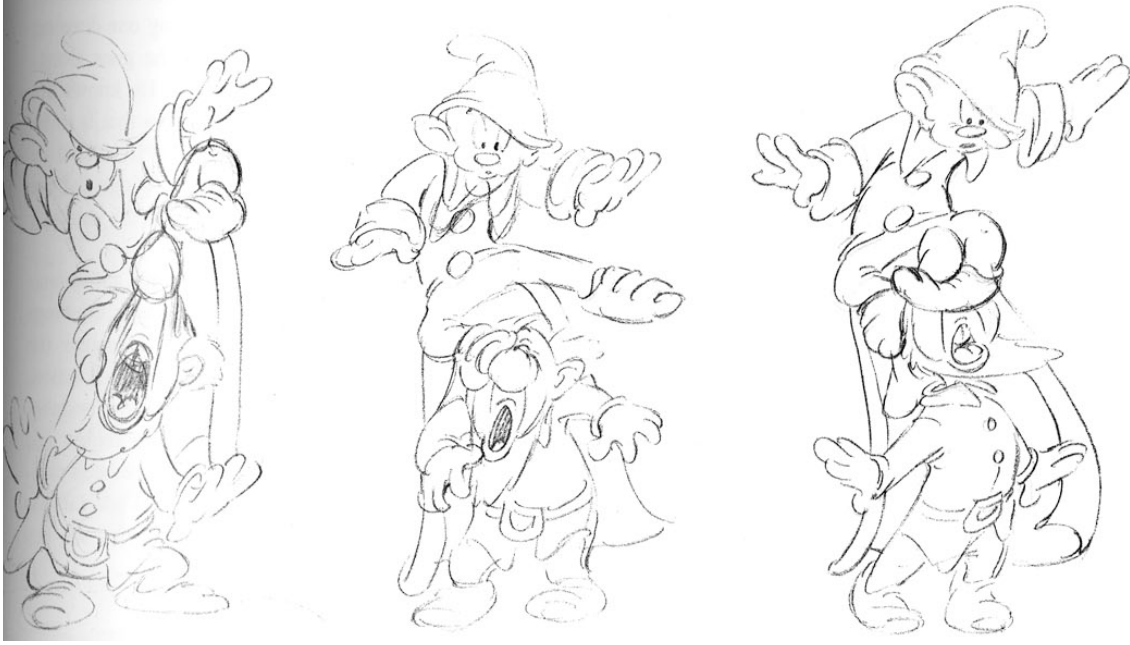
ANIMATOR: *Art Babbitt*
—The Country Cousin.

Only do one thing at a time: one of the most important rules of the theater. The country mouse, tipsy from fancy food and drink, is standing on a slice of toast and tries to act nonchalant. He flips his umbrella in the air, places it in position before leaning on it, and even holds the position briefly before the umbrella breaks through the toast.

ANIMATOR: *Fred Moore*
— Snow White.

Dopey uses his foot to temporarily stifle the sneeze of the dwarf beneath him. This complicated situation easily could become difficult to understand if not properly staged.

of gray to soften the contrast or delineate a form. Mickey's body was black, his arms and his hands—all black. There was no way to stage an action except in silhouette. How else could there be any clarity? A hand in front of the chest would simply disappear; black shoulders lifted against the black part of the head would negate a shrug, and the big, black ears kept getting tangled up with the rest of the action just when other drawing problems seemed to be solved.

Actually, this limitation was more helpful than we realized: we learned that it is always better to show the action in silhouette. Chaplin maintained that if an actor knew his emotion thoroughly, he could show it in silhouette. Walt was more direct: ''Work in silhouette so that everything can be seen clearly. Don't have a hand come over a face so that you can't see what's happening. Put it away from the face and make it clear.'' Constant redrawing, planning, and experimenting were required to make the action look natural and realistic while keeping a clear silhouette image. We had to find a pose that read with both definition and appeal.

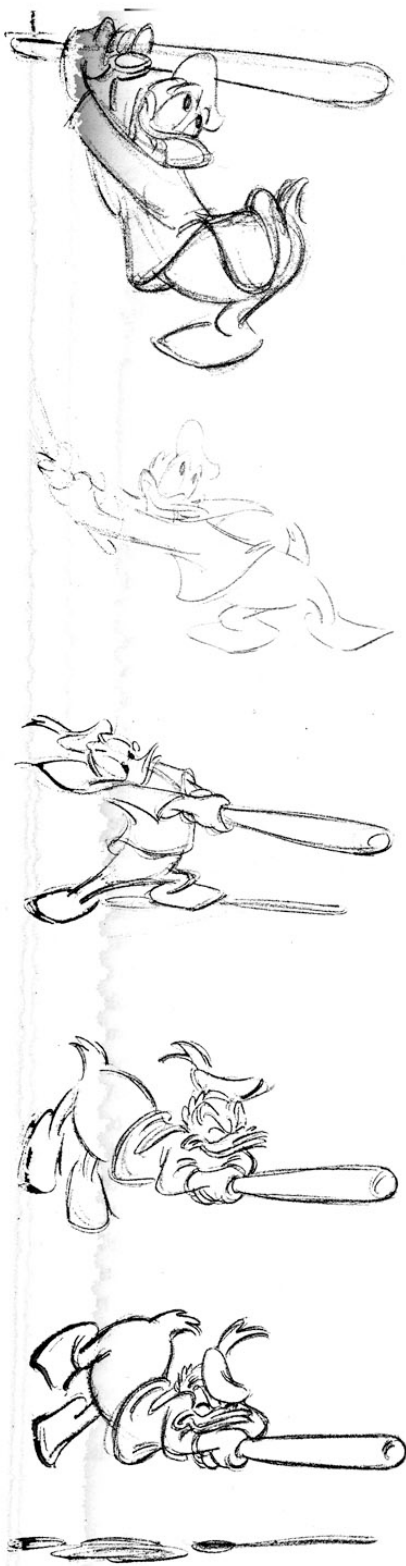## Straight Ahead Action and Pose to Pose[1]

There are two main approaches to animation. The first is known as Straight Ahead Action because the animator literally works straight ahead from his first drawing in the scene. He simply takes off, doing one drawing after the other, getting new ideas as he goes along, until he reaches the end of the scene. He knows the story point of the scene and the business that is to be included, but he has little plan of how it will all be done at the time he starts. Both the drawings and the action have a fresh, slightly zany look, as the animator keeps the whole process very creative.

