STOP MOTION ANIMATION

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A COMPLETE STEP-BY-STEP GUIDE!

COMPILED & EDITED BY DON DOHLER

The master of stop motion animation, Ray Harryhausen (shown here preparing storyboards for *7th Voyage of Sinbad*), certainly knows all the tools and techniques of his profession. Welcome to STOP MOTION ANIMATION — *your* guide to the tools & the processes to help make your animation as realistic and life-like as the pros!

Photo courtesy Ray Harryhausen & Ernest D. Farino

STOP MOTION ANIMATION

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Contents

Armatures:
An Easy Technique Using Throttle-Ball Joints

Art, Photos & Text by BOB YOUNG

Although there have been other articles recently on building ball/socket armatures — both simple *and* professional techniques — the method I use utilizes certain existing components that have not been mentioned before.

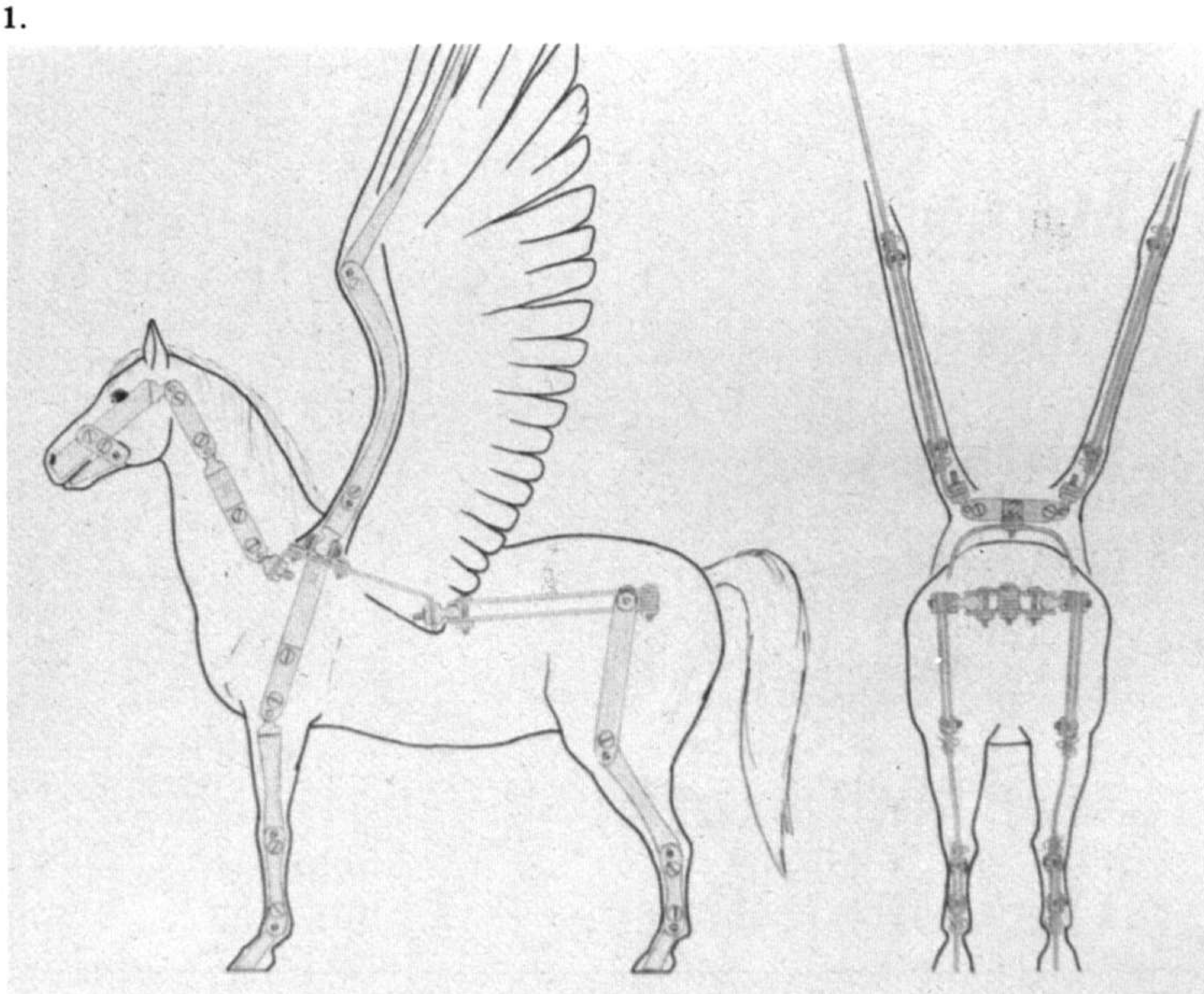
However, the first thing I do prior to starting on my armature is draw an actual-size picture of the model I want to make. In this case, I will be discussing a winged horse armature that I built, since it is a bit unique from the usual assortment of cyclops and dinosaurs. After I have sketched the model, I *draw* the armature configuration within the outline of the sketch. This gives me an exact idea of what the real armature should look like. In most cases I draw a side view and a front or back view of the model and armature (Photo 1).

I construct my armature plates using 16-gauge stainless steel plates that are 3/8-inch wide. To get these strips, you can go to a sheet metal shop and have them cut the stainless steel for you. For the winged horse I used 16 strips that were 12 inches long, plus 4 strips that were 2 inches wide by 12 inches long (these latter strips were used to cut out the curved wing armatures; thus, the reason for the extra width).

After I have my metal strips I measure the lengths between joints of the armature according to my drawing. I mark off the lengths on the metal strips and label each one, such as "upper back" or "hips" (Photo 2).

When the measuring and labeling is done, I saw the strips with a hacksaw (Photo 3). A vise is needed to hold the strips while sawing. Photo 4 shows all of the various cut strips used for the winged horse armature.

1.



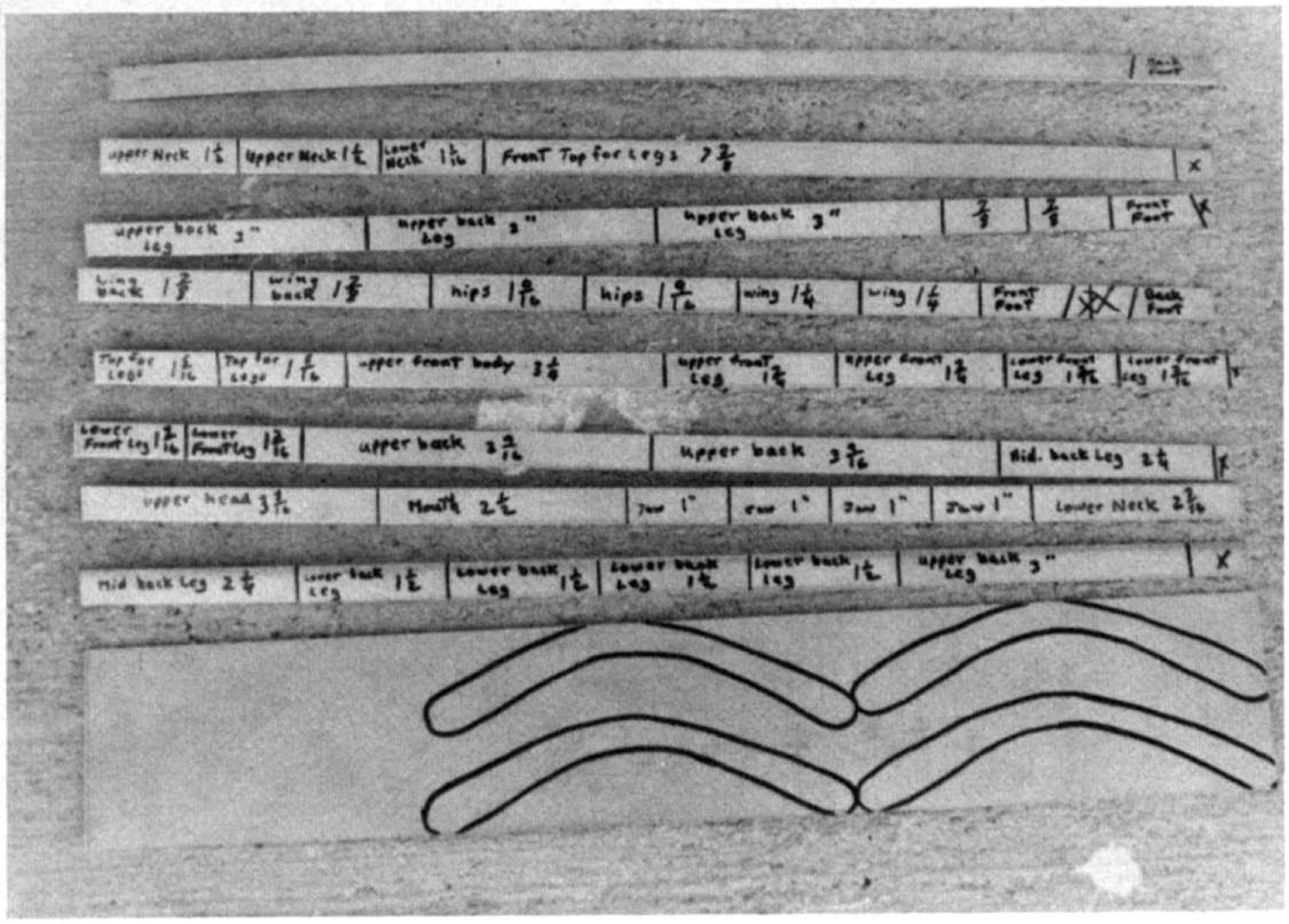
After sawing, the ends of each armature plate must be rounded off with an electric grinder so that plates will have freedom of movement while you are bending and twisting your armature as you animate. When grinding, hold each plate piece with vise grips — and be sure to wear safety goggles (available in hardware stores for about $2.00).

Since my armature technique calls for the use of both sandwich ball joints *and* regular swivel joints, secured with cotter pins, two different sizes of holes must be drilled into the plates. For the balls I use (described later), you must drill 5/32-inch holes. For the cotter pins, 1/8-inch holes must be drilled. I use a standard electric hand drill for this work (Photo 6), although a drill-press would probably be a lot faster and easier. I also use the 5/32 drill bit to make holes for the 6/32 size machine screws which will tighten the plate around the balls. When doing this drilling, it's best to drill through *two* sets of plates at once, so that all corresponding ball, screw, and cotter pin holes align properly.

The unique part of my armatures, as far as I know, is the balls themselves. For these I go to an auto supply store and buy (or order) 3/16 throttle ball joints. These handy little parts have a ready-made steel ball with a threaded rod already attached to them. And, as you will see, each ball joint can be used as a connector for two balls and rods.

But first, a little bit of work must be done to get at the balls and connectors. Photo 7 shows the four phases of removing the ball and thread, and the drawing accompanying this photo details the steps you must take to

2.



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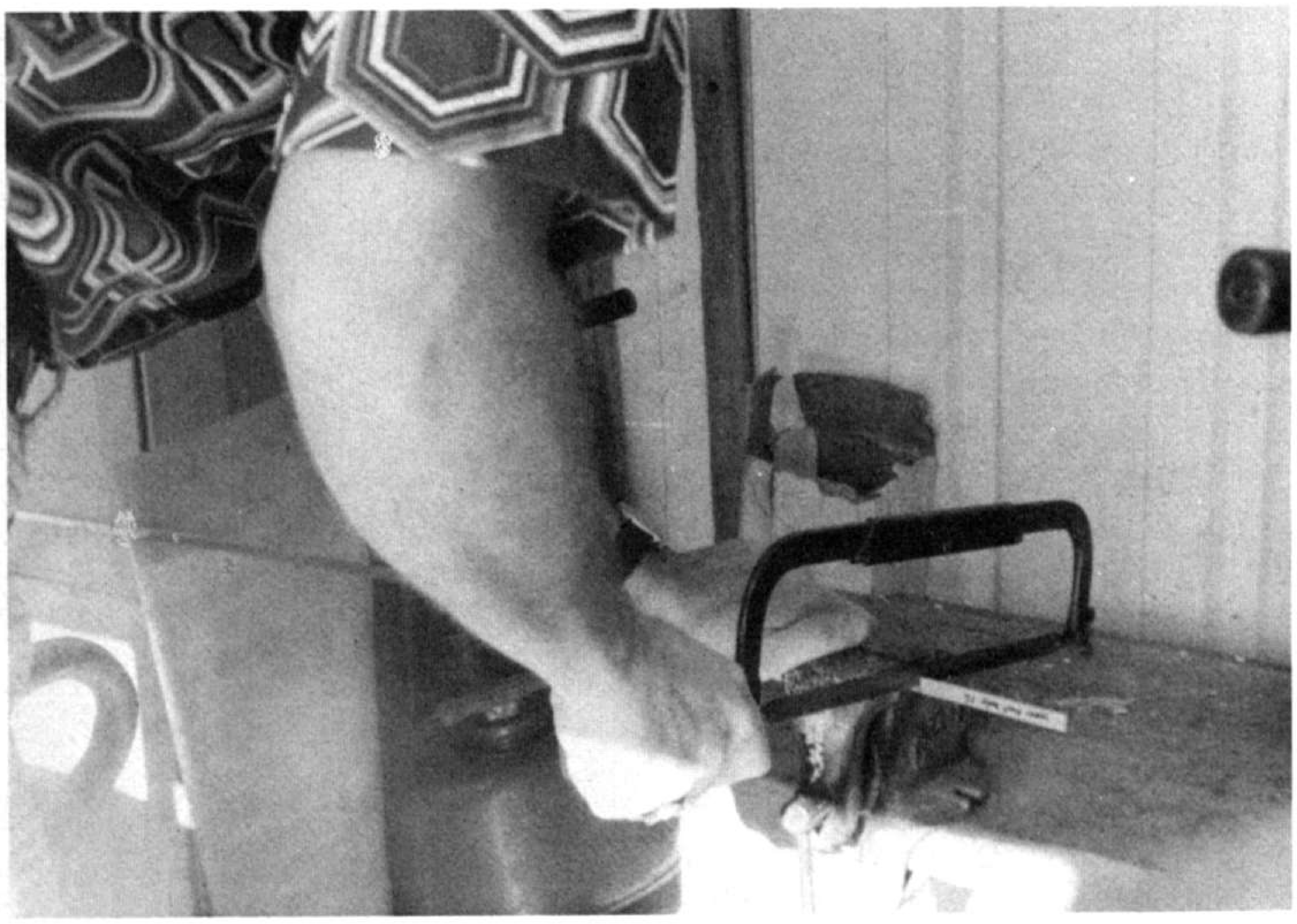

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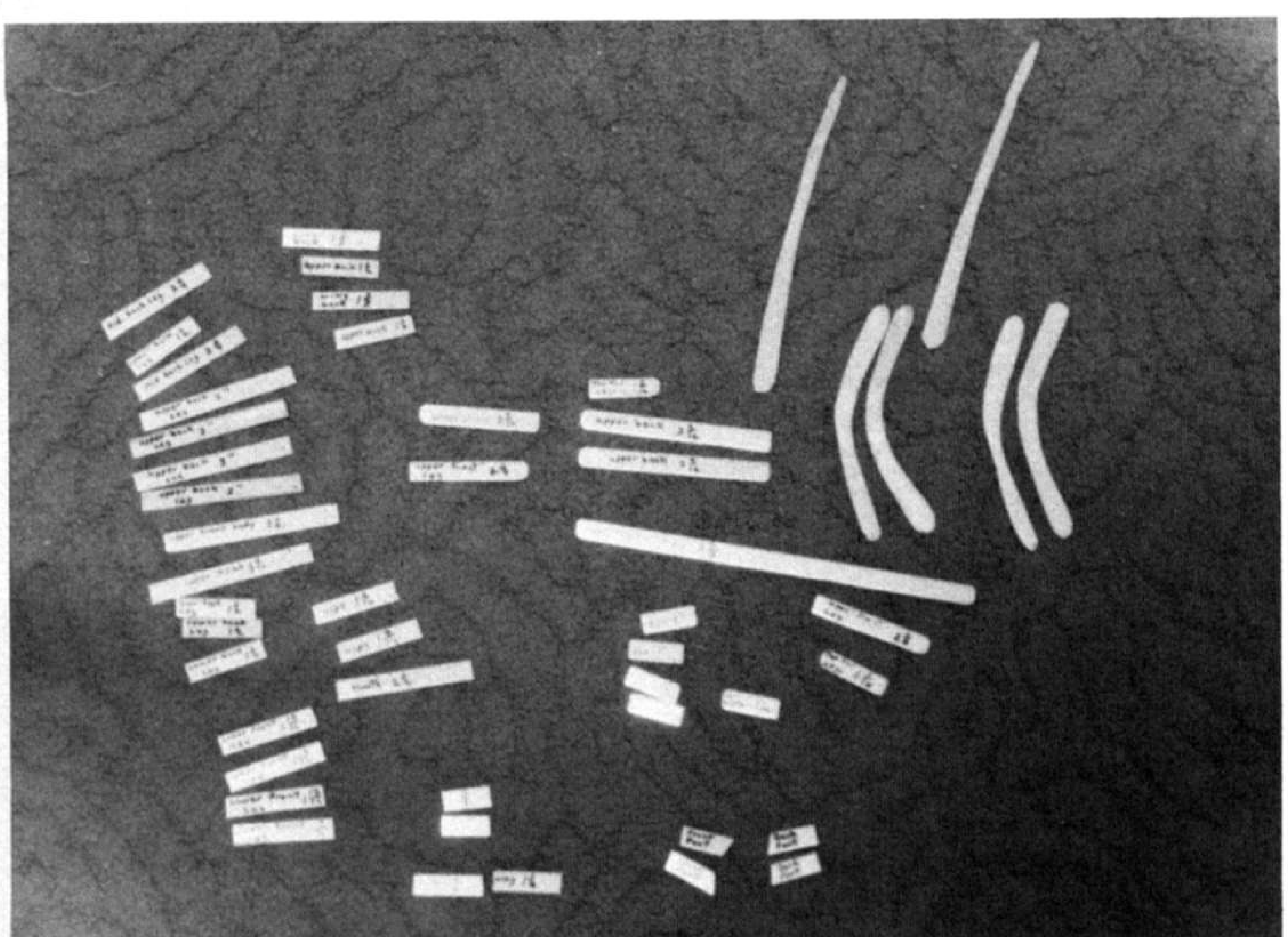
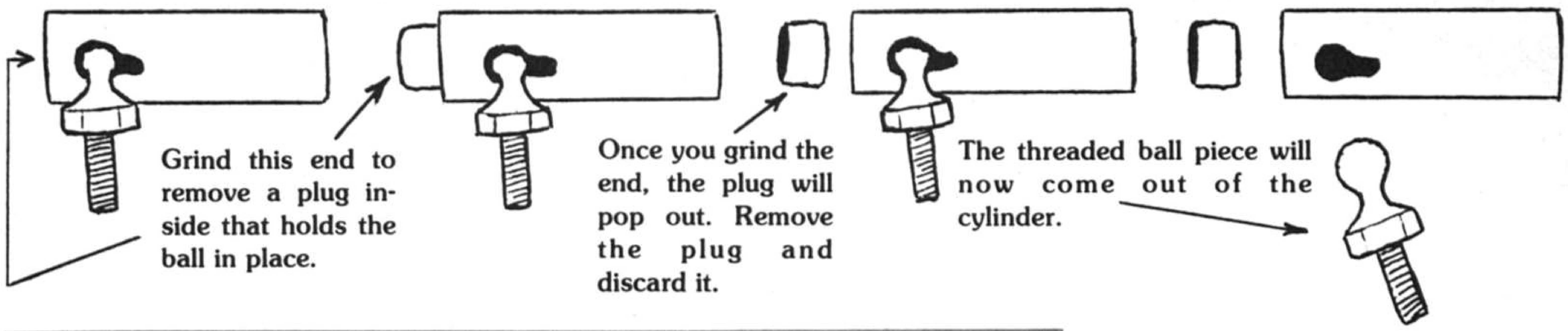
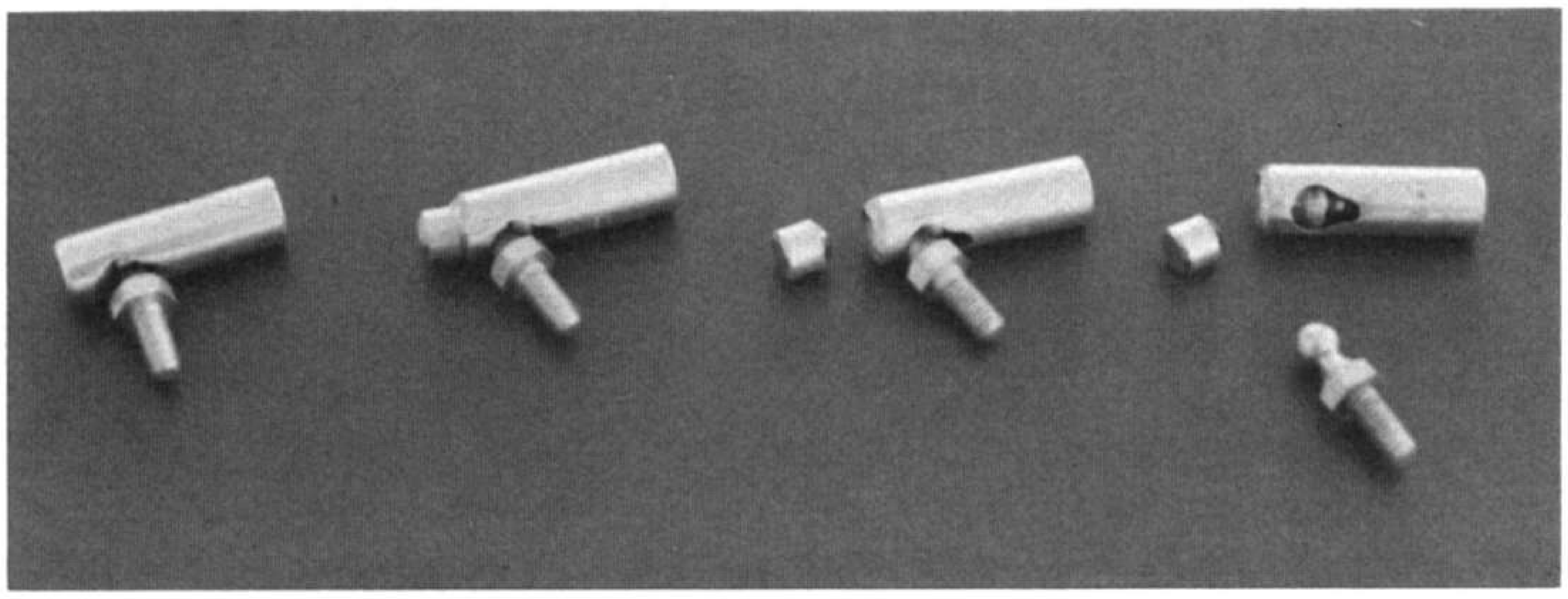


Opposite page: Bob Young's drawing of the flying horse model with a sketch of the proposed armature inside. This page: Photo #2: All of the cut and measured strips of stainless steel are labeled prior to assembly. #3: Sawing the individual strips with a hacksaw. #4: The final sawed component pieces to the armature. #5: Holding each armature piece with vise grips, the edges are smoothed with a grinding wheel. #6: Drilling the appropriate holes in each armature plate.

REMOVING THE THREADED BALL PIECE





Left: This photograph shows the sequence of removing one of the threaded ball pieces as explained in the drawings.

7.

remove the ball/thread.

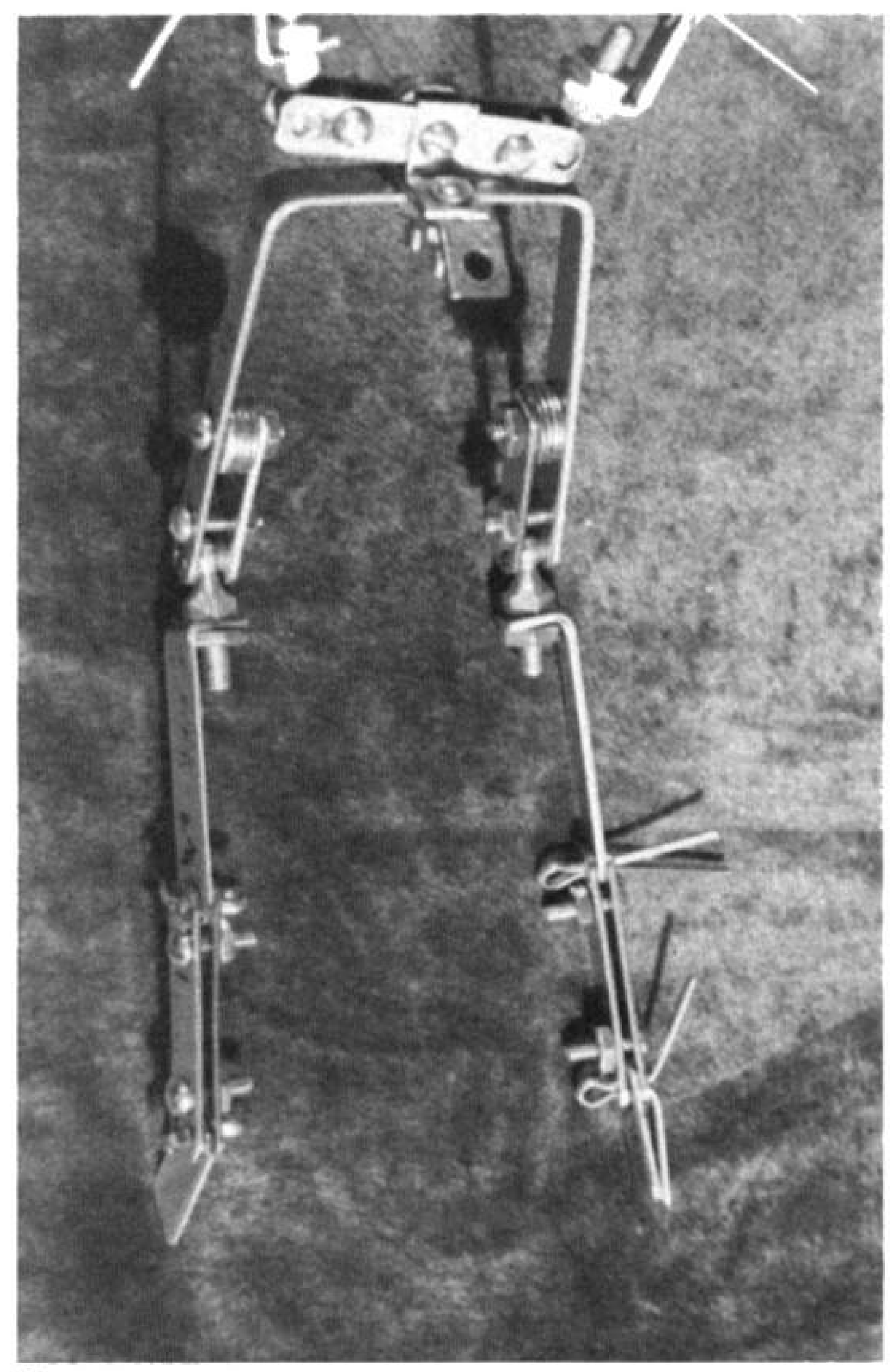
The opposite end of the throttle ball joint is an open, threaded hole which has the same thread size as the screw attached to the ball. Therefore, once the ball is removed, you can take your hacksaw and cut this threaded end off (see drawing describing this). This results in a cylinder with *two* open, threaded ends which can be used as a connector between ball/stems.

Photo 8 shows some of the ways to use the balls and fix them into place when constructing the armature. This particular piece was the neck of my winged horse. The 3/16 flat washers are used as spacers between the plates. The nuts used on the thread of the ball/thread are 10/32 size, and fit perfectly. You'll note that at the center of the neck piece the armature plate is bent and the 10/32 nut is used to attach the ball/thread to it.

Photo 9 shows the front legs of the horse and how they were constructed. Since the legs need only back-and-forth swivel movement, I extended the plate down to sandwich between two other plates and attached them with cotter pins. When the cotter pins are in place, the two ends can be snipped short before they are flattened down against the plate. This method of attaching plates should be used only when the limited "back-and-forth" movement is desired. It does, however, cut down on the time needed in getting at the ball/threads and in drilling the larger holes for the balls.

Photo 10, and the drawing accompanying it, show how I built the hinged head for the horse. The metal strips can be bent and grinded to get the shapes of the upper and lower jaw.

The only possible disadvantage to this armature method is that because of the length necessary between each ball/thread (about 2 inches), things like tails must be done with wire, since the 2-inch length is not small enough to bend like a tail would (where gradually smaller and smaller ball-joints are needed). But I feel that the advantages and time-savings in this technique far outweigh the few drawbacks. Once you have started working with the materials I've described you'll find that almost any type of armature construction is possible.■



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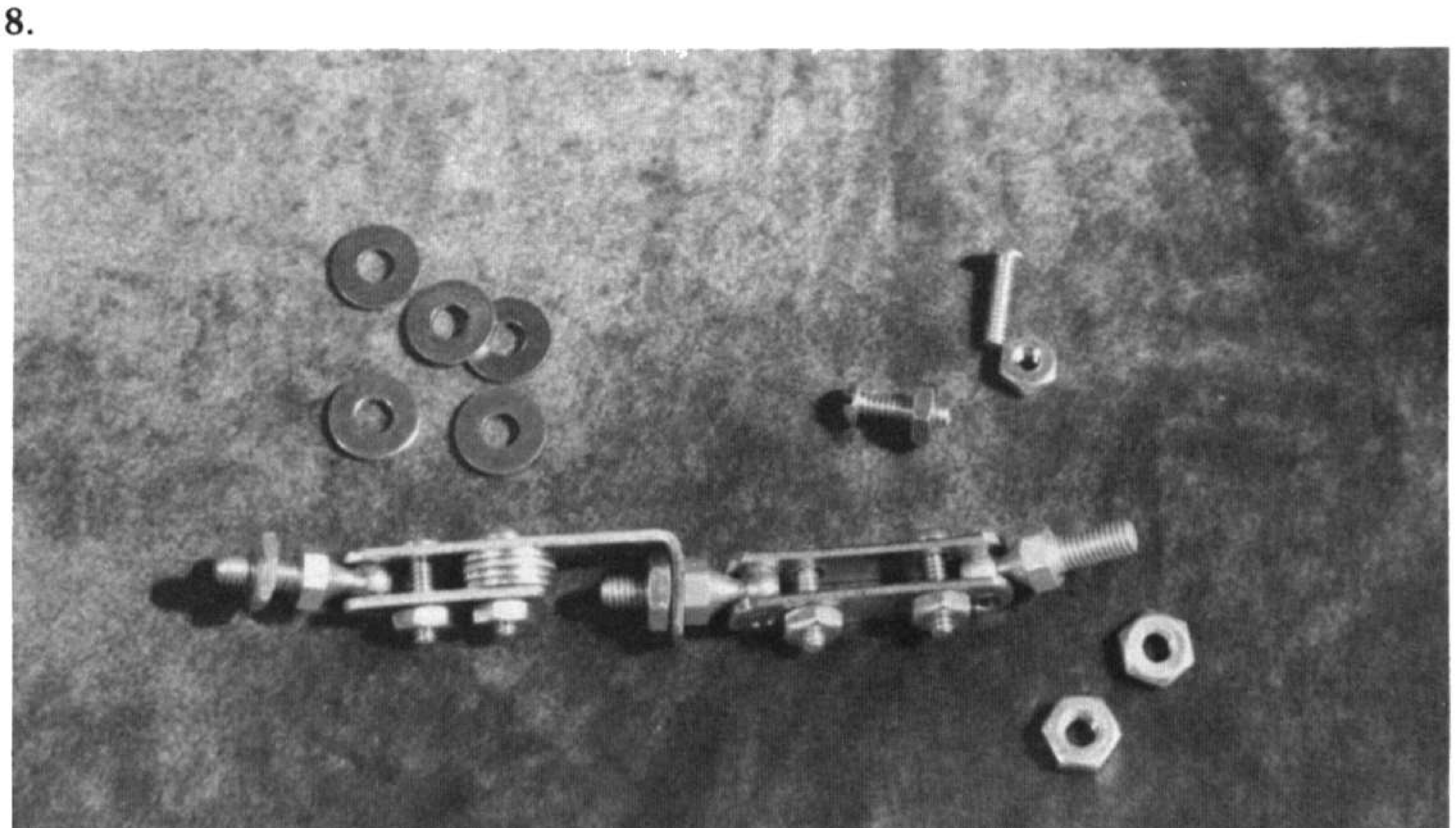
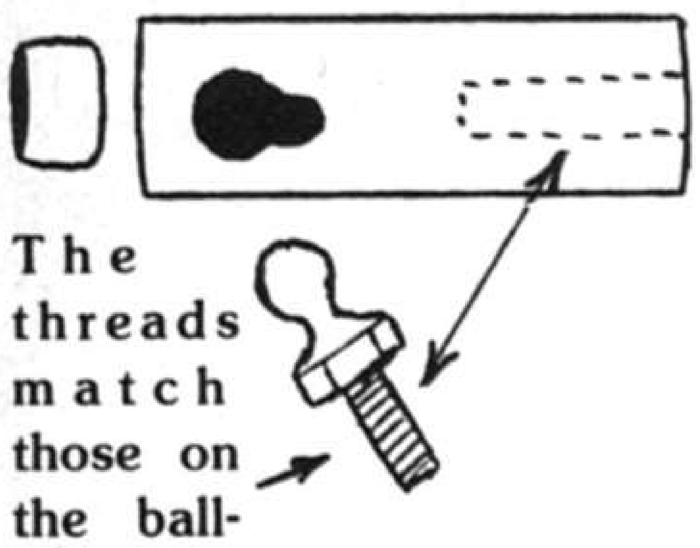
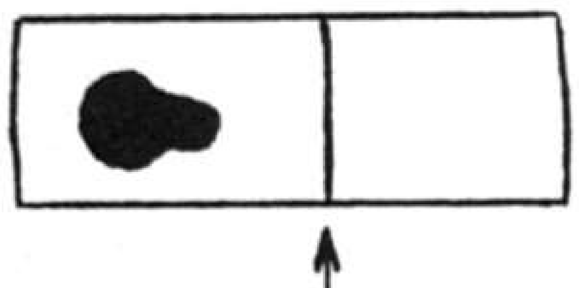


CONNECTING THE BALL THREADS



The threads match those on the ball-stem.

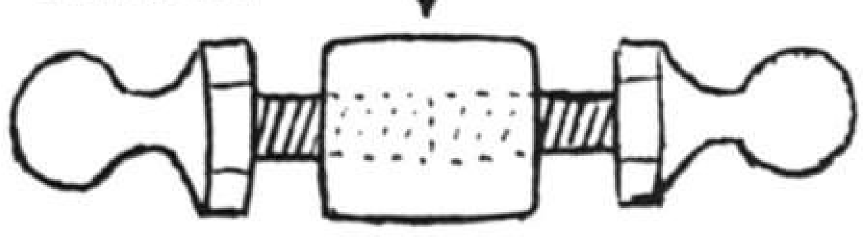
The cylinder the ball piece is in is threaded at the back end.



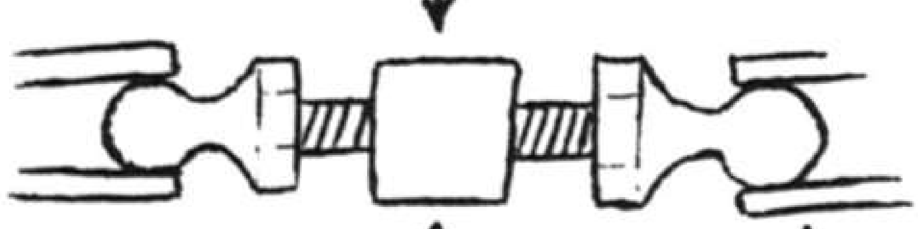
Cut here.

Cut the cylinder in half. Discard the front end.

Using the threaded cylinder, two of the threaded ball pieces can be attached.



The assembled ball-stems are sandwiched between the stainless steel plates.



Cylinder. Plates.

MATERIALS NEEDED FOR THIS ARMATURE TECHNIQUE:

16-gauge Stainless Steel Strips (sheet metal shop)

3/16 Throttle Ball Joints (auto supply store)

6/32 Machine Screws — 1/2-inch long (hardware store)

6/32 Nuts

10/32 Nuts

3/16 Flat Washers

Cotter Pins

TOOLS NEEDED:

Electric Drill

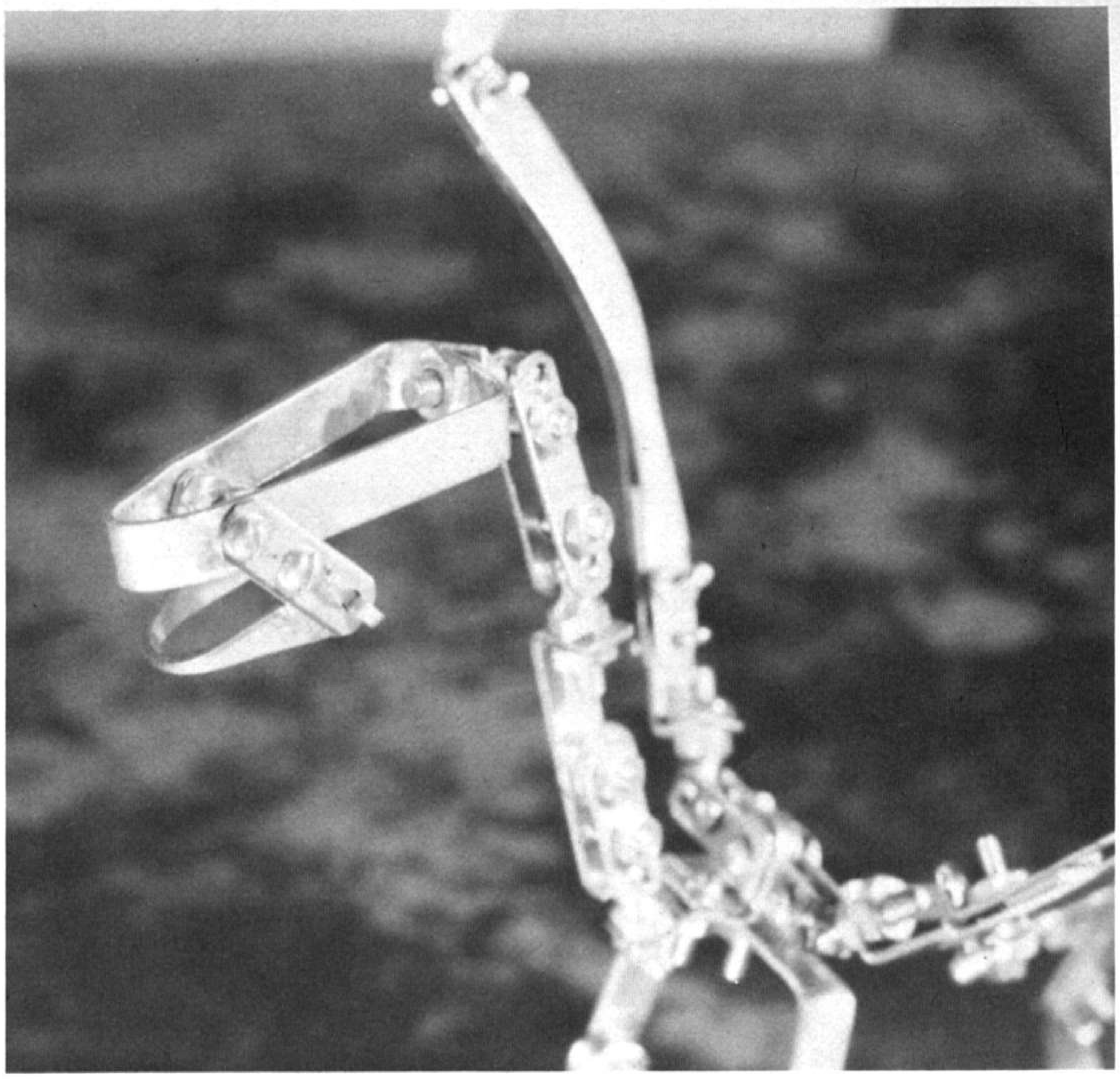
5/32 and 1/8 Drill Bits

Bench Vise

Vise Grips

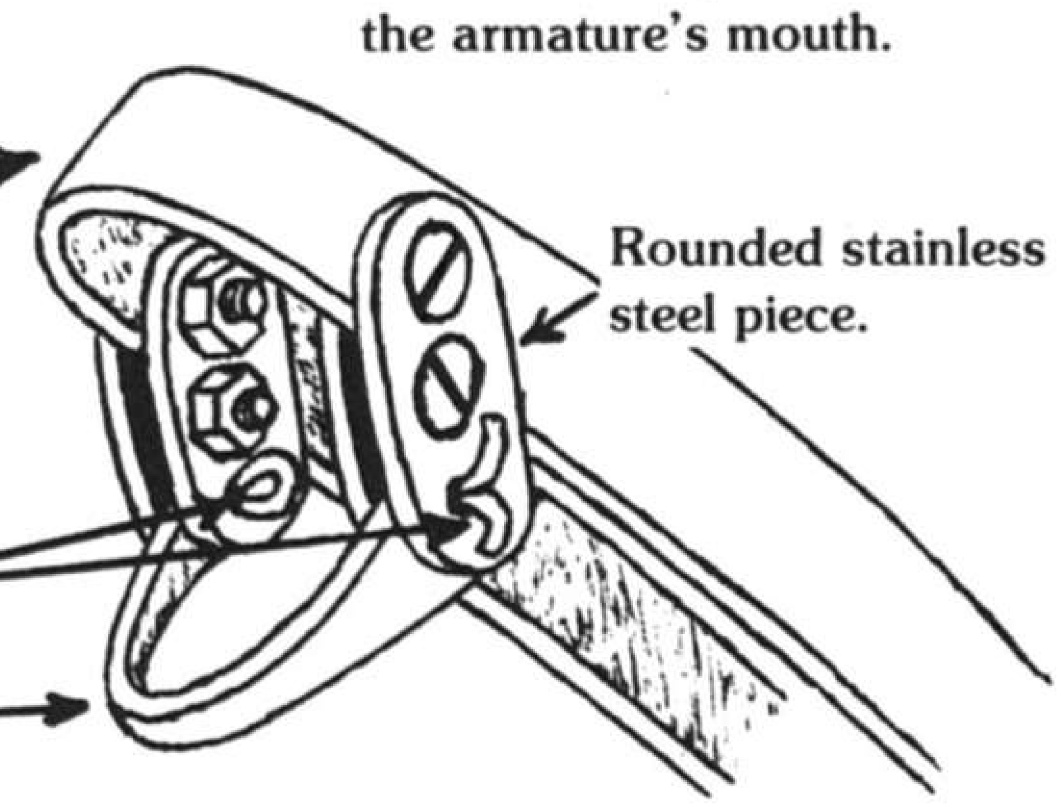
Electric Grinder

Safety Goggles

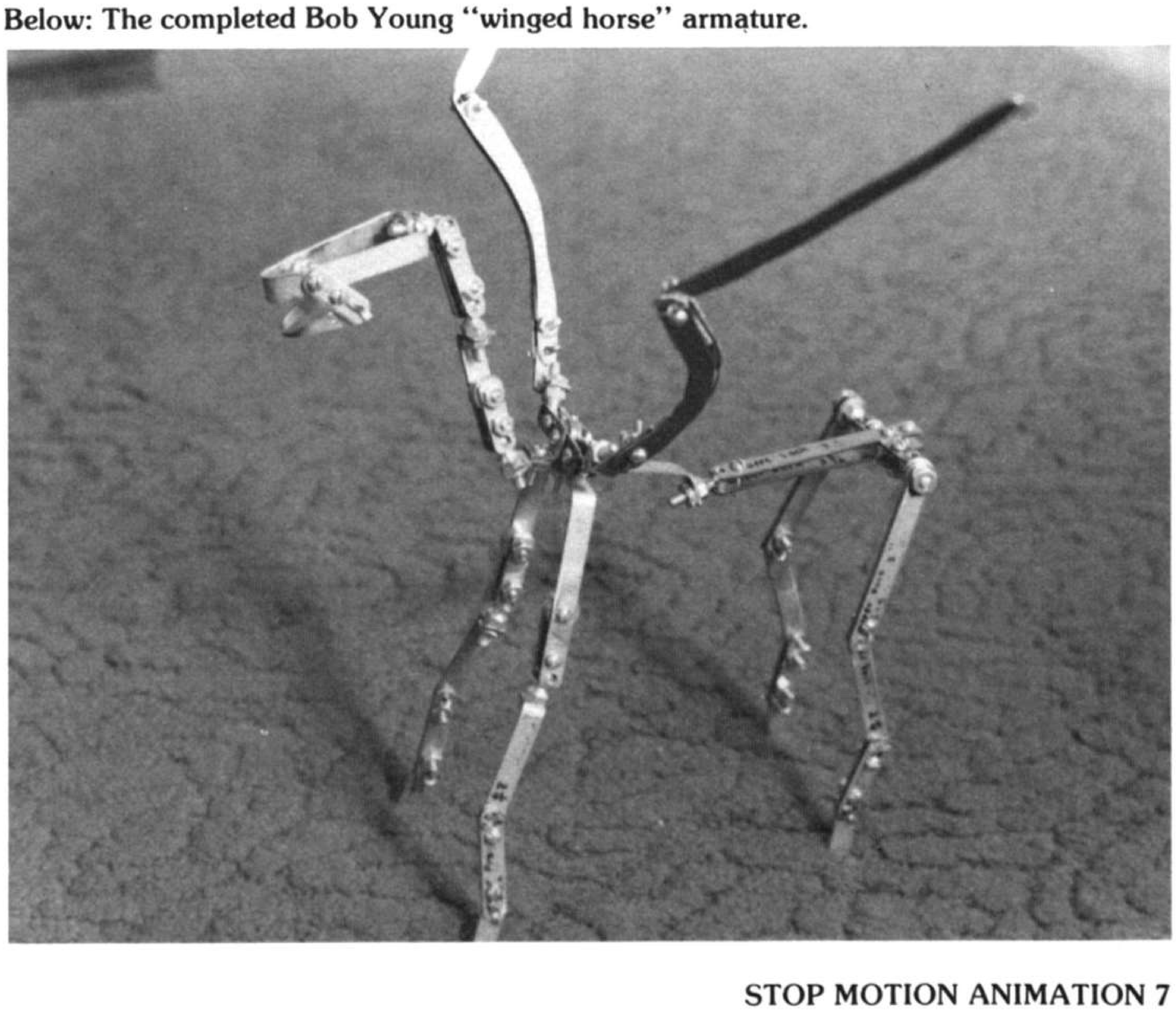


Above: Close photo detail of the armature's mouth.

