
Across the Eighth Dimension with
Buckaroo Banzai

Any film that strives to depict the eighth dimension, an invisible tenth planet, spaceships that look like seashells and interdimensional aliens who are all named John demands total suspension of disbelief. And the extent to which *The Adventures of Buckaroo Banzai* is successful in this regard can be laid, in part, upon the artistry and technological know-how of the people who labored on its special effects.

In all, three companies were principally engaged in the effects effort. Dream Quest Images produced approximately thirty shots involving miniature spaceships, matte paintings and some optical compositing. Peter Kuran and VCE, Inc., were responsible for another sixty-four effects shots, including all the live-action bluescreen work, various animation effects and more optical compositing. Finally, John Scheele and Greenlite Effects, Inc., tackled the brief but interesting segment in the eighth dimension. Because of its original design — and in some cases, equally unusual execution — *Buckaroo Banzai* strained the boundaries of the known. After all, no one knew what the eighth dimension should look like; no one knew what an alien Lectroid should look like; and certainly, no one knew how to make a seashell fly.

Even so, first-time director W.D. Richter never thought of *Buckaroo Banzai* as a special effects film. "Our approach was not to have the movie hang on special effects—not to give one effect after the other. Our effects punctuate a human story, and so we didn't feel we had to try and top such films as *Star Wars* and *Return of the Jedi.* We tried to be original in our design." Taking their cue from nature rather than high technology, Richter and production designer Michael Riva designed spaceships, aliens and 'other worlds' that have few precedents in film. Richter encouraged input from everybody on the show, and as in all good science fiction, origins were established for the worlds involved.

"We decided from the start that the whole movie was going to have a production design that was ramshackle or pasted together, as the real world is," said Richter. "It wouldn't be slick and it wouldn't look like it had been stamped out by a Hollywood studio. Factories and military facilities and houses really look messy — which to us said 'organic.' It's a lived-in, cluttered world. So when it came time to design the spaceships, that word 'organic' kept coming up. We were not going to do things with wings and conventional cockpits in them. We were going to take that notion of 'organic' into nature and see what we got back. As a result, some of the early designs were as simple as eucalyptus pods that fall off trees and are spiky and strange.

"The insect world also influenced us, because we were designing the creatures as we were designing the ships. The creatures started off based on ants and very quickly got away from that idea. An anthropologist in Canada designed a model of what he thought dinosaurs might have evolved into — upright and hominid — had there not been some cataclysmic disaster. These creatures were startling. They had large eyes. They had a lot of features we would recognize. They had very ordinary necks on a straight plane from the spine, but they had lizard-like hands. We began working with that design, trying to figure out how we could take something very complicated on the page and photograph and turn it into things that could be put on actors with any kind of speed." Once finalized, the alien designs were delivered to Tom Burman and his prosthetics makeup crew at The Burman Studio.

With an alien concept firmly in mind, Richter and Riva next turned their attention to the ship designs. "We asked ourselves, 'What kind of ships might things that look like this have?' There's a line in *Invasion of the Body Snatchers* (screenplay by Richter) that I've I always loved the implications of. Somebody said, 'Why do we always expect metal ships?' Because we are very self-centered and *we* have metal ships. But that is incredibly arrogant. They can come in anything they want ... that they can make work. For example, they might not necessarily manufacture sheets of steel. Instead, they might *grow* their spaceships. Once we got pretty solid on that concept, then we were back to the idea that the thing's *got* to have an organic look. Well, nature is seashells and things that fall off of trees, and sticks and twigs, and the designs started to evolve from that. Michael Riva got books on all sorts of natural subjects, and the seashell books were some of the most impressive. So we based the fathership on a seashell. Not every ship is based on a seashell, though. For instance, the thermopod that brings John Parker, the good alien, doesn't look like a seashell at all; it looks like a dinosaur with a huge spherical belly. The result is like something you've never seen before. It doesn't necessarily mean you're going to like them, but you haven't seen spaceships like this." Visual effects supervisor Michael Fink agreed. Never before had he seen spaceships like these.

Michael Fink began his career doing electronic effects for *The China Syndrome.* Since then, he has contributed to the 'special edition' of *Close Encounters of the Third Kind, One from the Heart, Star Trek – The Motion Picture* and *Blade Runner.* Most recently, he supervised the massive electronic, video and rear-screen effects on display in *Wargames.* As visual effects supervisor on *Buckaroo Banzai,* Fink was involved with the picture early and worked with it well into postproduction, bearing overall responsibility for miniatures, background photography, opticals and other technical effects. At the beginning, though, he was wary of the ship designs. "Mike Riva and Rick Richter asked me if we could make miniatures of these designs and use them as spaceships and I said, 'Yes, *but* you are looking for major difficulties.' The first designs looked like shells with long thin spines — lots of them — and they were usually of colors uncom-

article by
Nora Lee

The Adventures of Buckaroo Banzai *photographs copyright © 1984 by Sherwood Productions, Inc. All rights reserved. Production unit still photography by Bruce McBroom. Title page composite by John Scheele. Additional photography courtesy Michael Bigelow, Greg Jein and Mark Stetson. Special thanks to Anne Thompson and Paulette Levine.*

fortably close to bluescreen colors. In other words, not only would you have long skinny spines blurring past camera, but you would have a color that you could not readily separate from the background. So the first thing we did was change the color. We found new seashell colors that would be good for separations. Then we modified the length of the spines and the design of the ships, especially in places where it got really scary and things were just not going to hold up. We tried to put the ships together so they would be as clean as possible. They were designed and redesigned with major input from Tom Cranham — who really came up with the final design on the ships. Before that, it was all words. Tom's hand changed those words into pictures."

Cranham's sketches were delivered to two different model shops. Greg Jein and his crew built the fathership and its thermopod, while Mark Stetson and his were responsible for two Lizardo ships, a second thermopod, the Yoyodyne wall and the oscillation overthruster. For Jein, the most intriguing aspect of the assignment was the film's unusual designs. Certainly, he had never built a spaceship quite like these. Also, he could not resist the idea of building a fathership — just because it was a fathership.

Sculptors Mike Hosch and David Shwartz examine a clay rendering of the Lizardo thermopod featured in The Adventures of Buckaroo Banzai. *In keeping with the basic production design of the film, the thermopod had an irregular organic form that set it quite apart from the high-tech, hardware-oriented look most commonly found in speculative spacecraft. / Mark Stetson positions a smaller version of the thermopod onto the docking area of the Lizardo ship. Model-building assignments on the film were divided between two facilities — one supervised by Stetson and the other by Greg Jein. / The Lizardo ship — one of two constructed by the Stetson unit — was derived from a basic seashell design conceived by director W. D. Richter, production designer Michael Riva and production illustrator Tom Cranham.*

Working from Cranham's drawing — and a seashell as a model for the sculpture — Jein set to work on the prototype fathership. The body was carved entirely from a solid piece of styrofoam — the kind composed of a mass of tiny balls. The pebbly surface of the foam helped give the ship its organic look. Then each of the spines was added separately. The egg-shaped body of the accompanying thermopod was carved first out of heavy urethane foam. Then Jein applied a layer of wax which allowed subtle detailing to be added before the mold was made. The basic wing structure was fashioned from aluminum wire, with Doug Turner employing water base clay to sculpt the membranes.