The second is called Pose to Pose. Here, the animator plans his action, figures out just which drawings will be needed to animate the business, makes the drawings, relating them to each other in size and action, and gives the scene to his assistant to draw the inbetweens. Such a scene is always easy to follow and works well because the relationships have been carefully considered before the animator gets too far into the drawings. More time is spent improving the key

yard, clouds floating across the moon, threatening sky, maybe bare branches rattling or scraping against a window, or a shadow moving back and forth—all of these say ''spooks.'' A bright flower bed would be out of place.

If you are staging an action, you must be sure that only one action is seen; it must not be confused by drapery or by a poor choice of angle or upstaged by something else that might be going on. You do not make drawings just because they are cute or look funny. You make the drawings that will stage each idea in the strongest and the simplest way before going on to the next action. You are saying in effect, ''Look at this—now look at this—and now this.'' You make sure the camera is the right distance from the character to show what he is doing. If he is kicking, you do not have the camera in close on a waist shot. If you are displaying your character's expression, you do not do it in a long shot where the figure is lost in the background.

Magicians say they prefer to work close to the people they are fooling because it is so much easier to direct attention to any desired spot. When an individual works alone on a big stage it is too easy for the audience to watch his feet, what is behind him, his clothes, any unnatural movement; the spectators might be looking at everything except what the magician is trying to show them. As a director, Dave Hand emphasized the value of the close-up shot: ''By its use we are able to eliminate from the mind of the audience anything that is less important than the particular point we are putting over at the time.''

The animators had a special problem of their own. The characters were black and white, with no shades
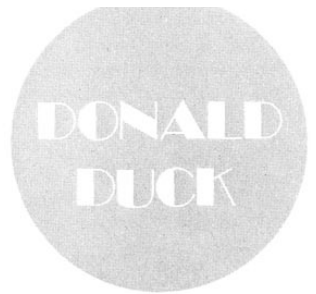
drawings and exercising greater control over the movement. With Pose to Pose, there is clarity and strength. In Straight Ahead Action, there is spontaneity.

Both methods are still in use because they each offer certain advantages for different types of action. Usually they are combined in a way that keeps the Straight Ahead Action from getting out of hand. The scene is planned with a path of action laid out, and rough drawings are made depicting the character's probable progress; although none of these will be used later in actual animation, they still serve as a guide for size, position, attitude, and relationship to the background. They offer as much control as might be needed, even though some animators feel that the very lack of control is the element that gives the spontaneity. They say: "The animator should be as surprised as anyone at the way it comes out." Most wild, scrambling actions are probably more effective with this method than with too much careful pre-planning.

Straight Ahead Animation will seldom work if there is strong perspective in the layout or a background that must be matched. One man animated a dog jumping excitedly and turning around, trying to attract attention. While he achieved a funny action with much spirit, it could not be used because he had failed to match the action to the limitations of the layout. There was no way to tell how high the dog was jumping since he never really contacted the ground, and the relationship of the drawings was thrown off by the perspective he had failed to consider. With a flat background and a clear arena in all directions, there would have been no problem.

However, many pieces of acting require a different approach. If Mickey Mouse is discouraged, he turns away, jams his hands far down into his pockets, looks back over his shoulder one last time, kicks a stone out of his path, and walks off. This must be done with Pose to Pose because each of the positions must be handled carefully for maximum clarity, appeal, and communication. They should be worked over separately and together, until they do their job as efficiently as possible. Once these poses relate well to each other, it is a simple matter to time the intervening drawings and to break down the action.

Another element that should be considered in choosing the method of animation is "texture." A series of
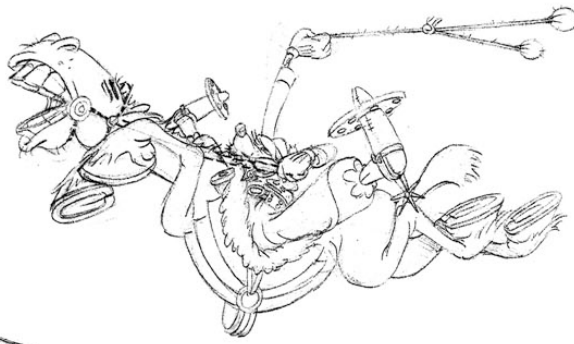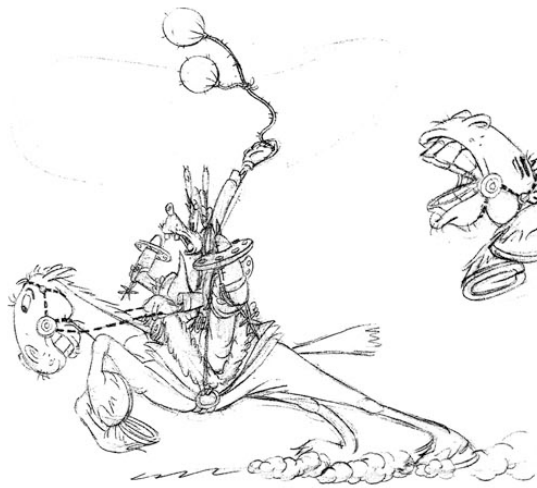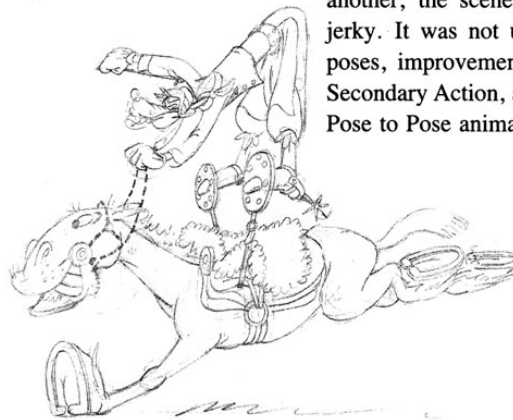
actions all with the same intensity and amount of movement will quickly become tedious and predictable. It will have no punch. But if the overall pattern contains accents and surprises, contrasts of smooth-flowing actions with short, jerky moves, and unexpected timing, the whole thing becomes a delight to watch. Obviously, this is impossible to attain with Straight Ahead Action. Using Pose to Pose, the texture in the variety of the movements can be planned and the action designed to make this a part of the total statement.