Right: This drawing indicates the assembly of the hinged jaw.



Below: The completed Bob Young "winged horse" armature.



Planning Animation

A Discussion of style, movement, speed & gravity

An Interview with animator Ernest D. Farino

(Interview conducted by Don Dohler)

In regard to planning animation, how can the animator think beyond "Well, I have a model...now, what do I do with it?"

First of all, an animator *does* need to be aware of basic physical laws that govern motion — in terms of gravity, weight, and displacement of weight; i.e., a model's shifting of weight as it stands, walks, etc. And, of course, other basic principles should be considered, such as "slow in" and "slow out" — the principle that everything starts out at gradual speed, increases to full speed, and then slows down again. In almost all cases this applies even to the most subtle of movements in animation figures. Of course, it's most visible in extreme actions where a creature is swinging a club or throwing a punch — where this type of movement has to be very graduated.

Are there any definite rules to achieving this graduated movement, or is it more a matter of doing it as you "feel" it?

Mostly it's based on experience. That's not very helpful to young people just starting out, but it points out a need to animate as much as possible, so that you become aware of these types of actions. Studying other animation is valuable. Studying motion in general is helpful — start to observe things in terms of their movement: people, moving objects, animals — try and translate it in terms of what's happening in the movement. One thing the animator should become aware of right away — and it's difficult to resolve at first — is that human beings in particular have a lot of extraneous, busy actions. We gesture a lot with our hands, and even when we are at rest there are a lot of little movements. The important thing to remember here, in my opinion and the opinion of many animators in the field, is that to duplicate such extraneous, busy movement is incorrect. Stop motion animation is by nature very stylized, but by desire and by design is *very* stylized. What you try to do is "clean up the act" and get rid of this extra, gratuitous movement and concentrate on the main thrust of the action, the activity, and the dramatic values. These kinds of things, after practice and study, should become second nature to the animator.

What about the "mother dinosaur" example in *When Dinosaurs Ruled The Earth* — the animation was so smooth and realistic that many typical audiences, unaware of the technique, probably thought it was a "real" lizard enlarged...

Even so, it's realistic in the sense that Jim Danforth was able to achieve exceptionally smooth animation, but kept it stylized in terms of the graceful moves, the gentle motions, and the reactions between the dinosaur, the girl and the egg shell, and the deer. So, though it's realistic, it's probably beyond what a real animal would do. Let's face it, a real lizard is not nearly that interesting to watch — especially a large animal, which is pretty sluggish and very dull. It's a matter of trying to impart mannerisms beyond what a real animal would do without being cartoonish. *Mighty Joe Young* is a very good example of this. Although apes are very expressive, a real ape certainly wouldn't do the things that Joe does in terms of the small mannerisms, or the gestures, or the expressions. It is in the realm of acceptability as you watch the movie, because it is done realistically in the sense of acceptable actions, enhanced by the character value. The realism part of the animating is something you want to get in the back of your mind so that it comes out automatically; then you can concentrate on the stylization values. This is why specific study of live action in terms of exact duplication, or even rotoscoping, is very inappropriate and often misleading because you get locked into a very mechanical copying of real life, which sort of defeats the purpose of animating. Plus, it's impossible to find a living creature that even halfway resembles, say, a Tyrannosaurus Rex, whose movements and actions are strictly up to the animator's style and judgement.

Do you know of any examples of rotoscoping in a professional stop motion film?

No, I don't. I know that reference films have been specifically photographed for purposes of study. For example, it's well known that on *Mighty Joe Young* they photographed real gorillas at the Chicago Zoo to study the mannerisms, walk, and so on. I would assume that when Ray Harryhausen was planning to animate the elephant in *20 Million Miles To Earth* he very possibly studied films of elephants. I know that animators quite frequently take trips to the zoo to study various animals. But I don't know of any actual rotoscoping in three-dimensional animation. Of course, it's done a lot in cartoon work, because it's easier to do in cartoon work. But technically, it's not feasible to try and rear-project film of a real animal and be able to look through the viewfinder and tell from frame to frame some of the subtle differences in movement. The time and effort spent in trying to rotoscope would be better spent in merely *studying* the films. Studying the 8mm home versions of Harryhausen and others was of great value to me when I was younger; not to the point that I wanted to copy the action, but to try and avoid wasting a lot of time in making mistakes by seeing what had been done and considered successful animation.

What about gravity? Is there a way the animator can think in terms of gravity and its effect on the model to be animated?

Yes. The most obvious example would be a creature falling. Naturally, it's going to fall down, but beyond that, when it hits the ground it's going to collapse, and maybe shift up and down again — depending on the length of the fall. Even in subtle motion, like a walk, as you take a step your body weight comes back down, so you have a very gradual up and down kind of shifting.

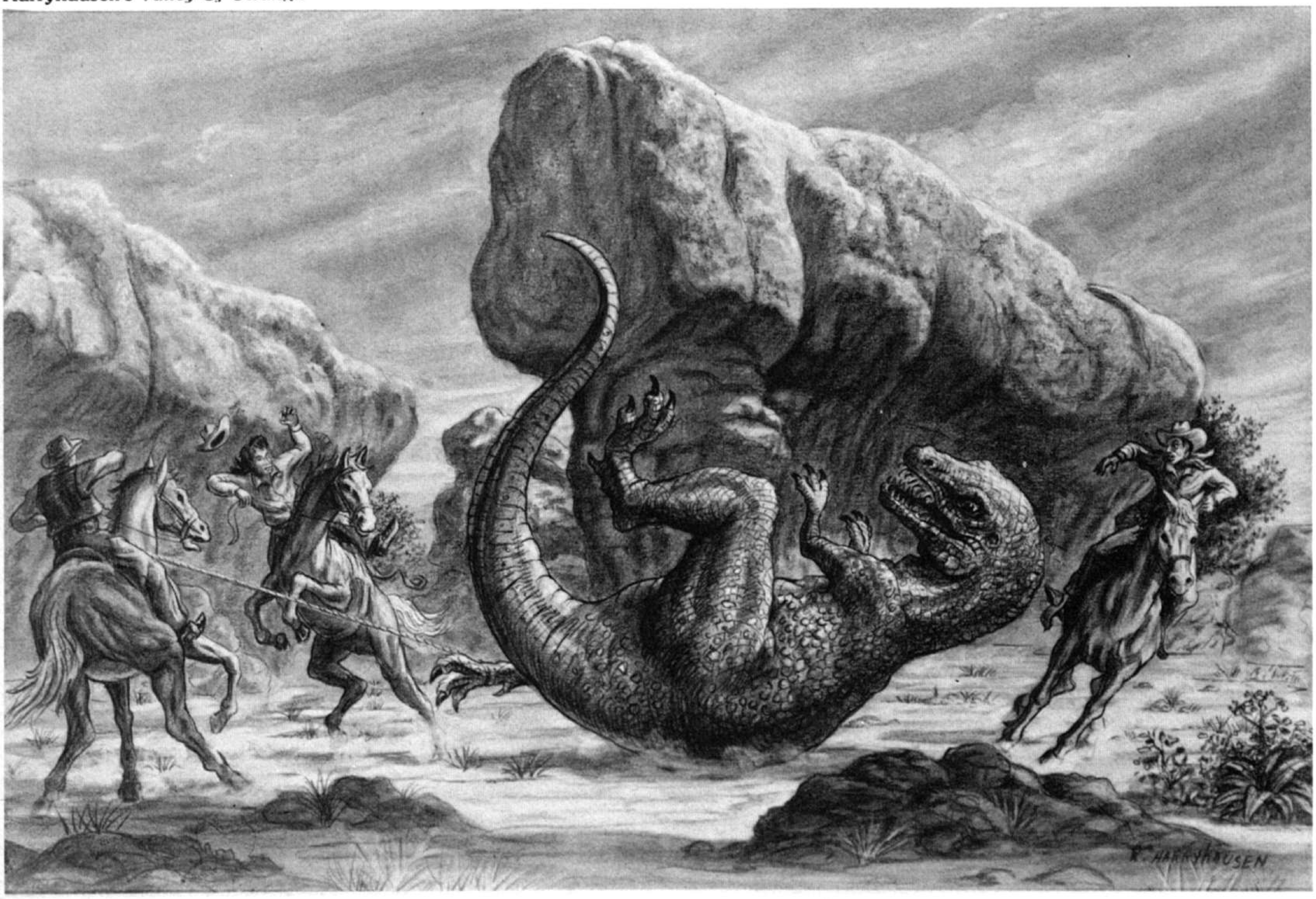
Are there any formulas for determining the true effects of gravity?

There are no formulas or mathematics for any of these areas (gravity, speed, etc.) of animation, as far as I know. Largely speaking, most animators have the feeling that by getting too scientific about it, you are endangering your work by giving too much of a mechanical feel to it. You need to absorb these laws or rules, as it were, and sort of impart them into your work as you go along. If you are animating something specifically mechanical, you could probably determine exact scales of movement and speed, but in animating animals or dinosaurs — or even people — you have to keep the physical laws in your subconscious.

You often hear the arguement, chiefly among novices, about shooting one frame per movement versus shooting two frames per movement. What's the accepted rule here, if any?

Generally speaking stop motion doesn't work very well on twos—that works much better in cartoon animation, although a great deal of cartoon animation is shot on ones. But stop motion normally has to be on ones because the live action usually being composited with it is moving at one motion for every frame. To have a resemblance of coordinated action, the animation also has to be on ones. Occasionally, if the puppet is in a held pose, or comes to a pause, you can get away with shooting twos by making very tiny movements. But you're better off shooting ones, and increasing or decreasing the speed in the incremental moves of the model. This way, you have a definite graduation, whereas if you go from two frames at a time to one, you'll have a jump. Even if you're on a held pose and you're on twos, you've got to be very attentive at the point where you come out of the hold so that you don't suddenly speed up too fast.

In stop motion work, the effects of gravity and speed have to be taken into account, as in this pre-production drawing of the roped Allosaurus from Ray Harryhausen's *Valley Of Gwangi*.



Is there any rule for a basic two-legged walk?

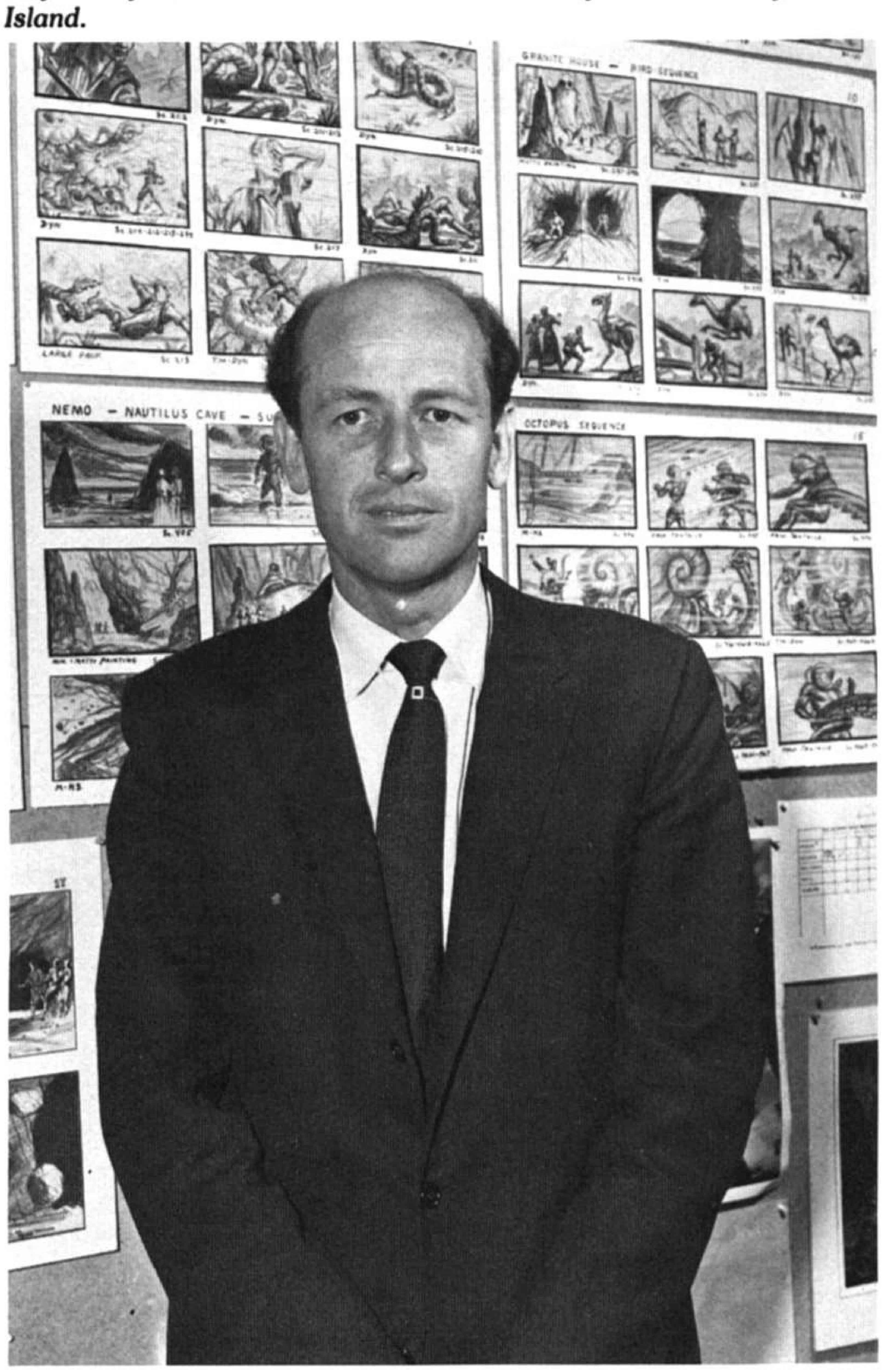
No, because once again — and this comes down to the whole crux of the matter — every time you animate something you want it to be different, because that is the whole basis for adding style or character to each creature. You don't want to get into a mold or frame of mind as to what a walk must be, or a fall must be — that depends on the physical nature of each creature you animate. A big, fat, bulky creature, should walk like a big, fat, bulky creature, and not the same as something more gentle and graceful.

Smoothness is a key concern among young animators — what are your feelings on this?

My feeling is that technical smoothness of animation is something you should strive for, but it should be second nature to the animator so that he can concentrate on the dramatic values — the characterization and what have you. Unfortunately, many people getting into the field tend to equate technical smoothness with being good animation. Very many times it is, but smooth animation unto itself is not automatically *good* animation. The one example I can use in this regard is the cyclops in *7th Voyage of Sinbad*. It's certainly not jerky, but let's face it, in many scenes it's "unsmooth" and has a very chattery feel to it — yet, it's easily Ray Harryhausen's most popular character. Just about everybody who's ever seen it thinks it's a terrific creature, and it's because of the underlying action, which may not have been executed entirely smoothly, but has such drama, such energy and vitality, that the model just comes "alive."

Again, young people getting into the field should cetainly be aware of things like smoothness, but more than that, they should study the performance. Like an actor who has to first study diction and delivery, but then has to concentrate on performance, the animator needs to rise to the occasion of the technical end of animation, but then go beyond that in delivery of a model's "performance."

Ray Harryhausen and the multitude of storyboards for *Mysterious Island*.



Can all the components (knowing about speed, gravity, movement) and tools (gauges, armatures, etc.), when mastered, help achieve good animation?

The young person (and I can use myself as an example) who first gets interested in stop motion is initially intrigued in asking "How did they do that?" And these days there's a lot more information available on *how* it was done, so when that person discovers this information they'll say, "Oh, I can do that." By nature, the first enticement toward stop motion is purely the technical end — building armatures, sculpting models, and this sort of thing. It's very important to learn all that; however, as the animator gets more and more serious and conquers more and more problems, he gradually realizes there are other qualities that transcend the strict mechanical end of it. I personally had a thing, years ago, to build the "perfect armature." One time at a convention I mentioned this to David Allen, who reacted, "Well, what's the point of that? An armature, like anything else, is only a tool and it's a means to an end." At first this really disturbed me, but shortly thereafter I reflected on what David said and it dawned on me that he was right — what's the point of a "perfect armature" or the ideal armature? When you get to the stage where you can do something that works and does the job, you'll concentrate on the other aspects of the animation itself. You can build all the armatures and models in the world, but it comes down to what is it you're going to do with them? What's it going to be? What are you going to contribute to it beyond some mechanical expertise? It's like an artist who learns all about various brushes, and canvasses, and pigments of color — sooner or later it's going to come down to what he *creates* after he has mastered the basic tools.

I think the important thing, particularly the areas we're discussing, is that hopefully people will become increasingly aware of the quality of their animation. While they strive to perfect their technical skills, they should simultaneously be developing their creative abilities along the lines of style, character, and the like.

In closing I would like to say that all of the views I've given are basically my opinion and my outlook on these areas. I certainly don't want anyone to interpret any of this as being "law" or "gospel," because there's a saying in this business: "Whatever works...." and things work differently for everybody, including their approach to the stylization in their animation. Naturally, that's a very personal kind of thing. ■

Possibly the best way to "plan" animation, in terms of style, movement, and so on, is to create elaborate storyboards. The examples here show the original color storyboard concepts and the finished film product (actual 35mm frame reproductions are shown). Dan Taylor and Mike Walker combined efforts to produce this commercial for a business school. Top, left: Mike's painting of "golden doors" opening to reveal beams of light. Top, right: Two frames show the final effect, with a miniature set built by Walker and animated & photographed by Taylor. Middle: The storyboard drawing on the left, the final results on the right — of the "tools" of business zooming out of frame with starburst effects. Bottom: The school's sparkling, glowing logo; conception on the left, execution on the right. According to Dan Taylor, the storyboard is the "togetherness" of the animation crew — where all minds and talents involved in an animation (or other) project find a central focus.

Sculpting Clay

Detailed skin textures and true-to-life anatomy will bring a look of realism to your models.

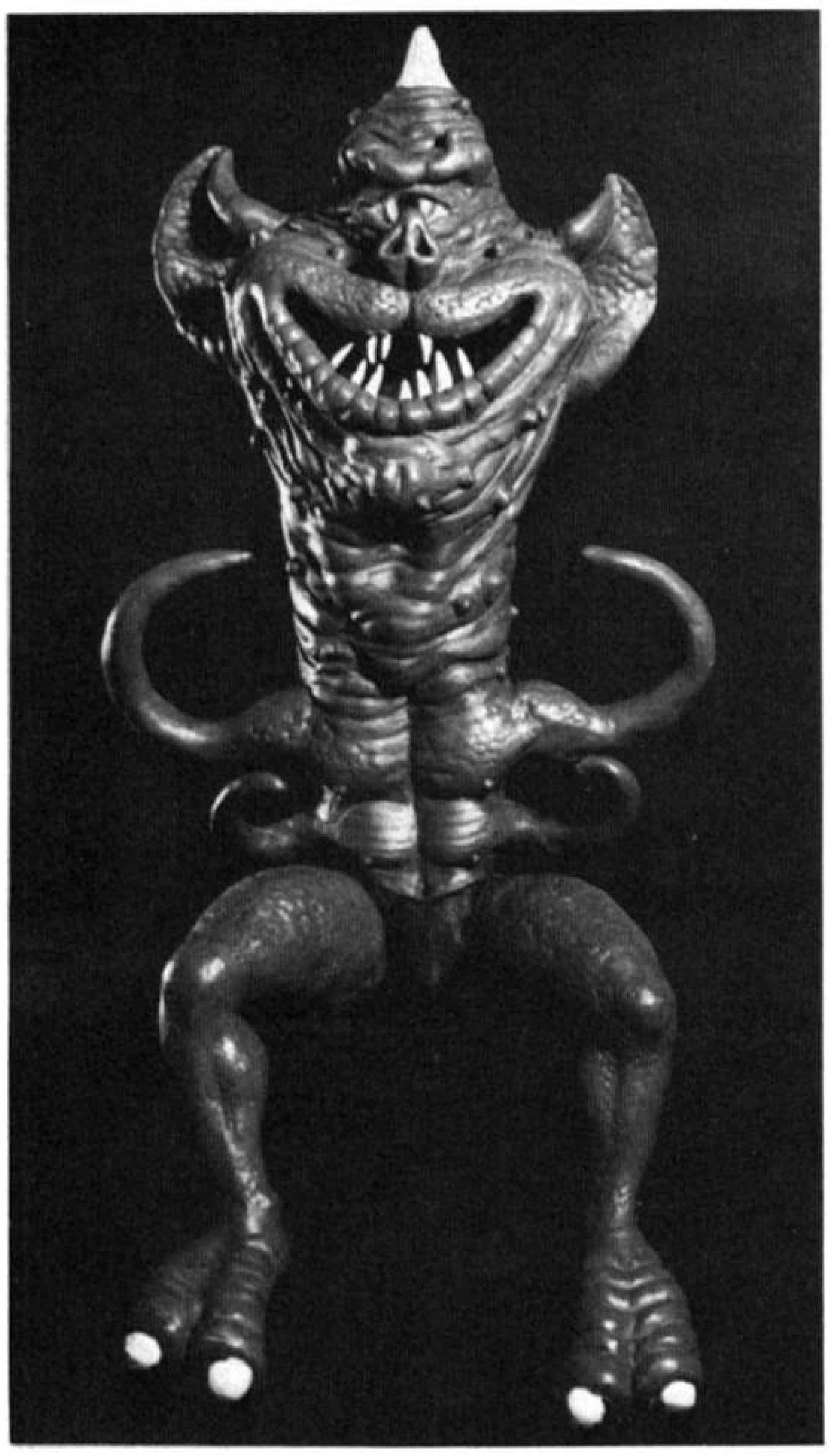
Text and Photos by JOHN DODS

Making your stop motion model look real is largely a matter of creating a skin surface that is detailed and realistic. This is the last step in the sculpture process; the final touch prior to making a mold of the model. It essentially calls for you to create a creature in clay that is ready to be "textured" — transformed into something that looks like more than a shape of clay.

Plasticene or permanent, non-hardening type clay (available under various brand names) is ideally suited for this kind of work. The properties of the clay will vary from brand to brand, and even from color to color, but the kind you use should be pliable, yet not too soft or too hard. If the clay is too soft it will be difficult to sculpt details into it; if it's too hard it will tend to chip or even crack.

Plasticene that is too soft can be hardened by mixing it with talcum powder (or any kind of powder). Heat the clay in a metal container in an oven at about 350 degrees for 20-30 minutes. It will become very soft and the powder can be mixed into it. When the clay cools, it will be harder than it was before. Experimentation will determine how much powder should be mixed into the various amounts of clay you might be using. Similarly, cold cream can be mixed into heated clay with the opposite result: it will end up softer.

It is very convenient to use clay in the heated, semi-liquid state for the preliminary sculpture work of the model. The softened plasticene is applied to the armature by using a flat, thin object such as a butter knife. This scultping must be done on an armature or it will fall apart — pulled to pieces by its own weight. Subsequent layers of clay can be quickly built up with this method until the general shape of the model has been formed. Now you are ready for the more time-consuming job of refining the anatomy and skin texture of the character.



The skin texture on this comical alien character was created with "freehand" sculpting and with "texture stamps" (see text) used on the legs, chest, and ears.

Sculpting a convincing anatomy on a model involves studying and copying real life. Even a creature that never existed — such as Ray Harryhausen's "Hydra" from *Jason And The Argonauts* — is a combination of features and textures very similar to those seen on real animals. Any good library is a source for enough pictures of wildlife to provide shapes and inspiration for dozens of imaginative stop motion designs. For models that are supposed to be "giants", pictures of elephants, big lizards, and dinosaurs can stimulate ideas; some museums even have three-dimensional reconstructions of such animals. Wildlife encyclopedias and magazines such as *National Geographic* picture a variety of animals from which textures, muscle structure, and even feathers can be copied.

The two-headed dragon on the cover of STOP MOTION ANIMATION was a dismal failure prior to a research trip I took to the local library. After hours of being immersed in books, making notes, and drawing sketches, I made some startling changes in my original concept: the dragon's underside became that of a snake; the tail became lizard-like with wrinkles similar to an elephant's trunk; a fish-like fin appeared on the dragon's back; and the muscle structure on the arms became defined and very human. After the library research, my dragon metamorphosed into a very fantastical creature, drawing anatomy and textures from all sorts of different real-life creatures.

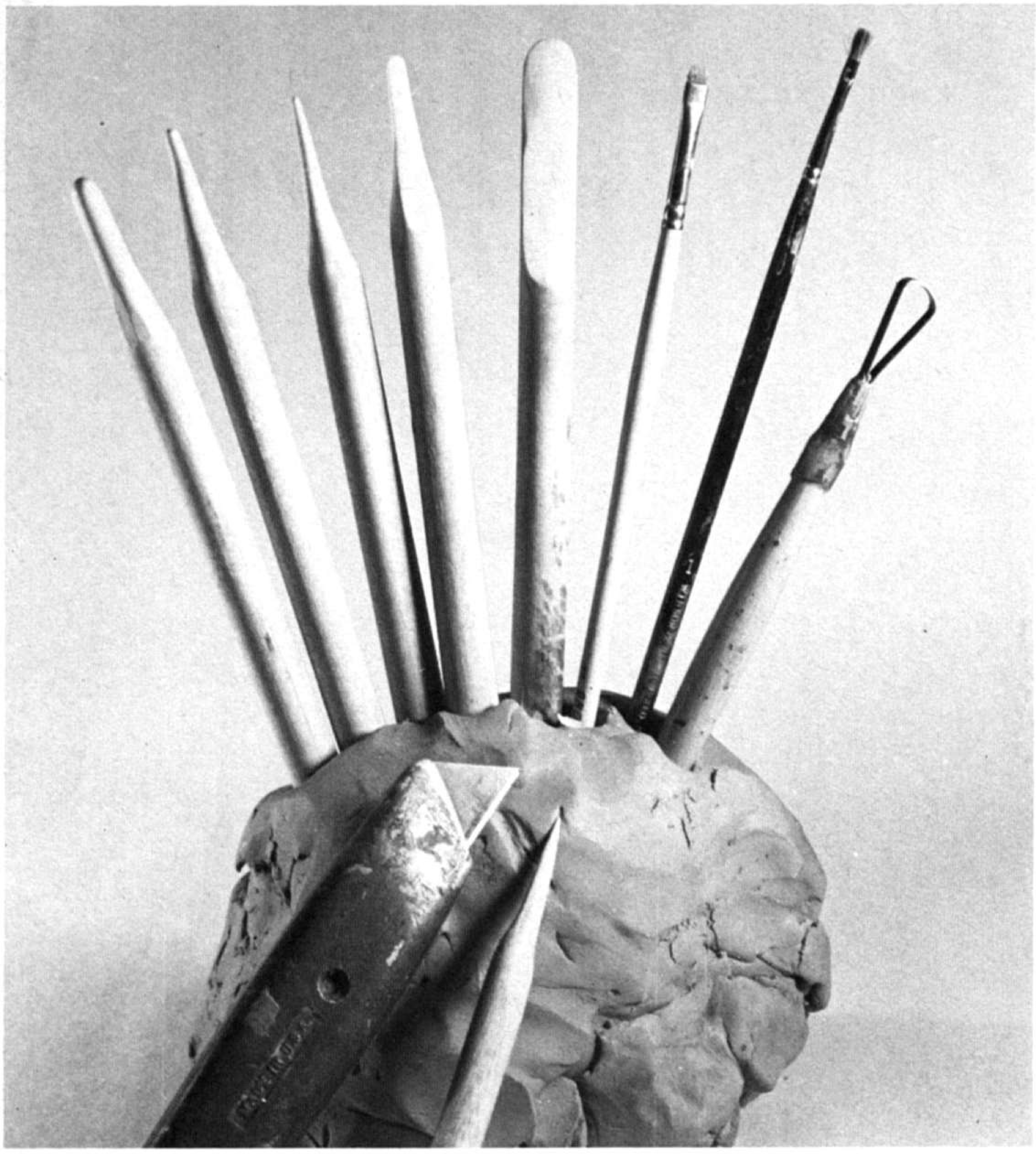


Photo: Lyle Conway

SCULPTING TOOLS

You can quickly carve many inexpensive sculpting tools — simple, useful shapes that might cost $10.00 or more to buy in an art store. A 3-foot dowel, 1/4-inch in diameter (costs about one dollar), can be cut up into six 6-inch lengths and carved with a knife to produce the tools pictured in the photos.

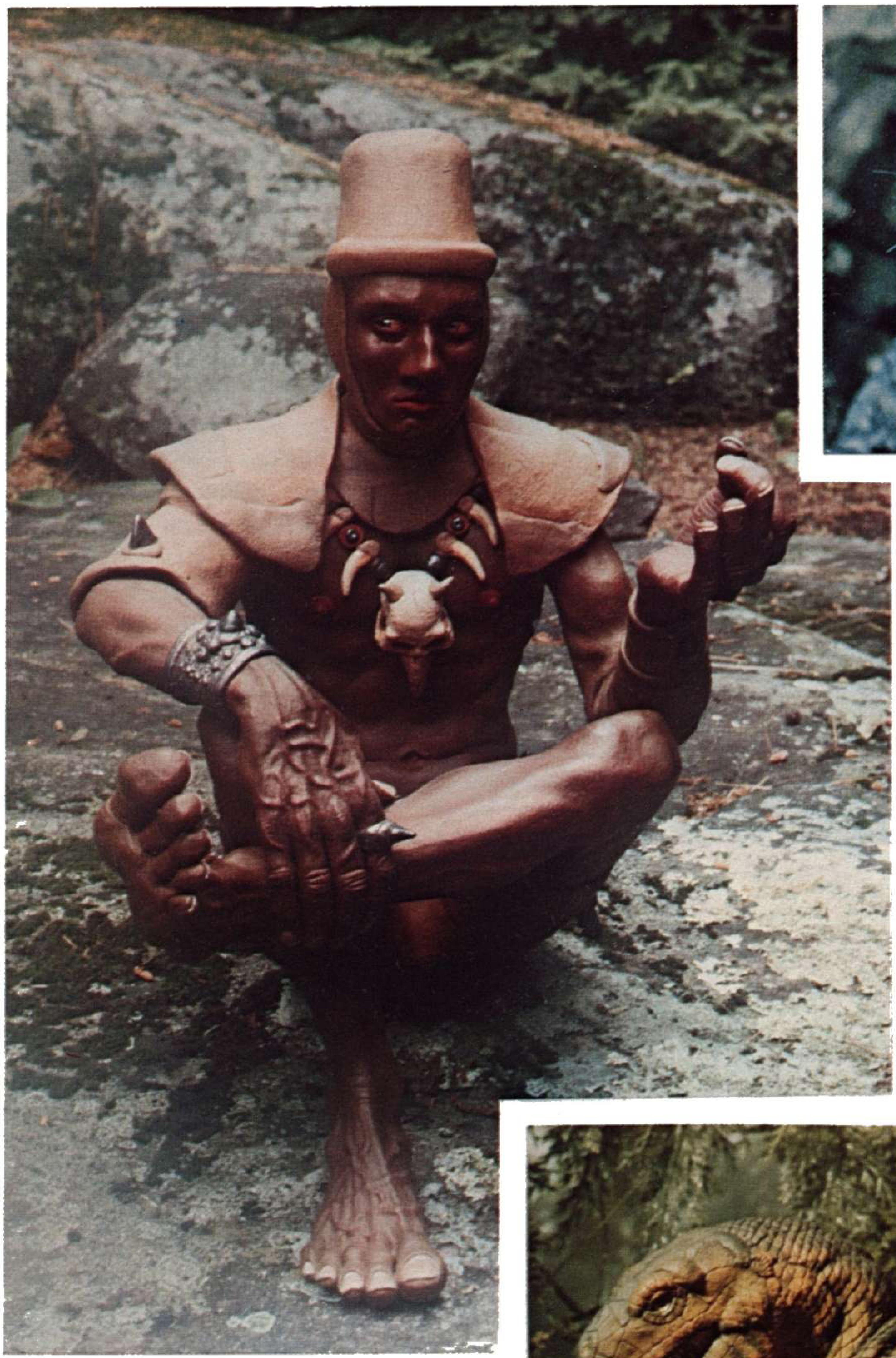
Small artists' paintbrushes are useful for smoothing rough spots left by the wooden carving tools. This will work best if the brushes are covered with a little cold cream. You can coat your own fingers with cold cream and use them to smooth large areas on the sculpture.

SKIN TEXTURES

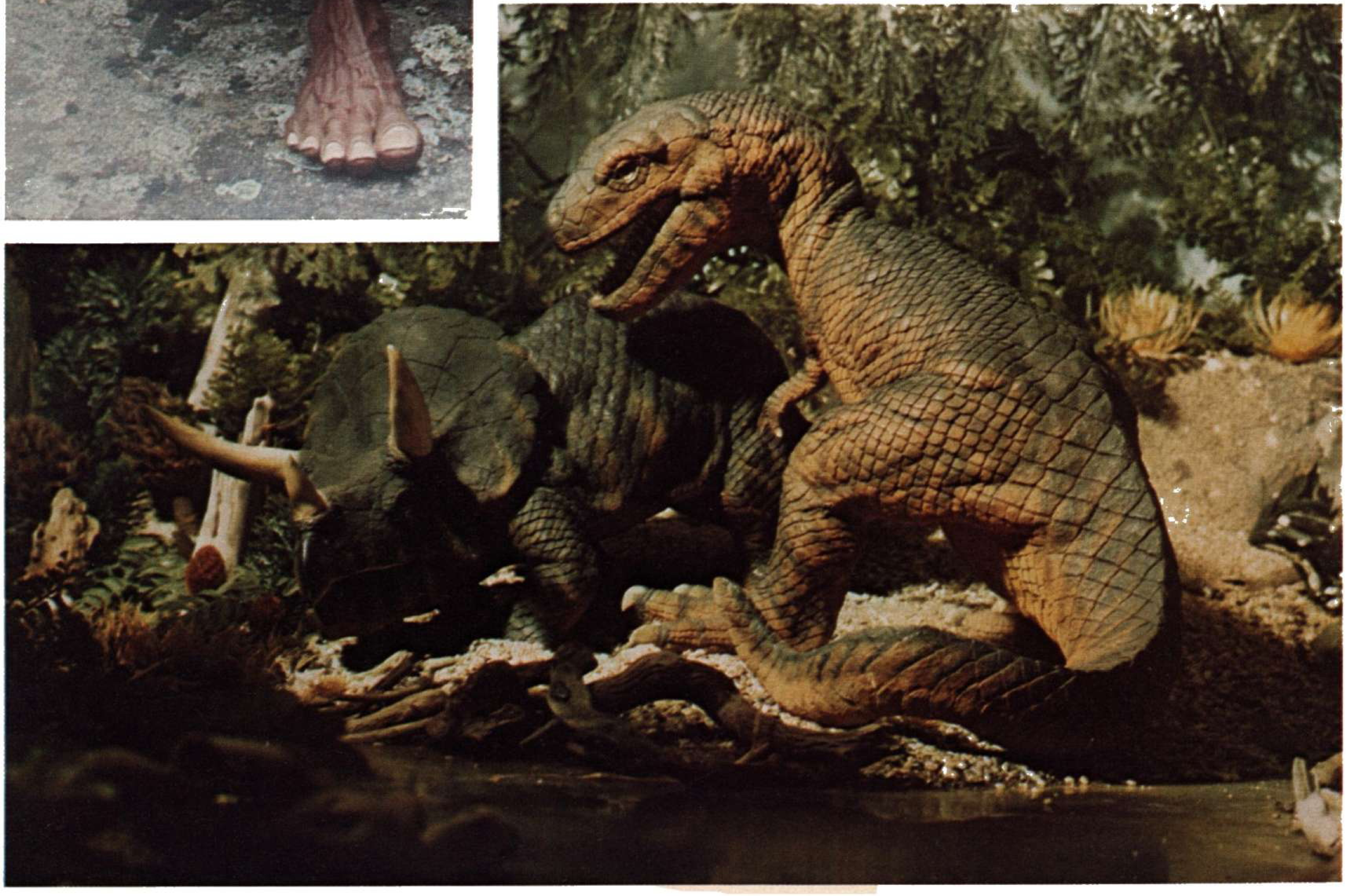
The process of adding skin texture to a clay model can involve freehand sculpting or the use of impression-making devices. A combination of both methods may be the best way to finish your sculpture. The photos accompanying this text illustrate some useful textures that can be sculpted freehand. Often this freehand work can be *very* time-consuming, so in each case I have indicated how long it took me to sculpt the texture shown.

An easier way to add texture is by using available objects to make impressions in the clay. A small piece of plaster can work well here. Shortly after a batch of plaster (mixed in a styrofoam cup) solidifies, it can be carved into an easy-to-handle shape and indented at the end with a series of small holes, made using a pencil point or a similar fine-tipped object. This gives you a "texture stamp" used to create an area of tiny raised bumps wherever it is pressed into the clay. It's good to make several of these plaster texture stamps, each with a different hole size, so that whatever size bump is desired can be produced quickly.

Left, top: The basic tools needed for sculpting details. The four tools on the left are hand carved from wood dowels; the others are available at art stores. Paint brushes are used with cold cream to "smooth" the skin texture. Bottom: Extremely realistic, subtle detail is apparent on this model sculpted by Lyle Conway for the film *Vortex*. Although a different sculpture was finally used in the film, this one remains Conway's favorite.



Opposite page: There's lots of fantasy detail in the "Orc"— a John Dods sculpture for his newest film, *Grog and the Castle of Doom*. This page, above: Lyle Conway's troll for Vortex. Left: Canadian sculptor Dzintar Mezulis combines total realism with a sense of exaggeration (hands and feet) in his sculptures. Below: the skin detail in these dinosaurs from Lee Seiler's I & S Visual Arts film, *The Silhouette Man*, makes them seem like "real" reptiles.