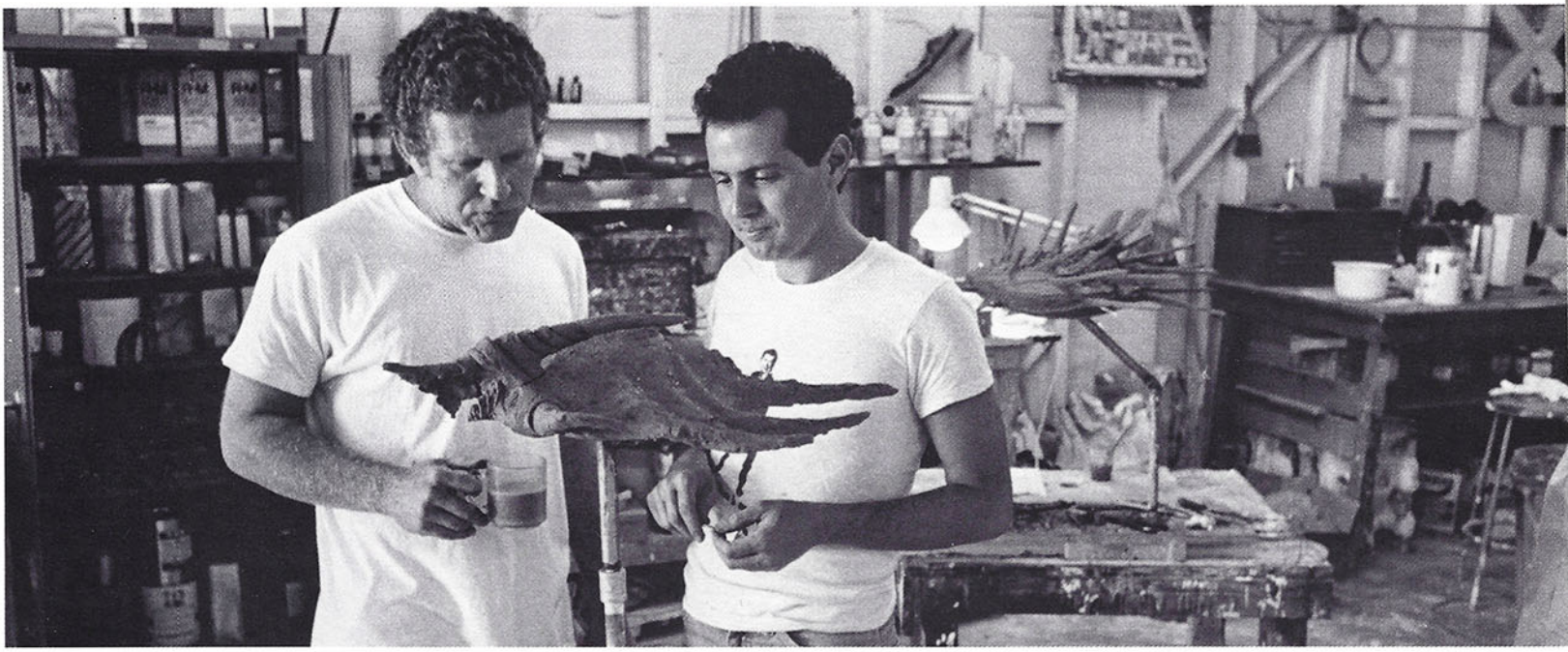
As Jein and his people had done, Mark Stetson's group also used one of Tom Cranham's production sketches as a basis for their work, augmenting it with various actual seashells for added inspiration. Unlike the Jein spacecraft, however, the prototype Stetson ships were first fashioned from clay. The most challenging proved to be the large Lizardo ship on which sculptors Mike Hosch and David Shwartz labored for several weeks. Particularly troublesome was the fact that the ship was covered with a large number of spiny outgrowths which needed to be incorporated into the basic sculpture. Then, once the final concept was okayed, each spine had to be cut off, keyed and cast separately. Once all the ships had been cast and pieced together, Dennis Schultz designed the multiple mounts and interior lighting. Ron Gress painted the final products.

All the spaceship model photography was done by Dream Quest Images at their studio in Culver City. "The design of the spaceships was one of the first obstacles that we encountered," recalled Keith Shartle, production coordinator for the facility. "The spaceships were very, very unusual. For example, we had the fathership, which is seen only in space. It looks like a beehive with tentacles. We had the first thermopod, which looks like a prune with batwings — or maybe a plum. Actually that's my favorite one. Then there was the second thermopod, which I think looks like a deformed arthritic hand. Plus we had the Lizardo ship, which is very large — probably the size of a 747 — but it has tentacles all over it and it looks like a flying seashell."

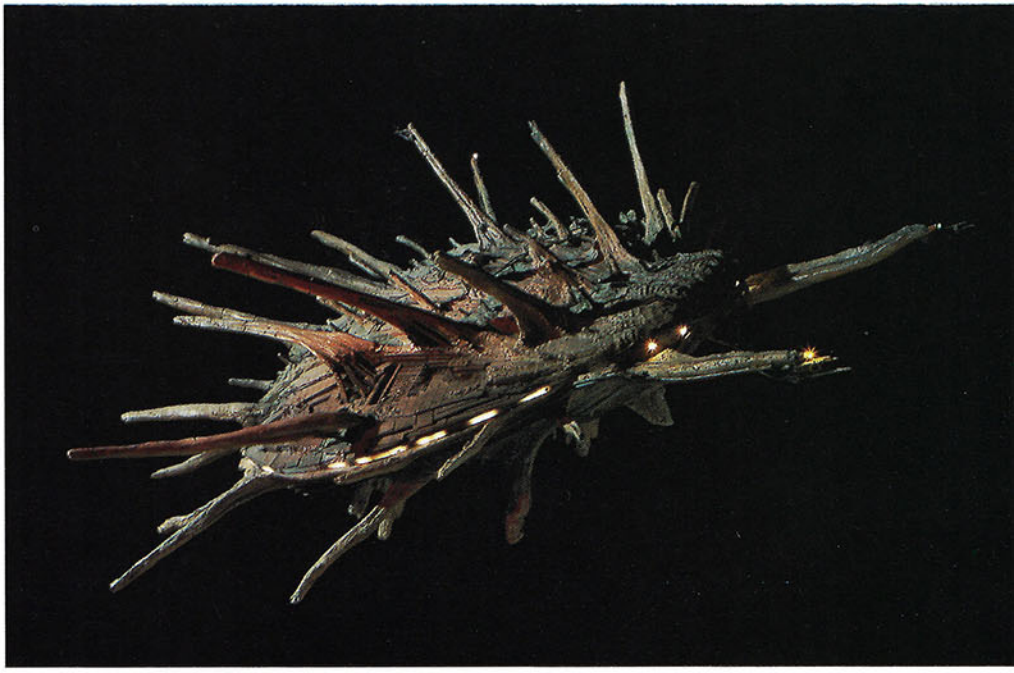
The Lizardo ship appears in various places throughout the film, but not every shot is a model shot. Since no full-size ship was built, two of the film's more intricate matte paintings involved placing the craft in its makeshift hangar. "There were two matte paintings inside the hangar at Yoyodyne," Shartle explained, "and in those, Rocco Gioffre painted in Dr. Lizardo's ship. For another shot, we actually photographed the miniature ship and matted that in. Then we rotoscoped the actors that walked in front of where the model should be. It's dark inside the hangar, which always helps the illusion, but it looks like a set piece — like it was really there. There is also a shot inside the hangar in which there is a track with a launch platform that is moving toward camera. We matted in the Lizardo ship above it, moving along and releasing from the launch platform and coming toward camera. One of our motion control technicians, Bill Reilly, had to track that and then Glenn Campbell rotoscoped the launch platform since on the live-action plate it had nothing actually on it. Scott Squires supervised the plate photography, which was done in a steel plant in Los Angeles. The set decorators used a lot of existing pieces of equipment and added on pieces to make it look very, very unusual — like something from the eighth dimension — wherever that may be. I think the art director visited there once to take some stills, just to make sure that we got it authentically."