The first animators to use Pose to Pose were interested in a quicker result and were not aware of its brilliant future. They were more concerned with the geographic locations of the characters than any potential for entertaining actions. ''The guy is over here, then he gets his hat, then his cane; he looks to see if his wife is watching, he does a hop, then runs out the door. Six or seven drawings, a whole bunch of inbetweens, and I'm through with the scene!'' When handled that way, with no attempt to relate one pose to another, the scenes were bound to be wooden and jerky. It was not until the development of stronger poses, improvements in timing, more skillful use of Secondary Action, and, finally, the Moving Hold, that Pose to Pose animation ultimately came into its own.

*Squash and stretch have
now been combined with
follow through and over-
lapping action on the
feather and other parts to
give a feeling of weight and
living form.*
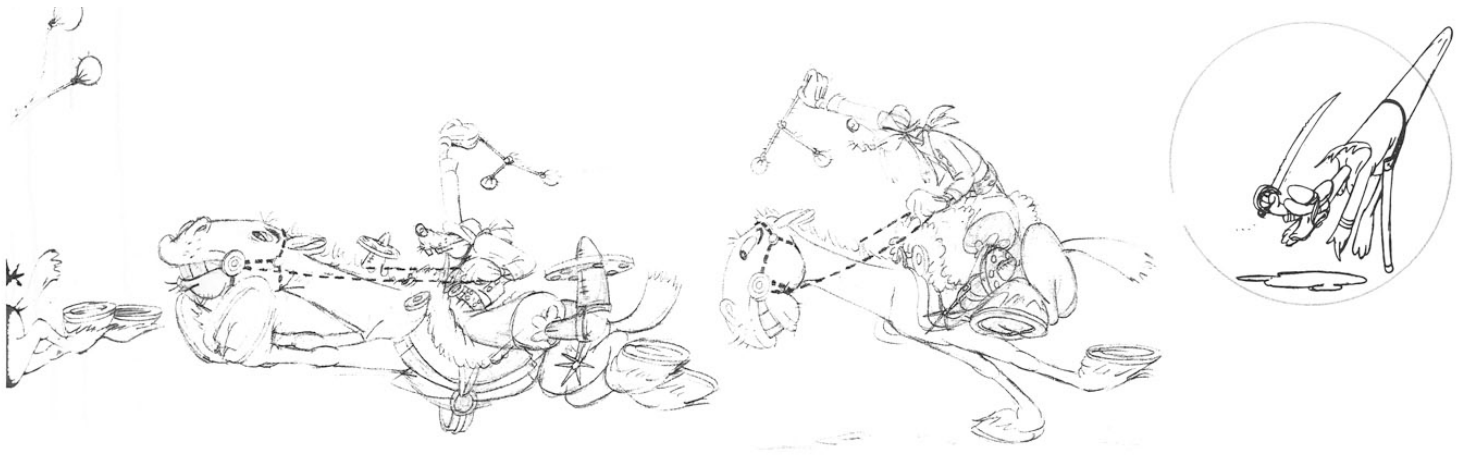
Follow Through and Overlapping Action

When a character entering a scene reached the spot for
his next action, he often came to a sudden and com-
plete stop. This was stiff and did not look natural, but
nobody knew what to do about it. Walt was concerned.
''Things don't come to a stop all at once, guys; first
there's one part and then another.'' Several different
ways were eventually found to correct these condi-
tions; they were called either ''Follow Through'' or
''Overlapping Action'' and no one really knew where
one ended and the other began. There seemed to be
five main categories.

1. If the character has any appendages, such as
long ears or a tail or a big coat, these parts continue
to move after the rest of the figure has stopped. This
is easy to see in real life. The movement of each
must be timed carefully so it will have the correct
feeling of weight, and it must continue to follow
through in the pattern of action in a believable way,
no matter how broadly it is cartooned.

2. The body itself does not move all at once, but
instead it stretches, catches up, twists, turns, and
contracts as the forms work against each other. As
one part arrives at the stopping point, others may
still be in movement; an arm or hand may continue
its action even after the body is in its pose. (Peg Leg
Pete's belly continued to bounce and sag intermi-
nably.) In order to put over the attitude clearly, the
head, chest, and shoulders might all stop together,

Tillie blows out candles on cake.
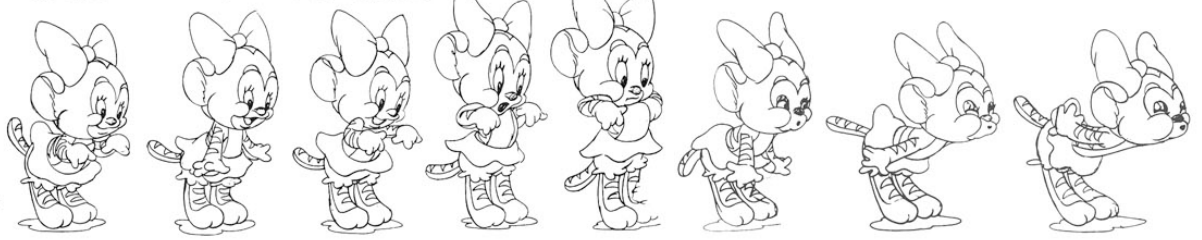
ANIMATOR: *Ham Luske*
— Elmer Elephant.

⊢— *she sees cake* —⊣ ⊢— *inhale* — *anticipation* —⊣ ⊢— *blows* ————— *"Moving Hold"*
little "take" — head up — *chest swells — up on toes —* *leans out — arms back —* *tail higher — chin out more —*
bigger smile — hands down. *shoulders up* *fanny up — head thrust —* *arms up — lips out —*
ribbon comes up.

since this is the part the audience should see (the part that registers how the character is feeling). Then a few frames later, the rest of the parts would settle into their final position, possibly not all at the same time. When the whole figure has come to a stop in a definite attitude, this is called a "held" drawing.