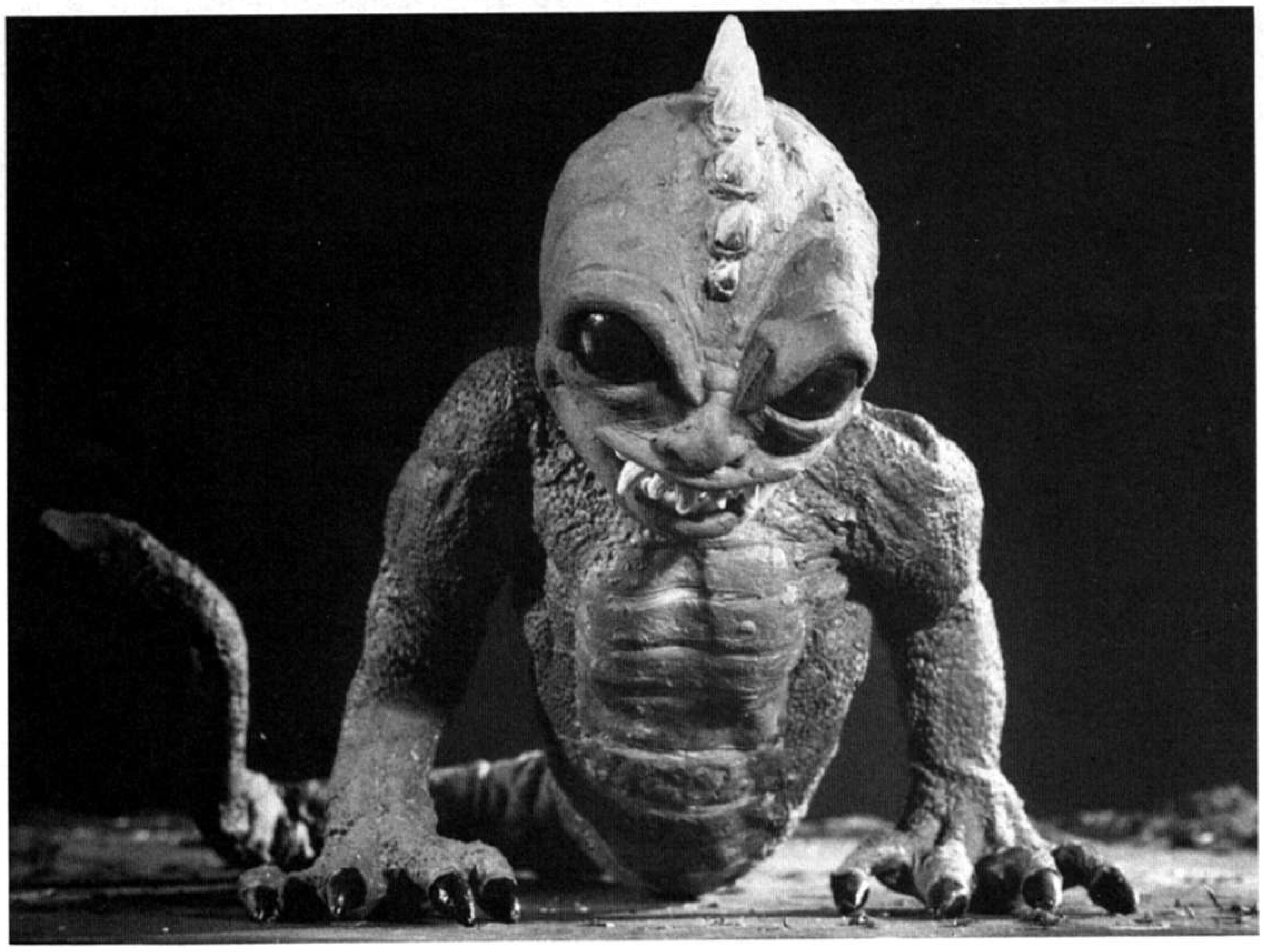
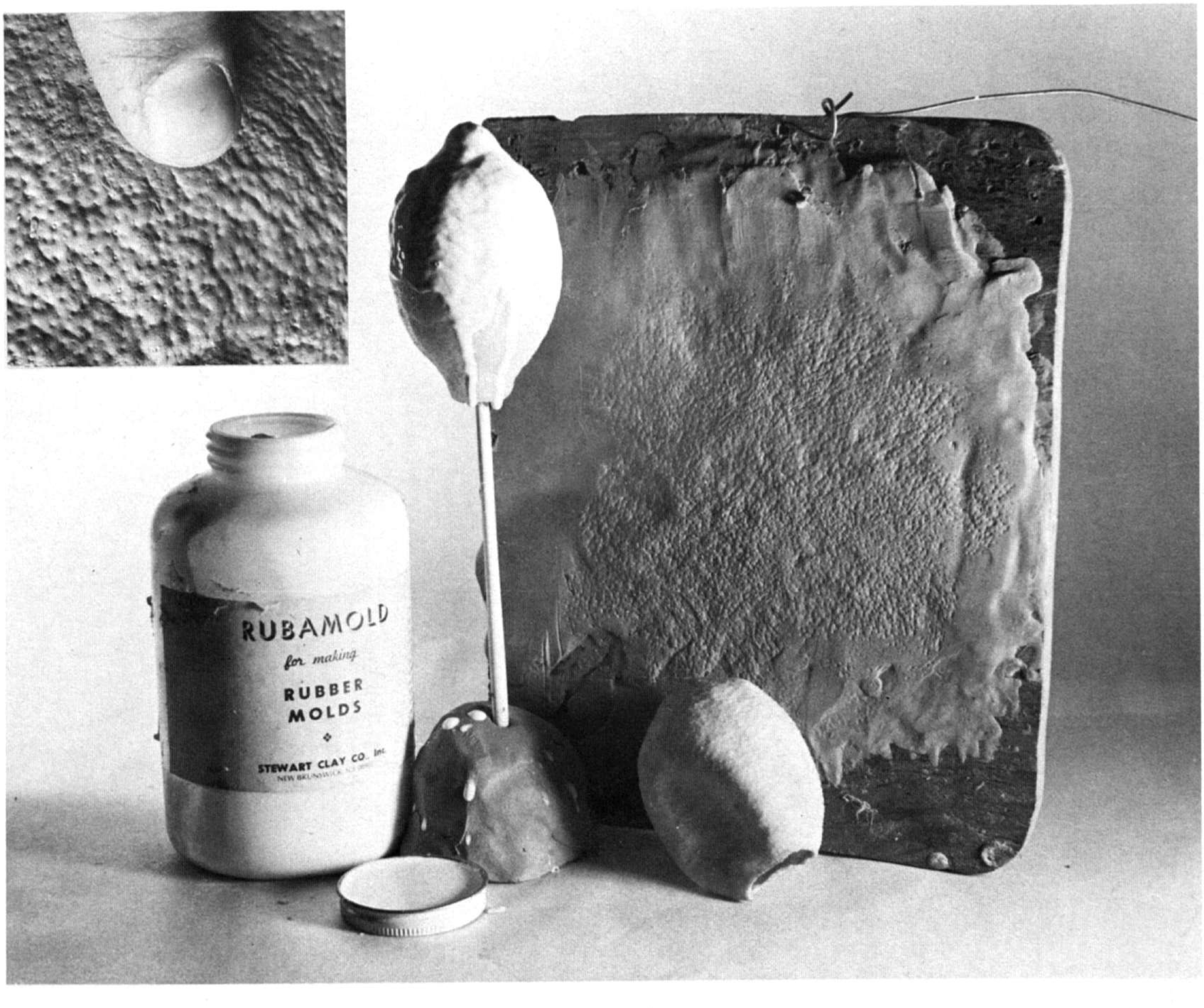


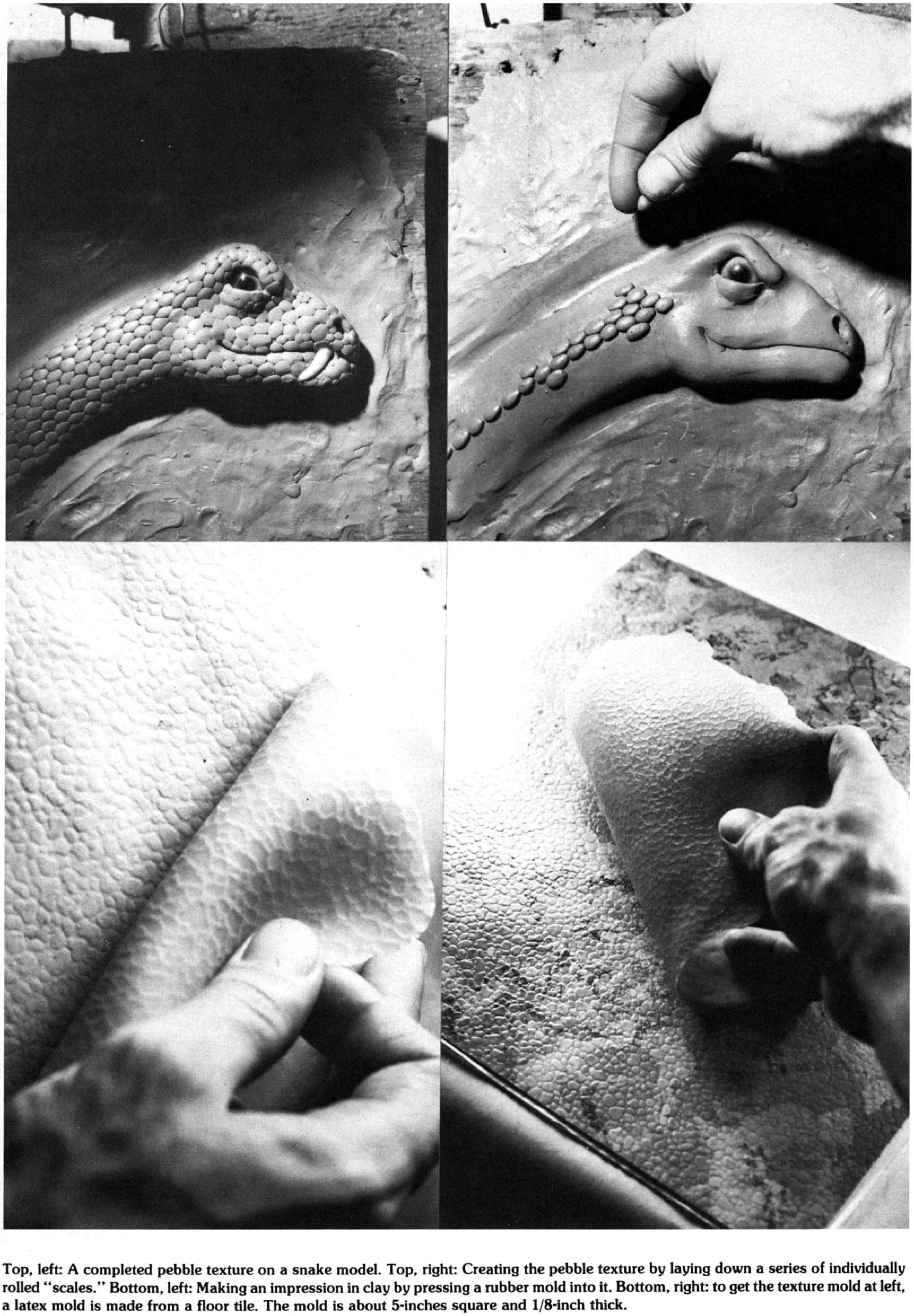
Photo: Ernest D. Farino

Above: Ernest Farino's "Leemoid" from *The Alien Factor* was a build-up model, but the skin detail was sculpted and slush-cast separately. Below: A lemon is covered with several layers of liquid latex. When dry, the latex is peeled off the fruit, turning the mold inside out, which produces the texture making device at bottom right; by pressing this into clay, you get the pitted texture shown in the close-up.

Another method of creating textures involves taking them from real-life. Citrus fruits — oranges, grapefruits, and lemons — can be used to produce a surface of small, raised bumps. If the skin of the fruit is peeled off it will be much easier to maneuver it into hard-to-reach areas of the sculpture.

To reproduce a texture *as you see it* on an object (rather than as a negative impression), you must first make a thin mold of the object. Latex rubber is ideal for this purpose. The liquid latex is applied to the object in a series of layers until a thickness of about 1/8-inch has been built up. Use a hair dryer on each layer to speed up the drying time. As soon as the rubber mold is dry it can be peeled off the object and used. Textures for this method might include such objects as rocks, concrete block, and even sidewalks — where the top layer of cement has worn away to reveal the bumpy, stoney under layer.





Top, left: A completed pebble texture on a snake model. Top, right: Creating the pebble texture by laying down a series of individually rolled "scales." Bottom, left: Making an impression in clay by pressing a rubber mold into it. Bottom, right: to get the texture mold at left, a latex mold is made from a floor tile. The mold is about 5-inches square and 1/8-inch thick.

Photo: Dan Taylor

Opposite page: Otherworldly sculpting is shown in this alien created by Mike Walker, Dan Taylor, and Alan Burton for the film *Nightbeast*. This page: John Dods experiments with the sculpting of his dragon (as featured on the cover of STOP MOTION ANIMATION); top, left and right: Dods uses a texture stamp carved out of plaster of Paris. Bottom, left and right: He uses an ordinary lemon for a subtle bumpy texture. Texture stamps produce results in seconds, unlike time-consuming freehand work.

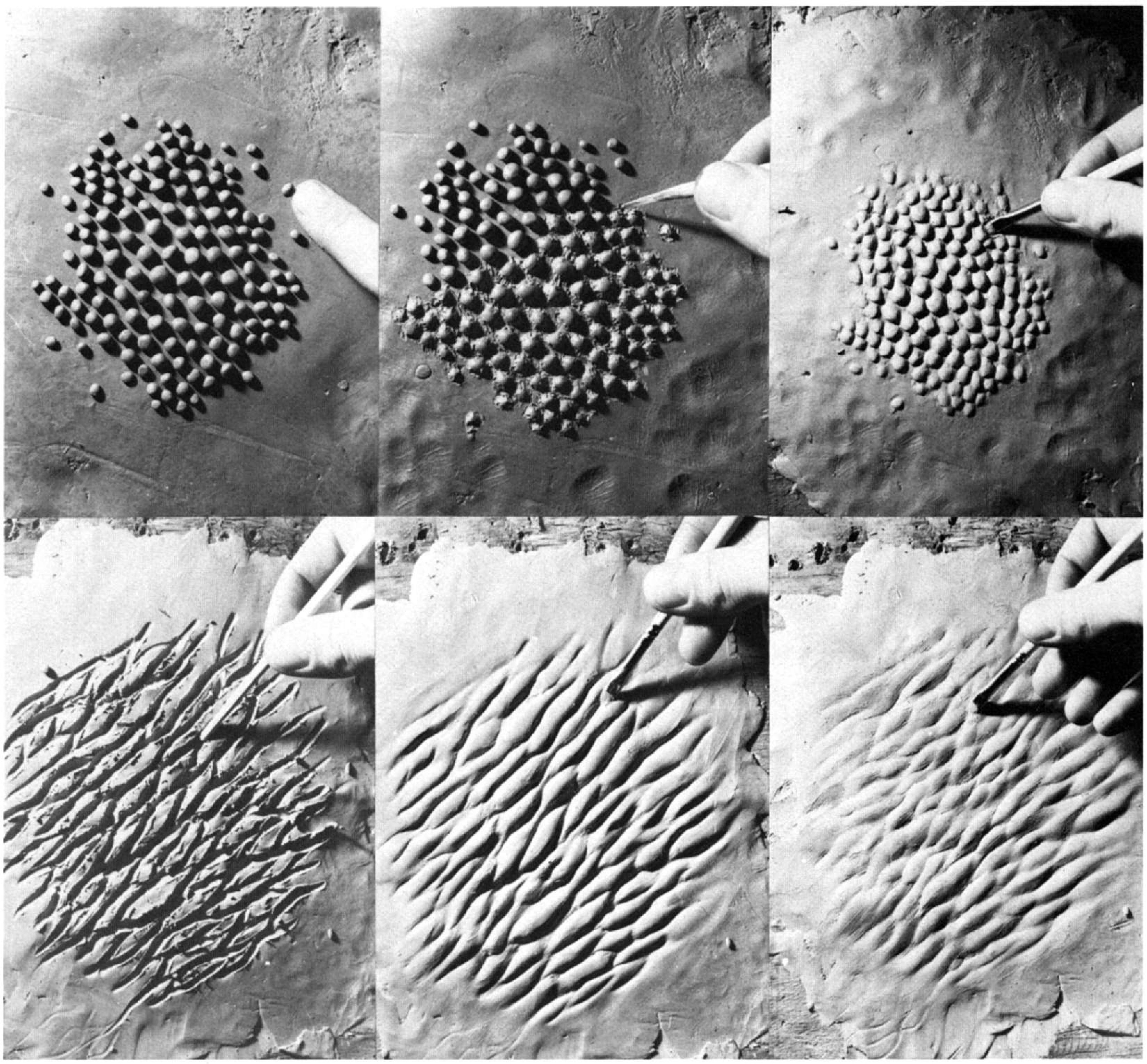
When you are using your latex impression pieces, they may stick to your sculpture if the clay is too soft. Much of this sticking can be eliminated by spraying the model lightly with water. Or, you can place your sculpture in a refrigerator for a few minutes to harden it up again.

Other ways to produce interesting skin textures include ordinary household objects. A wall that has been painted over several times with a roller (or a stucco ceiling) has an intriguing bumpy pattern to it. A toothbrush and sandpaper produce rough textures. All types of sponges yield strange and varied patterns.

A way to get a good "scaley" texture stamp is to roll tiny balls of clay, flatten them out (overlapping each one so that they form a pattern), make a plaster mold of them, and use the mold as a texture stamp. This is the best way to produce a controlled texture that you might have specifically in mind.

A collection of various texture molds and sculpting tools are valuable aids to you in trying to produce models with convincing, realistic detail. Another valuable aid to you as you work on your sculpture might be a Polaroid camera, so that you quickly see the progress of your sculpting from day to day. A series of shots taken over a long period of time will show how much has been accomplished, if anything — I have sometimes changed a sculpture back to the way it *used* to look when the Polaroids revealed that not all of my changes were improvements! ■

How to Create Textures In Clay



Top, left to right: To create a scaley skin texture—small balls of clay are placed on a bed of clay. Next, the edges of the balls are blended into the adjoining surface. Finally, the rough areas are smoothed with a small paintbrush and cold cream. Time to produce this texture: 90 minutes. Bottom, left to right: To create a wrinkled skin texture—rough in the basic pattern of criss-cross lines with a round-tipped tool. Next, smooth the edges with a paintbrush and cold cream. Finally, refine the wrinkles (making them less deep) by further rubbing with fingers or brush and cold cream. Time to create this texture: 75 minutes.

Mattes: Creation and Cinematography

Text and Photos by **DAVID W. RENWICK**

Matte cinematography is the combining of two or more images which, through camera manipulation, appear on the screen as one harmonious scene. The simplest, and most frequently seen example of this is that of an actor playing a dual role. The actor is first filmed on one side of the set; a black card covers half the camera lens, exposing only the portion of the set that the actor appears in. The film is then backwound to the beginning of the scene, a card is placed over the opposite half of the camera lens, and the actor moves to (and is photographed on) the opposite side of the set. The finished film shows the actor apparently in the scene with "himself" (see photos 1-3).

Matte work can be done in-camera, on the original film, or by rephotographing previously shot footage. Here I will deal mostly with the more professionally used technique of rear screen matte rephotography. The problems encountered in matte rephotography, and their solutions, are closely allied to those of in-camera mattes. This is also the matte technique best suited to combining live action and animated models.

Rephotography is the basis of most professional stop motion matte work, and consists of combining a previously shot live action scene with an animated model and/or miniature set. The idea is to rephotograph the live action scene using a rear screen projection system and, by strategic model placement and matte work, make the model appear to be in the scene, as a part of it.

In doing rephotography you will encounter the worst problem matte work entails: image registration, or steadiness. The causes of poor registration are many. A poorly adjusted camera; poorly adjusted rear screen projector; heat from the projector lamp warping the film; or movement of the camera, projector, rear screen, or matte between takes — any of these can cause a giveaway shifting of the photographic elements that will spoil the matte effect. Combined together, as these problems are in rephotography, the picture elements will bob and weave alarmingly in relation to the static matte lines and animation model, unless great care is exercised. There *are* ways to combat these registration problems!

Your camera is a very important consideration. For quality matte work you must have a camera with reflex viewing, manual exposure control, and facility for backwinding film. Ask around and buy a camera with a reputation for quality and reliability. I

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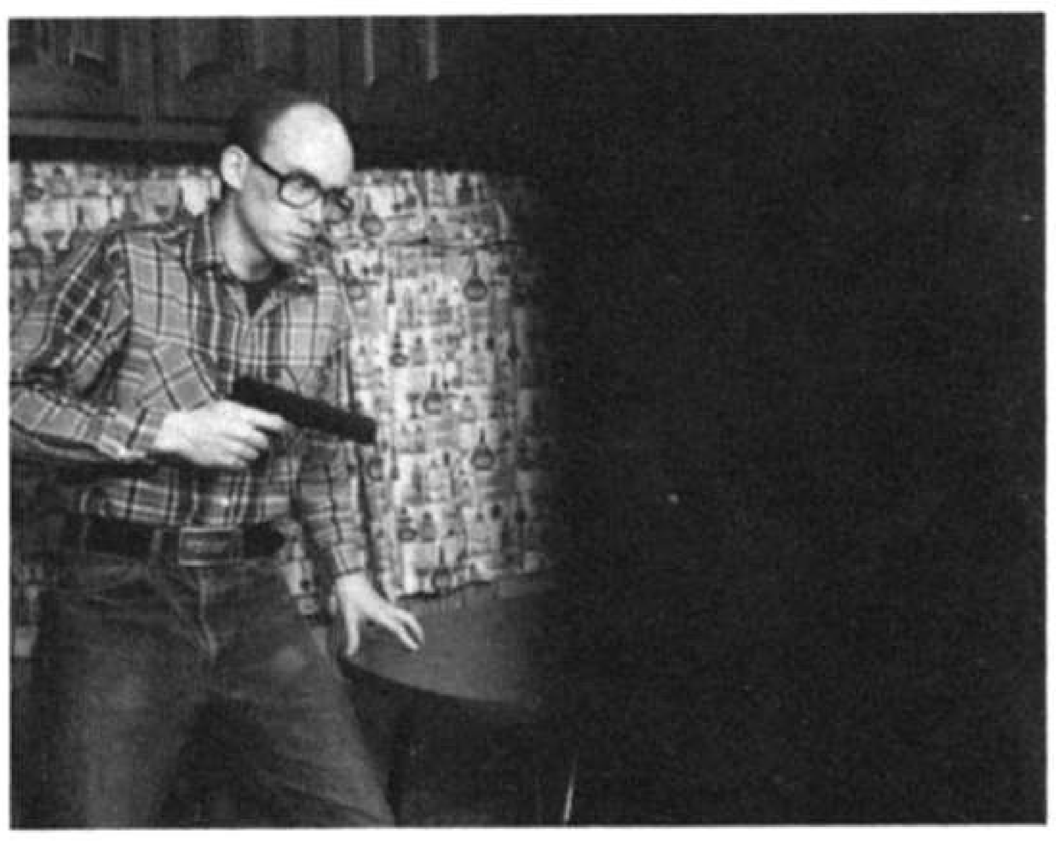

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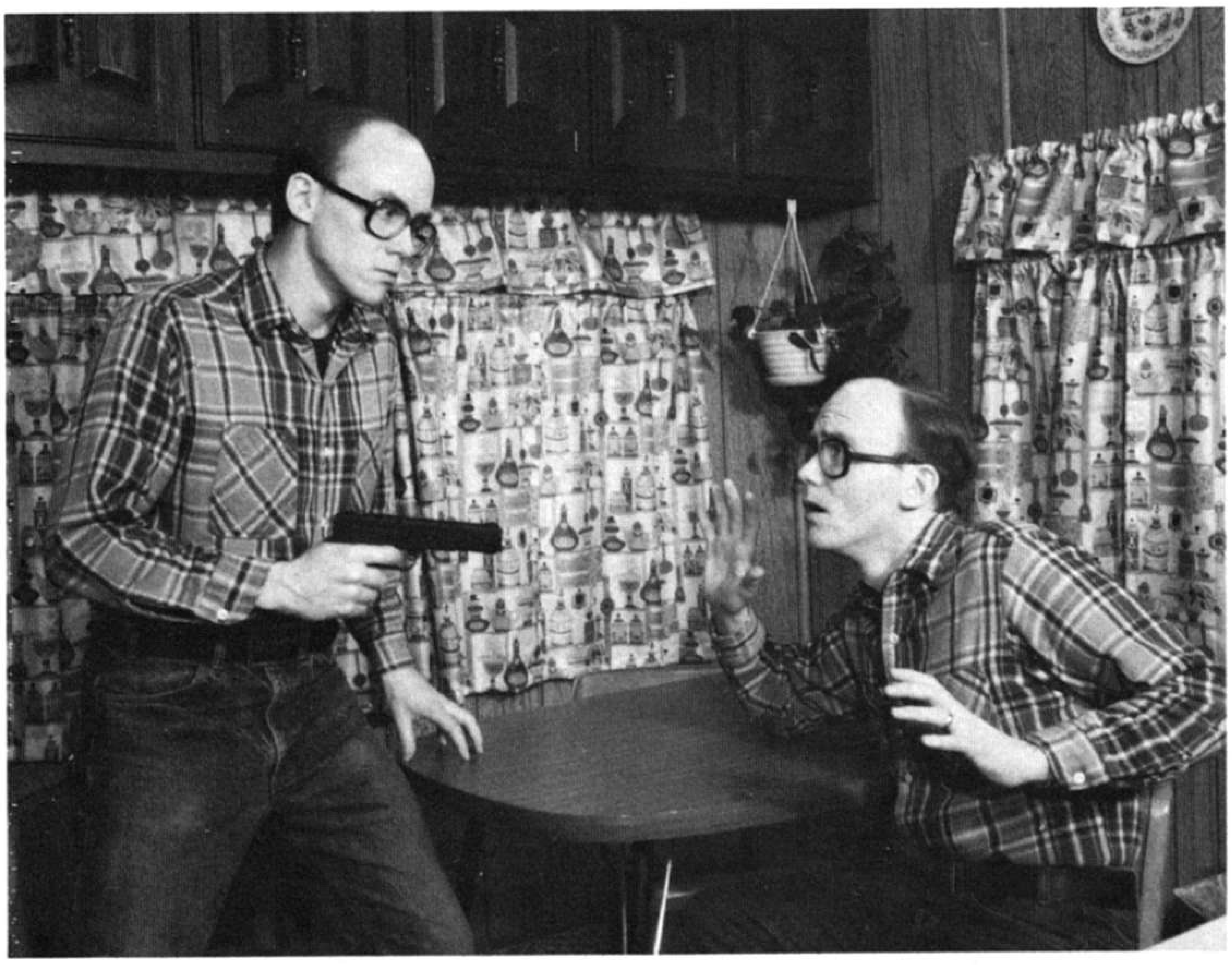

use, and highly recommend, a 16mm Bolex Reflex. Using a good camera, and having it properly serviced, will relieve most of your camera-caused registration problems.

The film gauge you work in is even important, *especially* for matte work. I worked in regular 8mm for several years, and achieved some good results. Regular 8 has all but disappeared, with equipment and film quite hard to find. Super 8, regular 8's replacement, is by far the worst format for matte work. By its very design you cannot backwind super 8 film in the camera for lengthy matte scenes, and there is no real pressure plate to hold the film completely flat. Super 8 boosters may howl, but I *do not* recommend this gauge for quality matte work. Single 8 (Fujica) cameras offer all necessary features for matte work — including unlimited backwind — but film availability and film stocks available are limited. I find 16mm the ideal low budget film and effects format for several good reasons. Any camera registration error in 8mm will look *twice* as shaky when projected, compared to the same amount of misalignment in 16mm. 16mm records much more detail than any 8mm gauge, and offers a wide variety (and easy availability) of professional film stocks and lab services. If you're going to put as much work as stop motion animation and/or matte work requires into a film, you are probably aiming for eventual distribution and large audience showings. 16mm can be reduced for super 8 prints, or enlarged for 35mm theatrical release, with little loss in quality either way. I see nothing wrong with experimenting, making first effort "learning films," or personal films in 8mm; I've seen some *good* 8mm films. However, if you're going to put the time and effort into making a quality film, you would be giving yourself several advantages by filming in 16mm. Unfortunately, 16mm costs roughly three times as much as 8mm, but once you've seen them projected side-by-side you may find (as I do) that the cost *is* justified.

Another problem in matte techniques is accidental movement of the camera in relation to the matte field and/or rear screen. If the camera shifts in relation to the rear screen the separately shot images will not mate properly. If the camera shifts in relation to the matte field you will end up with a black, or dark, fuzzy line between your picture elements. I have found that making a platform — to which the camera and matte field are both connected — seems to eliminate these problems. You can make your platform so the matte can slide towards or away from your camera, or pick a compromise position to do all your matte work at. Whichever you choose, it's best to build your matte box with black, light-tight walls. For the matte field itself, securely mount a piece of glass at the end of the matte box. It's best to also construct a hood to extend beyond the matte field glass to prevent any stray reflections. You can cut your mattes from black paper and tape them to the glass, or use black tape to construct your matte. A caution here: beware of fingerprints and dust; keep the glass clean. The glass will hold your mattes perfectly stationary in relation to the camera during use. Be sure to *rigidly* attach both the camera and matte box to the platform. This platform can then be securely bolted or clamped to your animation stand.

I may seem to harp on connecting things "rigidly" in the remainder of this text, but that's the name of the game here. *Secure* mounting of all equipment is an absolute *must*!!! Any movement of the camera, matte, rear screen, or projector will cause your matte to fail.

Your rear screen projector can also cause many registration problems. I have found that "stock" home projectors are not precise or reliable enough in the single frame mode to yield high quality film registration. If you're really pinched for money, use your home projector and hope for the best. My advice is to buy a used projector and perform some necessary modifications.

First, disconnect (or remove) the film drive motor. Now advance the film claw by hand until you're projecting a perfectly centered frame, and then glue the film advance claw securely in place. The film is now advanced by pulling it through the film gate by hand. It may sound primitive, but it yields *much* better registration than projector-advanced frames, and takes no more time to execute properly.

Next, the film gate and side tensioning springs need to be beefed up so they will hold the film rock-steady for projection; the springs in most stock projectors don't seem to have enough strength to perform this function adequately. Use rubber bands or small springs to increase tension in these areas. The projection aperture itself can be filed out so it projects a *full* film frame; there is always an image cut-off area on all stock projectors. It's also a good idea to secure the lens so it cannot be moved between exposures. Putting heat absorbing glass between the lamp and film is of great help in eliminating lamp-heat film distortion. Also, remove the "heat-shield" (the perforated metal disk between the lamp and film); it cuts the projector's light output and degrades the image. If you channel an auxiliary blower over the lamp, heat absorbing glass, and film gate, everything should stay cool enough; if not, install a dimmer for the projector lamp and adjust its intensity to keep your film from distorting. Another good point about using a second projector for effects work is that you can bolt it down to a rigid base, which can be securely bolted or clamped to your animation stand. This will eliminate accidental projector movement between exposures.

Movement of the rear screen itself can cause your mattes to fail. Mount your rear screen on a rigid frame and bolt and brace it securely to your animation stand.

Your animation stand is another cause for concern. It's best to build it of one-piece, solid construction. Bolt down your projector! Bolt down and brace your screen! Bolt down your camera/matte platform! Rigid mounting and careful operation of the foregoing equipment will immeasurably help film and matte registration.

After all I've ranted and raved, it is now my sad duty to report that no matter how careful you are, no matter how precise, you will still see an occasional (all but microscopic) slight flutter in your matte work. Even Hollywood, with all its technical marvels, has not solved this irritating problem. You've got to really apply yourself, be extra careful, and do the very best you can. Your efforts will be paid off in believable matte work.

Two other areas involved in rephotography that I feel I must touch on are color and contrast control of the rear screen image. The light emitted by most projector bulbs is not of the same color temperature as that required for most color films. Also, color films are more sensitive to certain colors and, through rephotography, you *double* this sensitivity — making some colors garish. You can correct these problems by putting color correction filters over the projector lens. Contrast build-up is another problem caused by rephotography. It can be corrected, to a degree, by adjusting your lighting ratios. The formula I use for footage to be rephotographed (also called "background plates") is to bring the fill light up ½ to 1 f/stop, and underexpose the film by ½ to 1 stop. When footage shot according to this formula is rephotographed it will exhibit roughly the same contrast range as normally exposed footage. However, different film stocks require different corrections for color and contrast. Experiment and discover what works best for you.

With all discussion of equipment behind us, we can now delve into the matte itself.

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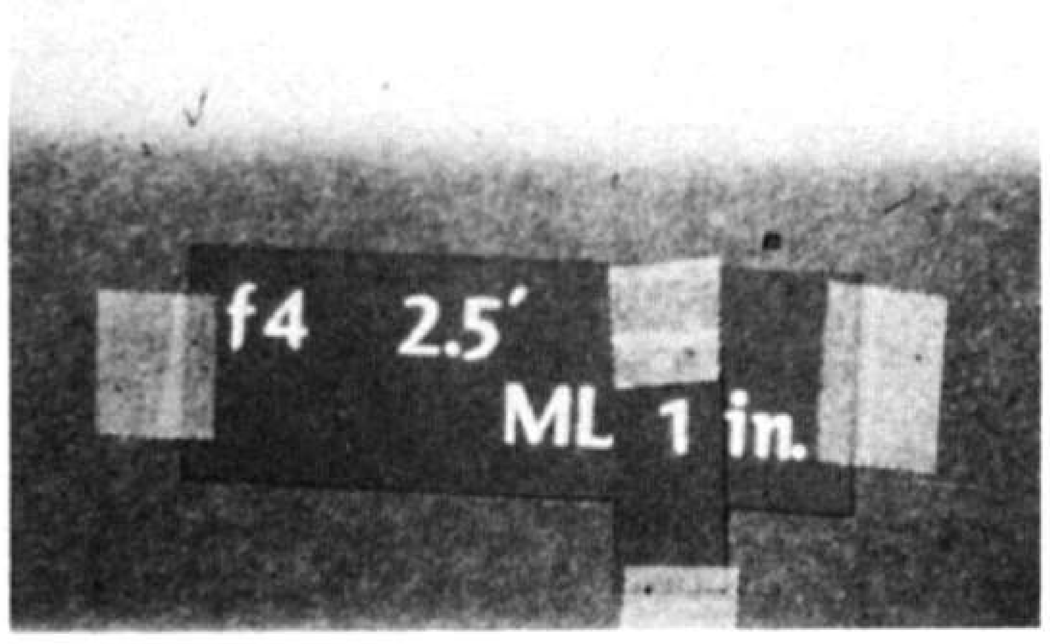

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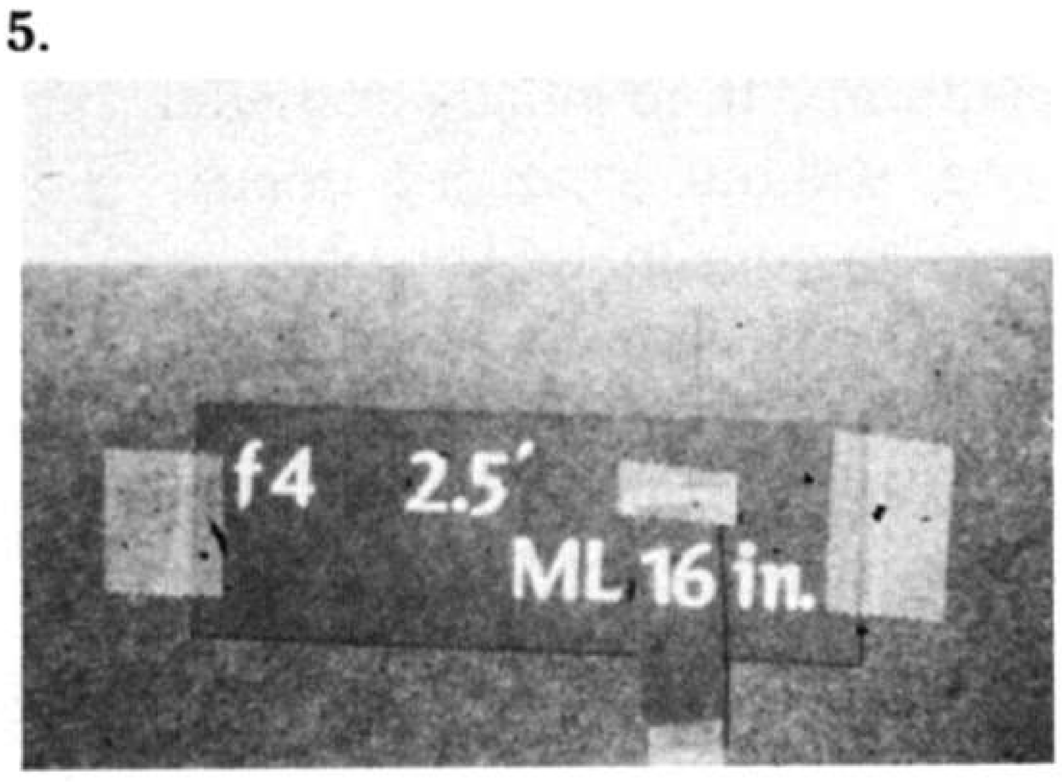

Top: Focus and f/stop constant: matte field at 1 inch. Bottom: Focus and f/stop constant: matte field at 16 inches.

Top: Focus and matte line constant: aperture at f/1.4. Bottom: Focus and matte line constant: aperture at f/22.

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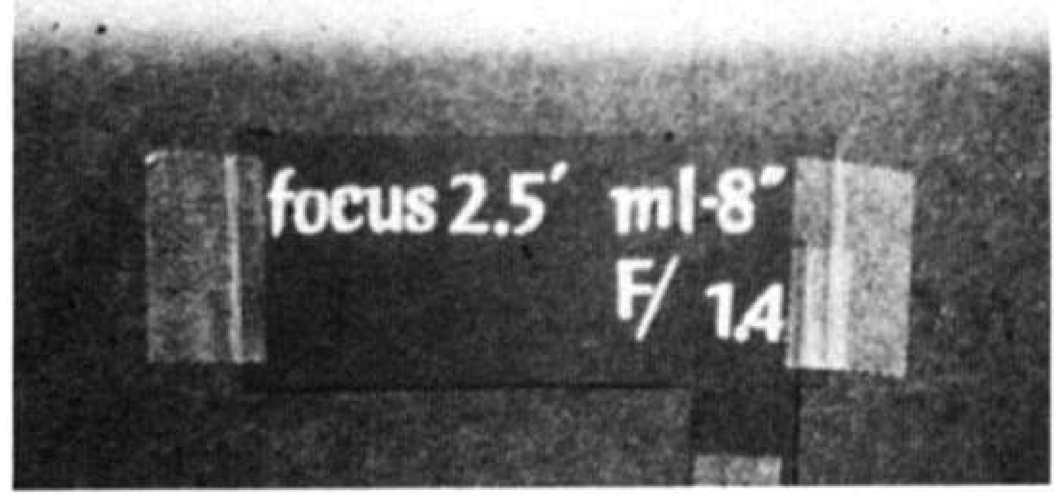

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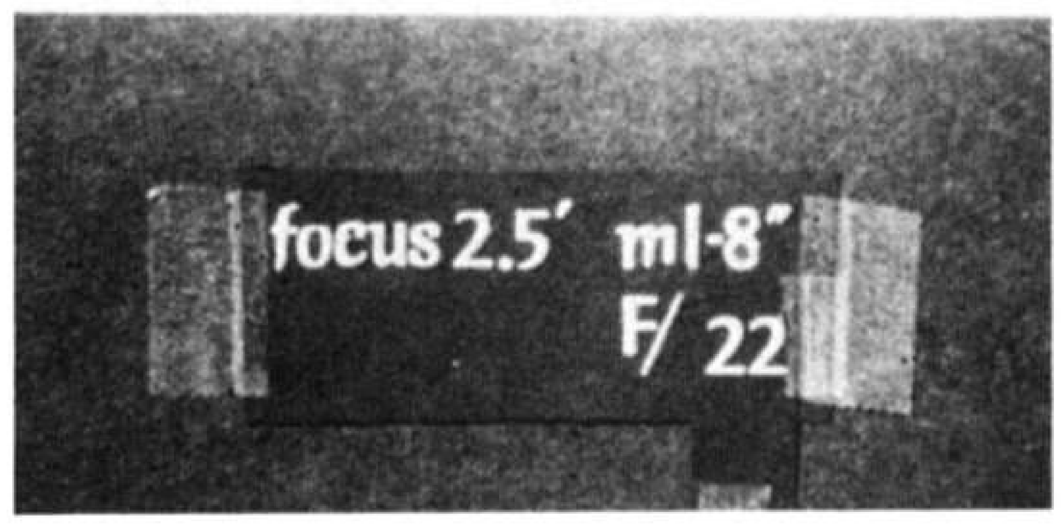

In matte cinematography there are three settings which should *not* be changed between successive exposures. They are: lens focus setting, f/stop setting, and the distance and/or position of the matte field in relation to the camera. If any of the foregoing are changed between matte exposures you will experience anything from a black haze to a black line between your matte elements. Photos 4 & 5 show how matte sharpness is affected by moving the matte closer to, or farther from, the camera. The next photos, 6 & 7, show how varying the f/stop will affect matte line sharpness. Finally, photos 8 & 9 show how varying the lens focus setting will affect matte line sharpness. From these photos the following conclusions can be drawn: A) The closer the matte is to the subject focus area and/or the larger the f/stop number, the sharper the matte line will appear; and B) The farther the matte is from the subject focus area and/or the smaller the f/stop number, the fuzzier the matte line will be.

From the foregoing you can see it's best to find what f/stop your rear screen image records best at and how close your camera will be to the screen, and *then* determine how far to put the matte field from the camera. It's usually best to have a matte line that is just slightly fuzzy, unless you are matting a subject that by nature has a sharp outline (like the side or top of a building); however, even this type of edge is not as photographically sharp as you can make a matte line, so exercise care. Experiment and learn by doing.