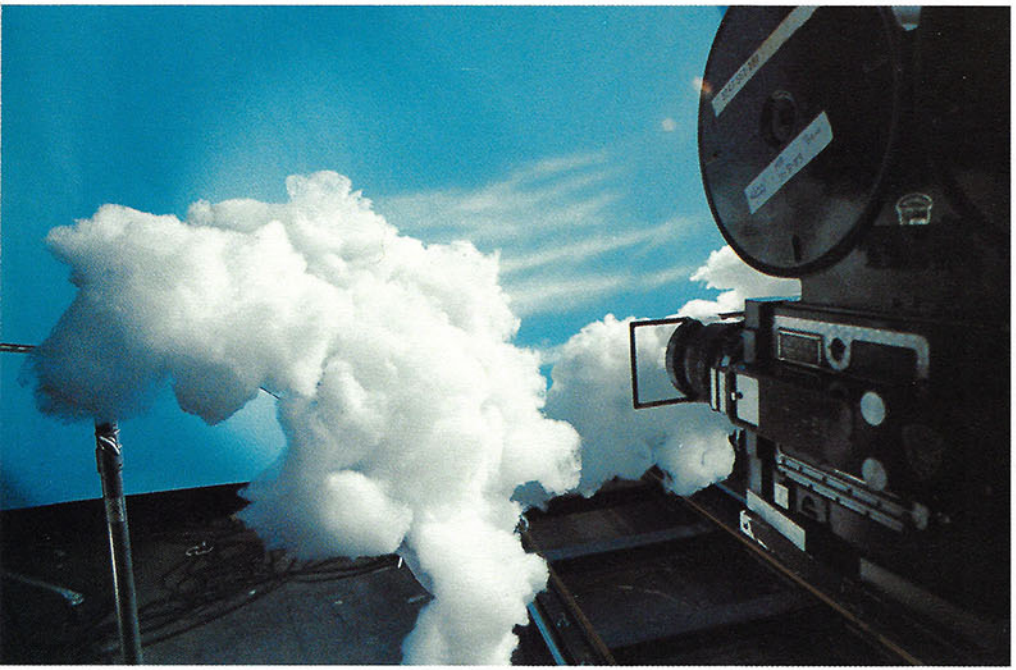
Along with such 'authentic' information came the down-to-earth advice that since all the eighth dimensional spaceships were spiny, the best way of matting them would be to use bluescreen techniques. Normally, Dream Quest employs an ultraviolet frontlit/backlit system which they developed on *Blue Thunder*. The *Buckaroo Banzai* ships, however, had so many spines on them that they could not be lit evenly with the ultraviolet light — and without even lighting, there would be holes in the mattes. The only other alternative was bluescreen, but it was no routine job.

"Bluescreen on *Buckaroo* was more difficult than usual because the ship designs were terrible for traveling mattes," explained Dream Quest visual effects supervisor Hoyt Yeatman. "We sometimes called the Lizardo ship a flying tick, because that's what it looked like with all those little spikes coming out. When you have a ship like that and it's moving rapidly through the air, bluescreen has a nasty habit of clipping. Clipping is where the film stock that you're using to make the matte doesn't know if the blur area — the edge that is blurring — is part of the screen or if it is part of the ship. At one time or another, the film stock has to make a decision. And that's













when you start getting this clipping problem. What you have is a very hard edge, and that hard edge makes the ship look like it is strobing — or sometimes things disappear completely and you don't have part of your ship. As the spindly ship starts to take off, it can lose all its little points and end up looking like a fuzzy ball flying through the air.

"To help insure that the streaking held up in the matte process, we used more of a continuous tone stock. Most people use Kodak 5369 or 5362, which tends to see black or white. So when you have a blurring image that is basically made up of grey tones or gradations, it doesn't know what to do. What we started using was a new special order film stock from Kodak—SO331 — which is an estar-based film and it is not so susceptible to shrinkage. It's really tough. We went through a lot of shenanigans in opticals where we used a 'super blue' print, which is made up of a blue print with a little double exposure from the green. There was a lot of playing and tweaking. Almost every shot had to be handled as if it were a special shot."

There were other steps that Dream Quest took to maintain the best quality they could when shooting the spindly ships. "In some cases," Shartle said, "we shot repeat pass bluescreen. Our motion control crew — David Hardberger, Bill Reilly, Scott Beattie and others — would shoot the model with production lighting, using black velvet in front of the blue screen. Then they'd rewind the film and put the model back to its start position. We silhouetted the model on the blue screen and shot a second pass on the same piece of film. You end up with a model that looks like it was photographed in one pass in front of a blue screen, but in fact it was shot in two passes. The mattes are pulled from the bluescreen, but you don't have as much problem with contamination — the blue light spilling on the model and causing holes in the matte. In some cases, where the model was going to be moving very, very quickly, we did a separate pass of the model against black, and then an interpositive was made of that and we would double-expose just a little bit of that pass against black over the top of our finished composite. This made sure that all our streaks were maintained."

Precise matting was especially critical since the *Buckaroo Banzai* ships were to be composited over blue sky and clouds. "Later on," said Yeatman, "opticals become a nightmare because of the same problems — the small spindles, the fast-moving blurring ships and the fact that you're putting them in over bright blue sky and cloudy backgrounds. It's the worst possible combination that one can have. This was really a challenge for our optical supervisor, Mark Freund, and his staff which consisted of Dennis Dorney and Eric Guaglione, among others. It took them a while to do it, but they finally got it. We learned a tremendous amount of what not to do — and also what *to* do — to make it work."

Even the blue skies and clouds themselves became a major challenge. After much discussion over the best way to get a perfect cloud plate, Dream Quest contracted to synthesize them in their studio. Normally, one would expect cloud plates to be shot by sending a cameraman up in a plane — a process which is not at all as simple as it might seem. First, the perfect clouds have to be found — and they could be halfway around the world, depending on the time of year. Then the director usually has a certain type of lighting in mind. If he wants magic hour lighting, that limits the flying time. The cameraman has nothing to focus on when he is shooting clouds. He does not know where the plane or ship will appear in the shot and he just has to guess. Finally, the whole project can be extremely expensive because of the unpredictability of Mother Nature.

From Dream Quest's point of view, there were definite advantages to controlling the cloud plates by doing them in the studio. The lighting on the miniatures would match, the motion control moves would match and that would save time. So in the end, Dream Quest produced their own perfect cloud plates, without ever going up in a plane. "Our first approach was to use matte paintings," Yeatman explained. "We had done one shot for *Deal of the Century* with a matte scan type of system. Our matte artist, Rocco Gioffre — assisted by Mark Sullivan — would paint a very large painting, about eight feet by sixteen feet. It looked like a giant mural, with different types of clouds on it. And we had the matte scan camera rig built by Tom Hollister, with electronics by Fred Iguchi, that could go north, south, east and west, track, roll ... the whole bit. We would split the clouds up into four or five bands and we then make multiple camera passes over them at different speeds — like Albert Whitlock would do on a matte painting — in order to get moving clouds into an otherwise static painting. It's like you are flying through the air and you look out the passenger window and see the clouds going by. But it was very difficult to get dimension. You couldn't move toward or away from the clouds very well. And unless you had the clouds moving at a pretty good clip, it always looked like you were flying through it sideways. Or if you stopped to make a move with your panning, the illusion stopped. So the uses were limited."

In researching other films with synthesized clouds, Dream Quest discovered that some of the skies in Roger Corman's films were made of cotton. Every kid has glued cotton to a piece of blue construction paper to make clouds — and in a somewhat more sophisticated way, Dream Quest ended up doing the same thing. Instead of cotton, however, they used polyester fiber fill, gluing it to pieces of plexiglass which enabled the 'cloud banks' to be lit from underneath.

"The next problem was using wide screen or anamorphic lenses," Yeatman continued. "You suddenly realize that for a little twelve-foot-wide bank of clouds, you would need to have a twenty- or thirty-foot cyc behind it. And if you are panning and tilting, it would have to be even bigger. Our space did not allow for that; besides, we would have to light it. So the alternative was to matte the clouds into a smaller-size painting of clouds and sky. That meant that we had to be able to scale the move on the painting down to half or a third the size of what we would be using for the banks.