Some of the animators thought we were getting too fussy, but that was only the beginning as Walt saw new possibilities in the work his men were doing. Les Clark said with a chuckle, ". . . we couldn't understand sometimes why he was giving us hell for something we thought was acceptable. Then later on we knew what he was talking about."

3. The loose flesh on a figure, such as its cheeks or Donald Duck's body or almost all of Goofy, will move at a slower speed than the skeletal parts. This trailing behind in an action is sometimes called "drag," and it gives a looseness and a solidity to the figure that is vital to the feeling of life. When done well, this technique is scarcely detectable as the film is projected. In effect, the animator is drawing in the fourth dimension, for he is depicting a figure the way it would be at only that precise moment. The drawings are not designed to be viewed by themselves, but only in a series projected at an established speed.

Many comic actions have been based on this principle, as the fat on a running character drags farther and farther behind, until the ultimate occurs: the skeleton runs off, leaving the flesh to fend for itself. This type of exaggeration will bring laughs in the shorter films, but the chief value of this kind of Follow Through lies in its more subtle uses.

ANIMATOR: *Bill Tytla—*
Snow White.

Loose flesh in fast moves creates a feeling of realism. By itself the drawing is too broad, but in action, it is never seen, only felt.

4. The way in which an action is completed often tells us more about the person than the drawings of the movement itself. A golfer takes a mighty swing, which covers only a few frames, but what happens to him afterward can easily take five feet of film and is much more revealing, whether he is graceful and slick in his follow through, or wraps himself up in a knot. The anticipation sets up the action we expect (or is it the action the character expects?), the action whizzes past, and now we come to the ''punch line''

more entertaining the action itself could be, or what it could tell us about the character's personality.

5. Finally, there was the Moving Hold, which employed parts of all the other elements of Overlapping Action and Follow Through to achieve a new feeling of life and clarity. When a careful drawing had been made of a pose, it was held without movement on the screen for a few frames—at least eight, maybe as many as sixteen. This was to allow the audience

of the gag, the follow through, which tells us what happened—how it all turned out. Obviously, the ending should be considered part of the entire action before any drawings are made, but, amazingly, the ending was hardly ever developed in early animation. It was enough just to do the reach, the throw, the kick, and no thought was given to how much

time to absorb the attitude. That amounted to less than a second, but it was enough. However, when a drawing was held for that long, the flow of action was broken, the illusion of dimension was lost, and the drawing began to look flat. A way had to be found to "hold" the drawing and still keep it moving!

ANIMATOR: *Ham Luske*— Elmer Elephant.

The other animal kids have made fun of Elmer's trunk. He tearfully looks at his reflection and kicks at his trunk, hoping to get rid of it. This poignant scene is full of strong poses, clear staging, anticipation, follow through, squash and stretch, exaggeration, and appeal.

ANIMATOR: *Ham Luske*— Elmer Elephant.

The Moving Hold: the pose is strengthened in a second drawing as all the parts drift or coast to a final position. This keeps the character alive yet allows the audience to see the attitude clearly.
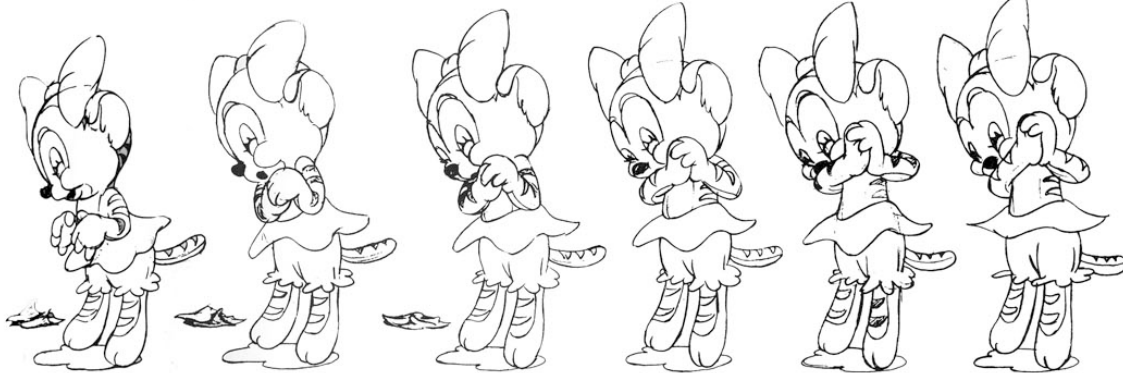
The answer was to make two drawings, one more extreme than the other, yet both containing all the elements of the pose. It was explained this way: ''You hit the pose, then drift on beyond to an even stronger pose—everything goes further, the cheeks go up, the ears fly out, the hands rise; he goes on his toes, his eyes open wider, but essentially he's still in his pose.'' Now we could use the Follow Through on the fleshy parts to give us the solidity and dimension, we could drag the parts to give the added feeling of weight and reality, and we could strengthen our poses for more vitality. It all added up to more life in the scene. The magic was beginning to appear.

## Slow In and Slow Out

Once an animator had worked over his poses (the ''extremes'') and redrawn them until they were the best he could do, he naturally wanted the audience to see them. He timed these key drawings to move quickly from one to the next, so that the bulk of the footage of the scene would be either on or close to those ''extremes.'' By putting the inbetweens close to each extreme and only one fleeting drawing halfway between, the animator achieved a very spirited result, with the character zipping from one attitude to the next. This was called Slow In and Slow Out, since that is the way the inbetweens were timed. Too much of this gave a mechanical feel to the action, robbing the scene of the very life that was being sought, but it was still an important discovery that became the basis of later refinements in timing and staging.

Walt continued to ask us to analyze the actions more carefully, and to understand how the body worked, since that was the only way to get the caricature of realism he wanted. ''Our work must have a foundation of fact in order to have sincerity. The most hilarious comedy is always based on things actual.''

One animator from outside the studio was ''amazed that anyone would be that interested in the mechanics of motion,'' but this unique approach was the very heart of our work. Marc Davis[2] summed it up, ''Disney animation is just very different. Nobody, I don't care who he is, can come from the outside and draw a Disney character without a full understanding of what it's all about.''

