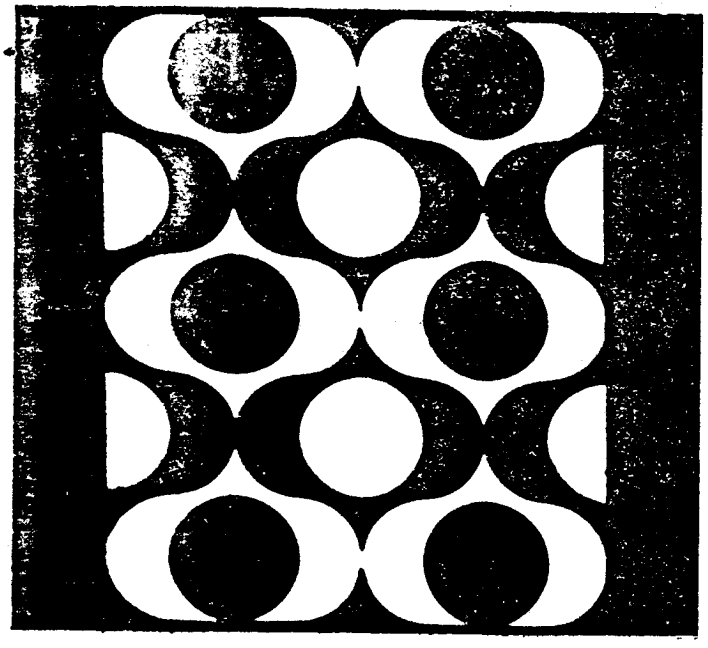

# COMPUTER ANIMATION

Images produced on the "Scanimate" Computer, Computer Image Corp.

Conventional animation locked the filmmaker into his original program once in production. If your artistic montage didn't work, or Minnie Mouse ran too fast, there was no alternative but to shoot over.

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by HATFIELD DAVIS

Film animation has done wonders for Donald Duck, Bambi, and a little less for Snow White. But animation as a vehicle of abstract expression has inherently been restricted by the nature of its construction. Conventional animation requires up to 120 separate art designs to produce five seconds of film. As a result, most animation effects are two dimensional. It was expensive enough to chase the Roadrunner across the screen; running him into the horizon cost more than a whole coyote was worth. Taking animation out of Disneyland was not only too expensive, it usually wasn't worth trying. Translating the concepts of imagery into effects on film often never made it.

After 20 years and three generations, computer technology is advancing to the point where it is beginning to restructure the parameters of film expression. In animation, it is in the process of expanding the scope of filmmaking from two to four dimensions. It is adding space, the dimension which, from any practical standpoint of filmmaking cost, conventional animation can't handle. It is also restructuring time. Animation is now live. Computer animation is in motion BEFORE filming. Previously, film life in animation depended solely on the motion of the film itself. Now animation can be filmed in "real time."

The new dimensions of animation are dramatic. A basic example is a recent animation of a helicopter sequence as part of a promotional film for one of the auto companies. The computer, in effect, flew the helicopter with blades turning; changed the copter body into fat, thin, long, and wide

configurations of helicopters; and then, banked and flew it off into the distance, rotor blades and body proportionately shrinking while still flying. The whole procedure took 30 minutes, required only three pieces of art work—the helicopter and two sets of rotors—and accomplished maneuvers virtually impossible in conventional animation. In this case, the filmmaker merely experimented with various effects while sitting at a console board and watching the screened video images until he had achieved the best representation. He then reran the sequence, this time filming. Five seconds of sequence required five seconds of film.

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But to discuss the state of the art of commercial animation and obtain an overview of its potential for independent filmmakers it is necessary to build upon a basic understanding of how a computer animation system works. From any angle, the use of a computer in filmmaking has formidable barriers. Cost, of course, is the most obvious. Experimentation requires institutional aegis. The computers we think of when we get our bills from Con Edison, the IRS, and possibly our local doctor all require another factor, a specialized group of people

who know how to tell the computer to raise our rates. As the computer-school promotions explain: "You have to know a special language to talk to a computer." Instructions to a computer—i.e.,programs—require specialized languages. The more sophisticated the project, the more sophisticated the language required. Unfortunately, drawing a picture is much more difficult than calculating a bill.