Dream Quest Images executed all of the motion control photography in the film. Since much of the action was to be staged against daylight skies, one of the first problems involved generating appropriate background plates. For maximum control, Dream Quest dismissed the possibility of using actual cloud footage in favor of creating their own on stage. Experimentation led to the employment of polyester fiber fill glued onto pieces of plexiglass. Originally planned for single-pass photography against a sky cyclorama painted by Rocco Gioffre, the concept was subsequently altered to a multi-pass approach, with the clouds matted in bipack against the painting. / An inverted camera and snorkel lens were used to obtain cloud imagery that appeared to be whizzing by on either side of the thermopod cockpit. / Gioffre makes minor adjustments to the simulated cloud formations.

"Since the clouds were white, we would light the clouds for production. We would have our nice strong back-light with the orange glow to it and the blue fill. We would set the camera up, and on color film we would shoot one pass — basically, the clouds against black. Then we would back the film up and take it off. Next, we would load the camera with black-and-white high-con stock and flat-light the clouds. Then we would shoot the exact same move. After that move was shot, we would take the film off and process it in-house — which took about fifteen or twenty minutes. When it came out of the processor, we had a matte — a clear field where the sky would go and a dense area where the clouds were. Then we would load and bipack the already existing latent image of the clouds with the matte. We would swing the camera around and look at the painting that Rocco did. At this point, we rescaled everything with the computer. We would go from using, say, a 50mm lens on the clouds to using a 100mm and cut the move. On that same piece of film, we would shoot the background. Now we have put the sky background in with the clouds and it's all original negative. It hasn't gone through any duping. The reason we chose to do it that way, as opposed to shooting the clouds as one element and the background as another, is because we wanted to get a better fit and blend between the elements. By shooting the clouds in two parts, we could keep the painting at infinity. Normally, if you have a backing and you move the camera on it, the backing will approach the camera as fast as the clouds approach — which is wrong. When something is approaching camera, the distant mountain range — or whatever is in back — stays at infinity."

Keeping the fiber fill from looking fibrous was another problem. "We tried different types of diffusion," Yeatman continued, "but diffusion diffused the clouds so much so that if you got rid of the little tendrils, you also lost contrast and it looked out of focus. We tried nets; we tried gauze; we even tried something that worked. We would shoot fifty-fifty — half-exposure — on the camera. Then we would offset the camera a little bit and go back and repluck the cotton and shoot it again. That made it have a sort of a ghosting image on itself."

"All the sky backgrounds you see in *Buckaroo Banzai* in the dogfight are either matte paintings or synthesized with fiber fill," commented Shartle. "There isn't a single live-action sky background — including the shot of Buckaroo coming down in a parachute. The man is a live-action stuntman who was shot full-frame in 35mm. Peter Kuran removed him optically using the blue sky like a bluescreen, pulled a matte off this guy and then matted him into our clouds. When we shot the clouds, we created a matte so that he could come out from behind the clouds. Part-way through the shot, he suddenly appears."

There were several problems involved in shooting the clouds so that they would appear to be whizzing by on either side of Buckaroo's cockpit. "In order to fly through the clouds, we used a periscope snorkel lens and mounted the camera looking straight up toward the ceiling," Yeatman explained. "We put a special anamorphic lens on the back end of the snorkel so that we could shoot anamorphic. That's kind of rare. I had to get the lens in England from Joe Dunton. Then we built an upside-down trench of clouds over the camera so that the camera had clouds going past on either side. Shooting with the anamorphic lens was a very big pain. An anamorphic lens cannot focus like a spherical lens. The use of the snorkel allowed us to get real close to objects we couldn't ordinarily get near. Unlike a normal anamorphic lens, the anamorphic portion rode at the back of the lens. We could keep a small-diameter Nikon spherical lens at the front and then at the very back — like a zoom lens — we had the anamorphic lenses put in. We could use the snorkel like a normal snorkel lens."

Eventually, the technical problems of bluescreen and cloud plates were overcome, leaving room for the question: "What does a seashell look like when it flies?" Richter and Riva designed the ships so they would not look aerodynamic — and they did not expect them to move aerodynamically, either. But it was not easy to make up a whole new set of rules and still be believable. Even Richter admitted that there were a limited number of ways to maneuver a spaceship. "The guys at Dream Quest felt that it would be impossible to make them look like they were really flying, because they didn't look like they should fly," Michael Fink recalled. "But what they found out was that since the movements didn't have to follow any aerodynamic laws — the shells certainly didn't — they had a reality all their own." Dream Quest understood that the ships were not supposed to follow any aerodynamic principles — that they were supposed to be magical — and that fact actually made the shots more challenging, because even if the Lectroids do not know physics, film audiences and visual effects people do.

"The Lizardo ship is supposed to be the size of a 747," said Yeatman. "This presented several problems to our motion control move designers, Mike Bigelow and Scott Squires. There are only so many things you can do to maneuver it before it starts looking like a fighter. If you start doing too much in terms of speed, it starts looking like a little ship — and yet it had to be massive. Then you have the escape pod that looks like an arthritic crab. In real life, it ought to be so much more maneuverable that it could easily shoot the other ship down. But the fact is, Buckaroo doesn't know how to fly. When you look in the interior, you know why. He's got battery clips and a low rider steering wheel; and when he turns left, it goes right." The consensus among the filmmakers seemed to be that if the audience bought the story, they would buy the ships — no matter how silly they might look out of context.

Dream Quest also produced the shot of Lizardo's ship crashing through the Yoyodyne wall. It was, in fact, one of their first live-action physical effects. "It was fun," Yeatman recalled. "It was also terrifying, in a sense, because you get to do it only once. But when it is done — it's done. It's not like shooting something and months later you are still putting it together. For this shot, Dr. Lizardo is launching his ship inside the

A winged thermopod — constructed by Greg Jein's modelmakers — on Dream Quest's bluescreen stage. Although Dream Quest normally employs a dual-pass ultraviolet matting system, bluescreen was found to be preferable for Buckaroo Banzai *since the spindly ships could not be evenly lit with the ultraviolet technique — a situation which would have caused holes in the mattes. / To conceal its mount, motion control assistant Scott Beattie repositions a blue paddle behind the Lizardo thermopod, which Buckaroo has commandeered.*

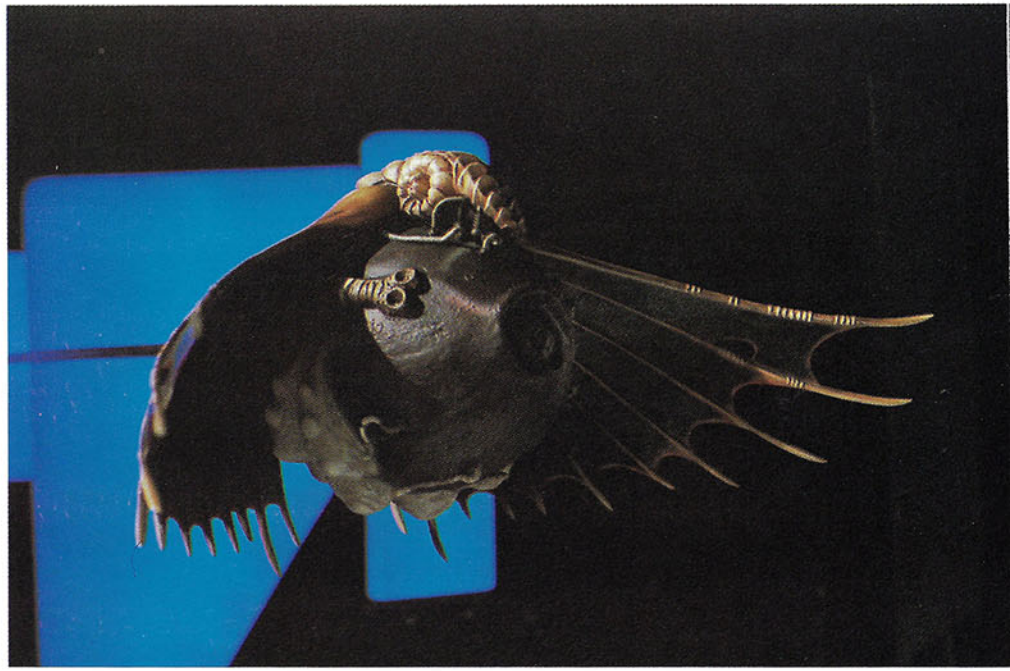
Yoyodyne facility. He has a tractor beam that comes out of the ship, which supposedly is going to dissolve the wall and he will fly through into the eighth dimension. It malfunctions, however, and he ends up ramming his way through. Mark Stetson and his group built two Lizardo ships. One was used for motion control and had several mounts and little lights in it. The other had just a rear mount. Its sole purpose was to smash through the wall."