The technique of changing mattes is very important. After shooting the first element of your scene, line up the second matte by aligning it against the first matte. When they mate properly tape the second matte in place — and *then* remove the first matte. This method greatly lessens chances for matte misalignment.

An example of making the model seem to be in the same plane as the rear-projected subject is shown in photos 10-13. By laying the matte line along the bottom of the model's feet, then backwinding and exposing just the lower portion of the scene, you end up with an invisible matte line. The model appears to be in the scene, and can be made to interact with the subject. The model's eye-line (where it's looking) and placement are important, and can only be checked through

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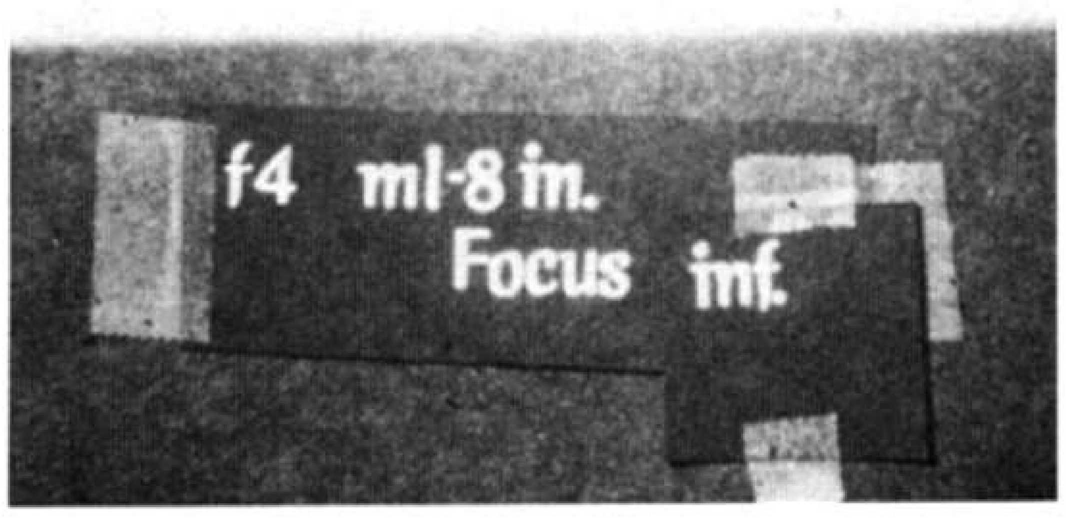

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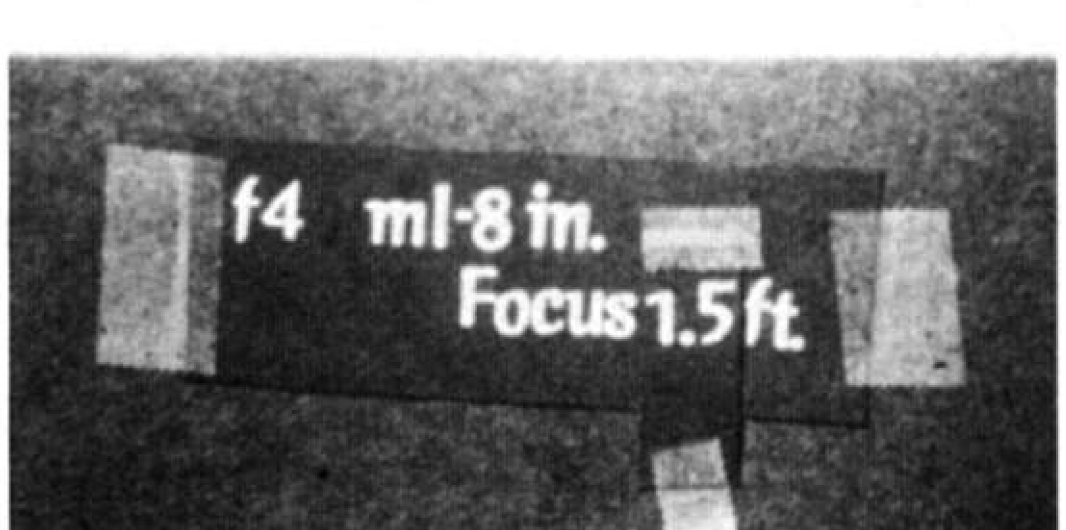

Top: Matte line and f/stop constant: focus on infinity. Bottom: Matte line and f/stop constant: focus on 1.5 feet.

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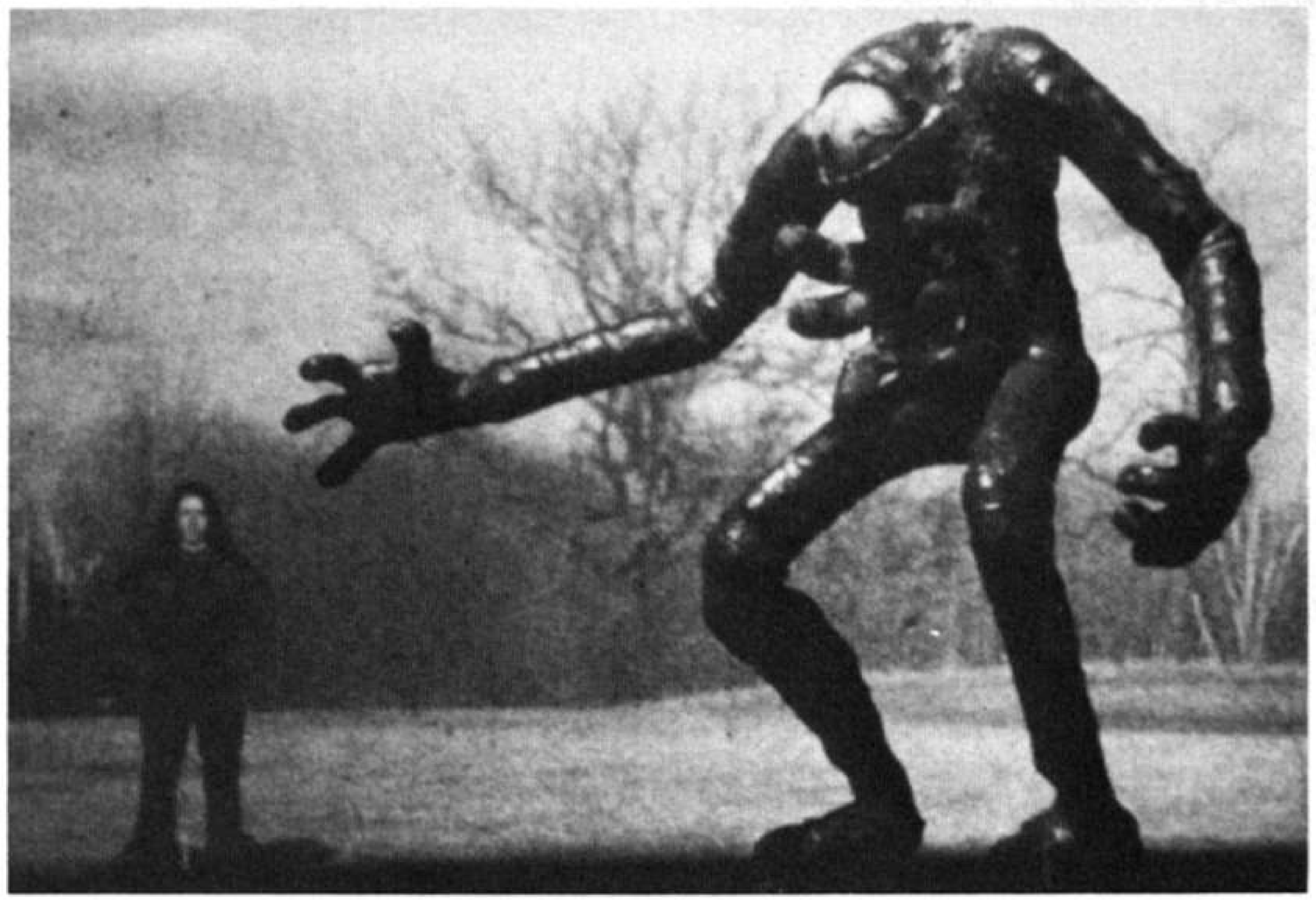

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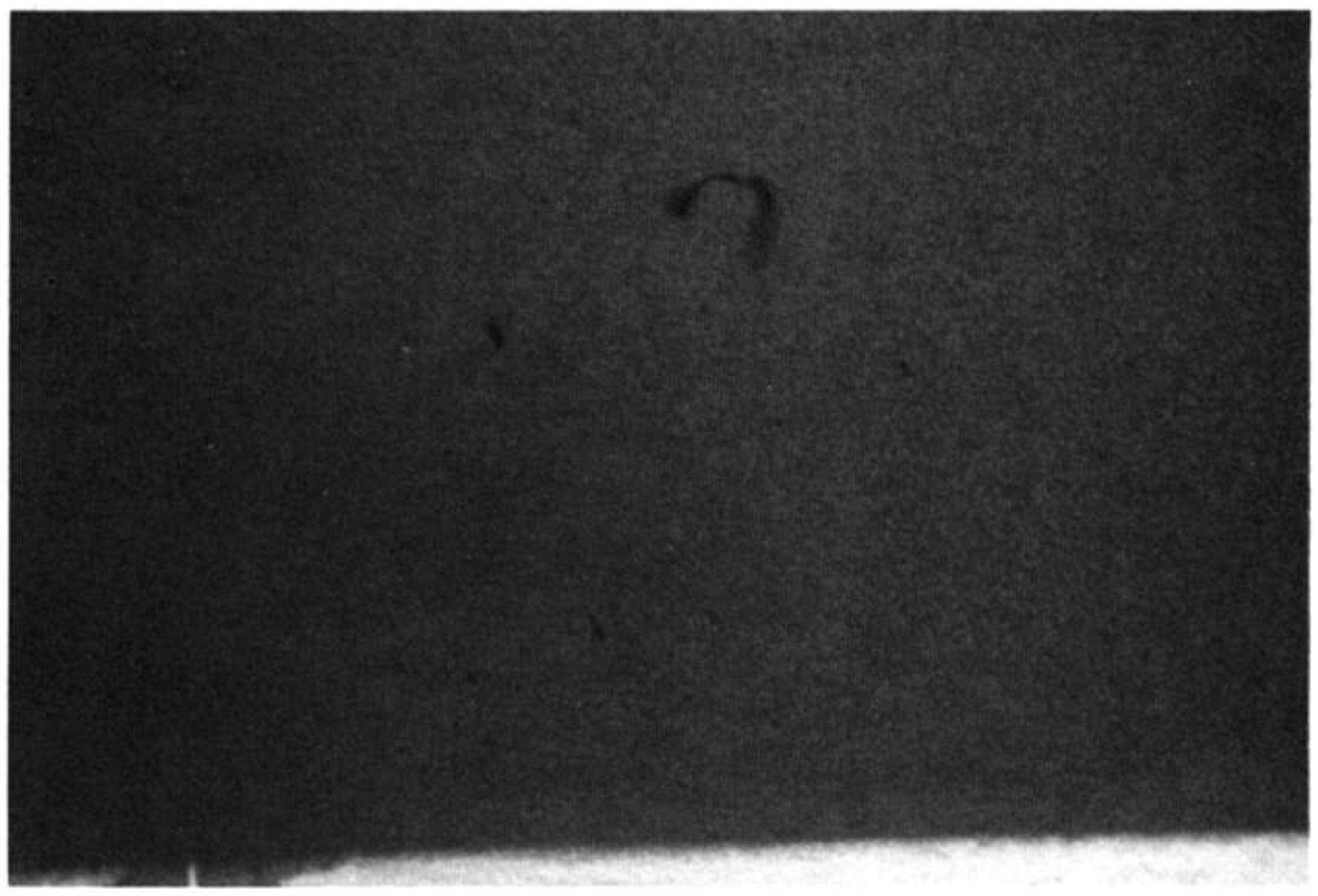

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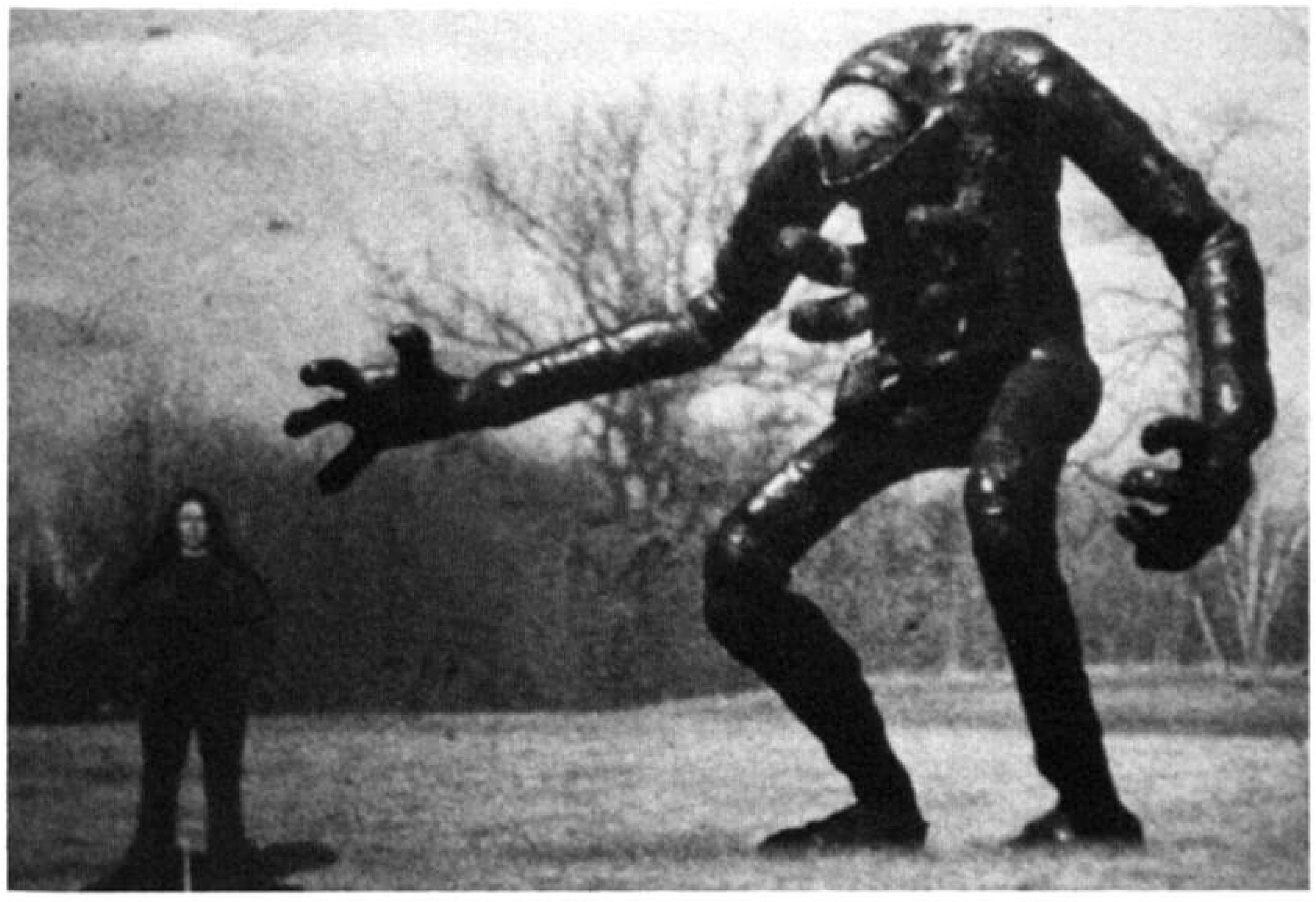


13.

Top,left: The model stands before a non-illuminated rear screen. Note spacers between the model's feet and the animation platform—this lifts the model high enough so that the platform cannot extend onto, and foul, the matte line. Top, right: Model with lower matte in place and rear screen on. Bottom, left: Ground shown, top matted out. Bottom, right: Completed matte image. Note "invisible" matte line.

the camera's reflex viewfinder. Equally important is the angle and intensity of the light striking the model. If you are careful in all things your model will appear to be a part of the scene. Though you can make an invisible matte line (as in photo 13) it's usually best to have your matte follow a natural line in the scene (the edge of furniture, boxes, a tree, a building, etc.); this will help disguise the matte line, and actually seems to make registration errors less noticeable. An example of a disguised matte line is shown in photos 14-16. By running the matte line along the model's feet and up the side of the mobile home, backwinding, and exposing just the ground and mobile home, you end up with the model apparently emerging from behind the mobile home.

Using rephotography, you can combine portions of two or more entirely different scenes. You can add an alien landscape behind your house, alter views through windows, and so on. The possibilities are limited only by your imagination. By utilizing rephotography you give yourself almost total control over placement of picture elements, matte focus, and exposure.

If you elect to shoot your mattes as in-camera composites on the original film, you will eliminate the "duplicating defects": projector registration problems, exaggerated color, and loss of contrast and definition. If you exercise care with your in-camera mattes you will end up with a finished effect indistinguishable from your normal footage. However, in-camera mattes require a lot of forethought and planning. You'll need to have specific actors, sets, and equipment available in order to shoot both halves of your matte, otherwise your camera — and production — will be tied up waiting to complete your matte shot. This is admittedly an amateur technique; professional mattes shot in-camera are the exception rather than the rule. However, when working in the smaller gauges — especially 8mm — and in the absence of sophisticated rephotography equipment, the quality gained by shooting mattes in-camera is well worth the time and effort.

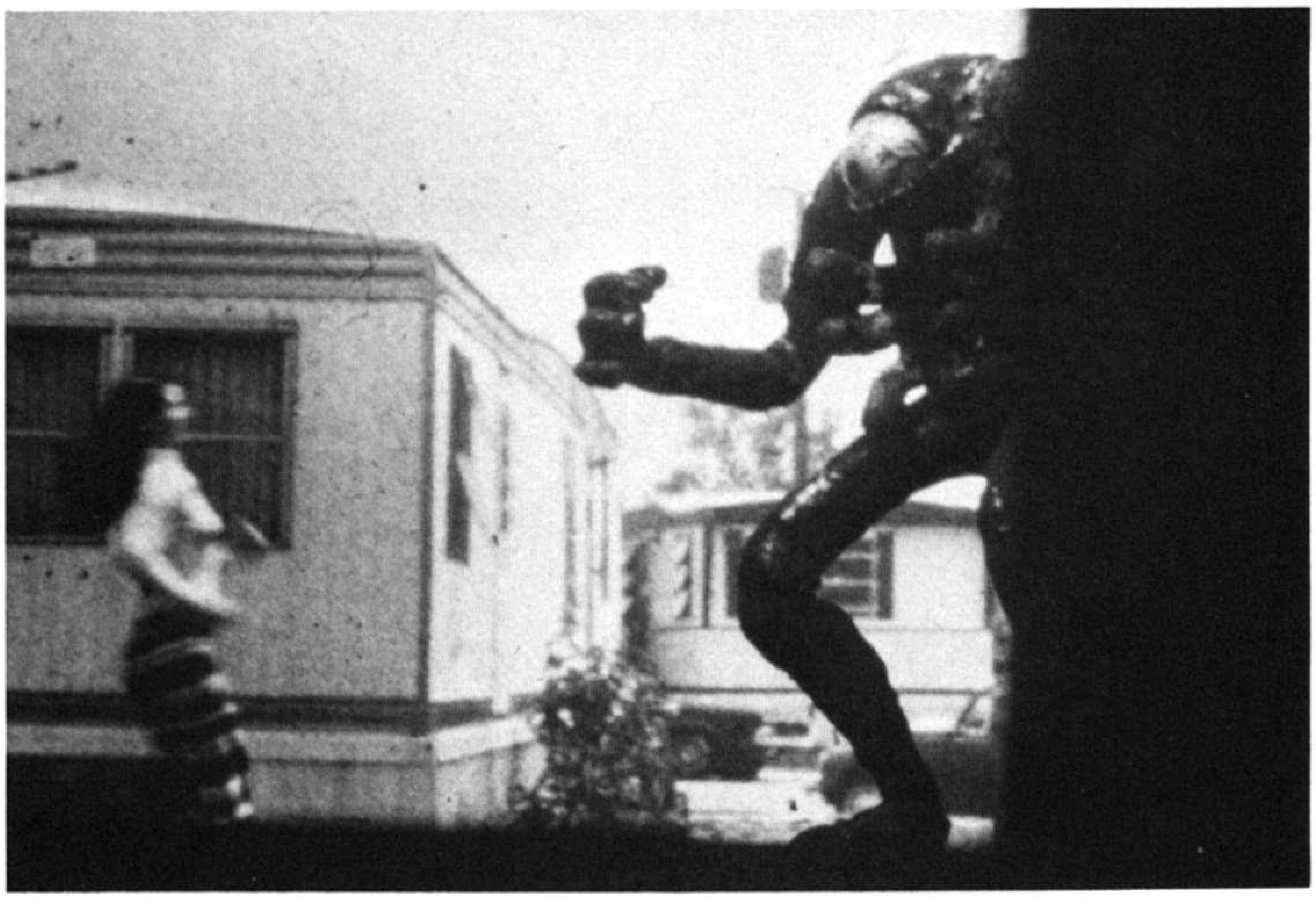
If you want to combine subject elements at various distances from the camera, use a compromise focus setting. On a 16mm camera, a 12.5mm lens, with its focus set at 6 ft. and its aperture at f/4, will maintain focus from 3 ft. to infinity. At these settings you can move your camera/matte platform 3 ft. to infinity from your subjects without changing focus, thus keeping your matte line uniform. You can expose half your scene at 3 ft., then expose the second half at any distance on out to infinity. You can create giants or Lilliputians using this technique, or even combine miniature sets with live action. Consult your lens' depth-of-field chart for more specific information.

If you will be combining live action and animation (or various camera speeds) some precautions are necessary. Your live action will most likely be shot at 24 fps, exposing each frame for 1/60 of a second. When you backwind, switch mattes, and go to single frame operation, you will be exposing at 1/30 of a second, or one full f/stop lighter than your live action. The solution is to place a neutral density filter, with a density value equal to one f/stop, over the camera lens. Doing this will allow you to use the same f/stop as was used for live action, thus not affecting your matte.

If subjects in separate matte elements are to seem to react to one another, timing of all actions is of critical importance. If your camera has a frame counter use it to time actions; if you have no frame counter, use a stopwatch and you'll come close enough to match most actions.

The question of whether to do your mattes in-camera or by rephotography is relevant only to how the final effect looks on the screen. Remember, the *best* matte effect is that which the audience is totally unaware of. I've given you the basics here. By using and modifying all the foregoing you should end up with high quality, professional looking mattes. ■

All photos shown are actual frame blow-ups from 16mm movie film.



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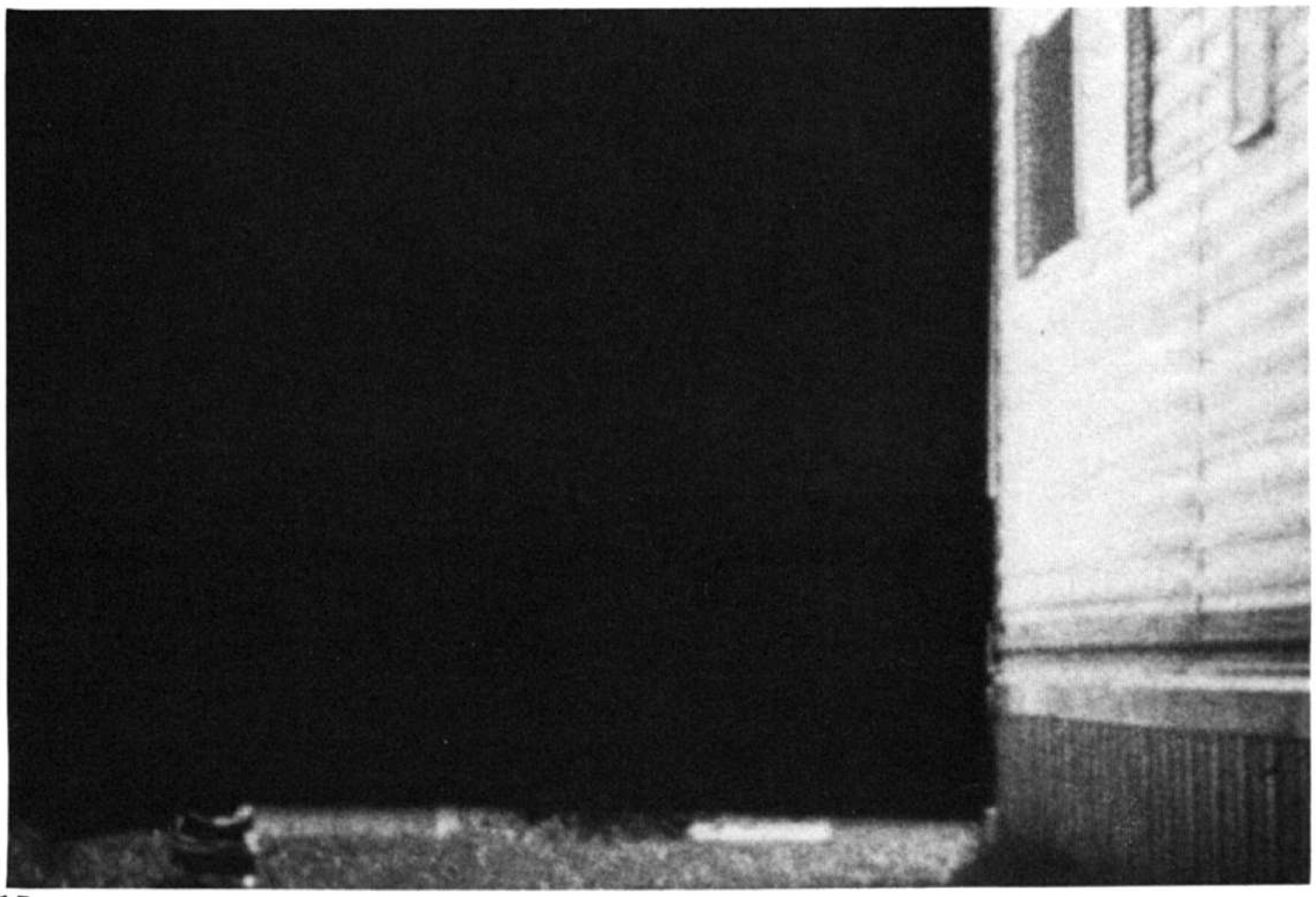

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Right, top: Making a creature walk from behind a building—first, the ground and mobile home are matted out. Middle: Second exposure is of just the ground and mobile home, with the background matted out. Bottom: The completed matte effect.

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FAST ACTING CREAM HARDENER
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Fiberglass: Indestructible Molds For Your Models

Text & Photos by JOHN DODS

"Oops!" you may say as you drop your plaster model mold and watch it break into a thousand pieces.

Plaster of Paris is inexpensive but it is not particularly durable. If a greater degree of permanence is desired, you might want to make your stop motion model molds out of polyester resin and fiberglass materials.

The mold pictured cost about $20.00 to produce. The same mold in plaster would only cost $5.00. But a fiberglass mold can be used to produce many copies of a model, without any deterioration of the fine detail. And best of all, a fiberglass mold will not tend to crack or chip; it won't break easily if you accidentally drop it! You can produce models using cold foam products without the fear that the pressure of the expanding foam will blow the mold apart.

The mold is built up in two layers: the first layer consists of a mixture of polyester resin (30-40%) and a plastic "filler" product also called "auto body filler" (about 60-70%). All of these plastic products can be purchased at auto body repair shops. The plastic filler is not liquid and must be thinned with the resin so that it will flow easily into the fine details of the clay sculpture. After the desired consistency is obtained, a small amount of catalyst or hardener is added to the mixture.

Left: The clay model of a comical dragon stands amidst the materials used for the molding process. The materials pictured cost $55.00 and are enough to make three molds of the size discussed in the text.

How much catalyst you add can be determined by experimentation and reference to the manufacturer's recommendations. I generally use less than the recommended amount because I find that the mixture will otherwise harden too fast (about 8 minutes or less), which doesn't always give me sufficient time to cover the model. This first layer of plastic material need only be 1/16-inch thick.

The second layer — the one that gives the mold its strength — is of a plastic material with added fiberglass particles. This is available under the brand names "Gorilla Hair", "Duraglass" and others. You can even prepare this yourself (and save a small amount of money) by mixing chopped up fiberglass particles into ordinary polyester resin. If you are working with fiberglass, in this way, *always wear a filter mask* so that you do not inhale any particles of glass.

This second layer of the mold should be about 1/2-inch thick or less, depending on how much fiberglass has been added to the plastic base. It's the fiberglass particles that provide most of the strength.

I usually like to further strengthen the seam wall portion of the mold with fiberglass fabric. The seam wall is the area of the mold where the greatest stress will occur during the molding of the positive; clamps or vice grips are used on the seam wall to hold the two halves of the mold together as the cold foam expands.

With this molding process you should work in a well ventilated area — especially when mixing and applying plastic resin materials. It's best to do this outdoors, since a small amount of resin will stink up the entire house. And the vapors are toxic; do not work with these materials for long periods of time, even in well ventilated areas. Be sure to wear cloth gloves to avoid getting these plastic products on your skin. They are very hard to get off and some of them will cause an intense burning sensation.

Mix the resin products in disposable glass or paper containers — it seems to eat through all plastic materials.

Most of the materials mentioned are available through:

IASCO Company
5724 West 36th St.
Minneapolis, MN 55416

Send for their big catalog full of all kinds of molding materials.

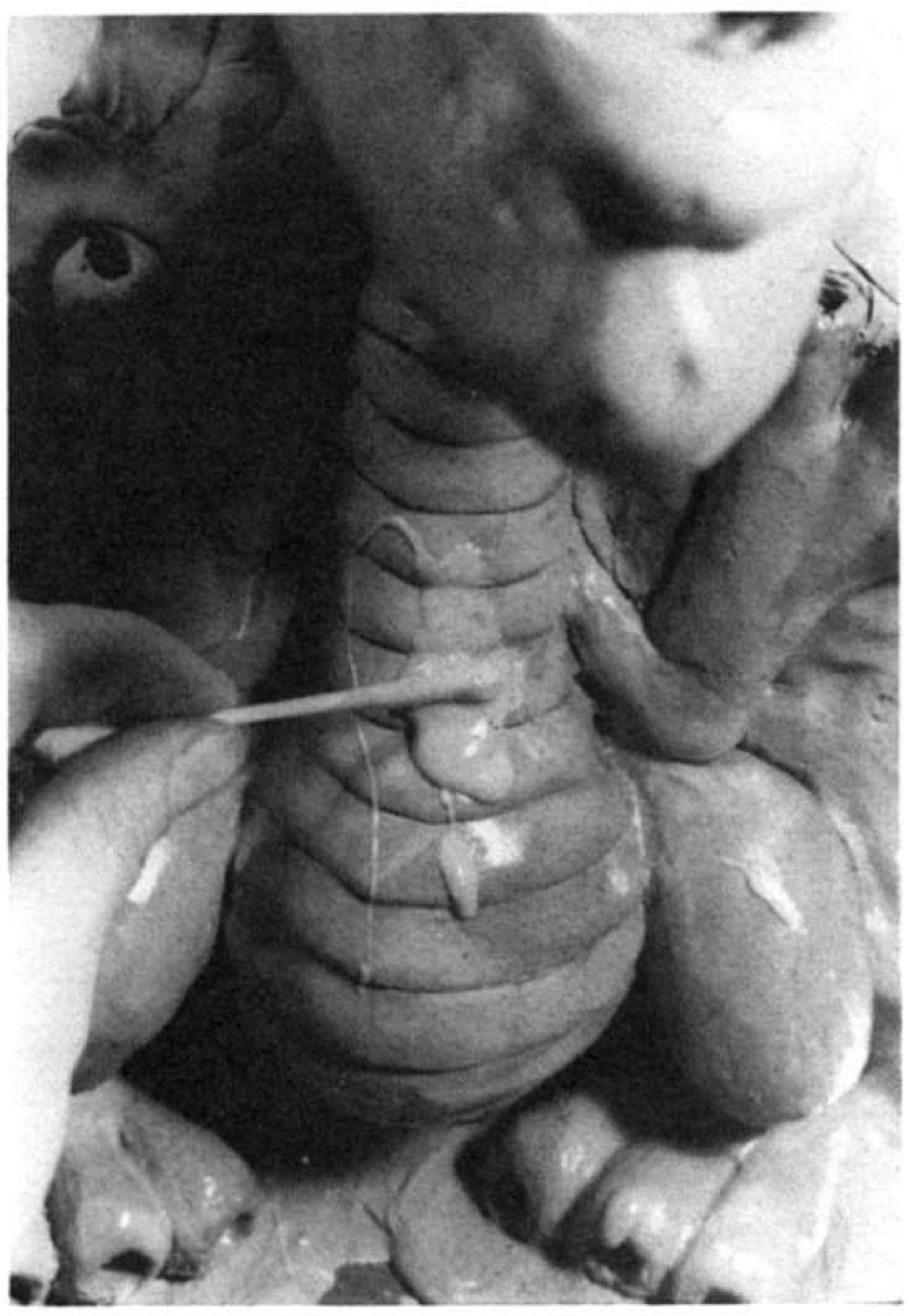
All the plastic products pictured herein were purchased at an auto body shop. ■

COMPLETE STEP-BY-STEP PHOTOS OF CREATING A FIBERGLASS MOLD BEGIN ON THE NEXT PAGE.

1. A clay seam wall is formed around the model. Plasticene clay is used.

2. The model is sprayed with Exxit II release agent. Apply liberally to prevent the plastic materials sticking to the clay.

3. Auto body filler mixed with polyester resin is applied.



4. The filler and resin should have a fluid, but not runny, consistency.

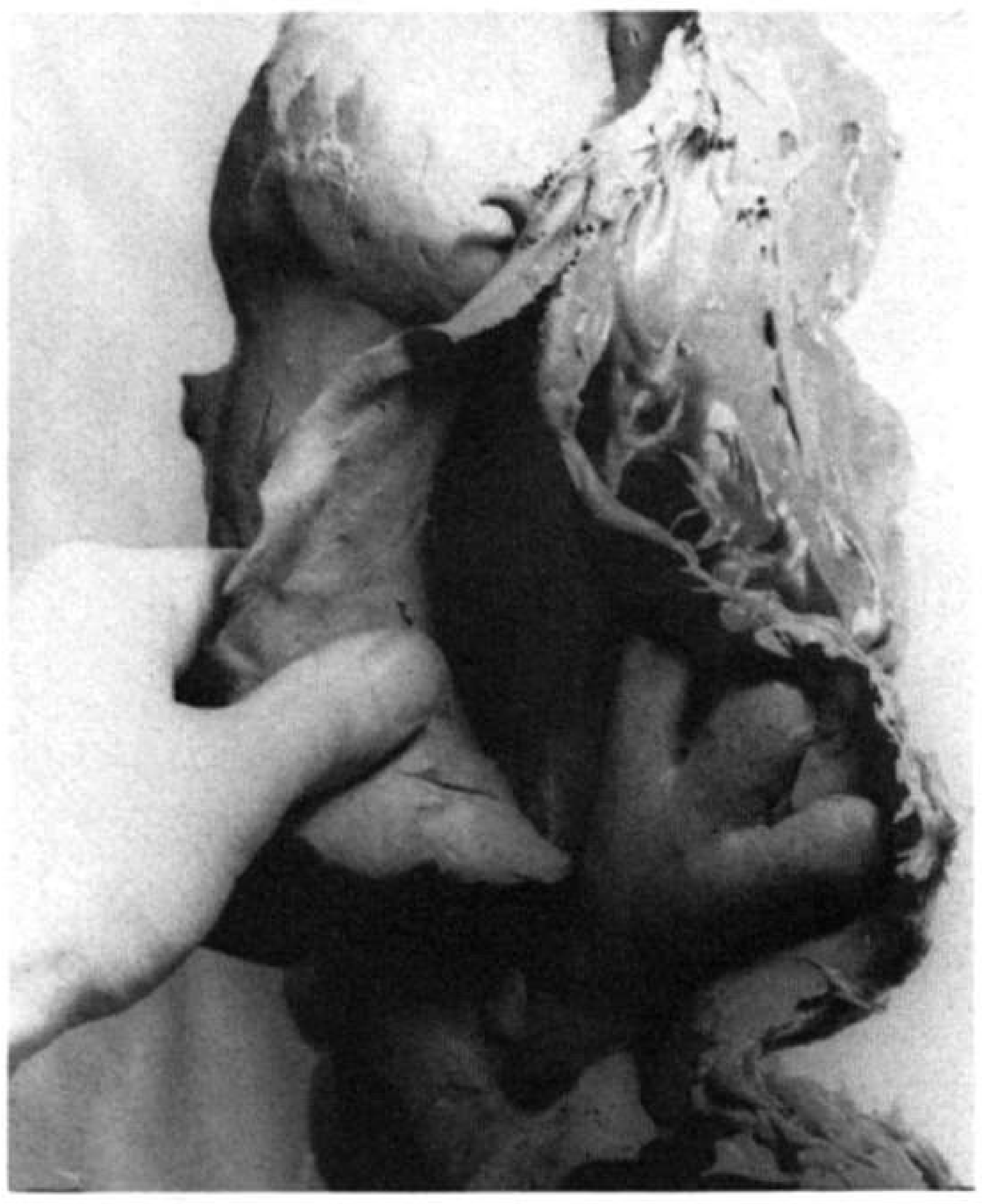
5. The mixture is applied carefully with a Q-tip so as to not deform detail areas.

6. The first coating of the front half is finished.

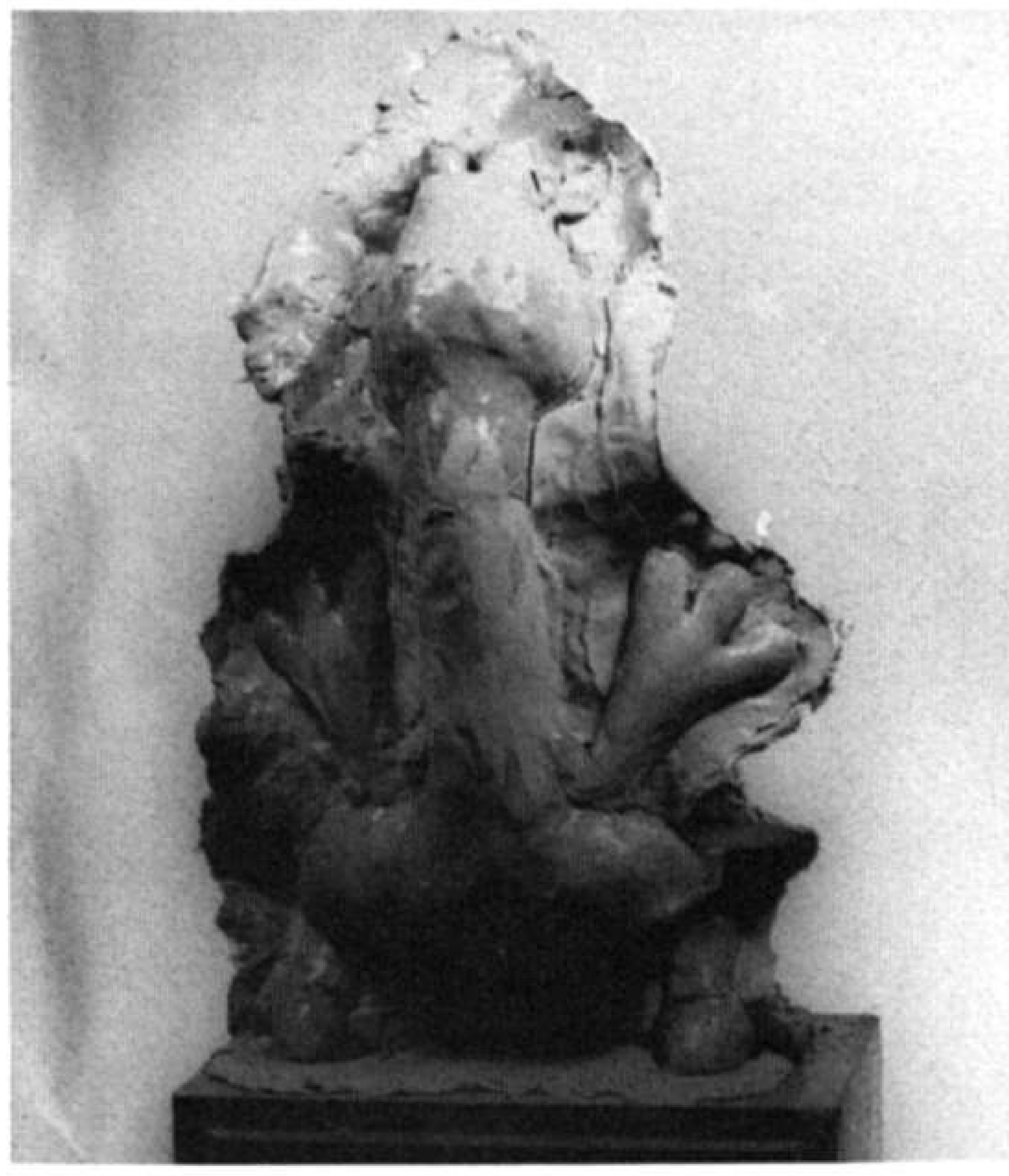
7. The second layer of polyester resin with added fiberglass particles is applied.