Most computers are digital computers. They perform arithmetic functions using discrete numbers in the same fashion as an abacus or a desk calculator. There is, however, a second type of computer, an analog computer, which is not generally used except in scientific applications. It calculates functions as continuous functions, whereas the digital computer calculates functions in discrete steps. An explanation of the difference can best be described by examples. A slide rule is a simple analog computer. An automobile speedometer functions as an analog, as does a supermarket scale.

Now before you think you have accidentally begun reading Freshman crib notes, let's bring out the relevance of all this to computer animation. If you yourself wanted to use a digital computer to produce animation you would have to learn, or if you had sophisticated objectives,invent, a computer language. As a filmmaker you would have to sign up for IBM school, or possibly worse, spend a good part of a year telling system analysts what you wanted to do. More important, you would not see what you had done until it was on film. From then on, it's back to the punch cards. By using a computer with analog capability, commercial animation has developed the state of the art to a point where one can play with dials, knobs, and joysticks (a fun game in itself) and see exactly and instantly the image created on a cousin to a television screen.

Yet commercial animation only arose about three years ago with the designing of special-purpose computers created specifically for animation which combined the features of both digital and analog computers. The "hybrid" systems usually use video techniques for detailed imagery and surface characterization of images; analog techniques for structures, basic shapes, and animation; and digital techniques for control, storage, and timing of the total animation.

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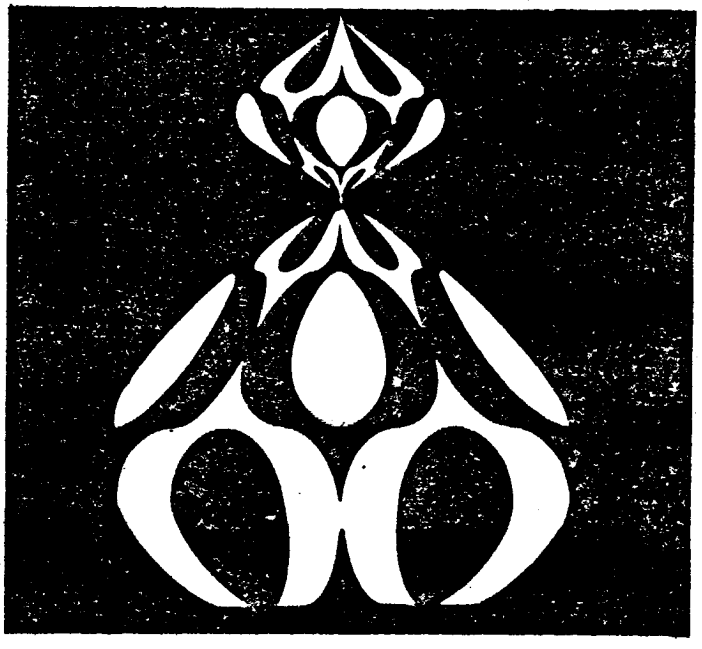
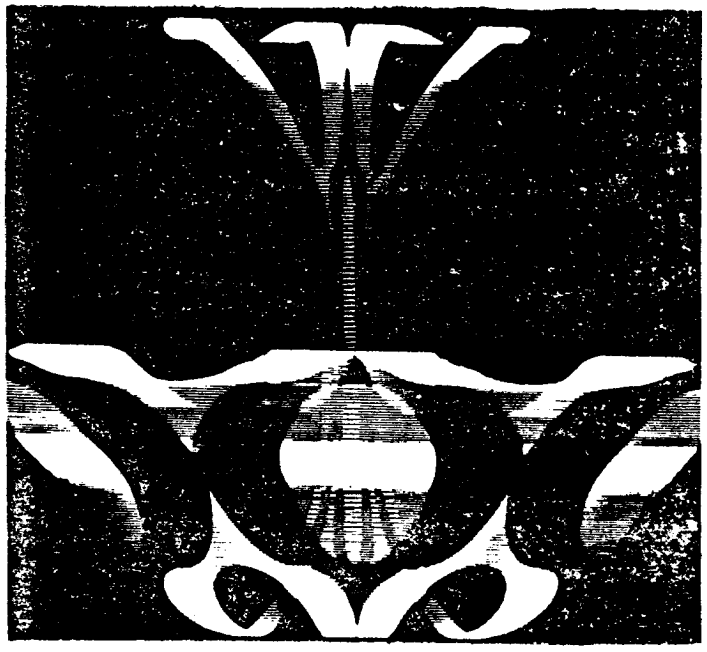
In response to an open-door policy for professional filmmakers, I recently spent a day at Dolphin Productions, a Manhattan subsidiary of Computer Image Corporation. Their