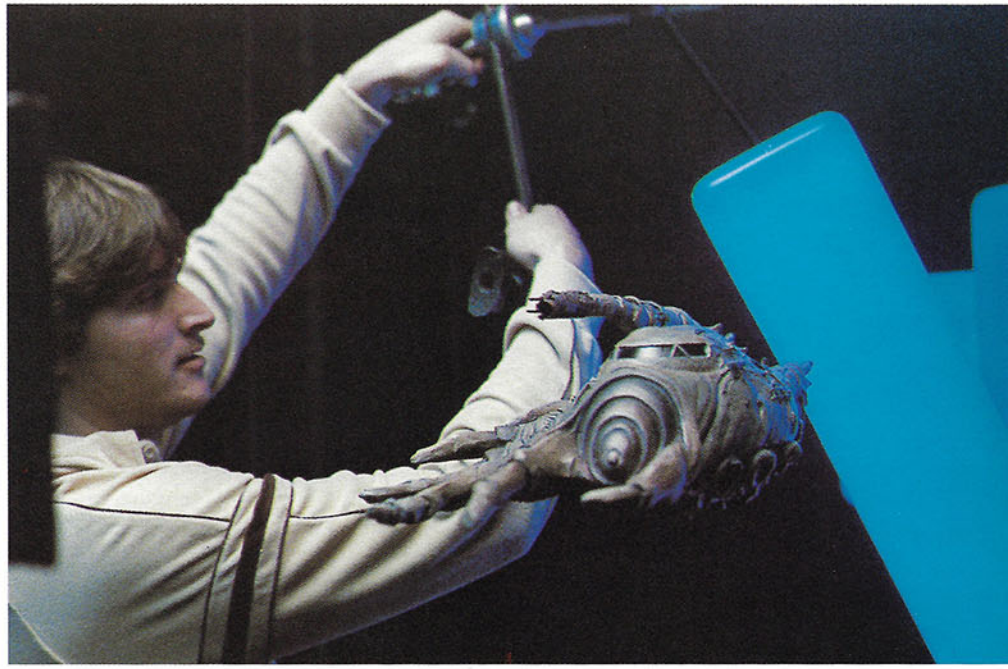
Mark Stetson also designed the breakaway wall, deciding in the process that in order to get the most realistic look, it should be constructed much the way a real wall would be. Individual bricks were therefore fashioned out of a dense twelve-pound urethane foam, then laid together with a clay slip developed by Mike Hosch. When the wall was finished, Hosch and Dave Shwartz washed it down with the clay to give it a more integrated look, and Ron Gress painted it. Hosch and Kevin Ross also built a test wall so that Dream Quest would be able to test camera speeds, the look of the debris, and ship speeds before attempting the real thing.

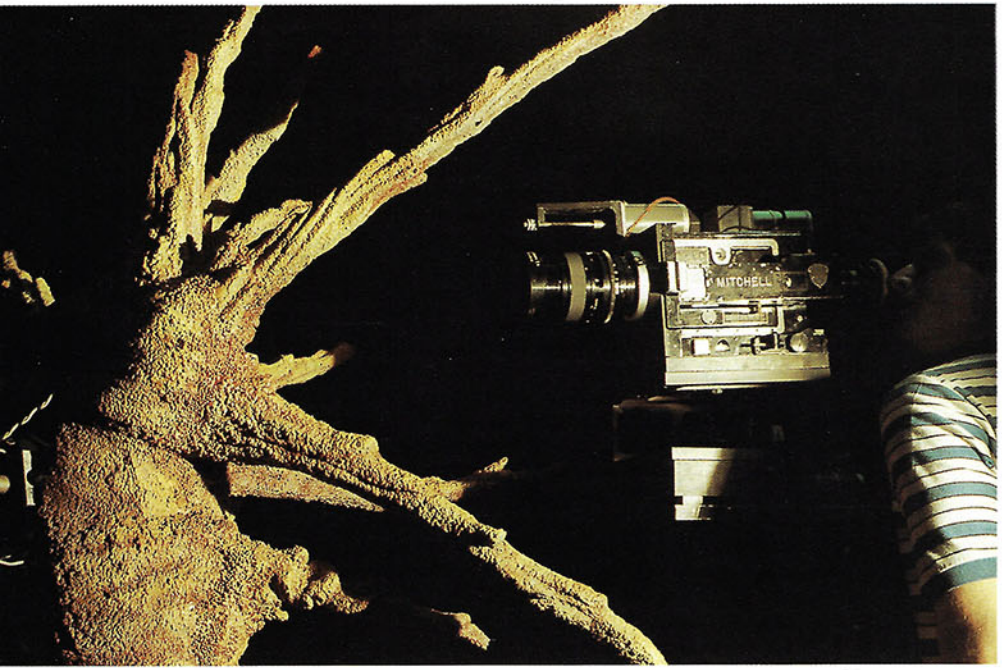
"We hired Richie Helmer to do the physical effects portion of the shot," Yeatman recalled, "and he is excellent. We made a thirty-foot track on a table top that we built outside in the parking lot. We got some small rails from Apogee, and we mounted the ship on a little DC servo cart that would get up to about thirty miles per hour. It would really cook down this track. At the far end, where the wall would be, was a rubber tire which was used as a bumper. We had a little pipe rig holding the Lizardo ship, and we'd get this thing positioned at the back of the track, and it would come screaming down and go *'smasho'* into the rubber tire. Then it would *tttwwaanngg!*