8. The edges of the mold (seam walls) are reinforced strips of fiberglass cloth.

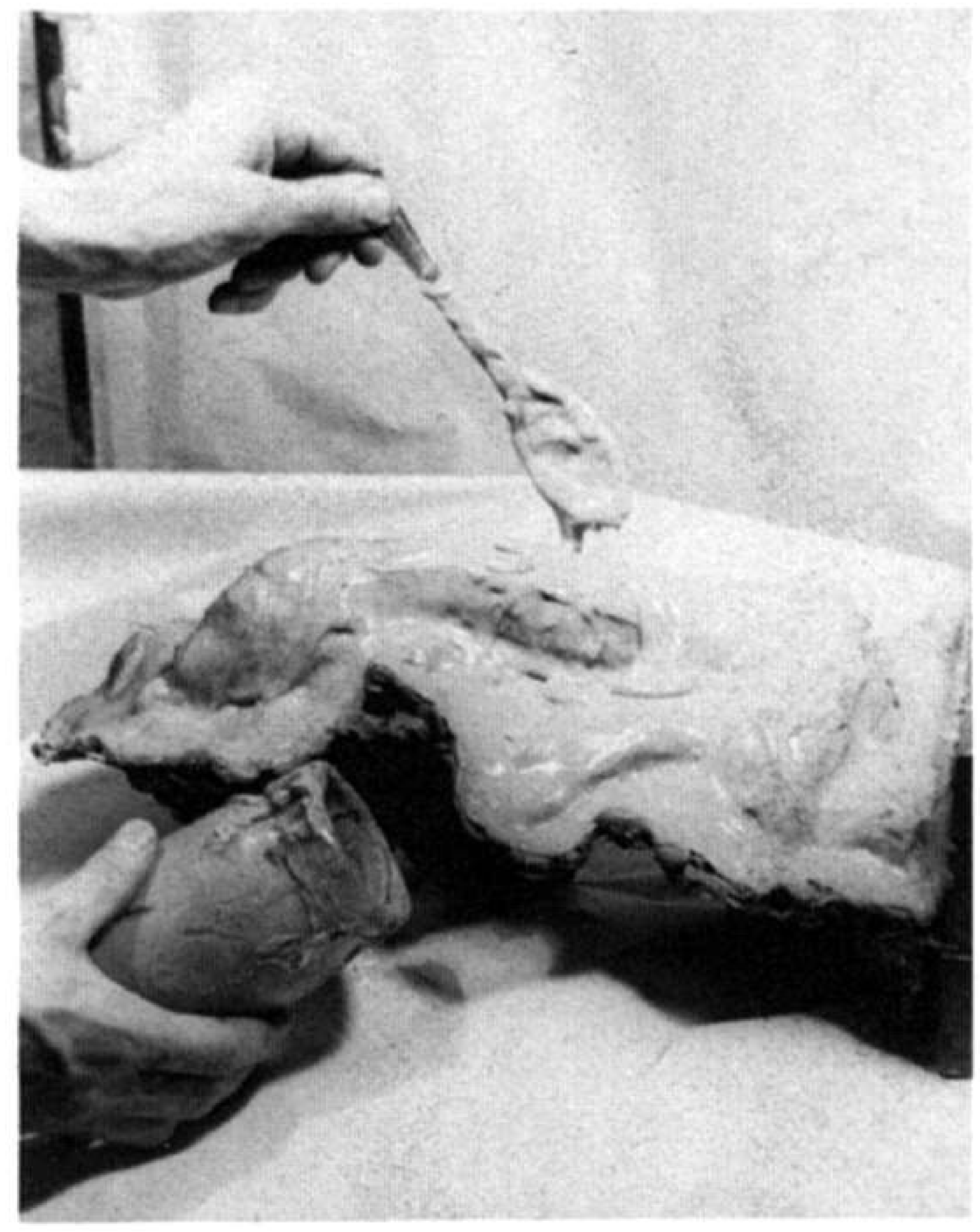
9. The front half of the mold is finished. The thickness should be about ½-inch, although it can be less if a great deal of fiberglass particle is mixed into the polyester resin. The mold should be totally hardened (dry) within one-half hour.



10. Clay seam wall is removed, revealing the hardened backside of the front mold.



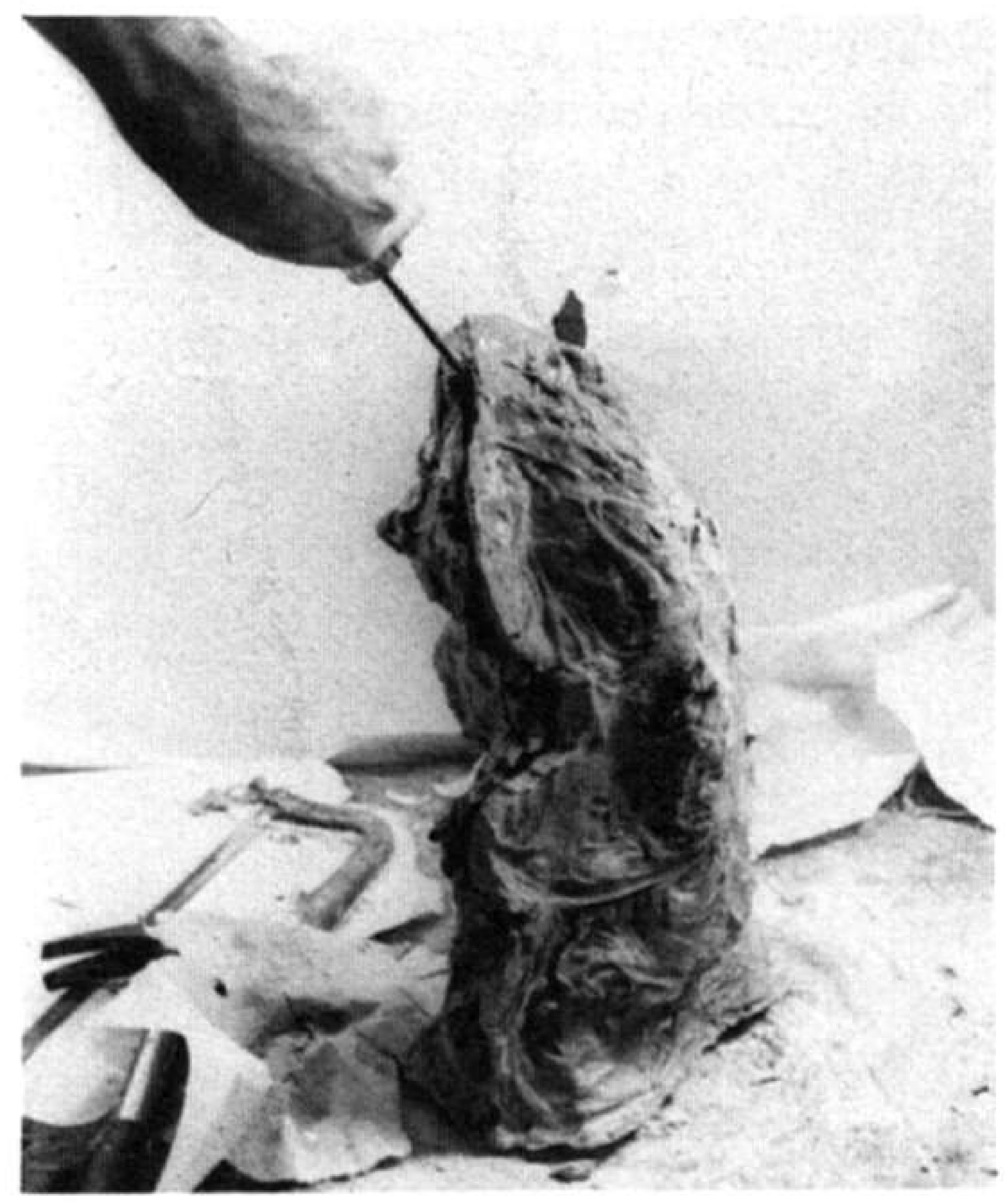
11. The back half of the model *and mold* are sprayed with release agent.



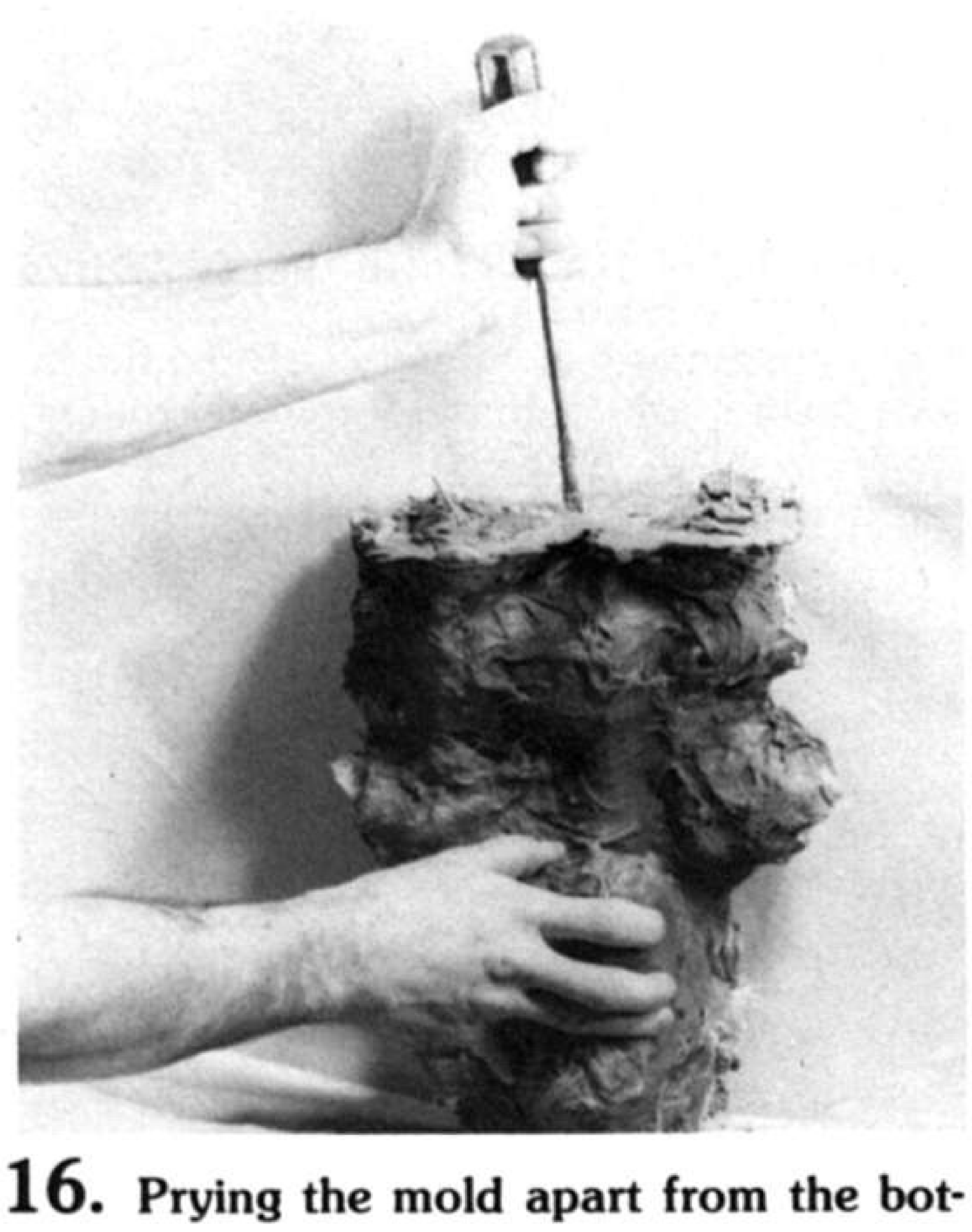
12. As in photos 3,4 and 5, the back half is covered with the polyester resin/plastic filler mixture. With the front half hardened, the model can be laid sideways, which is easier to work with.

13. Applying the Duraglass (fiberglass and plastic), which is the second coat. The edges are again reinforced with fiberglass cloth.

14. Both halves (front & back) of the mold are complete.

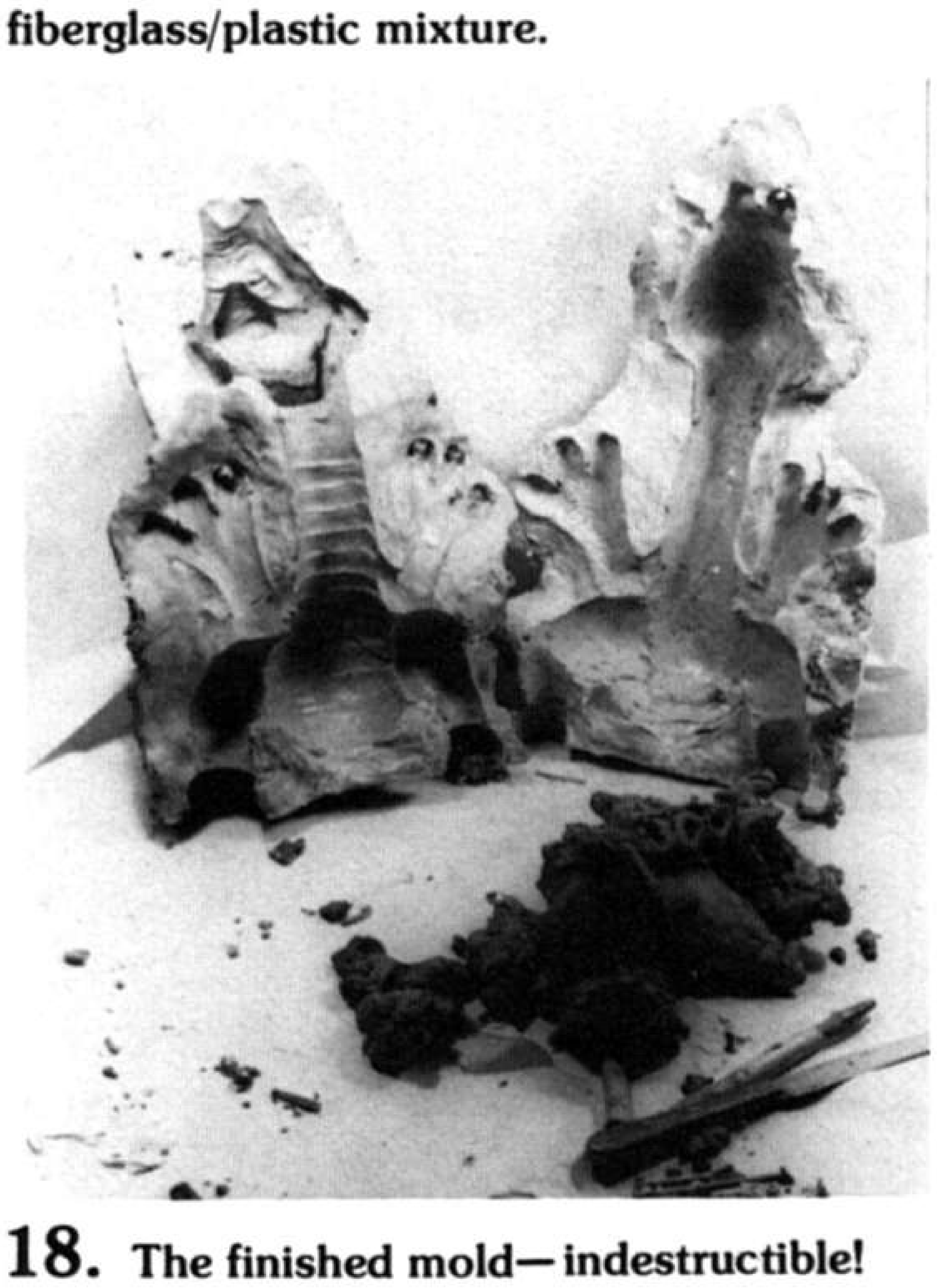


15. Carefully and slowly pry the mold apart with a screwdriver. If at this point the mold starts to crack, or doesn't seem strong enough, reinforce it with more fiberglass/plastic mixture.



16. Prying the mold apart from the bottom.

17. The clay sculpture, now not needed, is pulled from the mold. If any clay sticks to the mold, it can be removed by scrubbing with a wire brush and lots of cold cream.



18. The finished mold—indestructible!

Surface Gauges

by JOHN DODS

Does your dragon appear nervous? Has your dinosaur got the jitters? Your cyclops having trouble walking a straight line without faltering? If unsmooth and unsure movement afflicts your animation model epics, maybe you haven't been using a device that most professional animators always keep handy: a surface gauge.

I have interviewed four talented animators experienced in gauge use for this introduction to the subject:

ERNEST D. FARINO — Special effects and stop motion specialist who designed and executed the titles and opticals for the film *The Alien Factor*, animated the creature in the movie *The Strangeness*, and has done several local and national stop motion commercials (including recent Pillsbury Doughboy spots).

DOUG BESWICK — Sculptor, armature maker and animator who worked with Rick Baker on several of the aliens appearing in the popular cantina sequence of *Star Wars* and has recently completed animation chores for *The Empire Strikes Back*.

RICK CATIZONE — Pittsburgh designer, effects creator, and stop motion animator who has filmed many local TV spots, including a fantasy-filled commercial for QUESTAR Magazine's Celebrity Convention II in 1979.

WES CORLISS — Film student, animator, and artist who is currently studying film production as a member of the U.S. Navy.

WHAT IS A SURFACE GAUGE FOR?

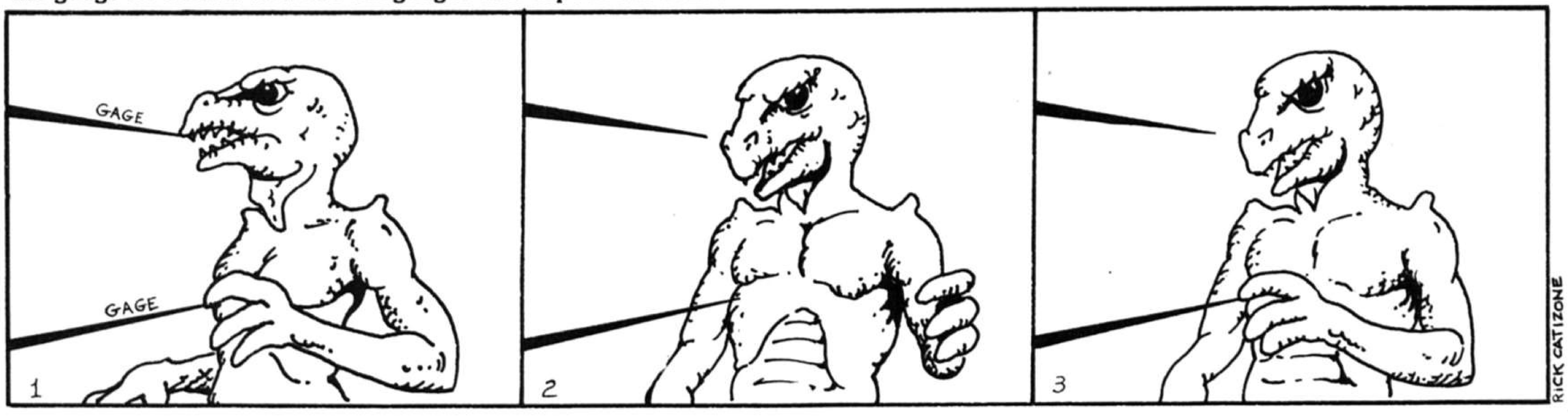
Ernest Farino explains: "A surface gauge, also known as a 'head gauge' or 'center finder' is an adjustable pointer on a base and originally designed for machinists. However, even a piece of sturdy, bendable wire on a wooden base would serve the same purpose.

The principle is such: the gauge is placed on the set near the model and the pointer is adjusted to point at any reference point on the figure (the tip of a horn, a nose, etc.) The model is then moved to its next position. Since the pointer of the gauge remained stationary while the model was being physically moved, the tip of the pointer represents, in effect, the 'last' position of the model. Since one can't refer to previous drawings in a series (as with cartoon animation), the gauge helps the animator check the distance of the move, to see if the figure is moving in the proper position, in a straight line, or whatever the case may be." Before the frame is exposed, of course, the gauge must be removed from view.

Rick Catizone adds: "The primary use of gauges is to provide reference points needed in order to obtain a desired movement. For example, if you want a creature to start to turn his body in advance of the head, you put the gauge on, say, the tip of the nose. After moving the body into its first position, you will have repositioned the head also because of the simple fact that everything is solidly jointed. So you must then turn the tip of the nose *back to the gauge you initially lined it up with*. The result is that the head appears to remain in the same position even though the body has begun to turn."

Further, "The careful use of gauges

Below: The movement—creature turns to its left with its body leading the motion. 1. Gauges are positioned. 2. Model is turned the appropriate distance; we also position his head lower so that it arcs through the turn. 3. Turn back the left arm until the forefinger touches the gauge as before. Remove the gauges and expose the frame.



will help to make the animation smooth," as Doug Beswick points out.

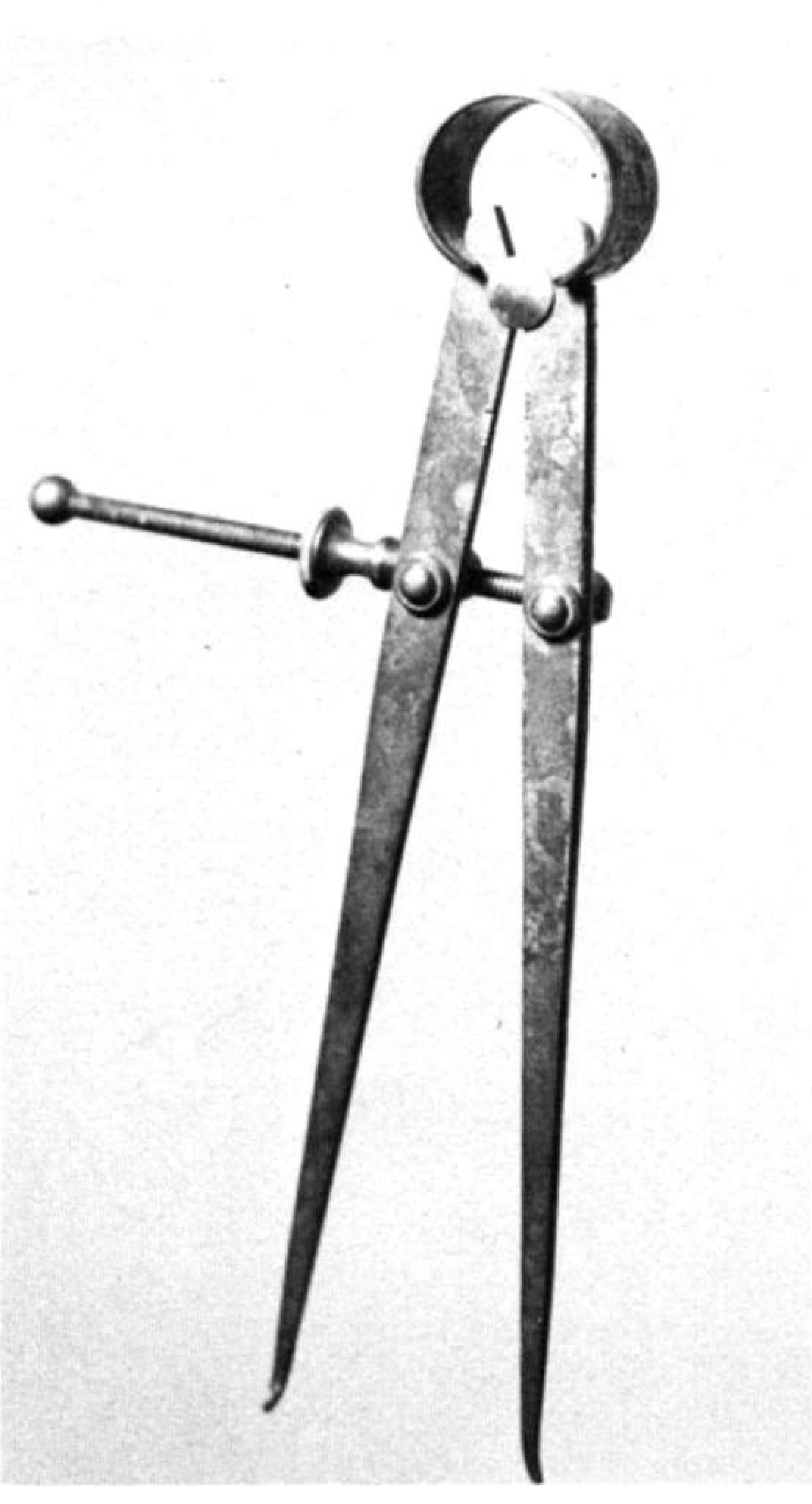
KINDS OF GAUGES

The pointer type of gauge is the most commonly used. These are available in different sizes from suppliers of precision tools such as the L.S. Starrett Company, Athol, Massachusetts 01331. The use of taller gauges (around 18 inches) makes it easier to keep the base out of the scene — the animator can pivot the pointer in and out of the frame. Short gauges are useful when work space is restricted.

But professionally manufactured gauges can be expensive, with an average price of about $35.00 each. And as Farino has pointed out, a piece of bendable wire (sculptors' armature wire is ideal) anchored to a wooden base will work fine, although it will take longer to adjust this sort of gauge.

A better homemade gauge — the kind I have built for myself — is an arrangement of armature-type joints with a rigid wire tip. This is assembled out of washers, stop-nuts, and mending plates, materials which are readily available from a hardware store. See the illustration within these pages which shows the construction of this gauge.

There are other ways of gauging model movement, too. A novel and useful technique involves the use of *projected light*. To set up a "light gauge" a 35mm slide projector is mounted on a camera tripod so that it can be adjusted easily for tilt and left/right movement. Then, a piece of thin cardboard, cut to the size of a normal 35mm slide, is punched with one (or more) pin holes and used to project a dot (or dots) of light onto an appropriate part of the model's anatomy (the eyes are usually a good place). When the model is moved, the dots of light remain in position — representing the place where the model *was*. Therefore, as with the pointer gauge, the animator knows exactly how much he has moved the model and in which direction. Before the frame is exposed the projector is simply turned off, or pointed away from the model. This projected light style of gauge is particularly helpful when there is no convenient area to place a surface gauge.



Above: Rick Catizone gauges his model with a professionally bought gauge. Left: A caliper type gauge, useful for mouth movements. Below: Carl Paolino's homemade gauge (see text).

The pointer gauge has to be placed fairly close to the model (which isn't always possible); where the "light gauge" can be placed several feet away and still be effective.

Another type of gauge is a "thread caliper" (see photo). This is handy for gauging the opening and closing of a model's mouth. Student animator Carl Paolino has found another use for the caliper gauge. He uses a caliper modified with a small piece of wood (which is calibrated) to gauge the leg movements of his puppets. This was used effectively in Carl's tabletop film, *Grimalkin*.

Rick Catizone will sometimes make a "throwaway guide" to gauge a model. "Sometimes I quickly cut an arc (when a model must pivot or such) and mark on it a scale for the appropriate distances and number of frames. These guides do not need to be elaborate, only *accurate!*

Similarly, Farino adds, "If a creature's tail is to be swishing along the ground, tracing its shape on the stage (provided this surface is not visible to the camera, of course) helps keep a running idea of the tail's curving pattern. Markings like these are common."

ANSWERS TO SOME SURFACE GAUGE QUESTIONS

We asked the four animators contributing to this text some specific questions about the use of surface gauges:

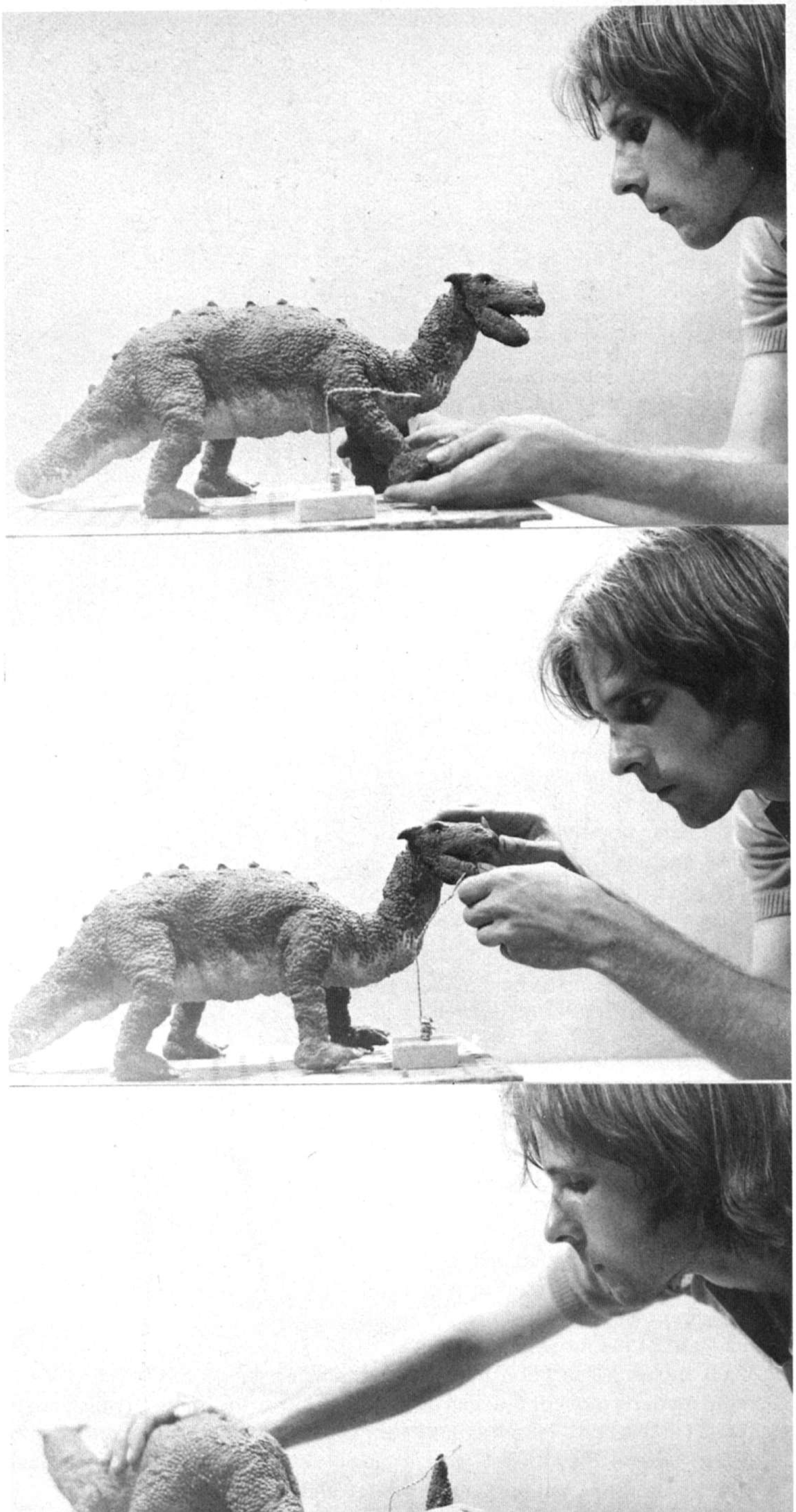
Do You Always Use A Surface Gauge?

All the animators we asked almost always use a gauge. Doug Beswick, however, animated the "dying spider" sequence in *Planet Of The Dinosaurs* freehand. Ernest Farino animated an alien "hand" (with writhing tentacles) emerging from a spaceship for the title sequence in "*The Intergalactic Picture Show* without the use of a gauge because "...there was no where to place a gauge while working. This was a case of being forced into a situation in which I might have otherwise wanted to use gauges, but despite a few rough spots it turned out alright."

Is It Ever Useful To Animate With More Than One Gauge?

Beswick mentioned animating a difficult maneuver in *Planet Of The Dinosaurs* in which one dinosaur lifts another during a fight sequence. Three gauges were used to control the movements, with one gauge each at the model's head, back, and tail.

Farino created a stop motion version of the electric company character "Reddy Kilowatt" which was animated as a 10-second tag for a series of TV spots. He elaborates: "Dressed in western chaps, the character has to lasso the logo of the local southwestern electric company. Since the thin 'electric bolt' nature of Reddy prevented the use of a conventional armature, his body was articulated mainly by flexible wire. The lasso was also heavy wire covered with rubber. Keeping track of his arms, the lasso, and his basic body posture — particularly in fighting the natural 'spring' of the wire — required three gauges for most frames of the action."



Photos: Richard Geiwitz

Above: Baltimore artist Larry Schlechter uses his homemade wire-type gauge to position various points of his dragon model.

When You First Began Using A Surface Gauge, Did Your Animation Improve Noticeably?

Corliss: "Yes. Gauges are expensive, but worth it."

Catizone: "Yes, somewhat."

Beswick: "Yes."

Farino: Certain aspects improved, and certain complex moves involving both primary and secondary action were more controllable."

For Smooth Animation What Is More Important, A Good Armature Or The Use Of Gauges?

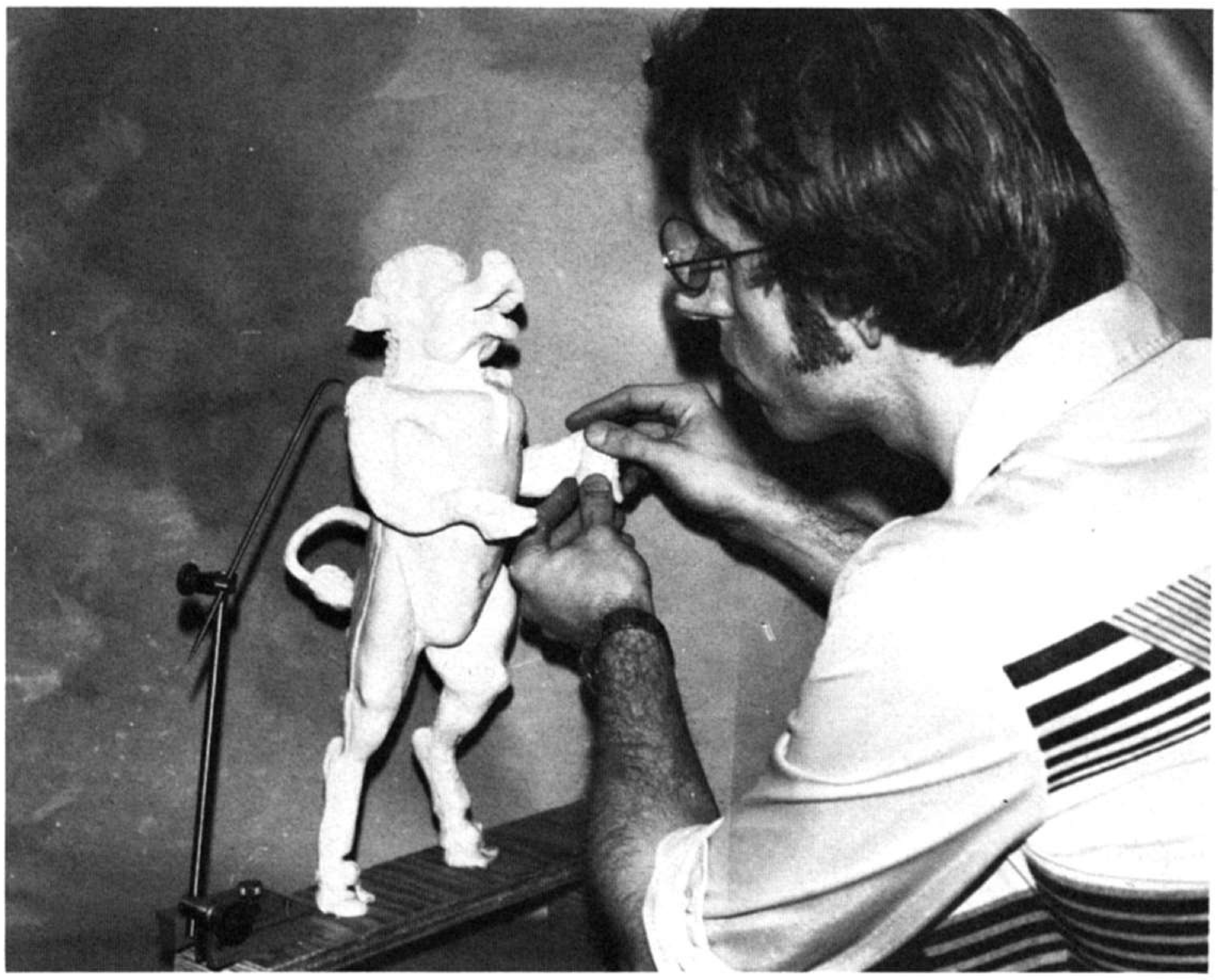
Farino responds, "They are equally important. However, one should not lose sight of the realization that both are merely tools for achieving a final result. Don't get caught up in the quest to build the 'ultimate armature' (as I once did) or put too much reliance on the use of a surface gauge."

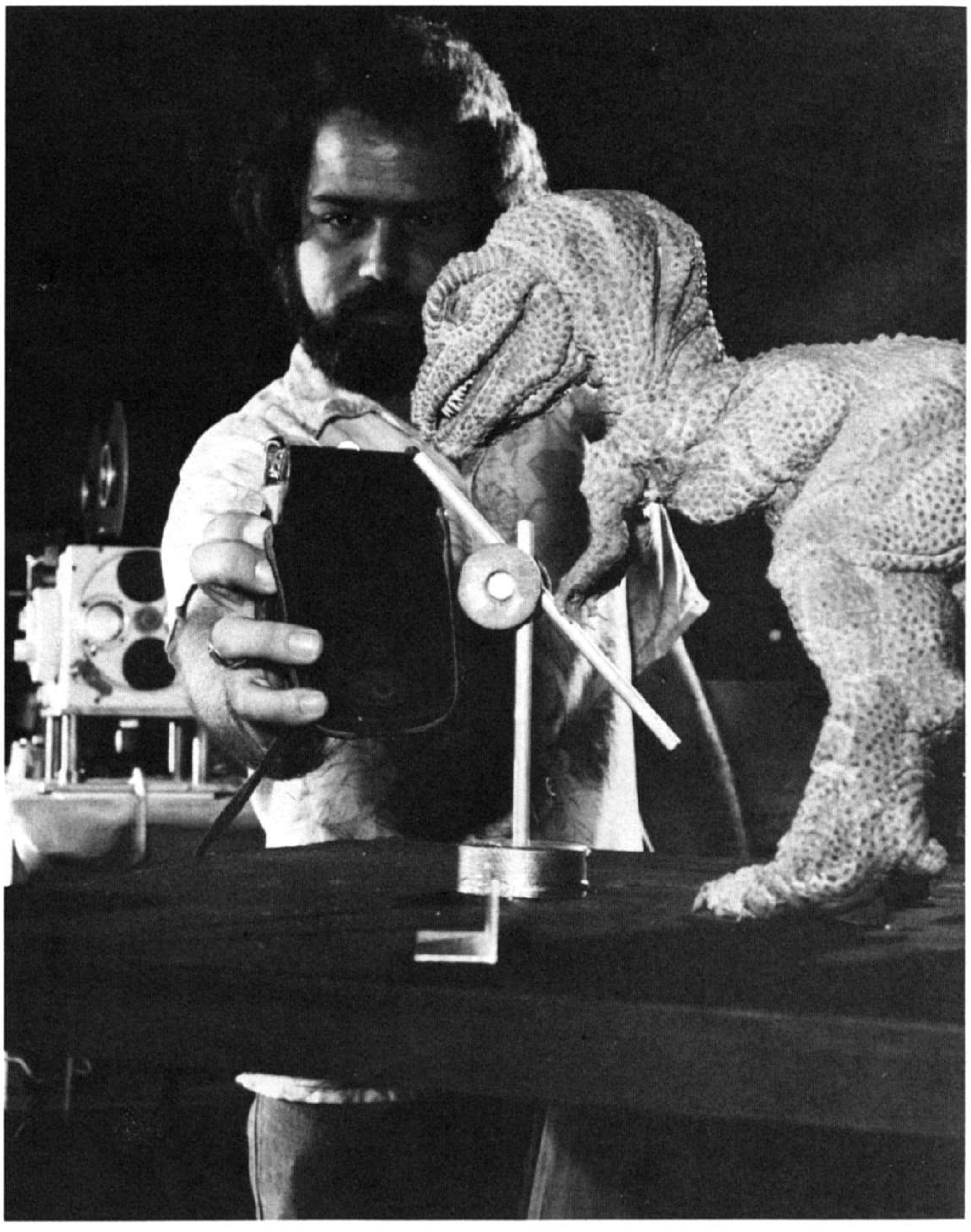
Rick Catizone adds, "An armature must have a certain *minimum* degree of precision. There is a point where a good wire armature is better than a poorly made metal ball and socket one. A good armature insures better control of the model, and a gauge can insure uniform movement when coupled with a good eye and mind."

For Good Animation Is There Some Factor More Important Than Either A Good Armature Or A Surface Gauge?

CATIZONE: "Yes — an accurate eye, because you're using judgement to continue moving the model. After all, a gauge only tells you where the model is. How *far* you move the model is a *judgement* you must make. You should strive for character in the movement more than smoothness. Look at Saturday morning cartoons — some of them do have smooth movement, but it's often inaccurate or lifeless movement. There's a great deal of difference between 'moving' something and 'animating' it.

CORLISS: The most often overlooked factor is getting into character. The animator 'becomes' the model and acts *through* it, giving it nuances of expression and feeling that ultimately reflect in the on-screen believability. In other words, you just don't grab the model and animate. You must 'put yourself in the model's shoes,' concentrate, daydream wide awake, and see





Top: Wes Corliss gauges a stop motion bull. Bottom: Steve Michael's gauge is made of metal tubing and wood.

it come alive before your eyes."

FARINO: Inate ability and concentrated training in the principles of animation and movement will result in quality animation. The surface gauge is merely a tool used to achieve that end. It is no magical solution to the secret of animation."