Arcs

Very few living organisms are capable of moves that have a mechanical in and out or up and down precision. The action of a woodpecker might be an exception, and, because of the restrictions of an external skeleton, there are undoubtedly some examples in the insect world, but the movements of most living creatures will follow a slightly circular path. The head seldom thrusts straight out, then back again; it lifts slightly, or drops as it returns. Perhaps this has to do with weight or maybe with the inner structure of the higher forms of life, but, whatever the reason, most movements will describe an arc of some kind.
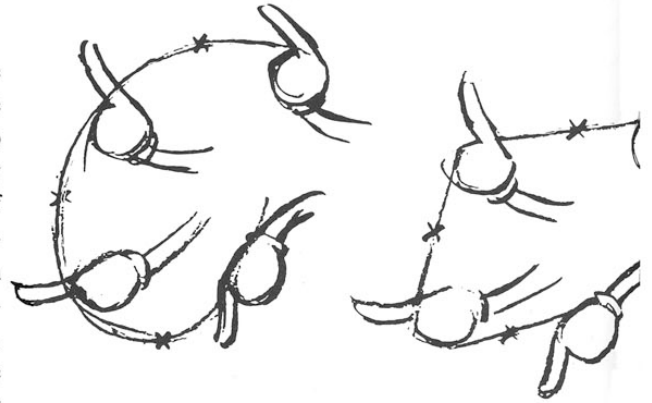
The action of a hand gesture with a pointing finger follows a circular path. The animator charts the position of his drawings along this arc. He makes his key drawings, indicating where inbetweens should be placed to keep the line of action on this arc. Inbetweens done without following this arc change the action radically.

This discovery made a major change in the type of movements animators designed for their characters, breaking with the rigid and stiff actions that had gone before. In a walk, the characters had popped up and down like mechanical gadgets on an engine; now they ''arced'' over at the top of their steps and ''arced'' under at the bottom position. A hit or a throw could be on a completely straight line, but the beginning of the action came sweeping in on an arc and the Follow Through started a corkscrew action.

As this principle was better understood, scenes were plotted out with charts and dots, as well as rough poses, to determine just how high and how low the

character should go in any action. Arcs were sketched in, as the key actions were planned, to guide the eventual drawings along this curved path. When the final drawings were being made, more ways would become apparent for the character to go even farther in the action, especially using Squash and Stretch and Overlapping Action to good advantage.

One of the major problems for the inbetweeners is that it is much more difficult to make a drawing on an arc than one halfway between two other drawings. Even when the position has been indicated, or a stern warning written on the extremes, "Watch arcs!" there is a strong inclination to pull back toward a more normal inbetween. It is only as a series of drawings is "rolled" on the pegs that the proper location for the drawing becomes evident. No one has ever found a way of insuring that the drawings will all be placed accurately on the arcs, even when experienced people are inbetweening the action, and it is one of the most basic requirements for the scene. Drawings made as straight inbetweens completely kill the essence of the action.

Secondary Action

Often, the one idea being put over in a scene can be fortified by subsidiary actions within the body. A sad figure wipes a tear as he turns away. Someone stunned

SECONDARY ACTION
ANIMATOR. Bill Tytla —
Snow White.

Doc is flustered as he tells the other dwarfs to put Grumpy in the washtub. The primary action is the body jumping up and down, but Doc's confusion is shown by having his arms follow a different pattern from his body; the head bobbing with dialogue is still another action. These secondary actions add excitement without conflicting with the basic movement.

ANIMATOR: Eric Larson—
Pinocchio.

As the kitten Figaro slips into bed, his shoulders, arms, legs, and the blanket all have independent actions that support and enrich the main idea of the scene without conflicting.

shakes his head as he gets to his feet. A flustered person puts on his glasses as he regains his composure. When this extra business supports the main action, it is called a Secondary Action and is always kept subordinate to the primary action. If it conflicts or becomes more interesting or dominating in any way, it is either the wrong choice or is staged improperly.

The chief difficulty lies in making a unified statement through the drawing and timing of separate, but related, parts. If the sad figure has an expression on his face that should be seen, the hand wiping the tear must be carefully planned to support that look. A broad, overwhelming gesture with a fist covering half the face would hardly be acceptable. Still, if the action is too subdued, it will be mushy, restricted, and inconsequential; if it is too strong, the face will never be seen. Should this Secondary Action be made to work with the features so that the expression is actually emphasized, the scene will be outstanding.

Sometimes the Secondary Action will be the expression itself. Suppose there was to be a change from a painful hurt to a helpless, bleak look as the character turns away, before he wipes the tear. The danger now is not that the expression will dominate the scene but that it never will be seen. The change must come before the move, or after, and must be staged so that it is obvious, even though of secondary importance. A change in the middle of a major move will go unnoticed, and any value intended will be lost.

One animator found the proper relationships among all these parts through a "building block" technique.[3] First he animated the most important move, making sure that it worked the way he wanted, communicating his thought in the strongest way. Then he went through the scene a second time animating the Secondary Action, and even once more if necessary, to make the rest of the drawing relate to those two actions. He continued to change and adjust until all parts of the drawing worked together in a very natural way.

It is advisable in any case to try it all in thumbnails—little exploratory sketches—before doing anything else, to make sure that everything will stage well and will look as convincing as the animator had hoped. When used correctly, Secondary Actions will add richness to the scene, naturalness to the action, and a fuller dimension to the personality of the character.

Timing

The number of drawings used in any move determines the amount of time that action will take on the screen. If the drawings are simple, clear, and expressive, the story point can be put over quickly, and this was all that concerned the animators during the early period. Timing in those cartoons was limited mainly to fast moves and slow moves, with accents and thrusts calling for special handling. But the personalities that were developing were defined more by their movements than their appearance, and the varying speed of those movements determined whether the character was lethargic, excited, nervous, relaxed. Neither acting nor attitude could be portrayed without paying very close attention to Timing.

The complicated relationships that came with Secondary Actions and Overlapping Movements called for extensive refinements, but even the most basic moves showed the importance of Timing and the constant need for more study. Just two drawings of a head, the first showing it leaning toward the right shoulder and the second with it over on the left and its chin slightly raised, can be made to communicate a multitude of ideas, depending entirely on the Timing used. Each inbetween drawing added between these two "extremes" gives a new meaning to the action.