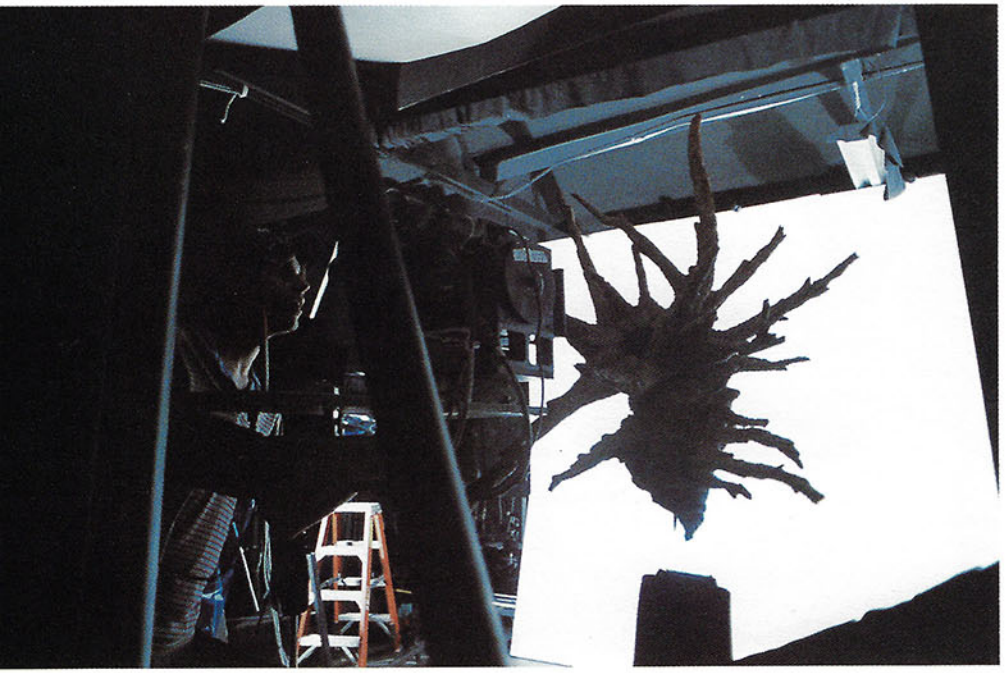
"Still, we knew that we would have to have a test wall. If we had only one chance to get the shot, we couldn't do without a test wall. So Mark Stetson built one out of the same materials. We ran several tests to find the best speeds, and at the end of the track we had dump tanks with debris and stuff in them. Just as the ship is breaking through the wall, we would fire the dump tanks with air mortars, which would blow out more debris and help break the wall. We had to figure out what kind of debris to put in and how much to put in, so we ran three or four film tests with no wall at all. We also needed to know how fast to go. We found that it worked best at about thirty miles per hour."

To give the feeling of scale, the crash was filmed at very high speed using a Bruce Hill camera that ran at about 240 frames per second. The shot was also covered from four other angles with cameras running at speeds of about 120 frames per second. "We put our test wall in place," continued Yeatman, "and tented the whole thing in black to make it dark. When it came through, you could not tell you were looking inside a tunnel or anything. Then we started the cameras and ran it through and it looked pretty good. One of the cameras malfunctioned on the test wall and one of the dump tanks didn't fire. So we decided not to automate the dump tanks — we had a little microswitch that









would get hit as the cart went by — but leave it for Richie to fire himself. We looked at the film the next day and made a few adjustments in speed and decided this was the day.

"So we brought out the real wall. It was so fragile that even the slightest push would break out the bricks. On top of that, it was fairly windy on the parking lot. With the tunnel setup we had out there, just the difference between the inside air pressure and the outside air pressure might well have been enough to implode the wall. So we had to put big pieces of cardboard over it and we used big flats to block the wind. We got everything all ready, and then waited for the sun to get in the right position. There's something about sunlight you just can't beat — so the only lighting we used was sunlight, shiny cards and bounce boards. When the sun came around to the right angle, we rolled the cameras. The cameras were screaming and made this big racket. We yelled, 'Okay, start the thing!' It started rolling down the track. Rich fired the dump tanks right on the money and they blew all the stuff out and it looked great. It happened so fast in real life — maybe in a third of a second — you kind of wonder, 'Did it really work?' It was only after we saw the film that we knew for sure."

True to form, the spiny ship design also created problems during the crash sequence. "Believe it or not," Yeatman explained, "all those little spikes that had been a pain throughout the rest of the production proved to be a problem here, too. We were afraid that one would break off when the ship crashed through and that you would be able to see it come off — we were shooting at high enough speeds to see something like that. That would mean that the rest of the cuts in the film — this was the last thing we did — wouldn't intercut. So one of the main things we were looking for when we went through the test wall was to see what would break off the ship. When it went through, several spikes did break off. The larger ones we reinforced with steel rods and the smaller ones we just left off the model so they wouldn't break during the shot. As it turned out, it might not have been necessary. I think the test wall was a little bit tougher than the other one, because the real one just crumbled away."

After Dream Quest finished its work, Peter Kuran and company took care of the rest of the effects shots using elements supplied by various sources. One unexpected development was that about halfway through effects shooting, production editor David Bretherton was replaced by Richard Marks. Marks had his own ideas about how the film should be structured, and when he had finished recutting the effects sequences, there were some new and very interesting problems ... and throughout the land, the cry was heard: "Let them fix it in opticals."

"Understandably," said Kuran, "most optical houses would rather do simple things that pay better, rather than do more difficult things that don't pay quite as well. That's where I come in. I try to do off-the-wall optical work that doesn't pay as well. We try to specialize in optical printing because generally people don't put enough effort into optical printing. When I first started

doing effects, I realized that the optical end of it needed more scrutinizing than other aspects of it. Optical work, in general, is the most difficult thing to pull off in any film. Since the optical printing is one of the last steps, somebody goes through and shoots the live-action and the problems that start accumulating are pushed back toward the end. By the time I get ahold of the film, the problems can't be pushed back somewhere else. This is the end." Kuran was hired to do the live-action bluescreen, animation and opticals. It seems that he was also hired to pull a rabbit out of a hat.

"I am real proud of some of the shots that happen near the end of the film — POVs from inside the thermopod," Fink explained. "The reason that I'm particularly proud of them is that they were band-aided together out of elements that were not intended to be in those shots. In other words, we had a couple of shots that grew." Originally there were two shots of the Lizardo ship as seen through the windshield of Buckaroo's thermopod. The original editor determined that one shot should be 100 frames long and the other 135 frames long. The new editor, however, wanted longer shots for his recut. Unfortunately, the shots had already been completed and, because of time and budget constraints, could not be totally redone to the proper length. It was up to Michael Fink and Peter Kuran to devise a means of stretching the existing footage to cover the new shots.

"I had two pieces of film I had to somehow put together," Fink explained. "Luckily, when Dream Quest shot the first piece of film, they ended it at the first frame of the second shot. So even though it was not a continuous piece of film, the position of the ship was identical. If the two shots were nailed together then, it would be 235 frames and that was more than enough for the new 209-frame cut. The problem was that there was a slight density shift between the two. They were lit differently. And there was a very slight move in the ship — almost imperceptible, but it was there. We were able to hide the transition between the shots by dissolving into some clouds at the transition point and then dissolving them out. We had foreground action that we had shot bluescreen, we had clouds that had to be dissolved together so that it looked like you were continually running through clouds, and we had the ship background which was shot bluescreen. Plus the ship had lights — three different passes on the ship — so we had all these separations running. Somehow, it all works. It all came together."

A second shot from Buckaroo's POV as he chases the Lizardo ship had to come from the same footage. It consisted of 260 frames and required the creation of a new move where none had been before. "We got to the 260-frame move and the dialogue had Buckaroo yelling, 'Dive, dive, dive!'" explained Fink. "Well, in the first cut, that was not in there. There was no dive built into the ship move and there was no dive built into the cloud plates for the background. So we had to go back and put moves into the ships, but we could not reshoot the miniatures or the clouds. First, Pete Kuran did a test to see if we could put a move into the ship that would work. He did a black-and-white test and it looked pretty good. I took it to The Optical House, with the original negative of the miniature. They have a fellow there named Ron Booth who is a very good optical printer operator. We plotted it out and Ron put a move into the ship on the optical printer. Then he made a new IP of the ship.

"Now, we open the shot seeing the ship and all of a sudden it just plummets out of the scene. Then the dialogue comes — 'Dive, dive, dive!' — but the ship is gone. It's gone for about twenty-five frames. Just long enough so that we don't have to keep dissolving ships together. Then the ship rises back up again into the scene and you continue the chase at one-to-one in the printer. Dropping the ship out of frame and bringing it back up all had to be done manually. We had to do it for the ship and for the three light passes so that everything moved together. Pete took the new IP and we made the move from the IP to an internegative and we made separations from the new internegative. The clouds had to dive, too. Pete made a diving cloud move and he did it in the composite. He made it without having to go through another generation. We lost a generation on the ships, but we didn't want to lose a generation on the clouds. On top of that, at the end of this shot is a laser beam and an explosion. Pete put it all together and the first time we saw it, it actually worked. I couldn't believe it."