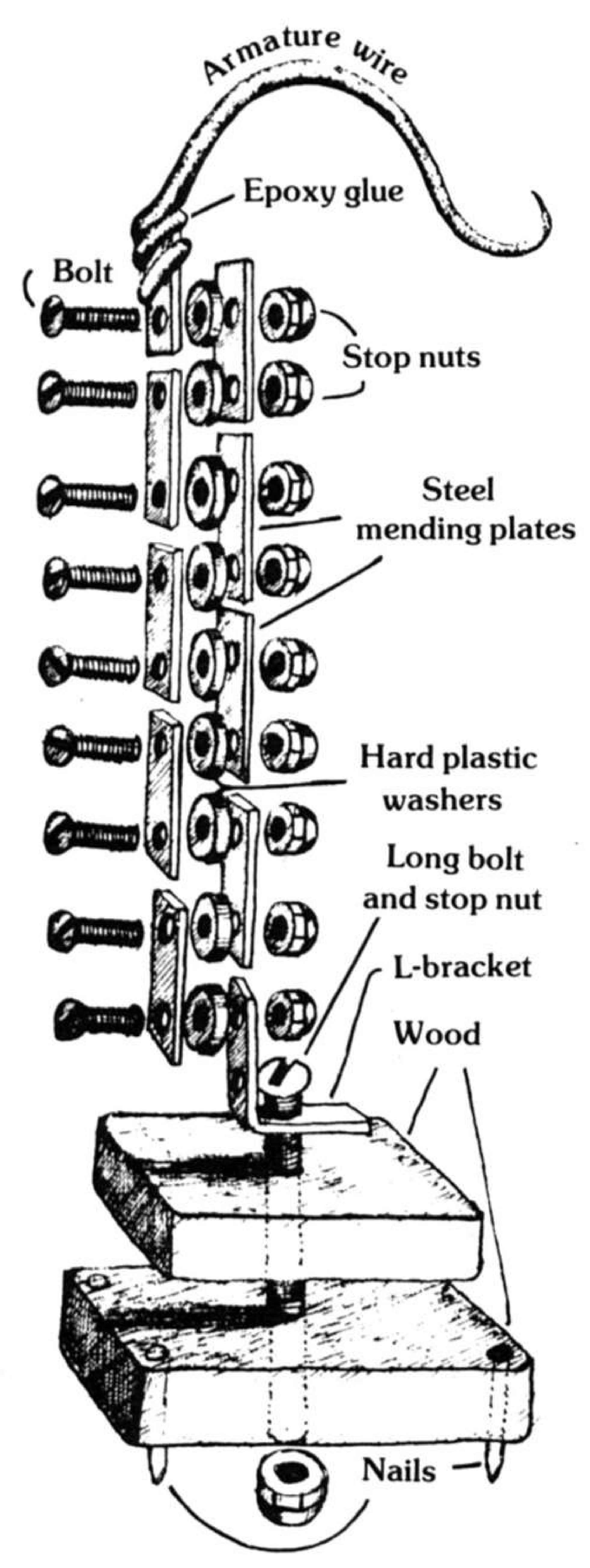
Farino's final comment seems to sum up the effect of using surface gauges in relation to achieving smooth, realistic animation; a gauge is only a useful tool to *aid* the animator. If it is used properly, in conjunction with an insightful mind's-eye view and a feeling for the model you are animating, it can help tremendously in achieving smooth results.

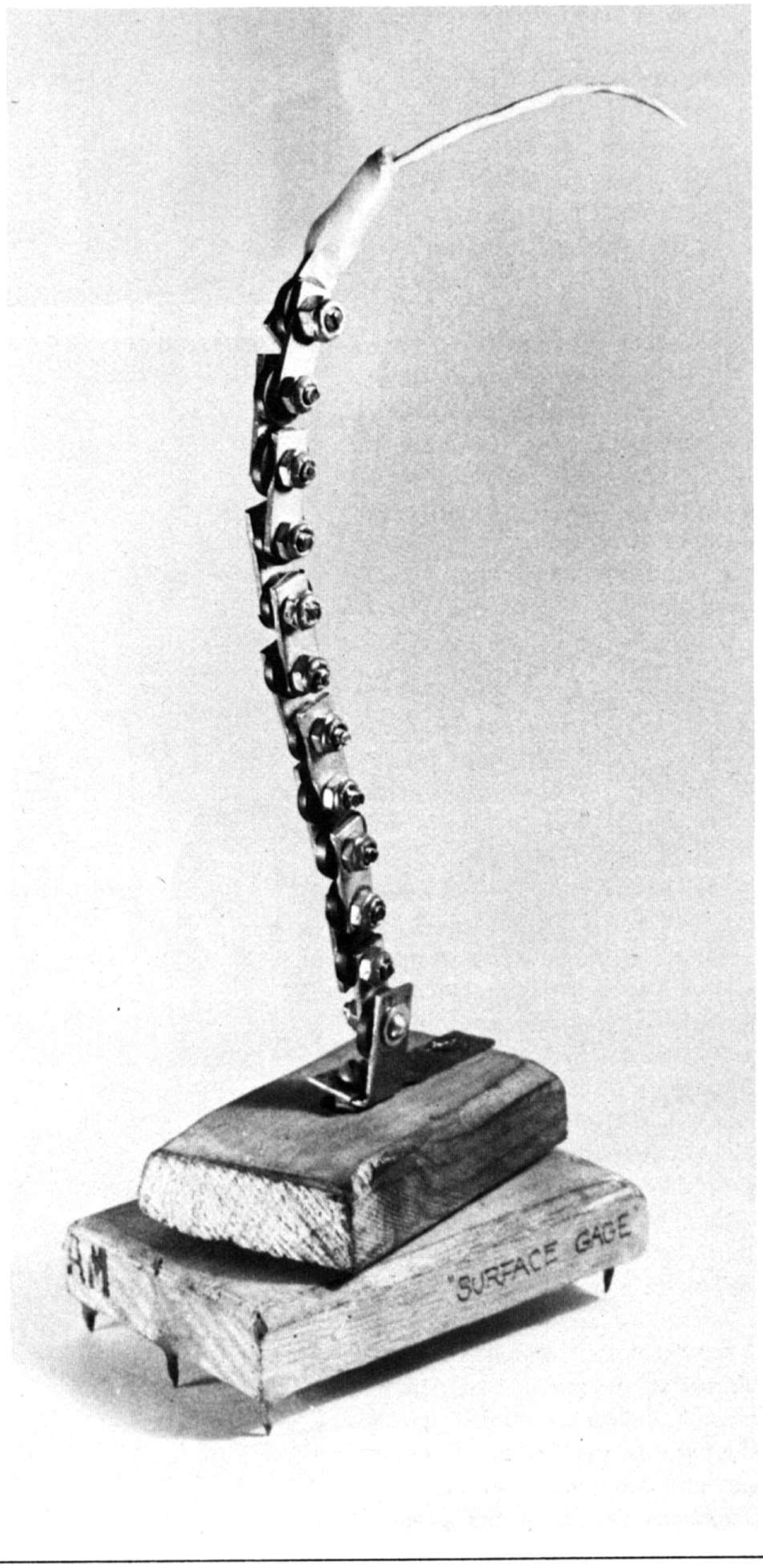
Farino summarizes that a surface gauge "...is a tool, a device, and an aid to animation. It is not always necessary, but it sometimes helps." ■

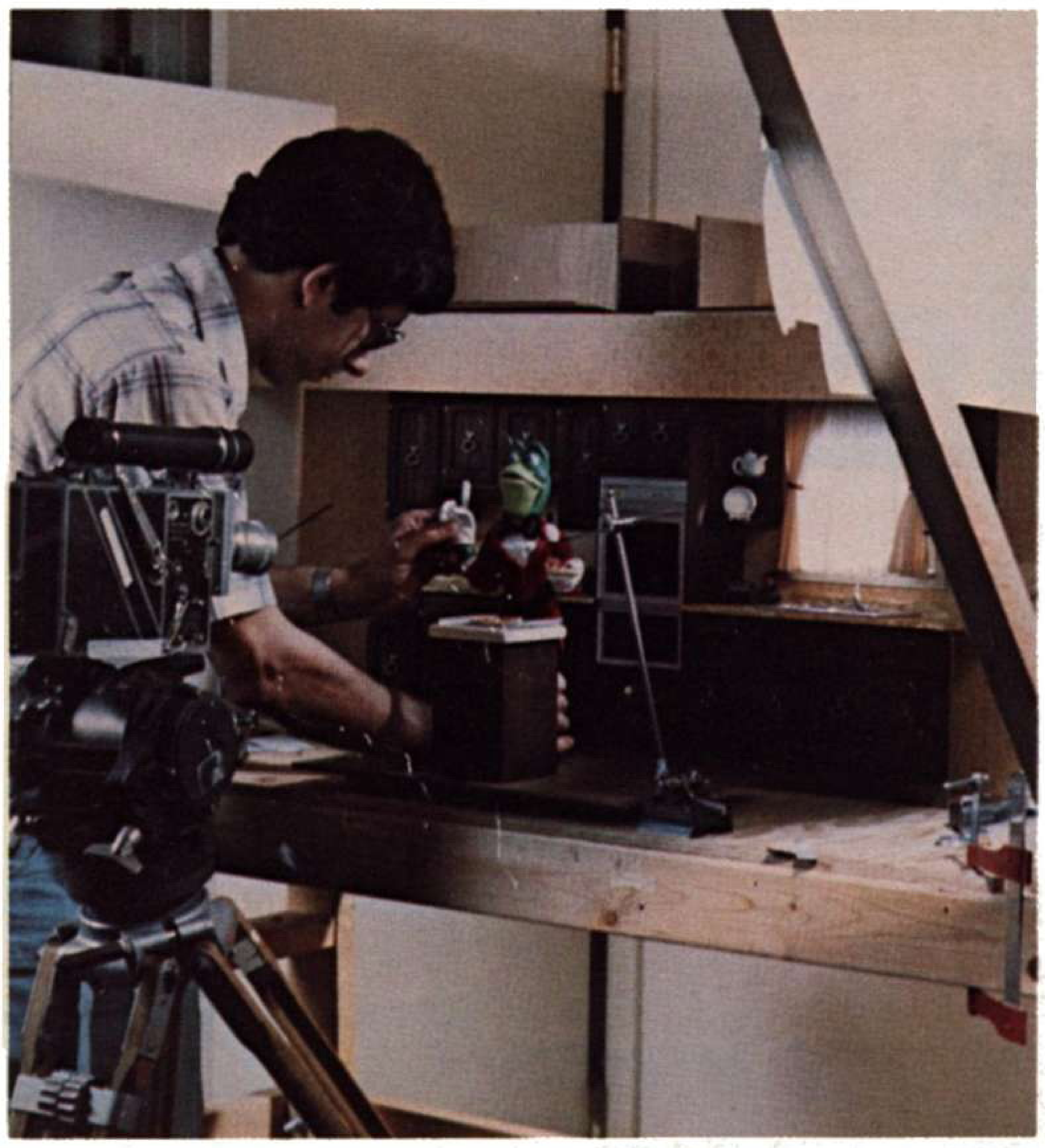
Color Page (clockwise from top left): Pittsburgh animator Rick Catizone gauges "Harry the Frog" in a TV commercial for pizza (model & set built by Rick)● Three Starret gauges were used by Rick to keep track of this dragon's movement for a Questar Magazine commercial● Animator Doug Beswick (*The Empire Strikes Back*) gauges his Diatryma model & miniature spear● Ernest Farino checks the shot and positions gauges for a "Bocce Ball" game show commercial● John Dods uses *light* to gauge a creature in *Forest Story*.

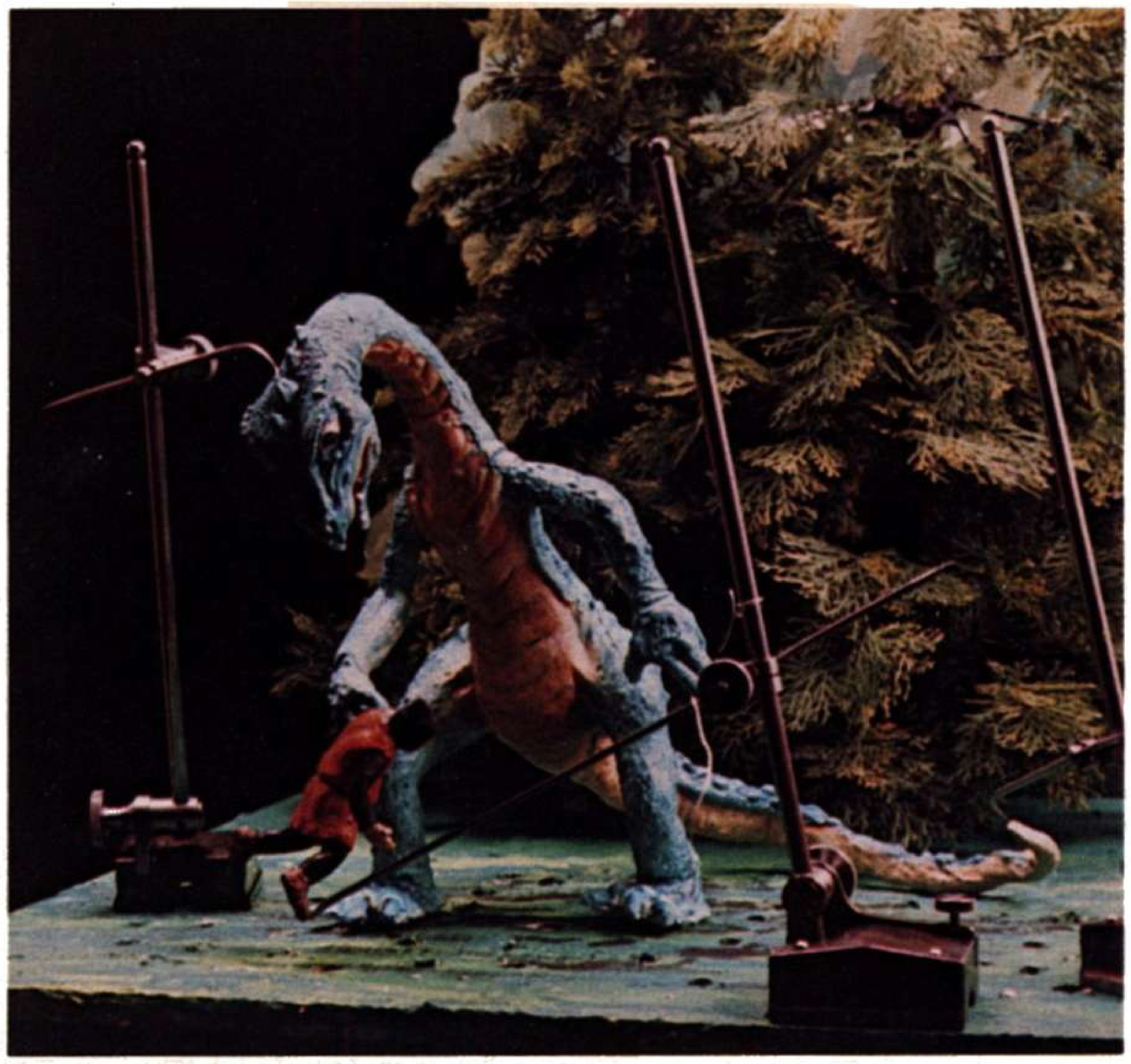
MAKE YOUR OWN SURFACE GAUGE

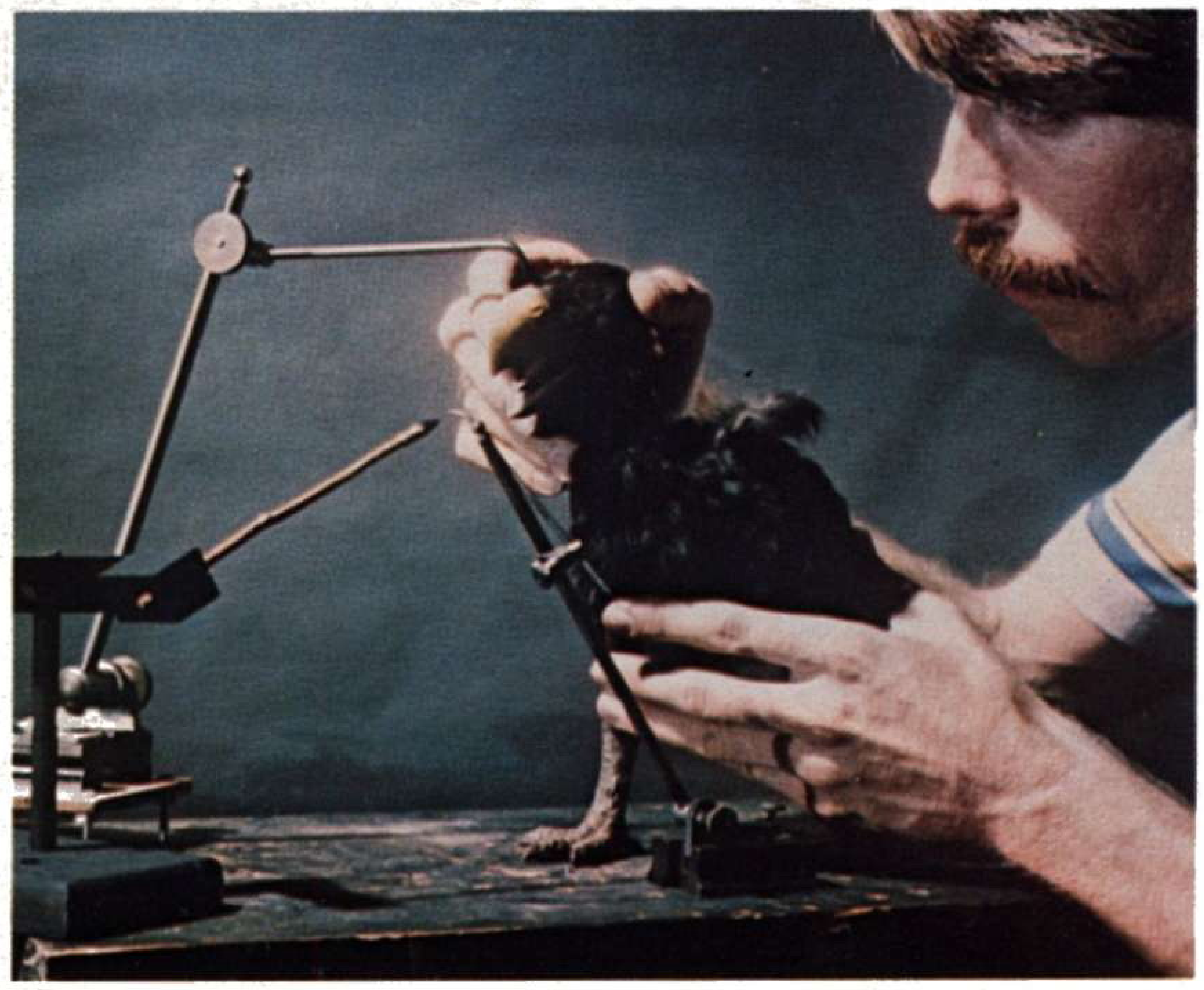
All of the parts shown in the drawing are available at your hardware store. Right: What the gauge will look like if you follow my blueprint drawing. Cost: $5.00.











A Guide To Basic Rear-Projection

The projection of color slides scenes onto a translucent screen in back of your stop motion models is a basic, simple, and inexpensive method of creating scenery. The rear-projection process enables you to shoot against realistic backgrounds; it eliminates the need for extensive set construction. This technique is so versatile that changing the set can be as simple as changing the slide in the projector. The basic equipment needed are a slide projector and some suitable rear-projection material.

PROJECTORS

Any type of slide projector can be used for rear-projection, but certain features will make it easier to get good results. An auto focusing projector will keep the image sharp — units without this feature won't correct if the slide warps from the heat of the lamp and throws the picture out of focus, which will necessitate a continual *manual* adjustment on your part.

A quartz-type lamp in the projector will maintain most of its true brightness and color quality during its long life-span, where the more conventional (but cheaper) lamps not only lose brightness as they age, but get "warmer" in color as well. Such changes may show on your animation footage if you are doing a long take of perhaps 6 hours or more, with the projector running continuously.

In any case, use a projector that yields a bright image — this will make it easier to get good exposure. If you must buy a projector I would recommend comparing several different models for light output. You *cannot* determine which projector gives the brightest image by comparing lamp wattages; other factors, such as construction, size, and reflector design of the lamp can make a big difference. A projector using a 500 watt lamp will not necessarily give a brighter image than one using a 300 watt lamp. The safest way to check the brightness of any given projector is to project its light (without a slide) onto a sheet of white cardboard at a distance of 6 feet and take a light meter reading. This will give you a truer account of the actual projected light.

Keep in mind that the center of the projected image is always brighter than the edges. This is the "hot spot" that must be minimized. The lens greatly affects the hot spot — with some wide angle lenses there may be as much as 3 f-stops (camera lens openings) of difference in light value between the center of the picture and the edges. With "normal" lenses (about 4 inches on a 35mm projector) the difference in light value will be more like 1½ f-stops, which is more acceptable for rear-projection work. Of course, when setting up your background, the edges of the projected image can sometimes be "cropped" away — not included within the camera's viewing frame. This will eliminate the worst of the light fall-off at the edges of the image.

If you don't have time to test projectors, I would like to recommend the Kodak Carousel line. I have been using their most expensive model (#850, but the model numbers are probably different these days) for 12 years, and despite rigorous use the only problem I have had is a squeak that developed only recently. When I worked in a camera store, the Kodak models were the only ones we sold that rarely came back for repair.

BACKGROUND SIZE & SCREEN MATERIAL

In getting your rear-projection large enough, there are three things to keep in mind: 1). The farther the projector is from the screen, the larger the picture will be. 2). If you are working in a small area you may have trouble getting the background as large as you would like it. 3). A wide angle lens could help but is not recommended because of the severe hot spot it will produce.

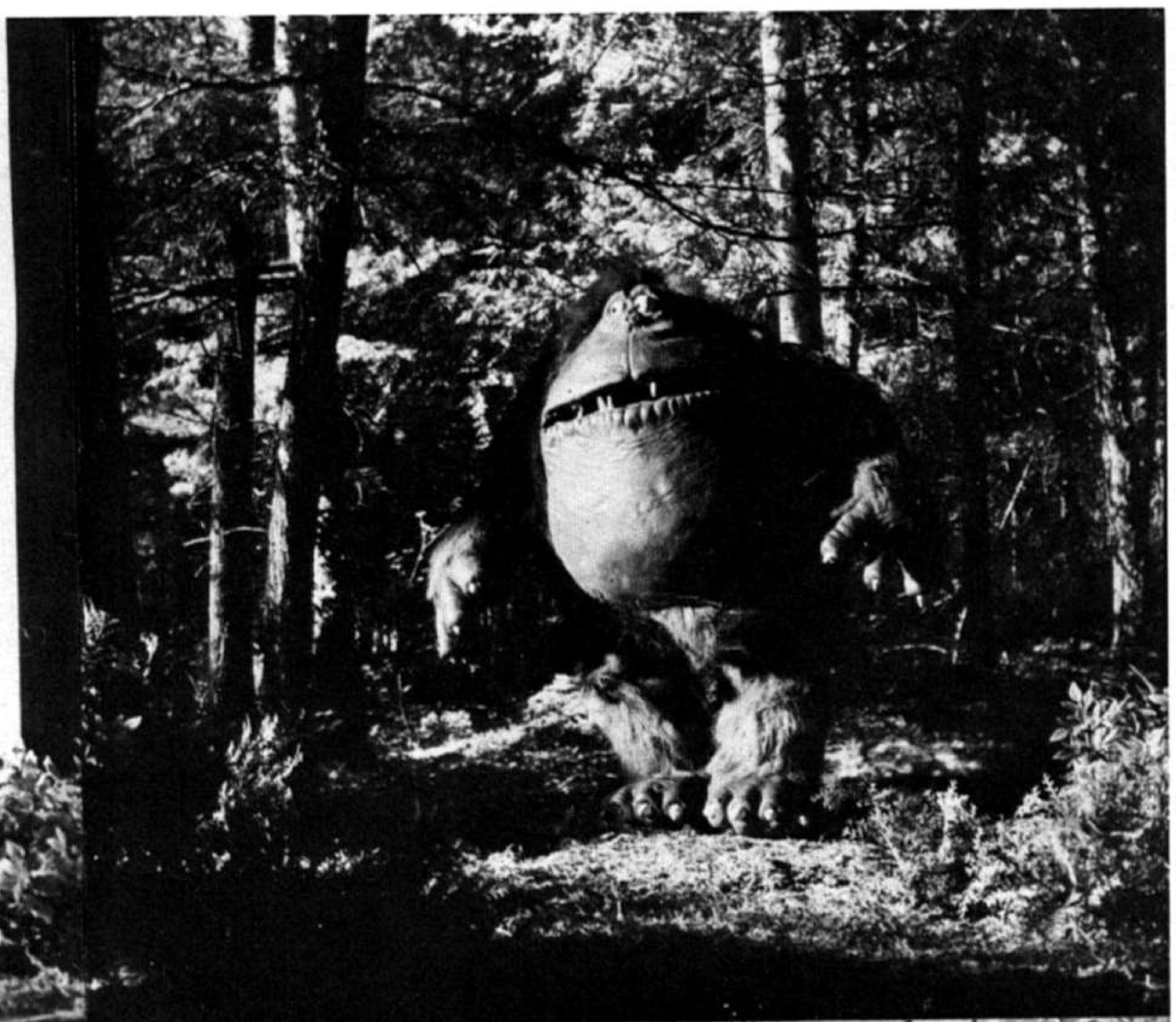
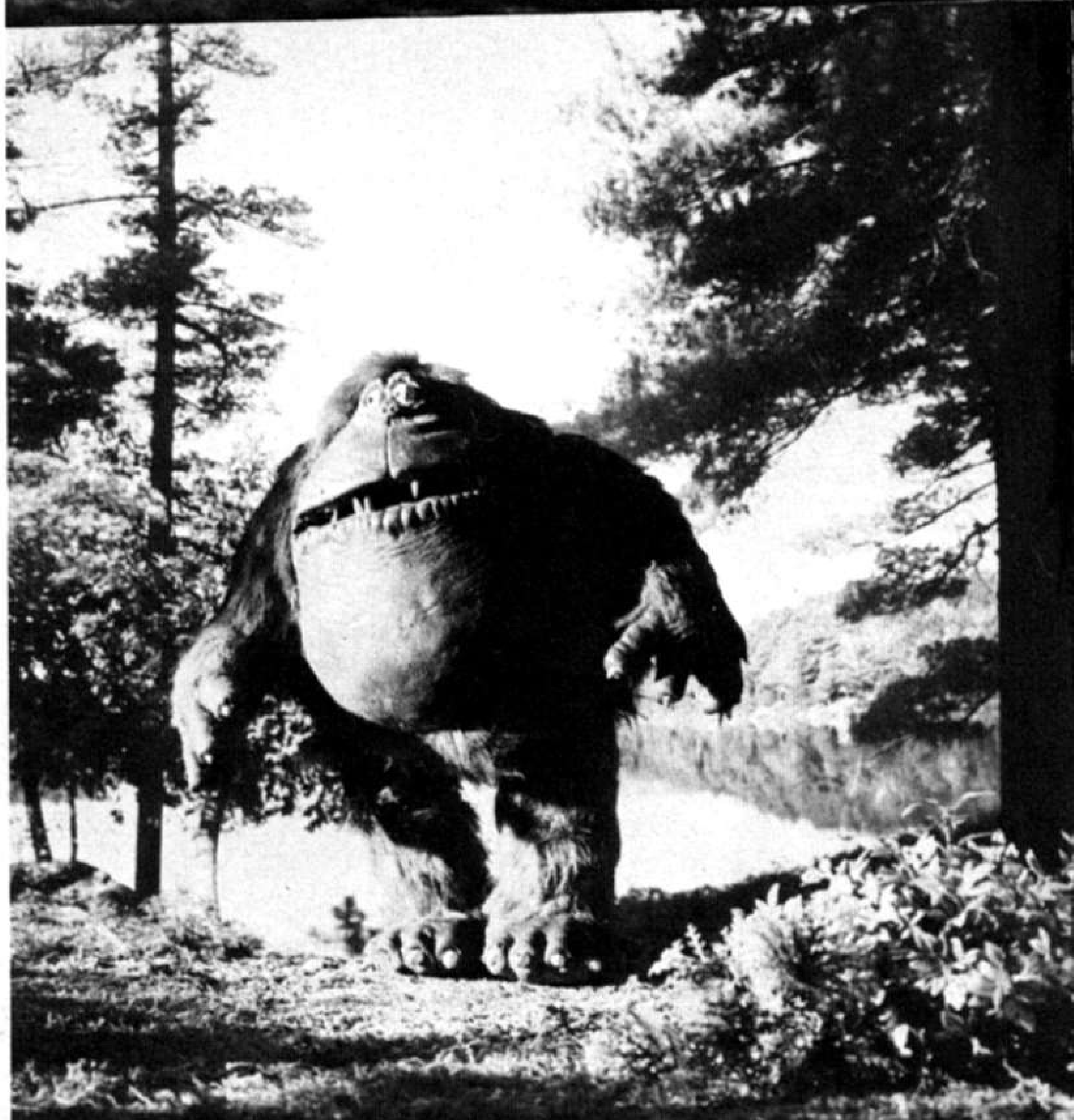
A better way to enlarge the picture is to project into a mirror and bounce the image back onto the screen. This is illustrated in a diagram within this text. An ordinary house-hold mirror will not work for this purpose, since it will reflect both the mirror surface and the glass covering it, thus causing a double image. A single surface mirror must be used instead. These special mirrors can be purchased from:

Edmund Scientific Co.
101 Gloucester Pike
Barrington, NJ 08007

A rear-projection screen can be made of any translucent material that is relatively texture-free. Very thin fabric — as commonly used in theatrical productions — is good, and white paper is a possibility. However, these materials distribute light poorly and add to the hot spot problem. Edmund Scientific is also a good source for an excellent, flexible plastic material specifically designed for rear-projection use. This product is called "Lenscreen" and can be ordered in various sizes. I use a 6 X 6-foot sheet, which costs roughly $125.00. Lenscreen is a flimsy material and must be mounted on a wood framework, but the results are worth the trouble. All accompanying photos from my *Grog* films illustrate Lenscreen in use.

Right: Changing the scenery can be as easy as changing the slide in the projector, as illustrated by these examples. The Grog model is only 6 inches in front of the Lenscreen material, which helps keep both the model *and* the screen image in focus.

Art, Photos & Text by JOHN DODS


LIGHTING

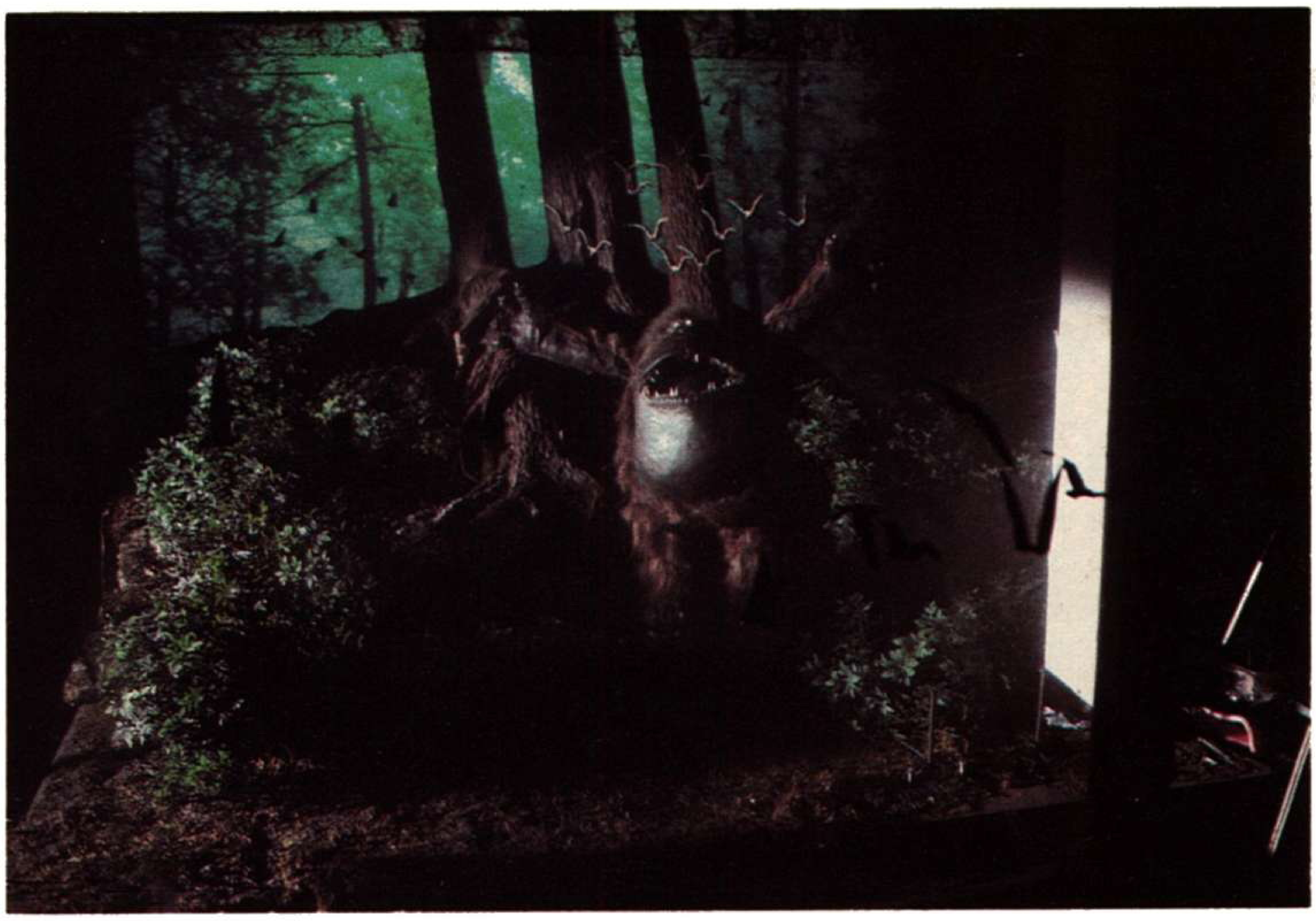
To be successful with rear-projection the most important thing you must do is keep stray light *off the screen*. Even a small amount of light can wash out the projected image, causing the blacks to look gray and spoiling the illusion. To avoid this problem isn't difficult; simply use side-lighting. This is the light of early morning or late afternoon (all *Grog* films take place at 7:30 in the morning!). Use of side-lighting not only enables you to keep light off the screen, but accentuates the details on the miniature foreground set and animation model, thus increasing the effect of size and reality.

When the light is coming from the side of the set it is fairly easy to place light shields between the light(s) and the rear-projection screen. Light shields, called "barn doors" in professional filming, are rectangular sheets of metal which attach to the front, top, and sides of the light housing and enable you to literally "direct" the light beam as you please. If barn doors are not a part of your lighting equipment, you can use sheets of cardboard (sprayed flat black to avoid unwanted reflections) clipped to your light reflectors, or attached to a light stand and moved around until a dark shadow falls over the projection screen.

Quartz lights are recommended for use in lighting for the same reasons they are recommended in the slide projector. But if your animation takes are fairly short, you can probably get by with standard bulb-type photofloods without any loss of brightness or color rendition.

MATCHING THE SET TO THE SLIDE

Naturally, if you are using side-lighting on the minature set you must also be using a background slide with similar lighting conditions. The lighting on the miniature must also match the projected image in brightness and contrast. If the light is too strong on the set, you can either move the light



Left: John Dods & Tom Davis prepare a scene in *Imagine*, where a "giant" Grog walks down the street (note rear-projection of suburban neighborhood). Right: Three examples of rear-projections & foreground sets from (top) the original *Grog* and (middle and bottom) *Forest Story*, both films by Dods.

source farther away or cut down the light intensity by placing one or more thicknesses of aluminum screening (to diffuse the light) in front of the bulb. If the light on the set is too weak you must simply use a brighter bulb or add additional lights. A comparative light meter reading between the set and the rear-projection will reveal whether the two are equally bright.

Matching the contrast of the set and projected image is largely a matter of making sure the highlights and shadow areas on the two elements are the same. A light meter helps in making these adjustments but usually it can be done by eye. If it looks right through the camera viewfinder, it will probably look okay on film.

If the dark or shadow areas in the background are black, the shadows on the miniature set must be black. But if the rear-projected image has detail showing in the shadow areas, the set must equal this. This can be accomplished by using a "fill" light — a 40, 60 or 100-watt lightbulb in an inexpensive holder that is placed opposite the main light (see diagram). A reflector, such as a piece of white cardboard, can also be used to bounce light from the main lighting into the shadow areas of the set.

Test stills taken with a Polaroid camera can be helpful in giving you an idea of the success of the illusion you are trying to create.

A most important consideration in achieving realistic rear-projections is *color*. The projection color must match the color on the set, or vice versa. Common elements such as trees, grass, foliage, etc. should match exactly. This is more a matter of painting the miniature properly than of lighting. Some patience may be required to experiment with painting: the color photo of the set-up in the film *Imagine* (with the Grog in the road) is a perfect example. The road on the miniature had to be painted 8 different times to match the road in the rear-projection.

THE TRANSPARENCY

It will help you tremendously to have a variety of appropriate slides to choose from when setting up for rear-projection work. It is sometimes so difficult to match a background to your set that it's often easier to merely try a different slide (which will save time and effort). For my stop motion work I have a library of about 1000 slides taken over the past decade. Most of these shots are of forests and woods, taken in the early morning to get the much-needed side-lighting. Most of the shots are Kodachrome film, which has excellent sharpness and color rendition, although it is a bit contrasty. Slides taken on Ektachrome are more contrasty, are not nearly as sharp and do not render color as beautifully as Kodachrome.

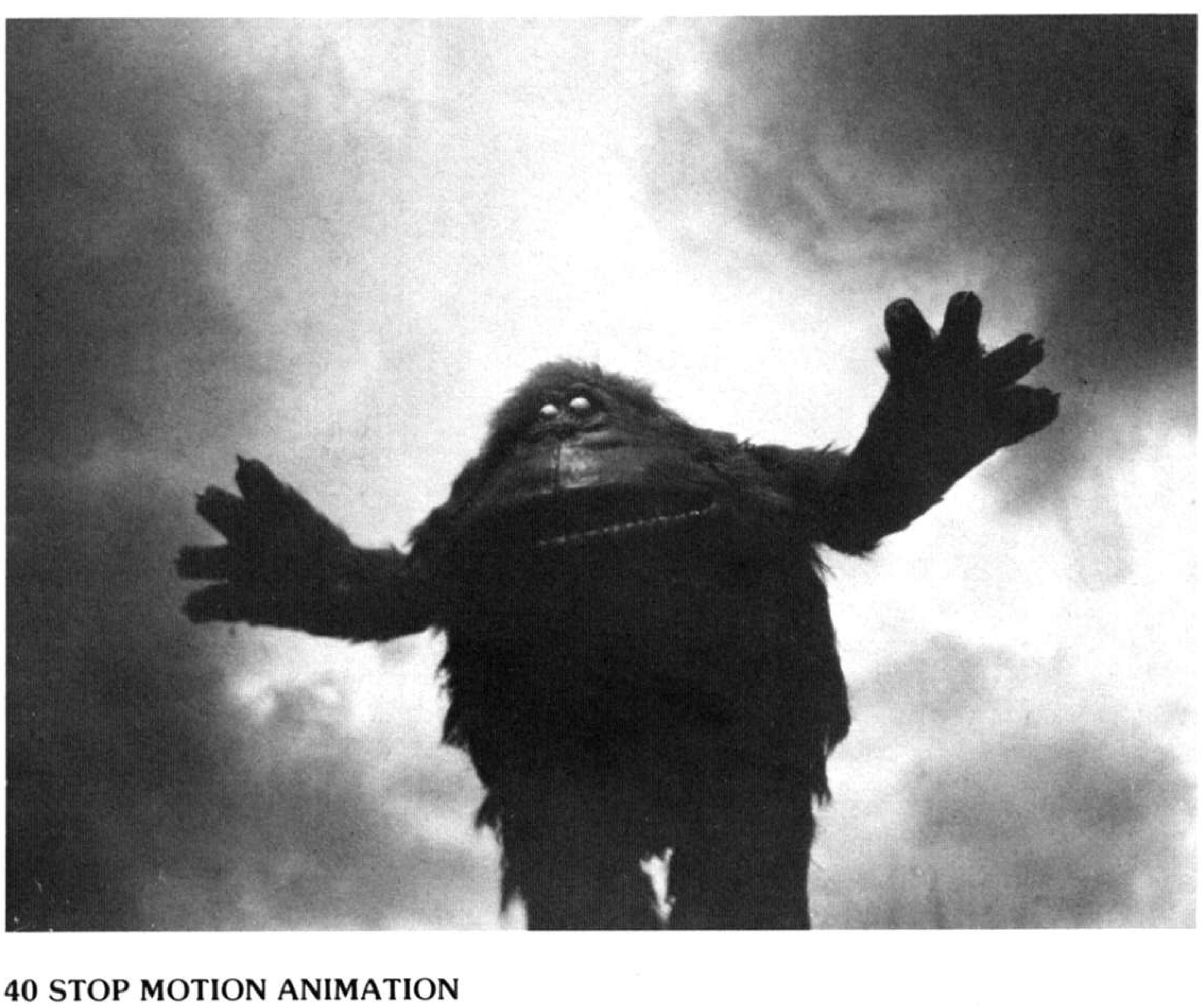
Keeping contrast moderate is important, since the filmed background will be more contrasty than the original slide (unless your movie stock is a low-contrast type, like Ektachrome 7242, which is available in 16mm, and on a very limited basis, in Super-8).

Remember that if a transparency is projected for long periods of time the color will begin to fade away. This might not begin to happen for 10 hours or so, but it's good to keep an eye out for this. If your backgrounds suddenly don't look right to you, it's probably best to "retire" the slide. I've lost several of my favorite backgrounds because of fading, so maybe it's a good idea to take *several* shots of the same back-ground so that you have reserve slides.