EXAGGERATION

ANIMATOR. Dick Lundy—
Orphan's Benefit.

Donald Duck is hit in the face with a scoop of ice cream as he tries to recite a poem. Exaggeration was the key element in finding the most entertaining way to do this scene. The duck is staged clearly; there is strong impact in the timing and a funny concept to the whole action.
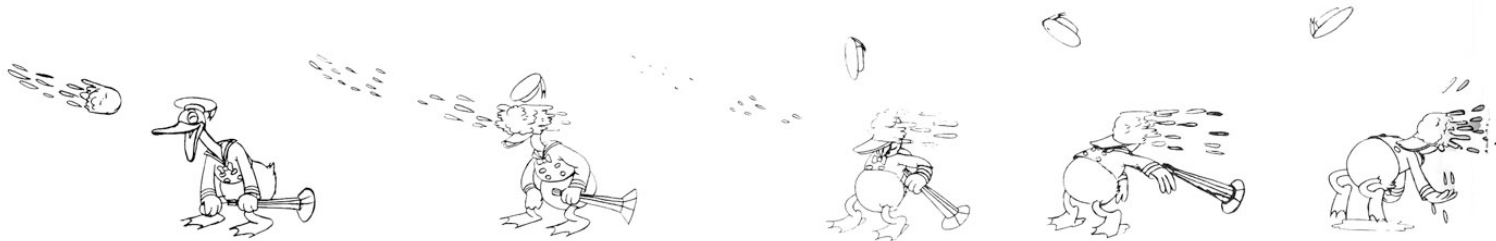
No inbetweens	THE CHARACTER has been hit by a tremendous force. His head is nearly snapped off.
One inbetween	. . . has been hit by a brick, rolling pin, frying pan.
Two inbetweens	. . . has a nervous tic, a muscle spasm, an uncontrollable twitch.
Three inbetweens	. . . is dodging the brick, rolling pin, frying pan.
Four inbetweens	. . . is giving a crisp order, "Get going!" "Move it!"
Five inbetweens	. . . is more friendly, "Over here." "Come on—hurry!"
Six inbetweens	. . . sees a good-looking girl, or the sports car he has always wanted.
Seven inbetweens	. . . tries to get a better look at something.
Eight inbetweens	. . . searches for the peanut butter on the kitchen shelf.
Nine inbetweens	. . . appraises, considering thoughtfully.
Ten inbetweens	. . . stretches a sore muscle.

The persistent question, especially from the New York men was, "When do you use 'ones' and when do you use 'twos'?" This referred to the number of frames of film to be shot of a single drawing. One exposure was called "ones," two exposures "twos." It had long been known that for most normal action there was no need to make a new drawing for every frame of the film. Each drawing could occupy two of the precious frames, and the audience would never detect it at 24 frames a second. This saved immense amounts of work and in the slower movements gave a smoother appearance to the action. More than that, a fast action on "twos" had more sparkle and spirit than the same action with inbetweens, which tended to make the Timing too even and removed the vitality.

Any time there was a pan move in which the character's feet or a point of contact with the background were shown, the action had to be on "ones" to match the moves on the pan, or there would be slippage which looked peculiar. Similarly, if the camera were moving in any direction (which must be on "ones"), there would be a strange jittering unless the character's actions were on "ones" also.

When more elaborate actions were called for and more delicate changes had to be seen, the animators resorted to the use of "ones"—sometimes throughout the scene and otherwise only in certain places. A scramble action or speed gag, a sharp accent or flurry of activity, the pay-off after a big anticipation, all needed "ones." But the choice was still difficult to make if the animator had not gone through a period of experimenting and trying and failing and trying again. Only then did he build up a backlog of experience that would guide him through these perpetual decisions.

Exaggeration

There was some confusion among the animators when Walt first asked for more realism and then criticized the result because it was not exaggerated enough. In Walt's mind, there was probably no difference. He believed in going to the heart of anything and developing the essence of what he found. If a character was to be sad, make him sadder; bright, make him brighter; worried, more worried; wild, make him wilder. Some of the artists had felt that "exaggeration" meant a more distorted drawing, or an action so violent it was disturbing. They found they had missed the point.

When Walt asked for realism, he wanted a carica-

ture of realism. One artist analyzed it correctly when he said, "I don't think he meant 'realism.' I think he meant something that was more convincing, that made a bigger contact with people, and he just said 'realism' because 'real' things do. . . . Every so often [in the animation] the character would do something unconvincing, or to show how clever the animator was, and it wasn't real, it was phony."[4] Walt would not accept anything that destroyed believability, but he seldom asked an animator to tame down an action if the idea was right for the scene.

Dave Hand told of a test he had done of Mickey riding along in his taxicab, whistling, with everything on the car rattling and bouncing. When they came to the corner, the car skidded and blew out a tire, at which point the car sagged, the license plate twirled over and landed with its numbers upside down and spelling, "Oh, heck." Dave was sure that was a laugh, and he was careful to stage it so that it could not be missed. Evidently he had not considered the whole car as carefully, for Walt complained of the lack of action and asked him to do it over. The next test received the same reaction. "It's not broad enough; it's not funny!" Six times Dave corrected the action, erasing and redrawing until he was nearly through the paper, and still Walt did not feel the action was spirited enough for what he wanted.

At that point Dave got fed up. "The only thing I knew to do was to do something he wouldn't take—to make it so extreme that he would say, 'I didn't mean *that* much!' So I went back and did something horribly distorted. I was kind of proud of myself and couldn't

Texture in a drawing is made up of open spaces, busy areas, richness of design, and a pleasing, sparkling appearance. These qualities are seen in both the rough drawing and the clean-up of Happy, each by Fred Moore.

wait for the film to come back. I put it on the Moviola, Walt came and ran it a few times, then stepped back and looked at me. I thought he was going to tell me to leave the studio, but he said, 'There, Dave, that's just what I wanted!'