Much of what Kuran and company do is done one frame at a time. Each frame of the film that needs an effect added is projected on the animation stand and the additive artwork is either done right there or a start point and end point are noted and the art is completed elsewhere. Later it will be shot on the same stand to ensure steadiness and a good match. "A lot of our stuff is basic rotoscoping," Kuran said. "Rotoscoping is something that we use for getting rid of a multitude of sins. Laser beams and any animation that we do is all rotoscoped. Sometimes we add colors on the animation camera to get a better blend. Sometimes we add colors with the optical printer, but when you add colors with the printer you get flat colors. When you add them on the animation camera you can get more of a range and tone."

Among the roto effects in *Buckaroo Banzai* are numerous electrical simulations produced by Peter Kuran's company in conjunction with animator Chris Casady. "Electrical animation usually doesn't look like electricity," commented Kuran. "Chris Casady is pretty good at doing something that looks like electricity. Printing it properly also helps make it realistic. Chris has studied electricity more than anybody else. He is also, in a strange way, a comedian. He is probably the only person I know who does funny-looking effects work. When I say funny-looking, I don't mean it's awkward looking. It's technically very good. There is just something about it that whenever I look at it makes me laugh. He has a certain style." Casady's style, for instance, can be as deceptively simple as adding a single spark to an electrical shot. The spark will just float and then suddenly

Scott Beattie lines up a shot on the underbelly of the Lectroid fathership — another organically designed craft constructed by Greg Jein and his unit. / Unlike the Lizardo ship, which needed to move quickly against blue skies, the fathership was called upon merely to drift languorously against the darkness of space. As a result, a simple backlit matting system in which the model was silhouetted against a white card proved altogether satisfactory.

plummet. The movement immediately draws attention and gives a bit of distinction to an otherwise routine electrical effect. The effort requires extra time and extra thought, but what better place for comedic electrical effects than *Buckaroo Banzai?*

"We also did the Emdall sequence," said Kuran, "in which a black woman — called John Emdall from Planet 10 — comes out of this cake." John Emdall, it seems, is there to warn earth that they had better destroy Dr. Lizardo or the people from Planet 10 will destroy earth. "The original idea was to set up a laser cone around this woman. They didn't want her to look like she was a hologram. It didn't quite work out, so animation was added to make her look like she was inside this cone. We sort of made it look like a round video image with a roll bar going around the animation. That sequence accounted for about twenty of our shots."

VCE was also responsible for some tricky bluescreen work. At one point in the story, Buckaroo attempts to enter the eighth dimension using the oscillation overthruster and his jetcar. The oscillation overthruster beam cuts a hole in the mountain side and the jetcar enters the eighth dimension. When the car exits the mountain, a half-minute later, the POV changes. The camera is now on the outside of the mountain, watching, as the beams appear and cut an exit hole for the car. "In the scene where the jetcar exits the mountain," Kuran explained, "the car we used was not a model. We pulled it off a production plate. We got the film with the car on it and just basically built the shot around it. It was real difficult, too. The car is going six hundred miles per hour, supposedly, and when you look at the film, it's a blur. The difficult part was being able to articulate that blur and make it look like it was actually part of the new scene.

"Jim Belohovek, our miniature maker, built a miniature of the mountain that the jetcar comes out of. Then we added animation and the live-action car to the scene. In the original piece of film, the desert was in the background and the car just streaked toward the camera. We set up our miniature landscape about three-quarters of the way toward the camera and lit it basically like the original scene. Then we rotoscoped this blurring car to come out at a certain point. Utilizing the rotoscope matte we had made to isolate the car out of the scene, we generated some printer mattes to sort of fill in the detail and give more of its blurring characteristics. Then, also, we animated some lasers coming out of the mountain wall."

The footage inside the mountain was even more intriguing, however, for it was there that Buckaroo was to penetrate the eighth dimension. Not surprisingly, the filmmakers wanted this other dimension to look like nothing that had ever been seen before — an increasingly difficult task for the modern practitioners of special effects. "The eighth dimension was one of those places where suspension of disbelief was very important," Michael Fink explained. "It was a place that had a story all its own. I had come up with a new look with lasers that was really good. It was dramatic, really violent, very active, scary, but difficult to do. It was definitely within the budget, though, and we were all pretty excited about it. Then one day I was talking to John Scheele, who had been heavily involved in *Tron. Tron* was not animated in the normal way that a film is animated. It was all composited frame by frame on the animation stand, not on an optical printer. The elements were all flopped through one frame at a time. And, as a matter of fact, the eighth dimension ended up being shot the same way, by necessity.

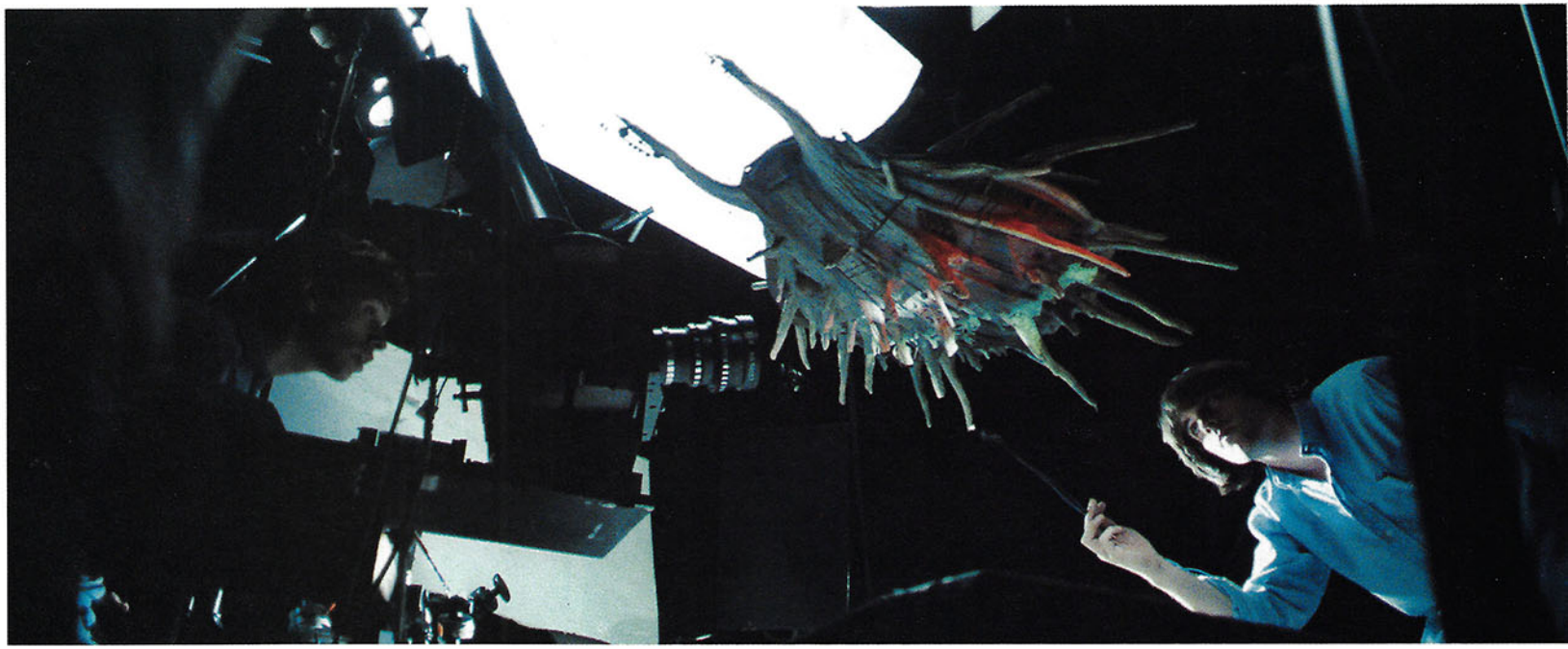
"Anyway, John is sort of a closet archaeologist. He collects bones and bugs and artifacts of ancient tribes or something. He said, 'Hey, Mike, have I ever shown you my stills from a scanning electron microscope?' I told him no, but that I had seen others. I asked him what his idea was and he said, 'What if we motion control a scanning electron microscope?' I asked him to bring his stills over so we could sit down with Rick Richter and show them to him. If Rick liked the idea, we could do a test. Rick loved them."