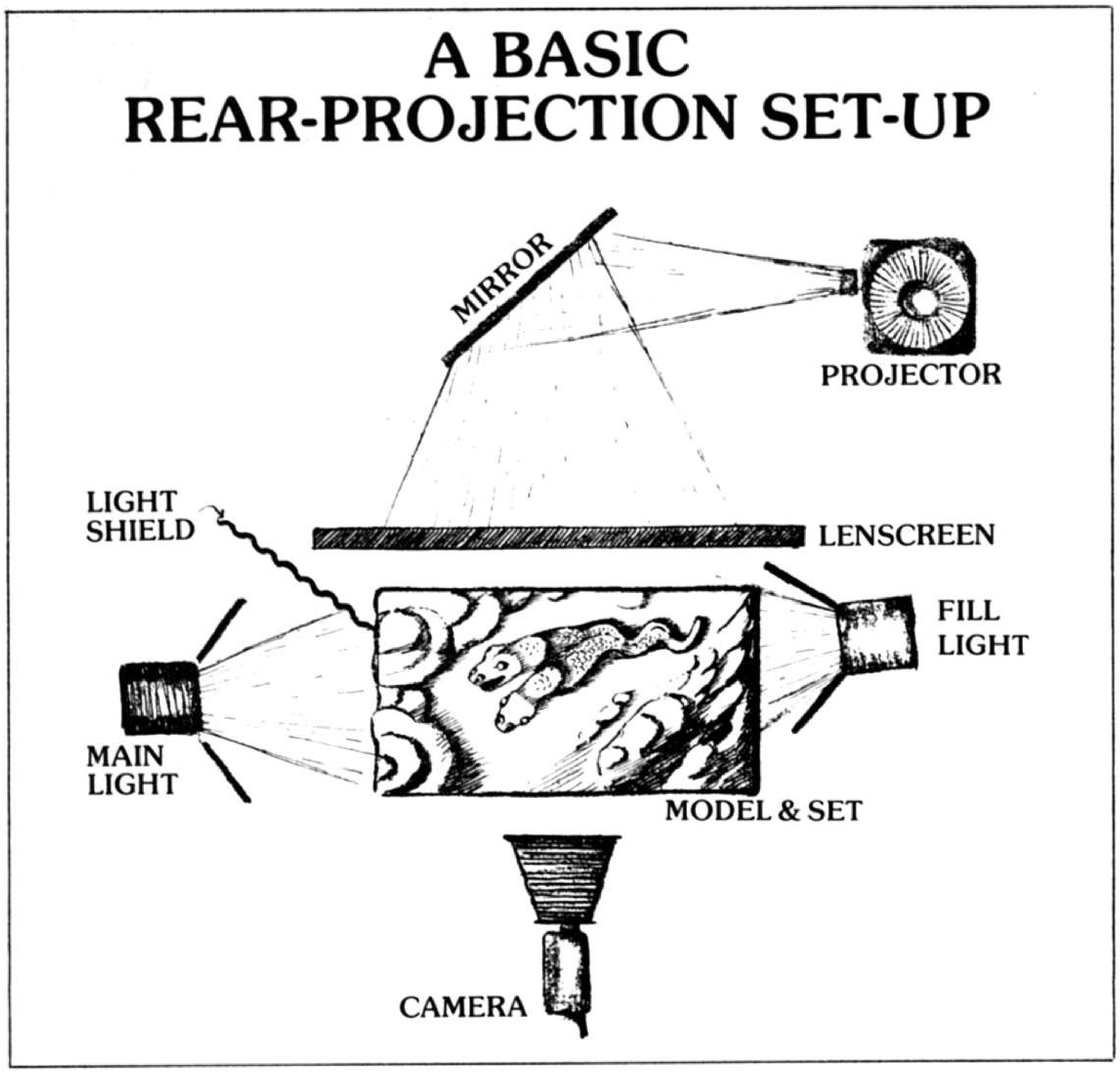
EXPOSURE

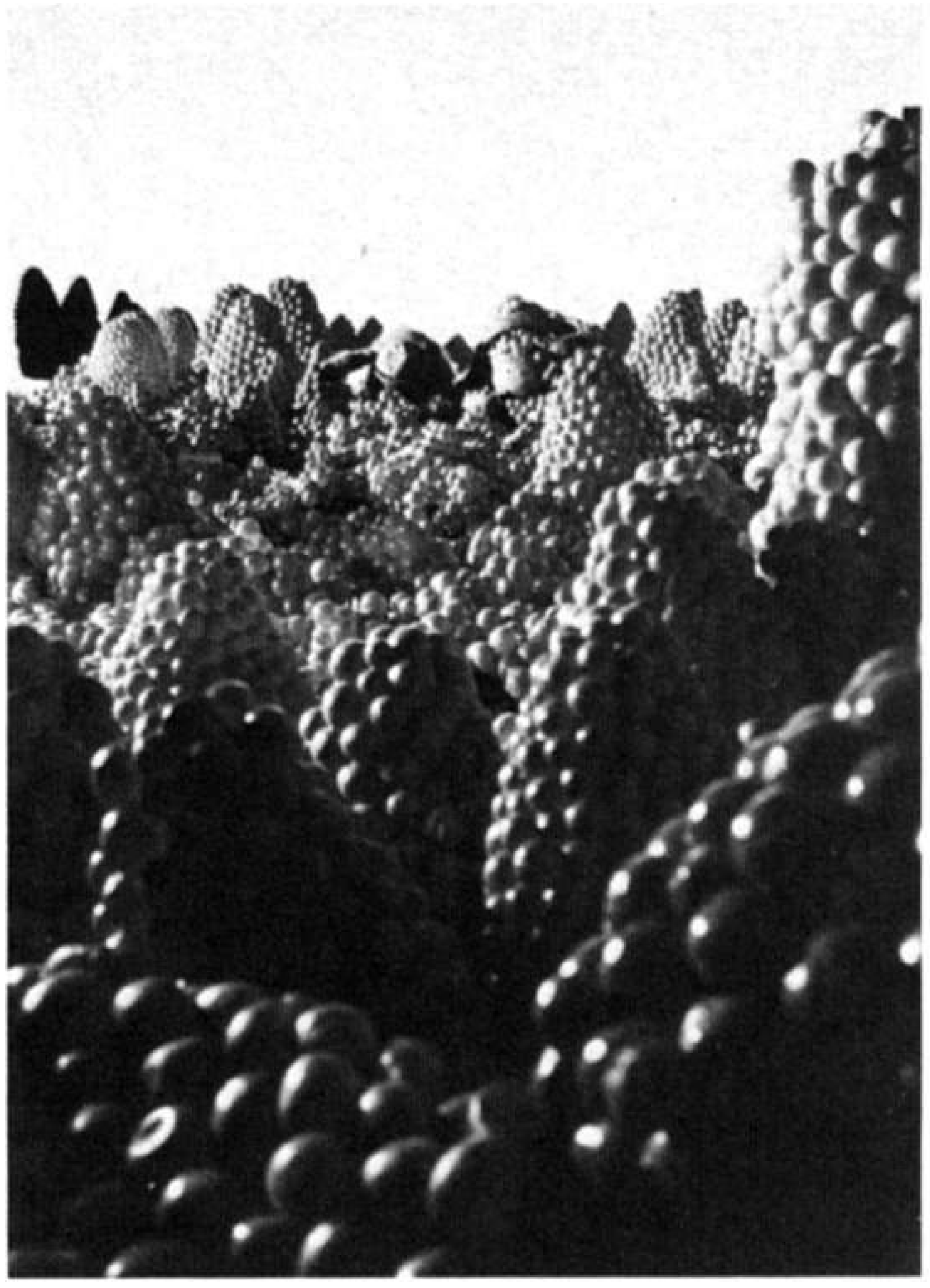
Although most amateur and Super-8 filmmakers are used to letting the automatic systems in their cameras take care of exposures, it's best to use a hand-held light meter for readings in rear-projection work. Such readings should be taken close, which is virtually impossible if you do it through your camera.

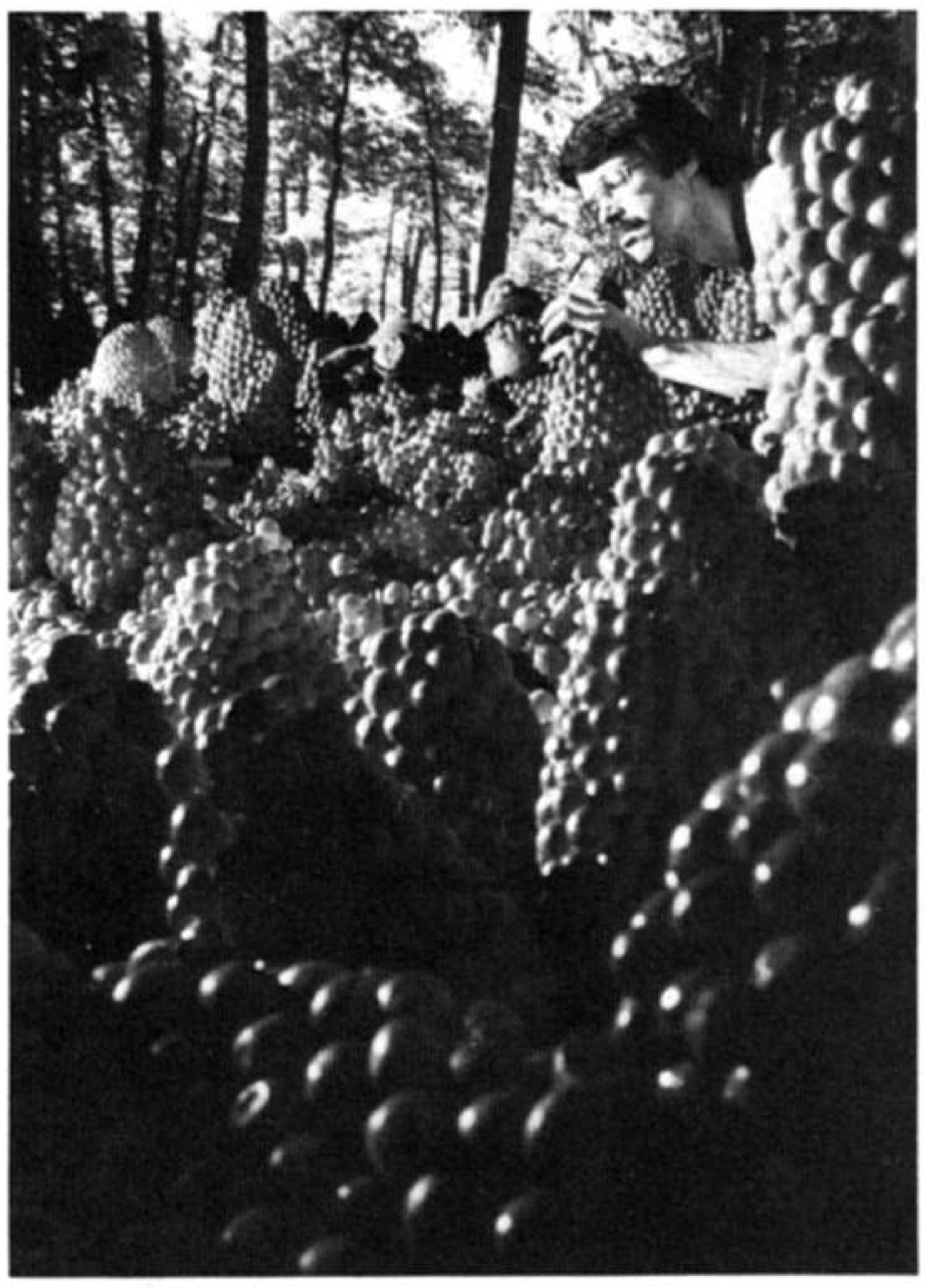
Light readings should be taken from the side of the projection screen the camera sees, with the meter close to it. I suggest that readings be taken off an area of medium tonality on both the set and the screen. Do not read from an area that is very dark or very light.



Left, top: Oops! There's stray light hitting the background screen in this early test shot of the original *Grog* (this model was never used). Bottom: The easiest way to hide the joining point between screen & foreground is to not show it at all.







Top: Big Grog and Little Grog begin eating 10,000 apples in the climax of *Forest Story*. Here they are posed against the screen, without a projection. Bottom: Same shot, with a background projection and the Grogs' creator, John Dods, who animates Big Grog.

An area that is about the same as the Kodak standard "neutral gray" test card would be ideal, and will give you the proper lens opening.

To get the sharpest possible filmed image, shoot the scene at the smallest feasible lens opening. The smaller the lens opening is, the greater the depth of field will be (the amount of area in front of and behind your point of focus that will remain in sharp focus as well).

The higher the ASA rating (film speed) of the stock you are using, the smaller you will be able to close down your lens. Unless you have special equipment (such as an animation motor) that enables you to keep the shutter open for a long period of time for each exposure, you will be limited in your ability to "stop down" the lens and still let in enough light to record a proper exposure. Most cameras will limit you to an exposure time of 1/40th of a second per frame, which may force you to use high speed film, with the lens in wide angle, to get the right exposure.

You should shoot with the widest possible lens, anyway, since it will increase your depth-of-field. A wide angle lens is anything smaller than 25mm in 16mm or less than 12 or 13mm in Super-8.

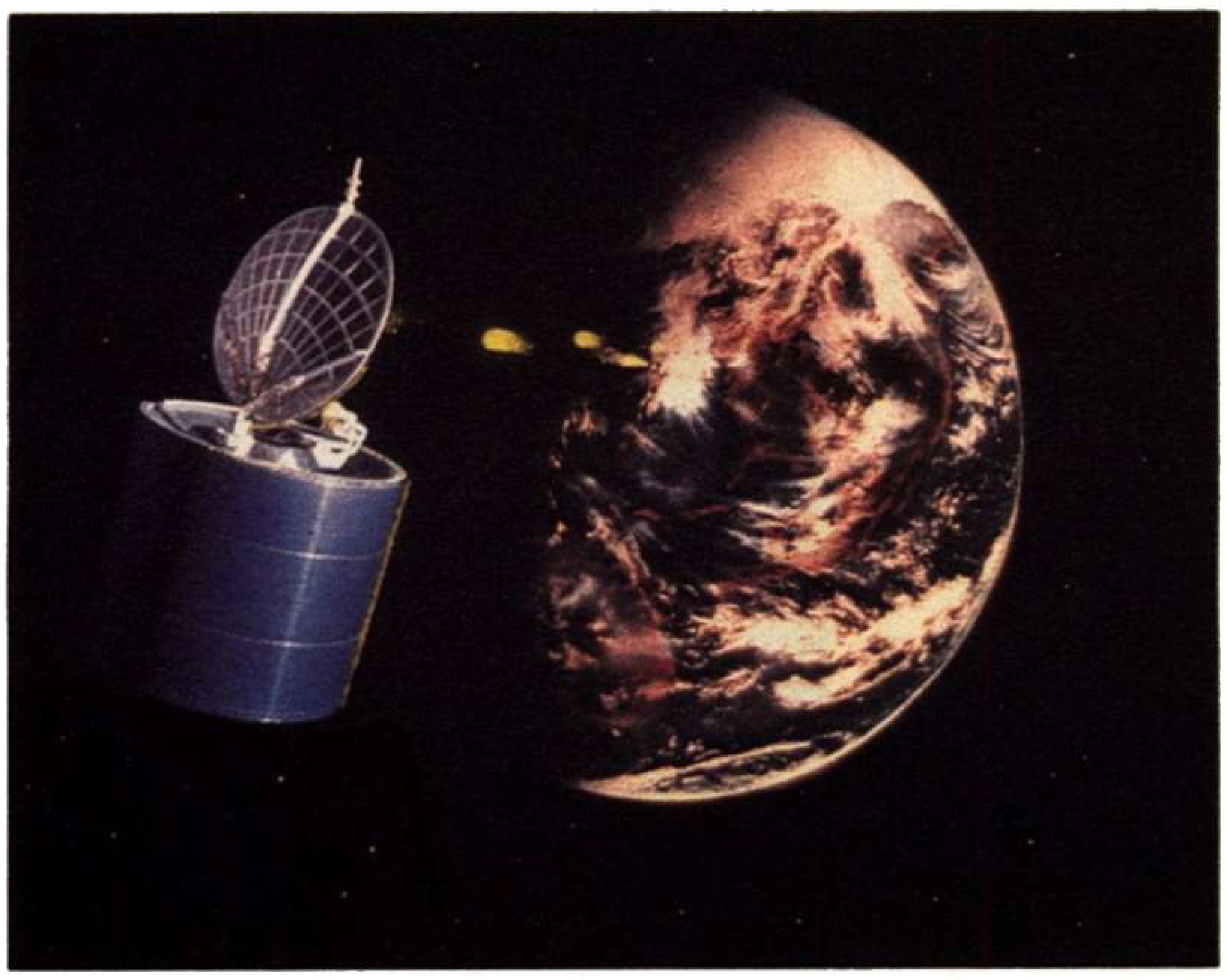
Eastman Kodak's publication *Close Up Photography N 12A* points out that as magnification increases, depth-of-field *decreases*. Generally, this means that the closer you get to the subject, the less the depth-of-field will be. Of course, getting close to a miniature model may be unavoidable, but what you *can* do is make your miniature sets and models as large as practical, which will avoid the need for extreme close-up work. The less depth that a miniature/rear-projection set-up has, the less depth-of-field problems you will have. Keep the stop motion model as close to the projection screen as possible to keep focus problems minimal.

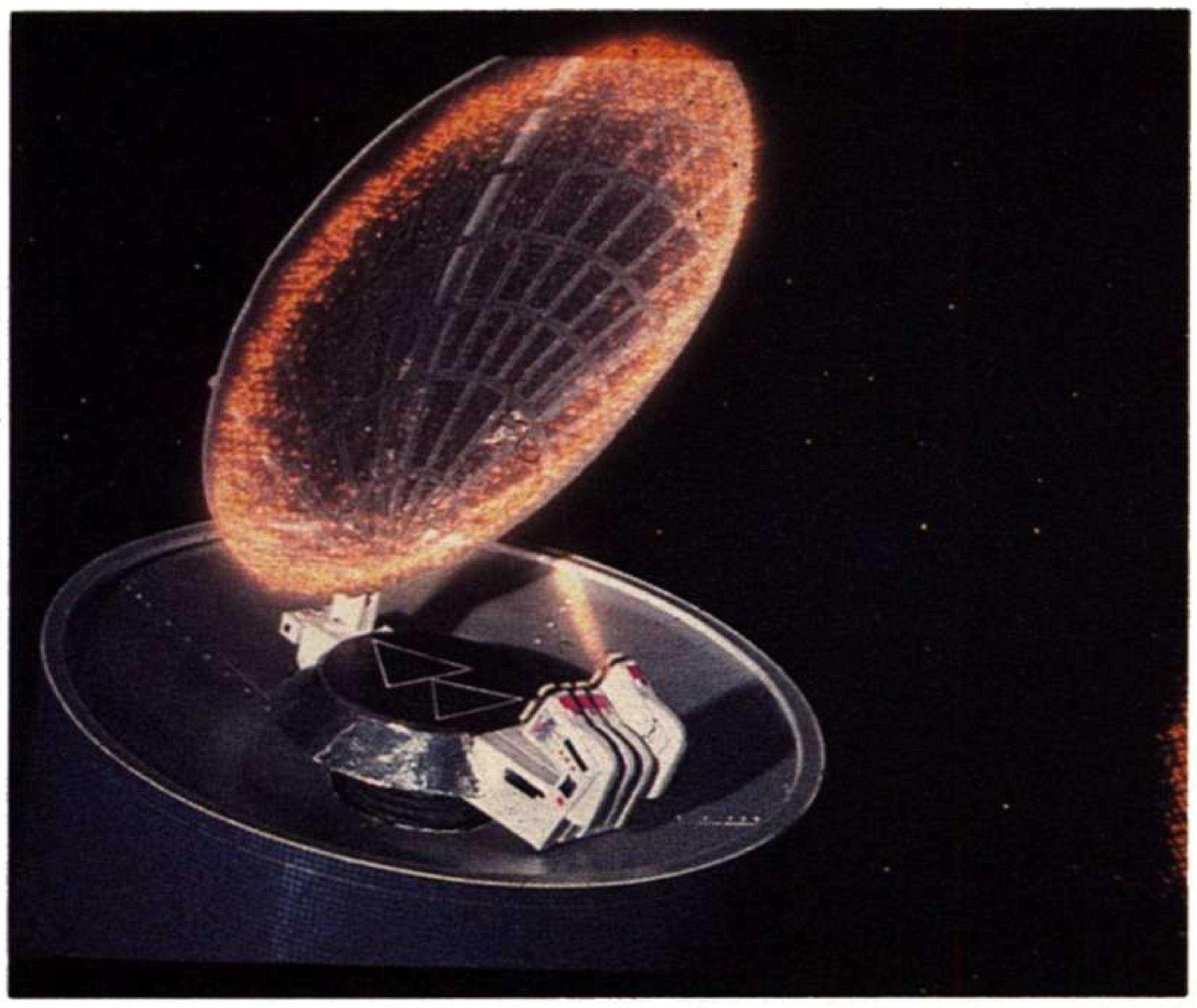
Much of my film *Forest Story* was shot without special equipment through an 18mm (wide angle) lens, usually set wide open (fl.8) at frame exposures of 1/40th of a second. I used Ektachrome film with an ASA of 125. This combination, together with sets that were fairly large, resulted in a depth-of-field that was only barely adequate (but it *was* acceptable).

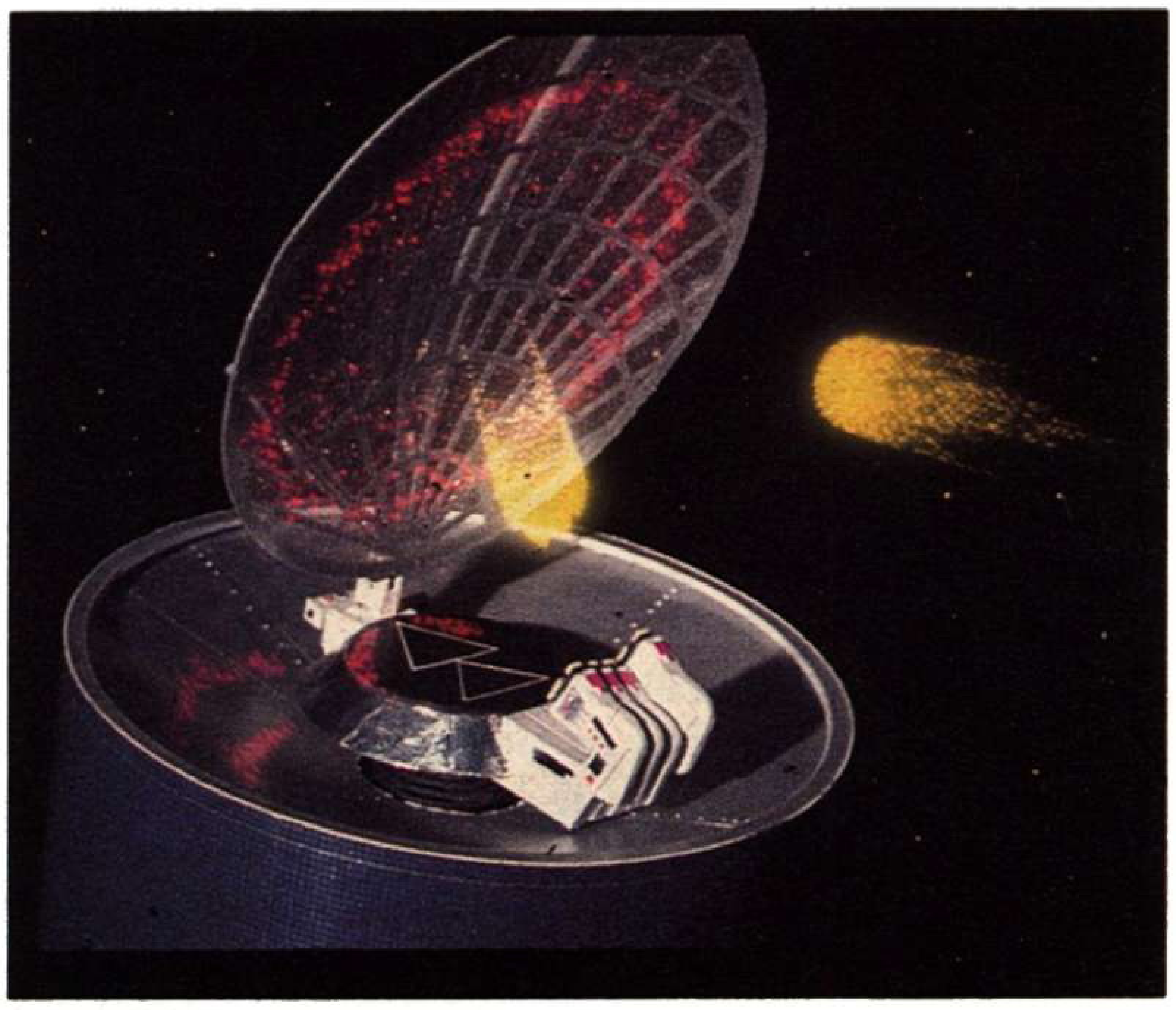
SUMMING UP

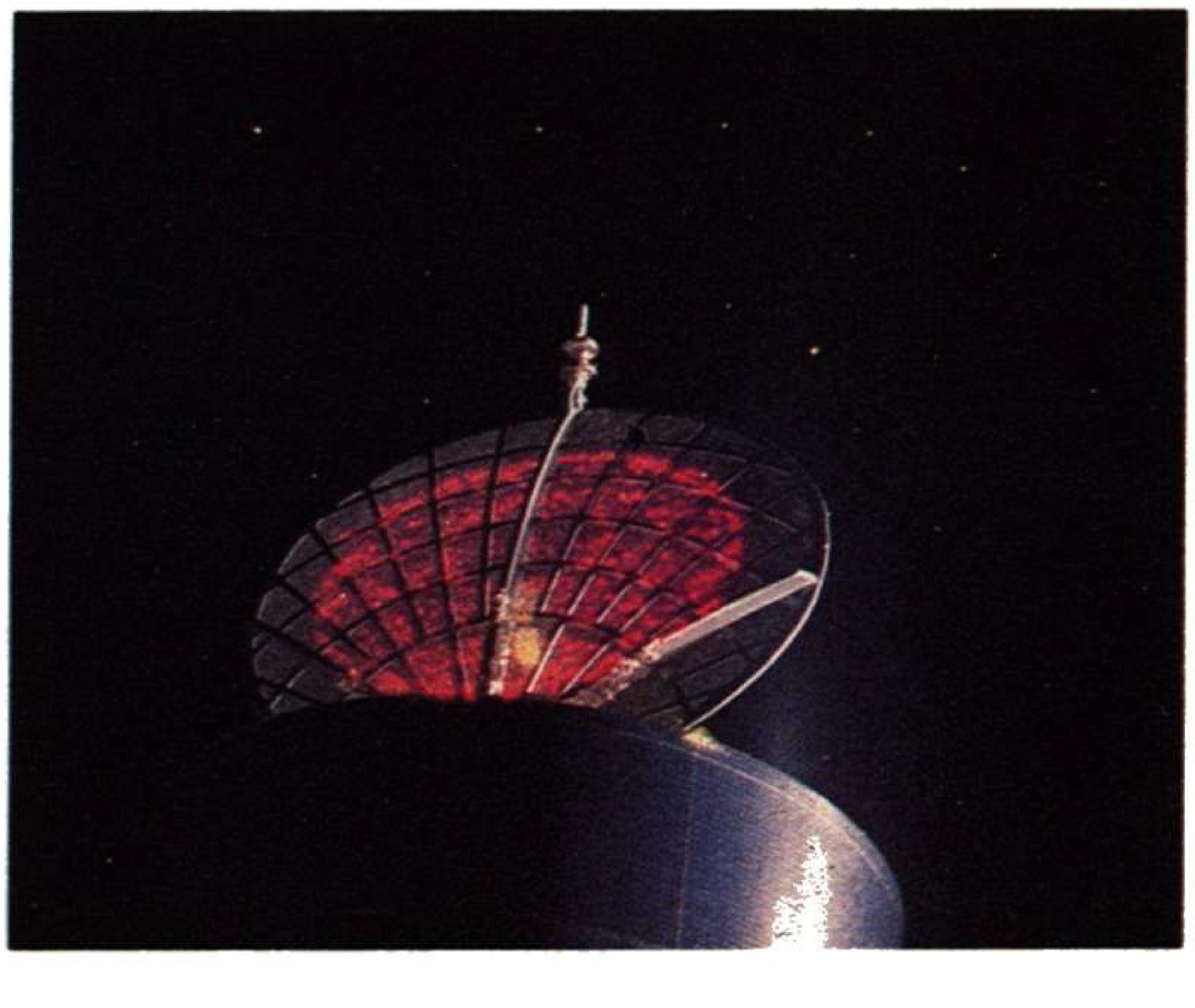
Although I've talked a great deal about technical data in regard to doing basic rear-projection, there are simplified alternatives. However, for truly life-like results that will literally fool your audiences, the guidelines I have set forth should be followed as closely as possible.

A good way to "jump" into rear-projection is to use a large piece of artists' tracing paper (art stores) for your rear-screen, use any slide projector available to you, and project slides that are very detailed and "busy." Such slides will conceal the texture of the tracing paper and the hot spot. Line up the shot until it looks good through the viewfinder, and you may get results that will surprise you. ■









Stop Motion In Space

Part I

Art, Photos & Text by
DAN TAYLOR

I recently had the opportunity to direct a stop motion sequence depicting an imaginary ride into space. The opportunity came about as a result of a film being produced by Tom Fleming (a Washington DC producer). The film is a promotional short for the Corporation for Public Broadcasting. Its purpose is to inform the public of a wide ranging satellite system now in use. The film was broadcast via this satellite system which covers all of North America, Alaska, Hawaii, The Virgin Islands and Puerto Rico.

The imaginary space ride is a (semi-fantasy) journey into space to observe the satellite in operation. Tom saw this as an opportunity to capture the audience by using some sort of animation. I immediately suggested stop motion animation. In my opinion stop motion is the most fascinating of all animation. Tom agreed that something more than the usual filmograph or cell animation was needed, and agreed to the use of stop motion.

The sequence was to involve several shots of the spaceship flying through space on its way to rendezvous with the communication satellite, a shot looking out from the cockpit of the spaceship, and a stop motion astronaut operating controls with computer-type lights and readouts flashing. The sequence also required shots showing the satellite in operation and the spaceship returning to earth. Since the only visible motion of the satellite is the outer drum rotating, it was decided to make the transmission effects visible. Using various color patterns accompanied by appropriate sound effects greatly increased the appeal of the satellite.

Music and sound effects should not be overlooked when planning an animation sequence. In my opinion animation without the proper accompanyment of music and/or effects has only a fraction of its potential impact.I am not saying animation can't stand alone. I merely want to impress the heightened impact that can be achieved through a well composed and executed music and effects track. On this film, as well as several other animated productions, I had the good fortune of teaming up with Jim Fox, Hal Lion and John Abernathy (Lion and Fox Recording, Inc., Washington, DC). They have a remarkable talent for composing and executing music and sound effects that capture the mood of the animated visual.

After the sequence was storyboarded we began work on the effects layout. From what I have observed, you could give five different animators the same job to do, and they would all come up with a slightly different approach based on their individual experience and limitations.

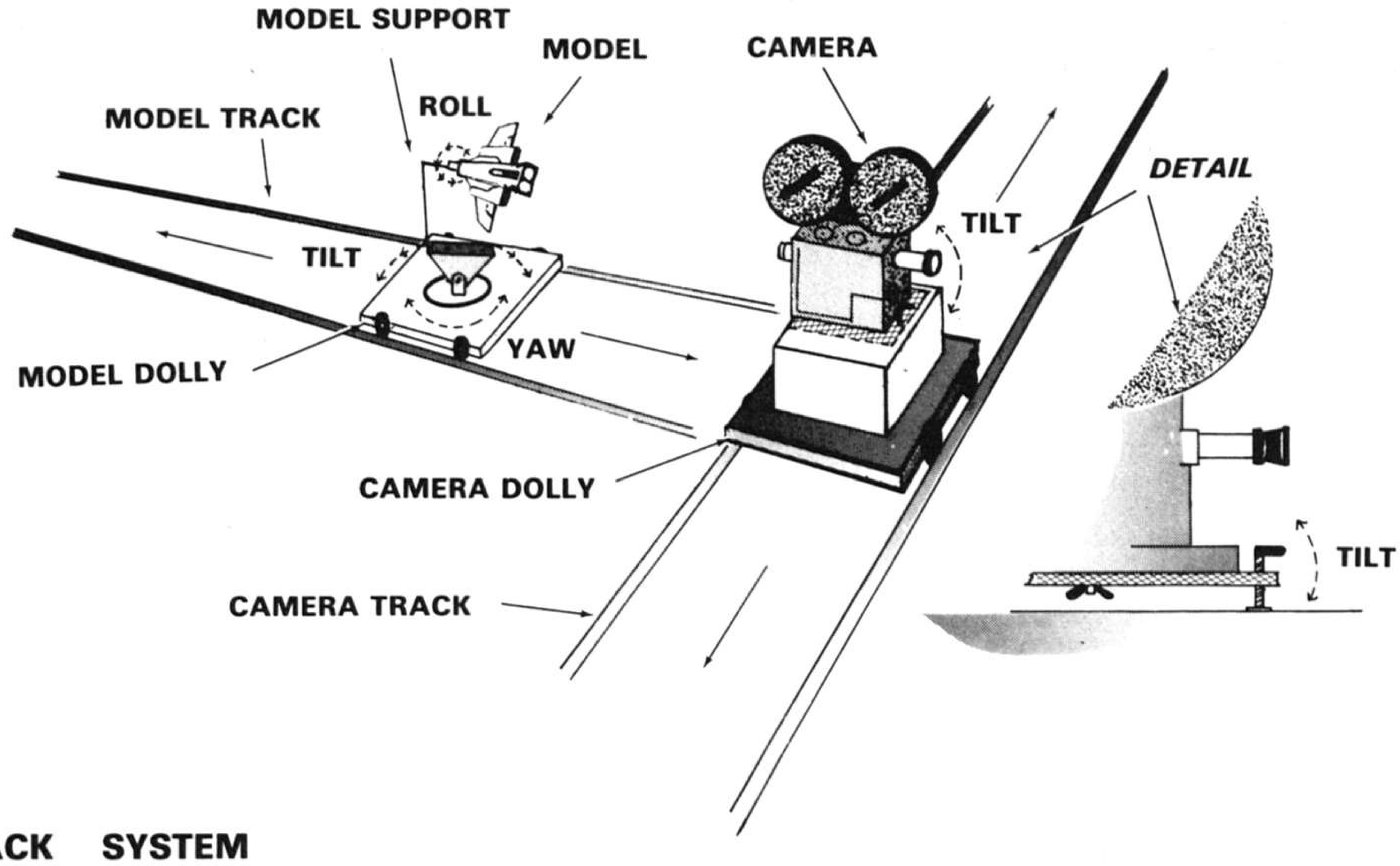
I feel good about any project that helps expand or develop a specific technique. The majority of the time, productions that cause you the most headaches are the ones you benefit from the most.

We decided the best way to achieve the effects of space flight was to mount the spaceship and satellite models on a track system as opposed to an aerial brace set-up. The camera was also placed on a smaller track system. This track was placed perpendicular to the model track. This enabled us to create the illusion of the models moving east and west across the frame. The model track allowed for movement toward and away from the camera. The camera mount also provided us with the capability of tilting approximately twenty-five degrees up and down. The models were mounted on a pylon-type set-up which allowed them to pitch, yaw and roll around their own center of gravity. With this relatively simple system we were able to obtain the required mobility of our models (see diagram).

The matting system that we elected to use proved to be one of those headache situations whose value can only be appreciated in hindsight. We shyed away from a blue screen system because of the time and expense of installation, and obtaining mattes through the involved separation stages. We also elected not to use an alternate frame matte system (a matting system that utilizes every other frame as a matte). I will discuss this system in more detail in Part II. Not using alternate frame matting proved to be a mistake. And, for the record, I now feel there is no cleaner matte system in use today. Examples of this matting technique are Ernest D. Farino's Pillsbury Dough Boy, and much of Ray Harryhausen's work. You can't argue with that kind of quality.

We used a studio at Consolidated Visual Center (CVC), located in Washington, DC., to film this production. We decided to shoot the models in black limbo and generate rotoscoped "garbage" mattes to eliminate the pylon support.

Left: Actual 35mm frame blow-ups of Dan Taylor's animation work on the satellite film. These shots show the animated satellite (built by Mike Walker) receiving and sending signals (cel animated); the cockpit with animated astronaut (top right), also built by Walker; and the animated spacecraft. The satellite's dish is cut out of thin cardboard!



TRACK SYSTEM

Rotoscoping is the process of using the animation camera somewhat like a projector. In this case the processed footage of the animated satellite going through its motions on the track system was placed in the Oxberry Animation Camera. The shutter rotated one hundred and eighty degrees so that in its stopped position it remained normally open, as opposed to the usual, closed position. The back pressure plate, located behind the aperture at the film plane, was removed. A light source, placed behind the film plane, was directed through the aperture causing the image on the film to be projected to the animation bed below. Now, by advancing the animation camera one frame at a time, we could project the animated scene. This enabled us to hand draw mattes ("garbage" mattes) to eliminate the pylon model support.

"Garbage" matte is a term given to hand generated mattes used to eliminate unwanted areas of a scene, such as model supports, lights, rigging, etc.

Our camera original stock was 35mm 5247 color negative. From the processed negative we had a 5243 A-wind color interpositive printed. The Interpositive was used in the above mentioned rotoscope step. It was also used as our bi-pack master. The Bi-pack is a means of contact printing, which can also be accomplished on the Oxberry animation stand. The A-wind interpositive is run through the camera sandwiched (bi-packed) with 5243 raw stock. The camera was focused on the backlight area of the animation bed so, when the bi-pack is run through the camera exposed to the light source below you have, in effect, a contact printer.

The garbage matte blocks out the area on the backlight glass which would cause exposure in the area of the pylon model support. As the camera was advanced one frame at a time, the garbage mattes were changed for every frame, always blocking out the area that would cause exposure of the pylon model support.

The satellite was animated in a black limbo situation, with the exception of the visable pylon support. We have eliminated exposure to those areas (through the use of the garbage matte); therefore, if we were to process the stock from our bi-pack, we would have a negative image of our satellite surrounded by a completely clear field.

There were a couple of additional steps that were necessary in order to obtain consistency of the orange contrast mask present in almost all color negative films. But, since this is not a matte technique. I would recommend, I won't discuss it here.

We also used garbage mattes to eliminate stars as our models moved across a given star field. We were very careful not to have our models pass directly in front of any planets — close, but always avoiding the actual obstruction of the planets.

Combining the backgrounds with the spaceship and the satellite model was the next step. We once again rotoscoped the processed interpositive/(the bi-pack master) down on the animation bed. The bed contained the backlight backgrounds (stars and/or planets). By rotoscoping the satellite we were able to plot our background moves in relationship to the animated flight of our model. This also enabled us to see where the satellite was going to pass in front of stars in the final composite. We generated garbage mattes to hold back the stars as they crossed the path of our model.

After the background moves were plotted, the 5243 raw stock containing the negative latent image of the satellite was put back in the animation camera. The backgrounds (backlight transparencies of the stars and planets) were photographed in conjunction with the garbage mattes. This created the illusion that the models were passing in front of the stars. This technique was also used to create the scenes of the spaceship in flight.

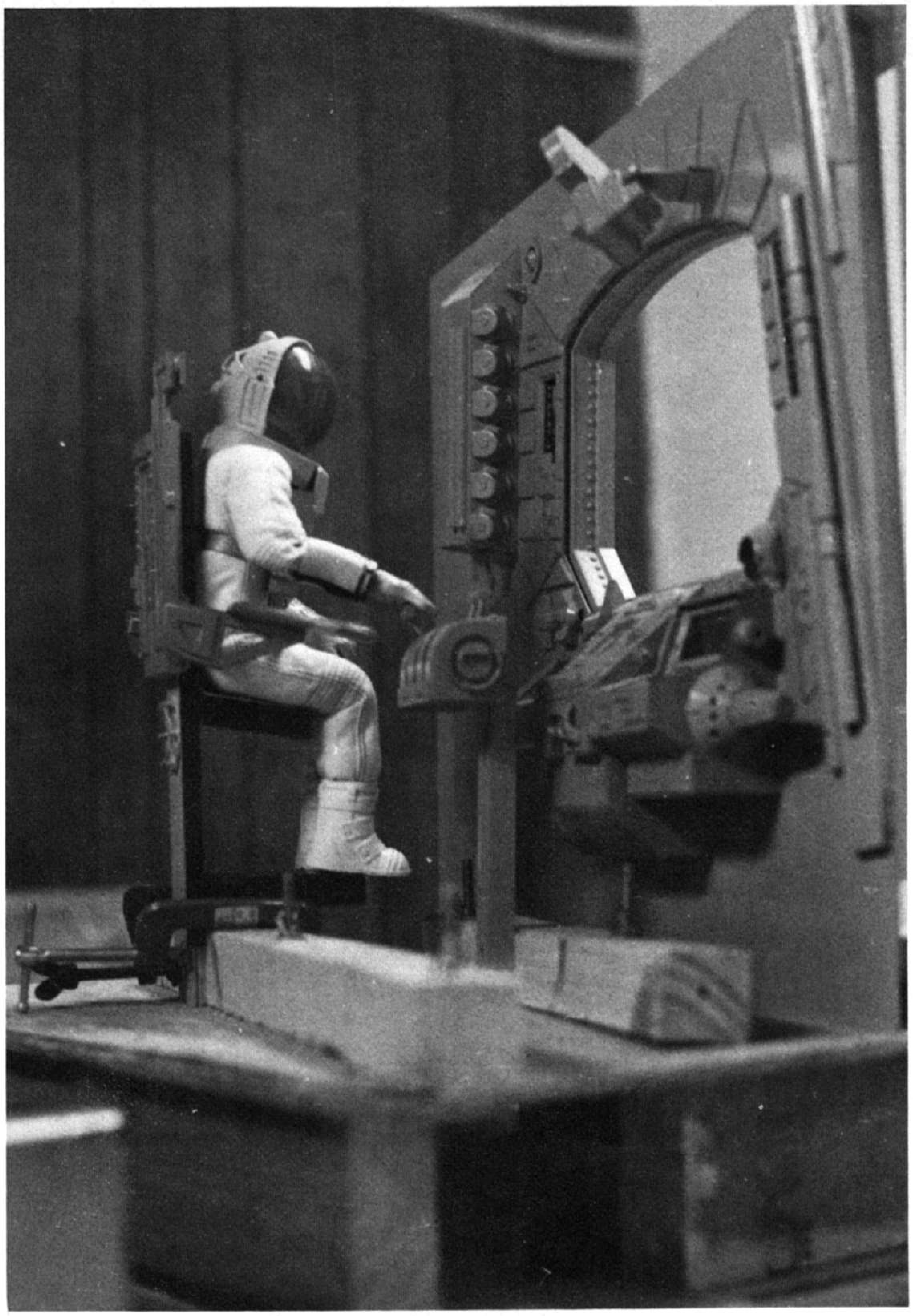
To create the transmission beams we used cell animation, designed by Mike Walker. Mike has been the Art Director on most of my animation productions for the past five years. His contributions during our association have greatly increased the quality of our animation.