"It taught me what to do at the Disney studio. From then on I never had any trouble with exaggeration. When I was directing I used to say to the animators, 'Will you do something for me? Will you make it so extreme that you make me mad?' "

Solid Drawing

The old-timers were hard pressed to keep up with the demands of the new type of animation. More than one top man counseled the beginners, "You should learn to draw as well as possible before starting to animate." Grim Natwick,[5] whose animation career started in New York in 1924, pointed out, "The better you can draw, the easier it'll be for you. You'll have to draw the character in all positions and from every angle; and if you can't do it, and have to stage it from some other angle, it's very restrictive and takes longer." Marc Davis was more philosophic a few years later: "Drawing is giving a performance; an artist is an actor who is not limited by his body, only by his ability and, perhaps, experience." Too many of the men, old and

THIS IS WHAT'S CALLED A "WOODEN" CHARACTER.

EACH EYE, EAR, ARM, HAND, FINGER, LEG, COLLAR, SHOE, etc. LOOKS THE SAME AS ITS COUNTER-PART. THE RESULT IS A VERY STIFF LOOKING POSE.

PAF!

...THIS CHARACTER LOOKS MORE NATURAL SIMPLY BECAUSE EACH PART OF THE BODY VARIES IN SOME WAY FROM THE CORRESPONDING OP-POSITE PART.

EYES IN PERSPECTIVE

FINGERS THAT VARY GIVE THE HANDS A MORE DYNAMIC LOOK.

No matter how hard young animators try to avoid them, "twins" creep into their work. Carson Van Osten of the Comic Strip Department reminds young artists everywhere to beware of this hazard.

new, were full of tricks and techniques that had looked great in cartooning school but did nothing for them at the Disney studio. The little shadows under the toes of the shoes, the slick line, the flashy verve of clothing reacting to violent exertion—all these devices that had impressed us in high school were of little use anymore.

Signs were hung on many walls where the young trainees would be sure to see them, and the one we remember best was this: "Does your drawing have weight, depth and balance?"—a casual reminder of the basics of solid, three-dimensional drawing. Men had devoted their whole lives to the mastery of these elusive principles, and here was this sign about as pretentious as one that said, "Buy Savings Bonds," or pointed to the nearest exit.

Another sign admonished us to watch out for "twins" in our drawings. This is the unfortunate situation where both arms or both legs are not only parallel but doing exactly the same thing. No one draws this way on purpose, and usually the artist is not even aware that he has done it. This affliction was not limited to the thirties, for again in the seventies young animator Ron Clements was annoyed to find "twins" in his drawings no matter how hard he worked to keep them out. "It was one of the first drawing principles that I heard of at the studio. If you get into acting, you
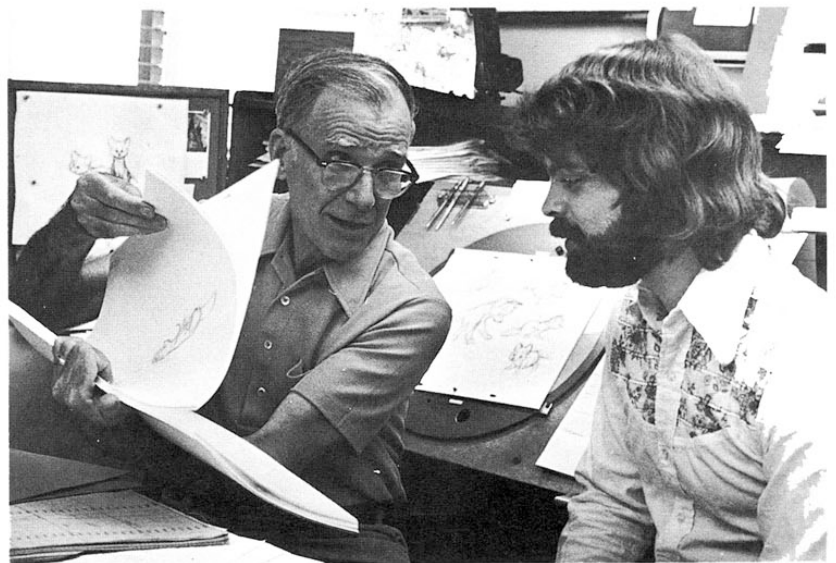
would never think of expressing an emotion with twins anywhere, but, somehow, in a drawing, if you're not thinking, it creeps in time and again."

Our main search was for an "animatable" shape, one that had volume but was still flexible, possessed strength without rigidity, and gave us opportunities for the movements that put over our ideas. We needed a shape that was a living form, ready to move—in con-

Young animator Ron Clements discusses his drawing problems with Frank Thomas.
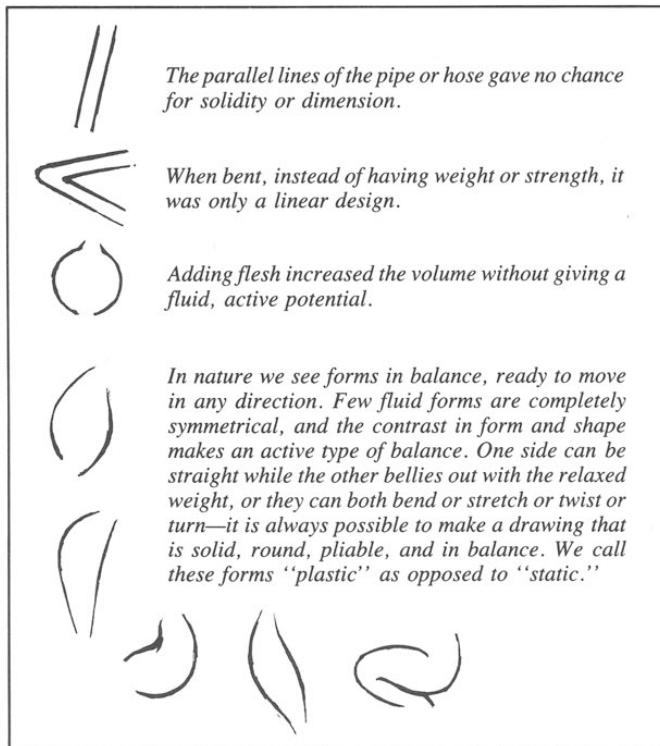
trast with the static form. We used the term "plastic," and just the definition of the word seemed to convey the feeling of potential activity in the drawing: "Capable of being shaped or formed, pliable."