system is compact, taking up a space comparable to the cockpit of a 747 jet. The art work, which has been previously converted to a high-contrast photo of drawn material, is placed on a back-lit light box. Taking the helicopter as an example, the body and two rotors are set up separately along a vertical axis. The box is viewed by a specially designed TV camera with a high-quality, scanning-format, pick-up device which allows up to seven separate photos to be set up on the box at one time. The art-work conversion unit then converts the images it has received to electrical signals. These in turn are fed to the computer, which then restructures the signals in accordance with the various positions of the dials and knobs. The resulting image is created on a cathode-ray tube.

The filmmaker at the console can choose one of two modes of manipulating the image. One is DIRECT. In this mode he just grabs a knob or joystick and moves it and the image moves accordingly. The other is PARAMETRIC. In the parametric mode you establish the parameters of some kind of motion and then the motion will continue. In the first case it requires skill on the part of the operator. He must be able to move with the image, and the image will do exactly what he tells it, including shake if he shakes. In the second mode he can establish smooth harmonic motions or more complex motions and try them over and over until he gets them exactly the way he wants them. It's almost like putting the computer on automatic pilot. You may often go through a time-consuming process to get exactly what you want, but once it is established in the computer you can go back and change a little piece of it without losing the rest of the completed sequence. A filmmaker with a project in animation can come in with his art work and a rough storyboard and describe the basic images he is looking for—and the filmmaker at the control panel can recreate various images on the screen in response. If you want, an interesting form of interaction can take place between the two filmmakers, with the control operator running through other possible images or turning the computer loose on the parametric mode to see what unplanned variations can emerge. The filmmaker himself can also get at the controls. He can take a basic image and put it through the variations of exploding, twisting, squeezing, revolving, growing, undulating, plasticizing, and pulling-through-itself. (Saul Bass spent six hours at Computer Image's facility, and the last two hours he was able to run the computer himself.)



Once the filmmaker has created the image sequence he requires, he is ready to film. A camera is mounted directly in front of the cathode-ray tube. (Computer Image uses the Arri for filming 16 and a Mitchell or Acme for 35.) The camera and the computer are linked with a synchronous motor. The computer activates the camera once you are ready to begin filming. The camera films at a normal 24 frames per second. The computer completely calculates, updates, and draws the image at 48 frames per second. The reason for the disparity between the frame rates is the fact that most cameras have a 180 degree shutter. The computer must draw the entire picture during the time the shutter is open. If you're shooting with a single-lens reflex camera like the Arri, you can watch the picture through the camera at the same time and do your framing right there.

A number of interesting films have been done using sequences made on Computer Image's system, which incidentally is named "Scanimate." "Mandate for Tomorrow," a NET television special run on the eve of the election, used some animated sequences of photographs to produce an imagized version of a marijuana scene. Later, in an air pollution sequence, multiple fragments filled the screen and then resolved into an air pollution photo image. Even the title began as an atomic mushroom which again resolved into itself. Perhaps the best range of images was demonstrated in a reconstructed series of shorts made into a film called "Theta," an animated robot's trip through a 2001-style solar system.

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Commercial animation cannot yet do the type of animation we saw in "Snow White." But then, "Snow White" would be impossible to do today using conventional animation because of the cost. Although the big digital computers now have the power and potential to produce unique and far-ranging sequences, the capabilities of the analog-digital (hybrid) computers are growing very fast—and even more capabilities will be added to existing hybrids as research engineers develop specialized hardware subsystems.

Presently a day on Computer Image's system costs $3,000, half the cost of conventional animation. But conventional animation was about 5% creative and 95% production. On a computer the ratios are reversed. They say that once it used to take three days of storyboarding and nine months of production for the average cartoon. 83 minutes of "Snow White" took 750 artists 3 years to complete 1,000,000 cels. 750,000 were never used. That's too much of a space flight—even for independent filmmakers.

*Computer Image's open-door policy for professional filmmakers is in effect at its Denver (2475 West Second Ave Denver Colo. 80223), Los Angeles (268 So. Beverly Dr., Beverly Hills, Calif. 90212), and New York (Dolphin Productions, 666 5th Ave., NYC 10009) facilities. Interested filmmakers should write for further information or appointments.*