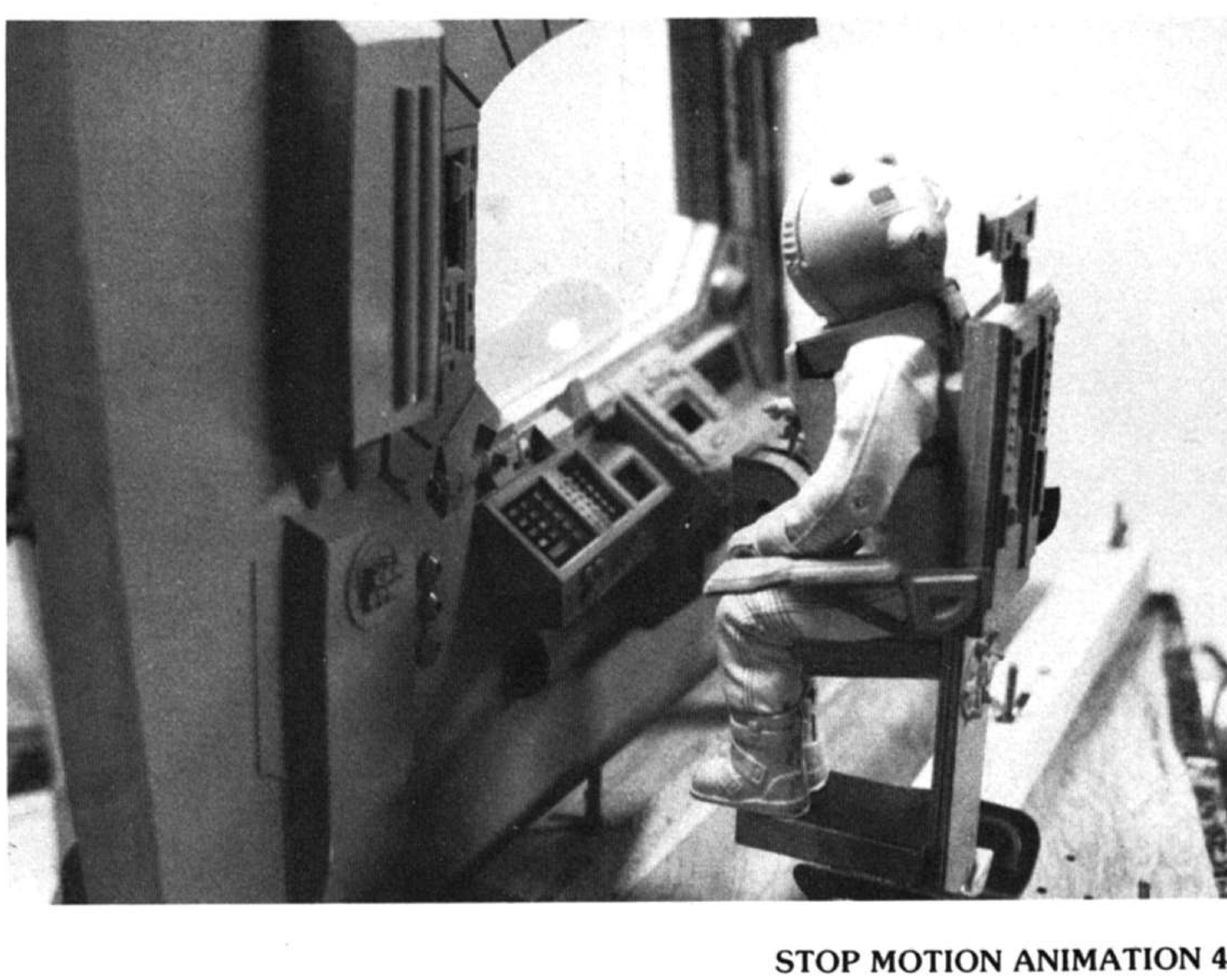
The sequence required several types of transmission effects: beams being transmitted from the earth to the satellite; beams ricochetting from the satellite antenna to the satellite receiver; transmission beams from the satellite transmitter to the satellite antenna; and beams returning to the earth from the satellite. By use of cell animation we also created a dissipating flare on the antenna as well as reflections of the transmission beams on various surfaces of the satellite.

The transmission effects were created using pen and ink on punch registered velum paper (a thin paper something like tracing paper). The punched velum was placed over a paper print frame blow-up of the satellite and earth. This enabled us to obtain proper registration of the transmission effects and their relationship to the satellite. After Mike finished the pen and ink animation of the transmission effect, we contact printed them directly on Kodalith sheet film. This gave us high contrast negatives of the transmission effects. The high-con Kodalith negs were individually registered, using the original art for placement. The registered Kodalith negatives were placed on the animation bed, backlit, and animated directly onto the 5243 dupe negative, which already contained the image of the satellite/earth composite. The 5243 was then processed (see photos).

The cockpit scene required stop motion animation of the astronaut, second and third pass exposures for the instrument panels and computer readouts, and a static matte of the window area to allow compositing of the cockpit scene with the satellite.

Mike constructed a fine model of the cockpit and astronaut. The armature for the astronaut was constructed by Dave Proctor.





Right, top and bottom: Two views of the cockpit miniature and the astronaut, both constructed by Mike Walker.

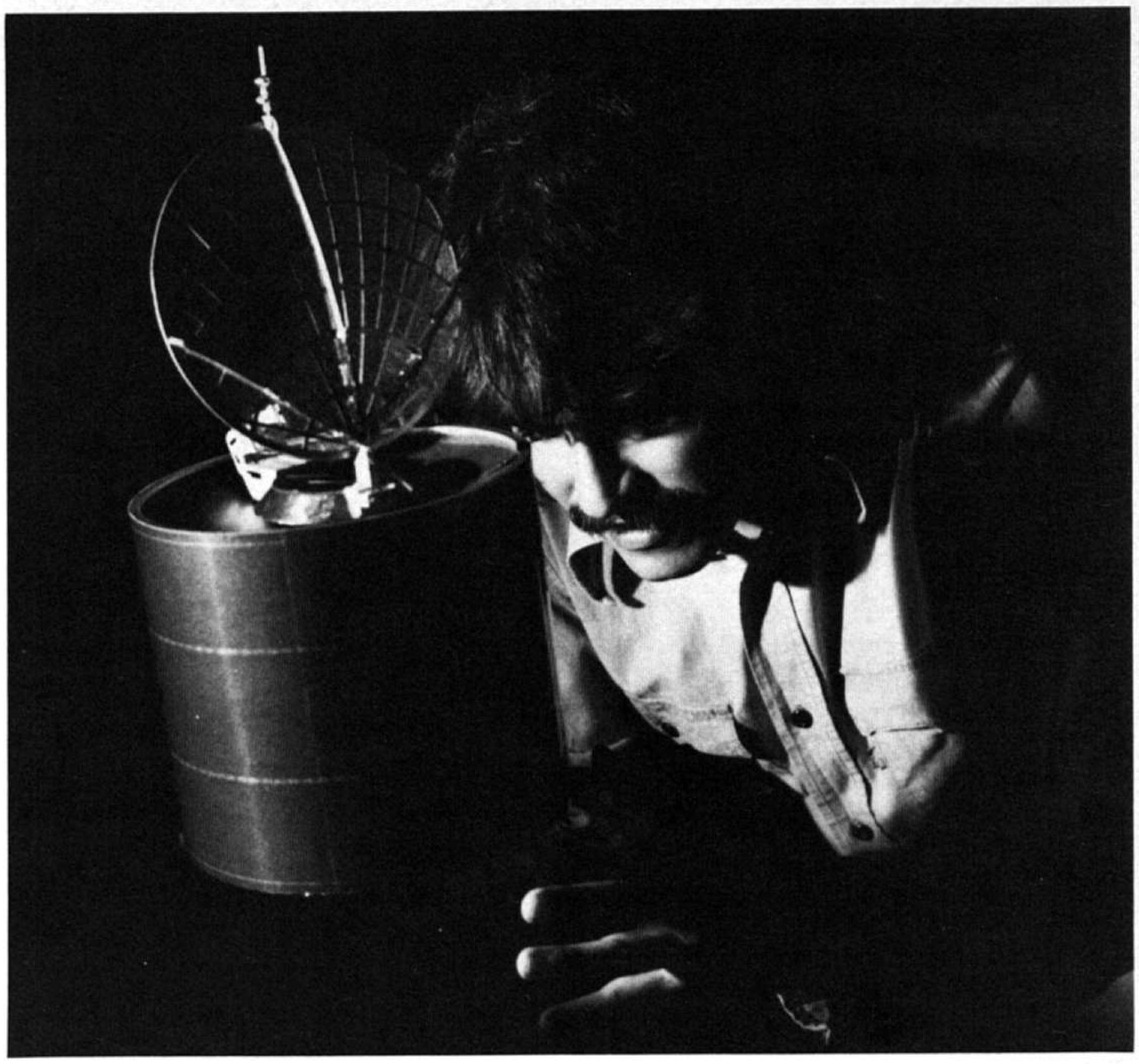
We decided to light the cockpit with colored gells. This, in combination with the flashing instrument panels and computer readouts, gave a unique mood to the cockpit scene. I also mounted a light on a pivot arm outside the window. This light simulated the sunlight coming through the window. It was animated on the pivot arm to produce changing shadows in the cockpit as the spaceship banked, climbed, etc.

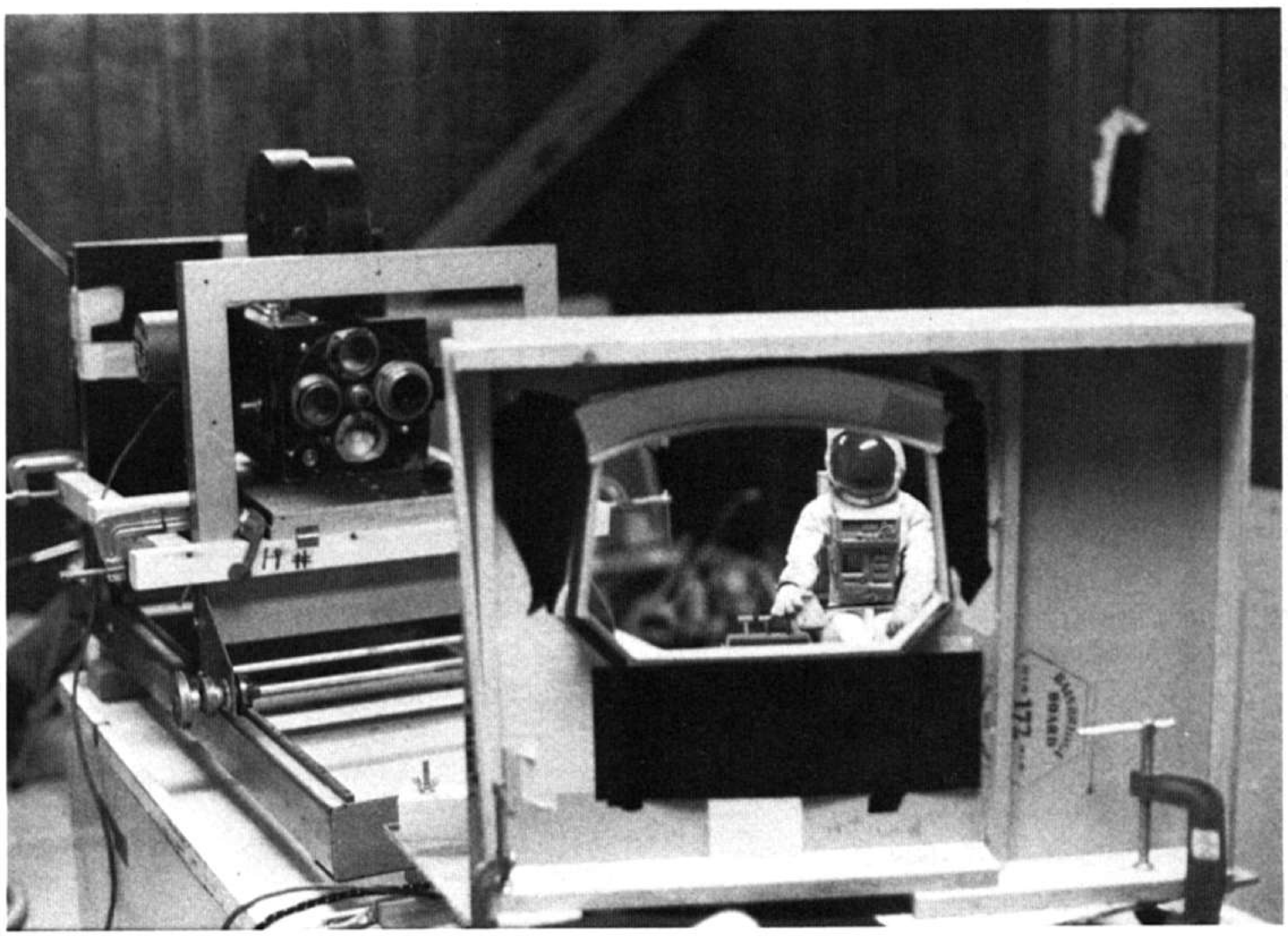
The lights on the instrument panel were Kodalith negatives built into the model. The back of the model was left open to allow for backlighting of the Kodaliths. The backlit instrument panels could have been animated at the same time as the astronaut, but we decided against it. The less complex each stage of the animation process is, the less chance there is of making a mistake.

So, on the first pass I animated the astronaut moving levers, pushing buttons, etc. The light on the pivot arm was also animated on this pass. On the second pass I animated the lights on the instrument panel. During this pass all the front lights, and the light on the pivot arm, were turned off. The only light used was a backlight directed at the instrument panels. Therefore, the only things visable when looking through the camera were the lights of the instrument panels. Obviously, during the second pass, there was no exposure in those areas previously exposed by the front lights. During animation black tape was placed over predetermined panel lights to create various changing patterns of flashing lights.

A third pass was required to insert computer readouts on a small screen located below the cockpit window. A similar backlighting technique was used here, the only difference being the use of replacement Kodaliths.

The mattes of the window were accomplished by silhouette lighting. All the shots in the cockpit were lockdown shots, therefore a static matte was all that was necessary. The silhouette of the cockpit window was filmed on Eastman 35mm high-con Positive (high contrast positive A film designed for matte work). Finally, all the elements were sent to the lab for composite printing (see photo).





The compositing of the cockpit and the satellite was supervised by Joe Bono of Bono Film Services in Washington, DC. Joe's dedication to quality and efficiency assured the success of composite print. The lab is where the final polish is added to your production. Because of the nature of the business, most animators are constantly fighting deadlines. If we are fighting deadlines, you can imagine where that leaves the lab. Working with their backs against the wall is a way of life...talk about your unsung heroes. ■

Top: Dan Taylor animates the satellite model, which is an exact replica of the real thing. Bottom: This view shows the filming set-up of the astronaut and cockpit. As elaborate as the effect looks on film, the rig is a simple affair, with C-clamps visibly holding much of it together! Note the tracking system for the Mitchell 35mm camera.

STOP MOTION IN SPACE: Part 2

***Combining animated spacecraft and stop motion models for the film* Nightbeast.**

The opening sequence in *Nightbeast* involves a spaceship chase; one ship containing the title alien, and the other is piloted by another alien in rapid pursuit. After an involved chase the Nightbeast crashes on Earth, setting the stage for the rest of the film.

The chase sequence involves several complex exterior shots of the ship. Also, interior shots of the pursuing ship, complete with a stop motion alien and operating crystal-type controls that give off blue and white electrical arcs. The enormous ship interior is a combination of miniatures and a matte painting. The matte painting was rendered by Bill Wright, a talented science fiction illustrator.

Alan Burton, a recent addition to our team, did the coloring of one of the stop motion aliens for *Nightbeast* . It's a first class job—a tribute to his diversified artistic talent. Alan was heavily involved in all phases of the special effects in the film.

One major change in our approach to effects in *Nightbeast* was the use of the alternate frame matte system. We used it for both the spaceship chase sequence and for compositing the stop motion with live action. As far as stop motion work is concerned, the alternate frame matte system is quite possibly the ideal matte system. It is economical, clean and accurate.

The system utilizes every other frame as the matte for the previous frame. For example, frame one contains the stop motion model with desired lighting. The second frame contains the model lit in silhouette. The model is then moved to its next position and the procedure repeated for each individual move throughout the animation.

Using an optical printer the processed negative containing the alternate frames is skip printed twice, the first time to produce an interpositive with consecutive frames of the normally lit animation model and the second time to produce a high contrast matte printed from those frames containing the silhouette.

If the model is to appear behind foreground objects in the live action, it is necessary to lift a static matte (non-travelling matte) of those foreground objects. One way of generating this matte is to rotoscope the live action and render the matte by hand. High contrast frame blow-ups with a little retouching also produce surprisingly clean mattes.

The interpositives, with their corresponding mattes, are optically printed to produce the final composite dupe negative (see diagram). If you wish to learn more about optical printing, one comprehensive reference is the *American Cinematographer's Manual.* *

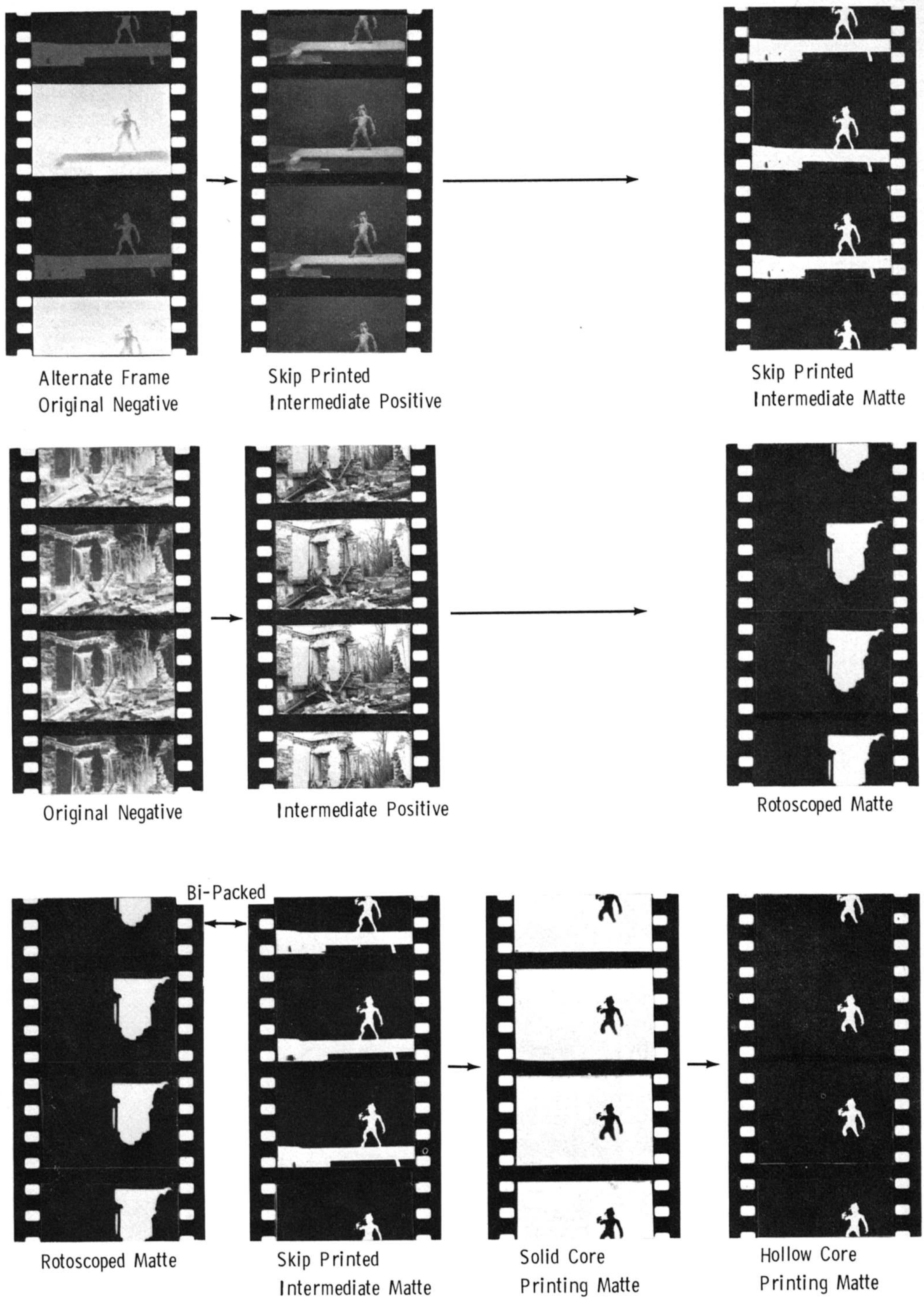
When using the alternate frame matting system a rear screen projection set-up can serve as an alignment aid as well as providing an easy means for silhouette lighting your model. By rear-projecting the live action (which will later be composited with your model) you will be able to closely match the interaction of your anima-

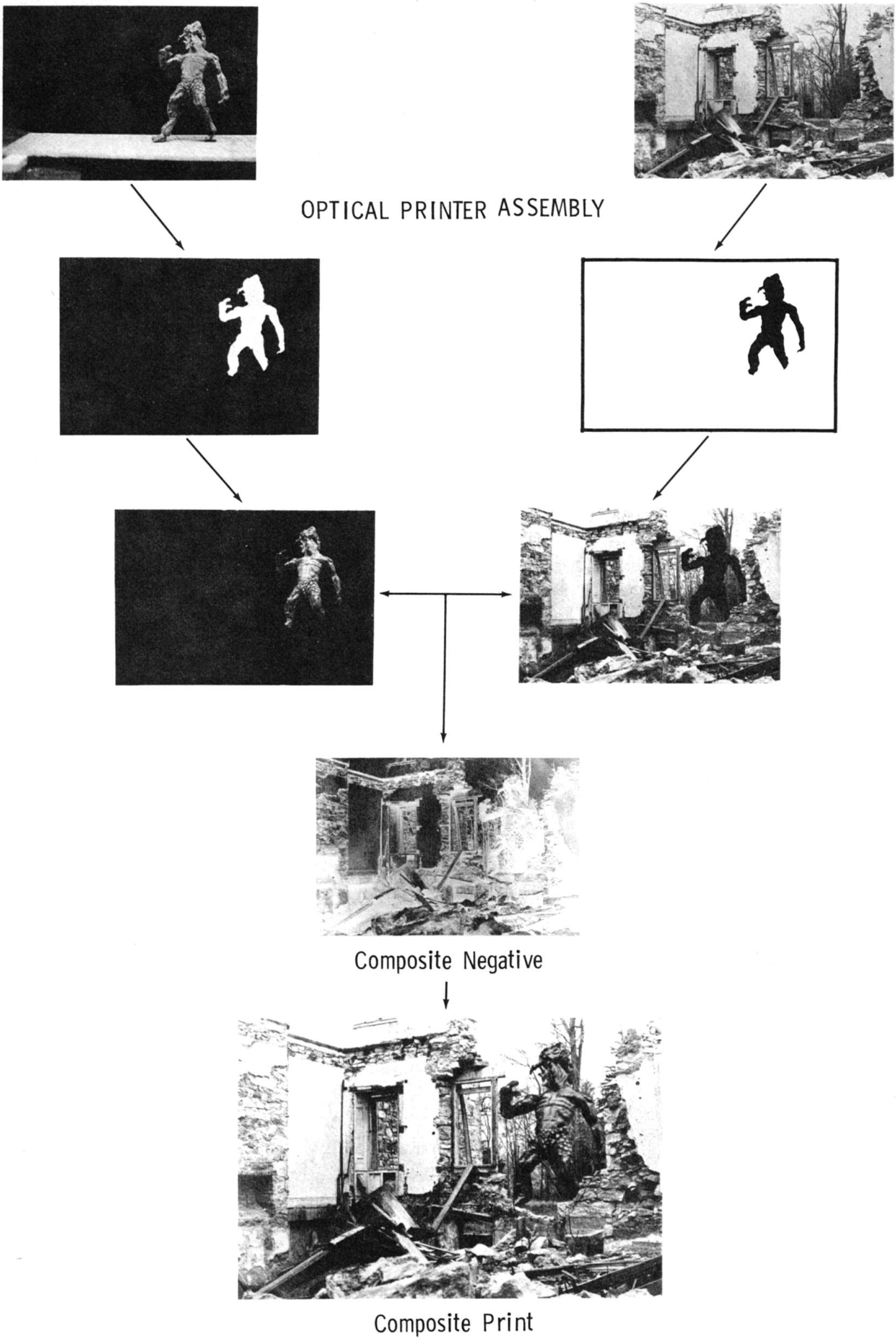
(continued on third page following)

**American Cinematographer Manual available at a cost of $20 plus $1 handling. Write the American Cinematographer Manual, P.O. Box 2230, Hollywood, California 90028. This is a professional handbook loaded with valuable technical information pertaining to all phases of film production. Well worth the money for the serious animator or filmmaker.*

Mike Walker sculpts the stop motion "alien" who pursues the title creature in *Nightbeast*. A full-color photo of the finished alien can be seen on page 18.

THE ALTERNATE FRAME MATTE SYSTEM




OPTICAL PRINTER ASSEMBLY
Composite Negative
Composite Print

tion model with the live action. The rear-projection will also enable you to match perspectives and lighting direction.

In the case of the alternate frame matte system, the rear-projection is used only as a reference. It is not meant to be part of the final composite. So, using the rear screen as a reference, you position your model for the exposure of the first frame.

The first exposure can be made with the rear-projected image on or off. It does not make any difference. After the first exposure is made the front lights are turned off and a back light (behind the rear-projection screen) is turned on. The illuminated rear-projection screen produces a silhouette of your model in front of the screen. Your second frame is now exposed, recording the silhouette of your model, or the matte for frame one. The rear-projected live action is advanced to the next frame, the model moved to the next position, the front light exposure made on frame three, its silhouette matte on frame four, and so on. Make sure the backlighting on the rear projection screen is as even as possible to avoid problems with hot spots.

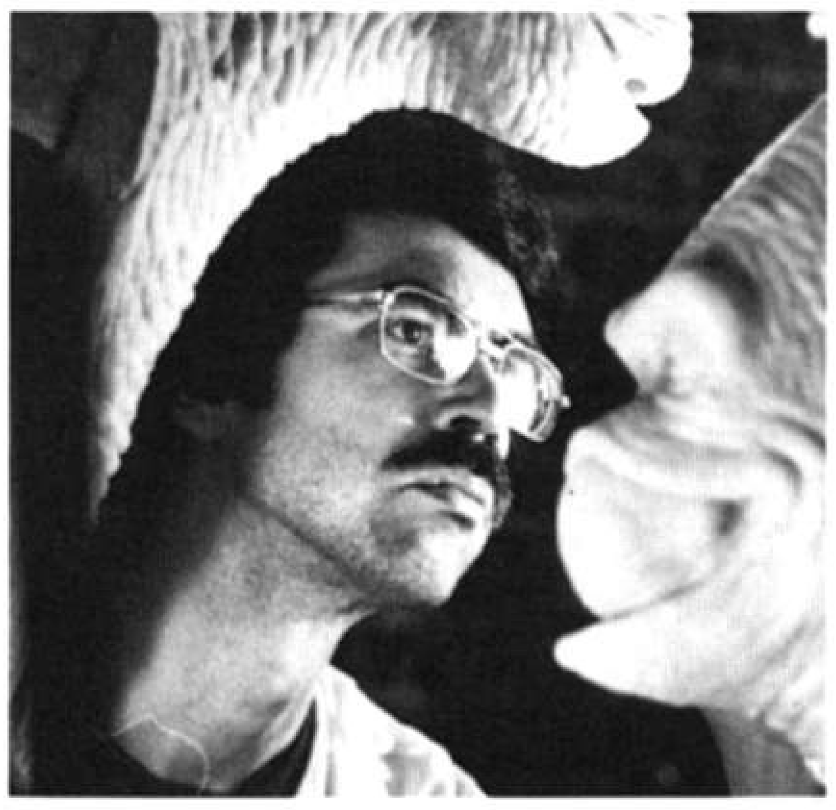
The final composite print obtained through the alternate frame matte system is far superior to front or rear projection. Another big plus is that both the live action and the animation are the same number of generations away from the original.

The live action is filmed on 35mm color negative. From this camera original, a 5243 interpositive (for composite printing), is printed. Also, a positive print of the live action is necessary for rear projection reference. The animation is also shot on 5247 and a 5243 interpositive printed from it. Both the live action and animation interpositives are one generation away from the original. When they are composite printed and the composite dupe negative processed, they both become two generations away from the original. Being the same generation away from the original prevents a mis-match in quality between the two elements. However, it is more expensive because of the composite printing stage, whereas in front or rear projection the composite is acomplished in the camera.

The 5243 interpositive is designed by Kodak to be used in composite work and similar *intermediate* functions. The Eastman Kodak company will provide you with a complete list of their motion picture films and their designed purposes.

Maximum quality is essential when doing animation for a living. But if you are doing it as a hobby or find costs a major factor, I would suggest doing your compositing in camera by using front or rear projection. The true test of a good animator is not how sophisticated and complicated the production, but rather what is accomplished with what one has to work with. I've seen some amazing things done on 8mm with a $1.98 budget. ■

The Contributors



JOHN DODS

Creator of the Grog animated films; designer of the alien make-up for the film *Nightbeast*; a master sculptor and animator.

ERNEST D. FARINO

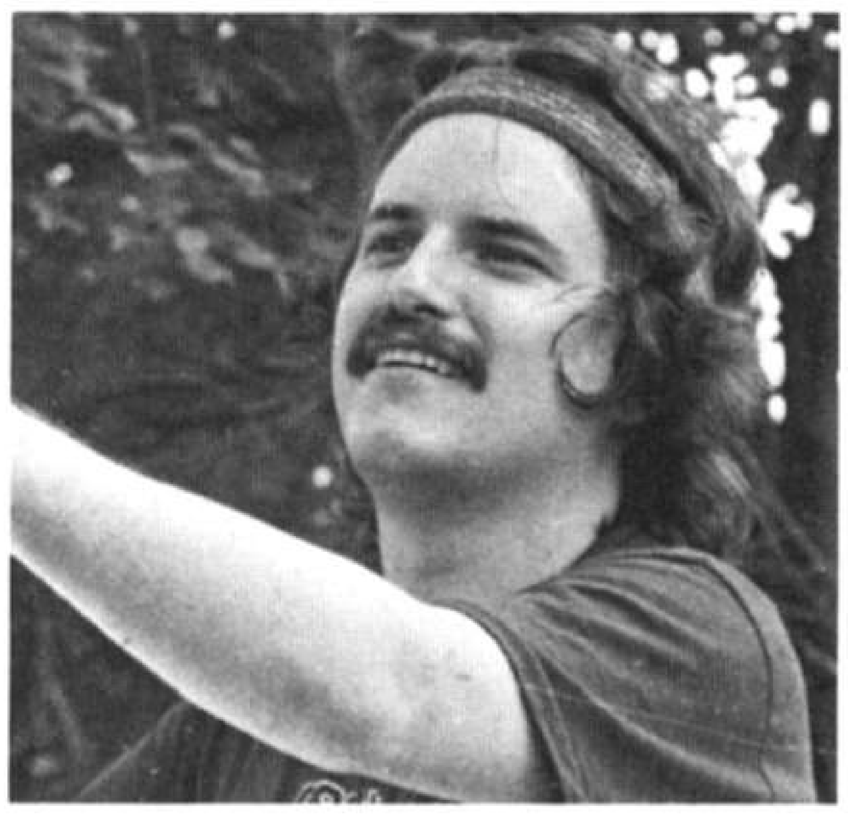
Stop motion animator whose work includes many TV commercials (among them the Pillsbury Doughboy) and feature films like *The Alien Factor* and *The Strangeness*.

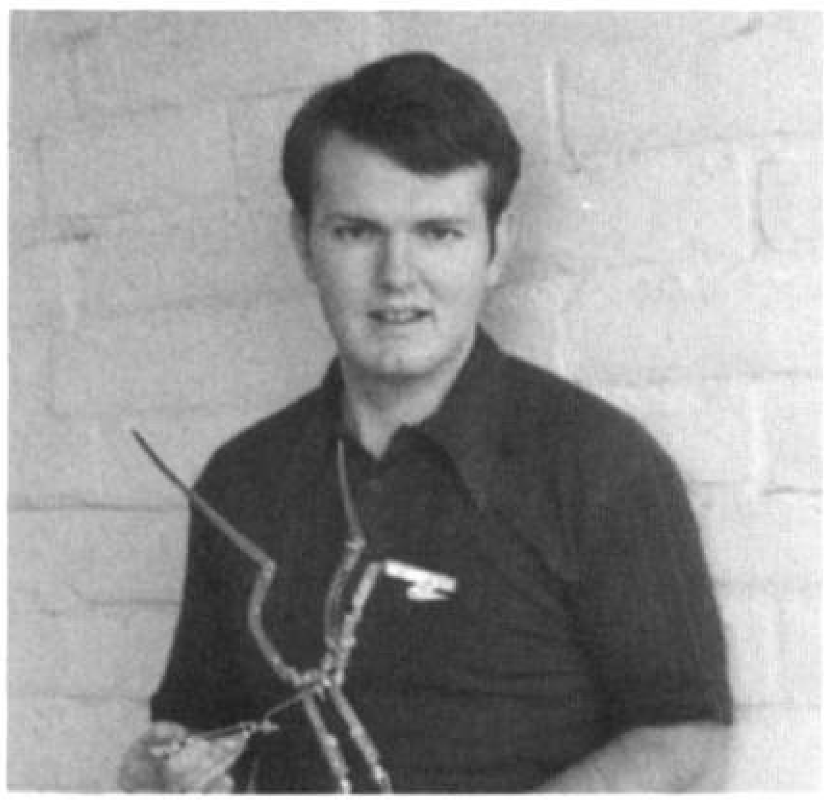
DAVID RENWICK

Animator of award-winning films like *The Fight Game*; an optical effects craftsman whose visual dazzle can be seen in the feature fantasy film, *Fiend*.

DAN TAYLOR

Emmy-nominee visual effects expert who has created TV spots seen across the country; headed the optical and stop motion effects in the feature, *Nightbeast*.

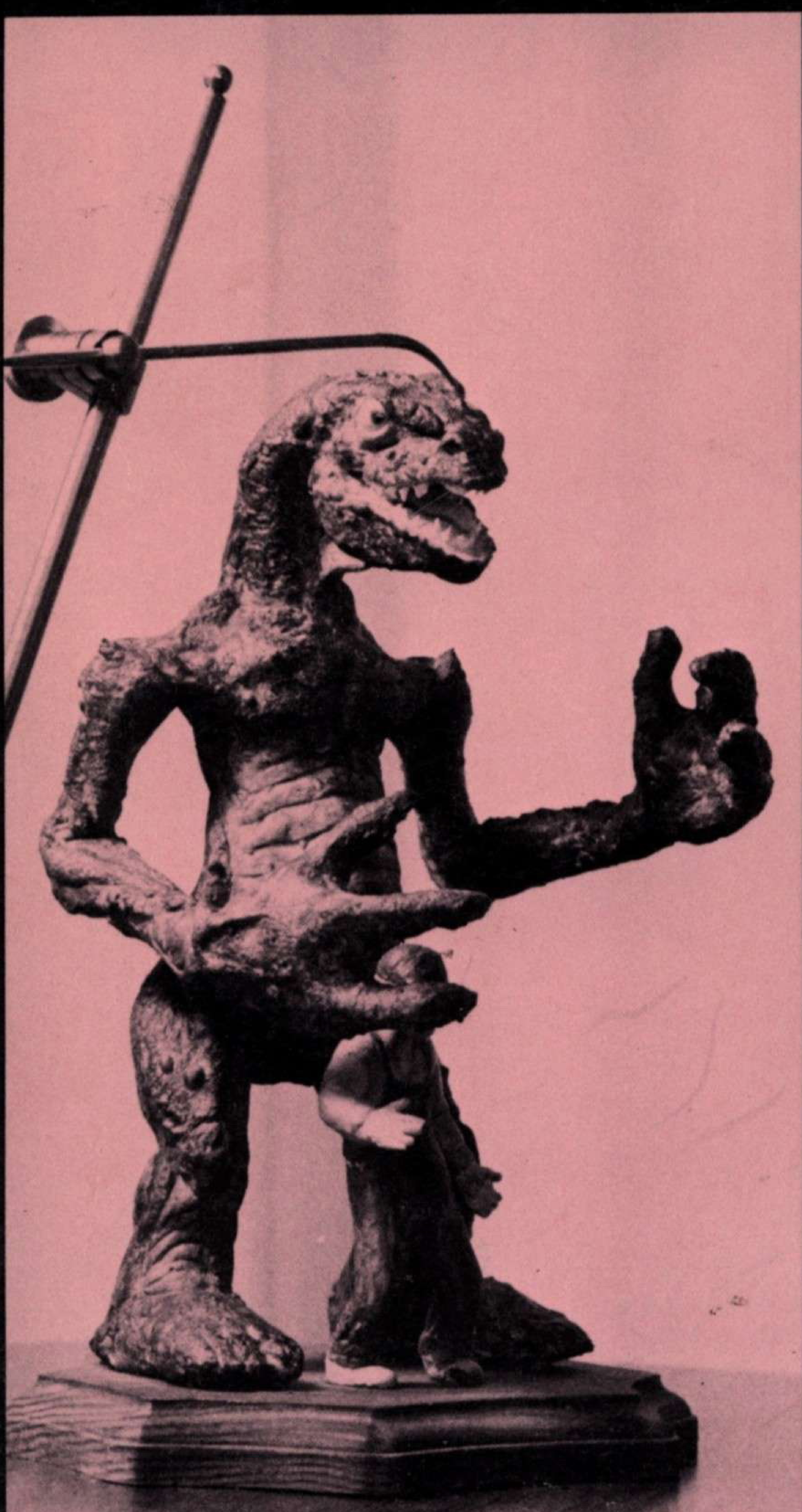




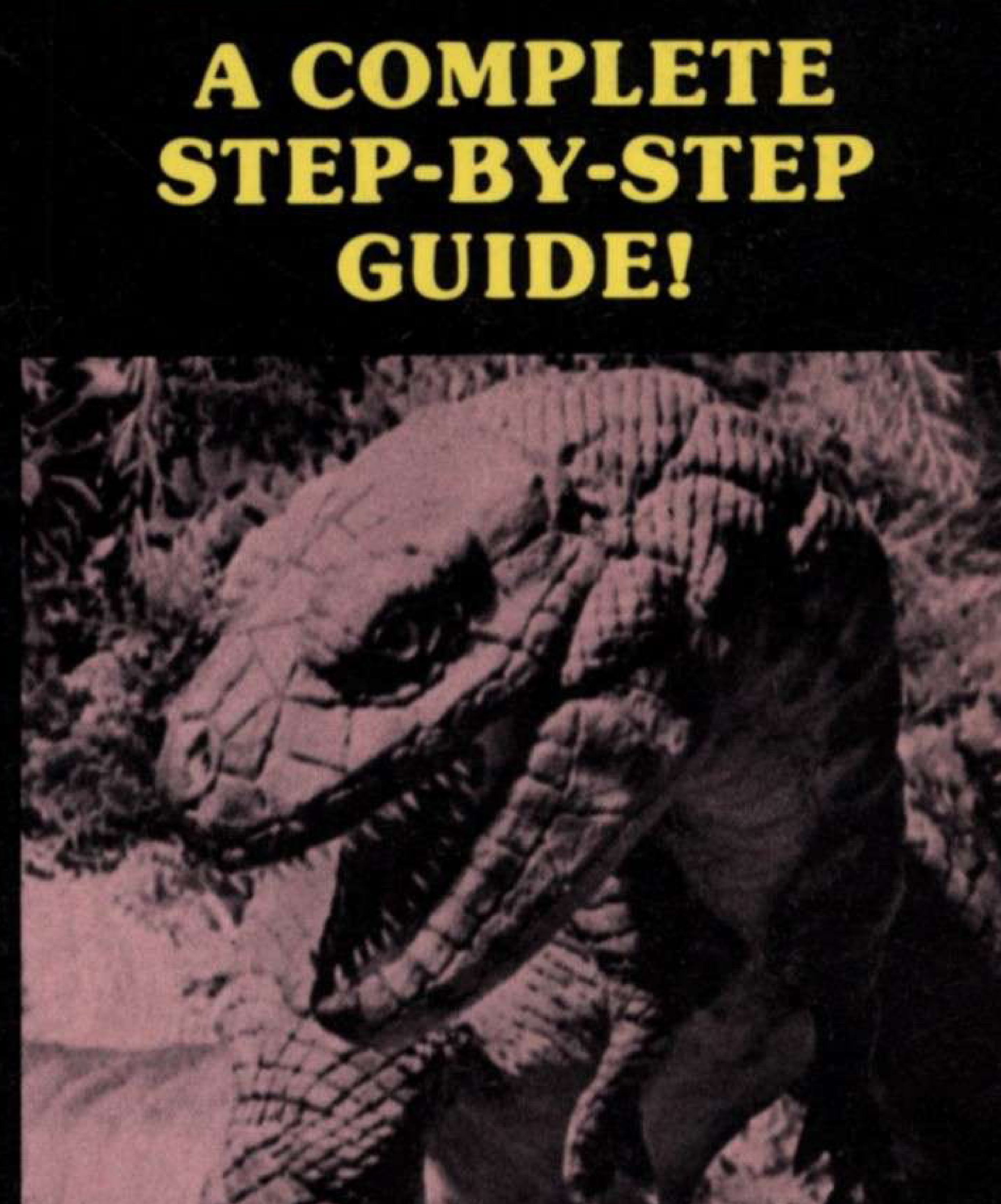
BOB YOUNG

Amateur animator of tremendous scope; creates fantastic stop motion models employing his unique armature method; a talent on the rise.

STOP MOTION ANIMATION



A COMPLETE STEP-BY-STEP GUIDE!



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