Appeal

Appeal was very important from the start. The word is often misinterpreted to suggest cuddly bunnies and soft kittens. To us, it meant anything that a person likes to see, a quality of charm, pleasing design, simplicity, communication, and magnetism. Your eye is drawn to the figure that has appeal, and, once there, it is held while you appreciate what you are seeing. A striking, heroic figure can have appeal. A villainess, even though chilling and dramatic, should have appeal; otherwise, you will not want to watch what she is doing. The ugly and repulsive may capture your gaze, but there will be neither the building of character nor identification with the situation that will be needed. There is shock value, but no story strength.

ARTIST: *Marc Davis*—Sleeping Beauty.

The parallel lines of the pipe or hose gave no chance for solidity or dimension.

When bent, instead of having weight or strength, it was only a linear design.

Adding flesh increased the volume without giving a fluid, active potential.

In nature we see forms in balance, ready to move in any direction. Few fluid forms are completely symmetrical, and the contrast in form and shape makes an active type of balance. One side can be straight while the other bellies out with the relaxed weight, or they can both bend or stretch or twist or turn—it is always possible to make a drawing that is solid, round, pliable, and in balance. We call these forms "plastic" as opposed to "static."

ANIMATOR: *John Lounsbery*—Lady and the Tramp.

A weak drawing lacks appeal. A drawing that is complicated or hard to read lacks appeal. Poor design, clumsy shapes, awkward moves, all are low on appeal. Spectators enjoy watching something that is appealing to them, whether an expression, a character, a movement, or a whole story situation. While the live actor has charisma, the animated drawing has appeal.

Young people, excited about the great successes achieved with line drawing, are always perplexed to hear that delicate refinements are not possible in this medium. They recall scenes of great beauty and pictures with strong emotions and cannot see that there is any problem in communication. But the problem is there, in every scene and every day. Since the medium lacks the subtle shadow patterns on the face that can reveal the shades of character in a person, we must concentrate on the acting or the story structure. Delicate expressions can be misinterpreted, to everyone's confusion, and attempting too much refinement can make the drawing so restrained or involved that no communication is possible. Only simple and direct attitudes make good drawings, and without good drawings we have little appeal.

The whole idea of trying to communicate feelings with mere lines does seem ridiculous at times. There is always the temptation to get in close so the audience can really see how the character is reacting, but the close-up presents the greatest problems. Dave Hand said, in 1938, when questioned about the advisability of using extreme close-ups: "The face begins to flatten out when you get too close on it. We are attempting to overcome that now, with a new dye process, but it will be some time before it's perfected." (It never was.)

Many great effects are possible, but too often they cost more than the average production can afford. The constant battle is to find the elements that will look best in this medium and still allow the strongest communication of the idea presented. A drawing must be made in line, duplicated on cels, painted in flat colors, photographed over a background, and projected onto a giant screen. Tiny, sensitive lines on the drawings are now enlarged until they are more than a foot wide, and very, very black. In the mid-thirties, we wished for shading, for textures, for areas with no outlines, but they were not practical. We had to find other ways of putting over the points in the scenes, and in so doing developed character animation into a communicative art that astounded the world. But at the time there was neither glory nor pride in our efforts, only the nagging limitations. As we passed each other in the hall, we shook our heads and shared the thought, "It's a crude medium."
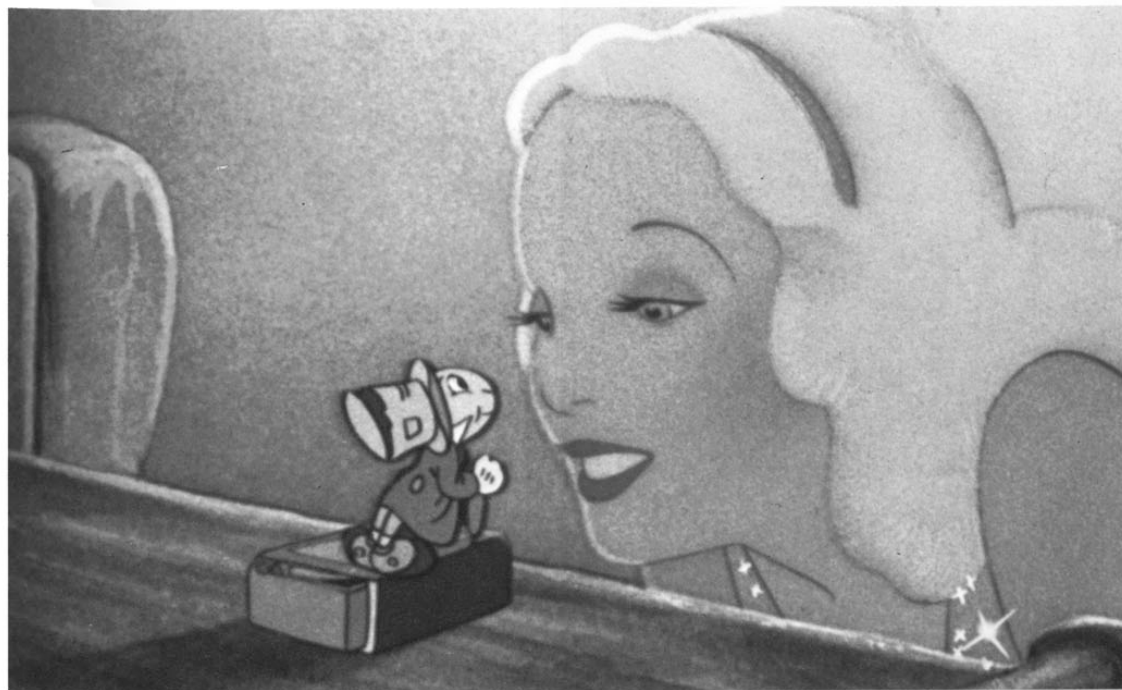
ANIMATOR: *Jack Campbell—*
Pinocchio.

Extreme close-ups tend to go flat because there is so little to draw that can be related to other parts of the head. The large expanse of flat color creates a problem as well. The Blue Fairy in Pinocchio *received careful additions from the Ink and Paint Department to make this close-up believable.*