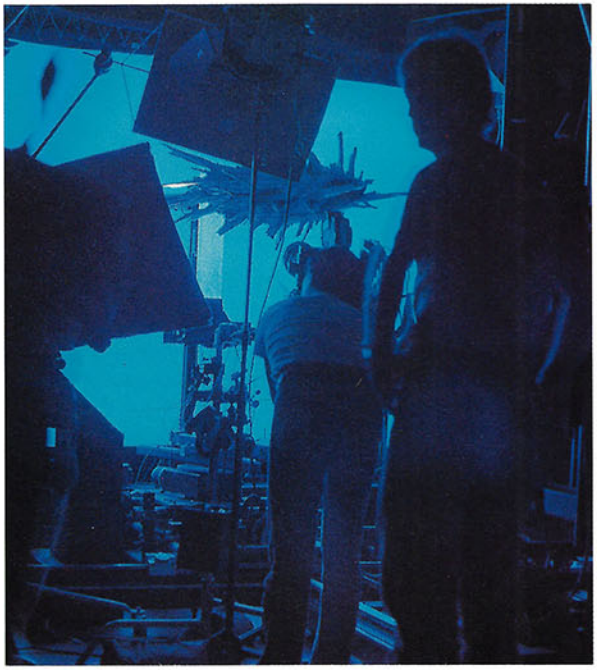
"Special effects are a combination of what you can imagine, what is possible and what that costs," commented Richter. "In this film, a lot of real abstractions — like the eighth dimension — I didn't have a single idea about. We knew that Buckaroo had to enter some kind of world that hopefully seemed to be populated by something — creatures or lifeforms. It wasn't just going to be a void. He was going to have to move through it at high speed and it would hopefully look different from what you had seen in films before. We knew we didn't want to animate stuff, because I just have a fear that no matter how much people tell you it's going to look real — when you get it delivered to you, it's going to look animated. There are wonderful animated effects throughout this film sweetening things, but we didn't want to have to depend on them. Nor did we want to depend on laser photography, because that looks too much like the stuff in *2001* — channels that you move through at high speeds. So it was suggested that there was a young company called Greenlite Effects that might be able to do something with scanning electron microscope photography. Now, we've all seen still photographs of bacteria or napkins or cheese or anything, and we've seen how weird they loom; but no one had ever been able to do any movement over those things. So they began doing tests."

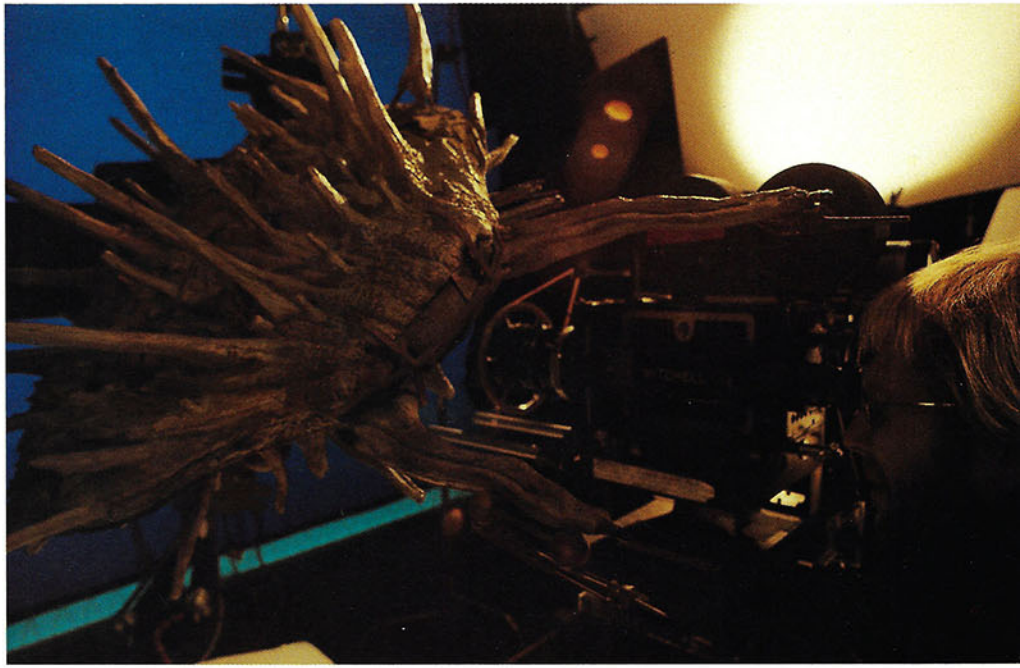
"It certainly looked like something that had never been done before," said Michael Fink. "Nobody *had* ever done it before. There was one doctor who had made a 16mm movie on an electron microscope by tweaking the controls by hand. I finally tracked him down, but he had lost the film. So we paid John to do a test. He found a scanning electron microscope at a local research facility and arranged to hook up his computer with some stepper motors. He got out one of the beetles from his collection and did a move on it. It was fabulous! You come flying over the shell of this beetle and then you zoom through the eye socket. This was probably only 500 or 1000 times magnification, but on the screen it looked great because you couldn't really tell what it was."

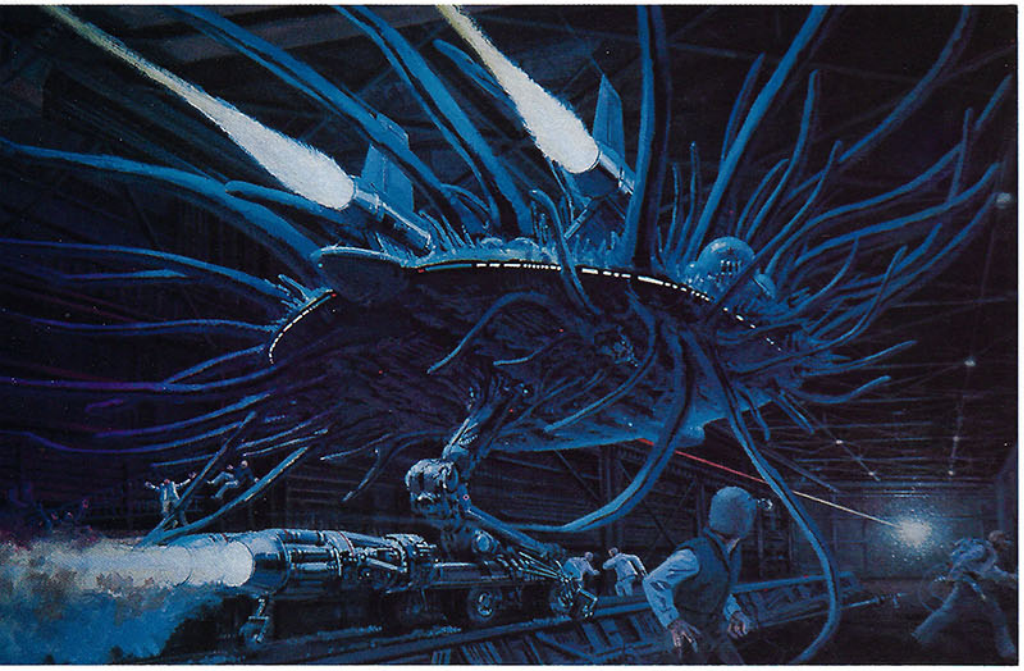
Once the test was determined a success, Scheele set about

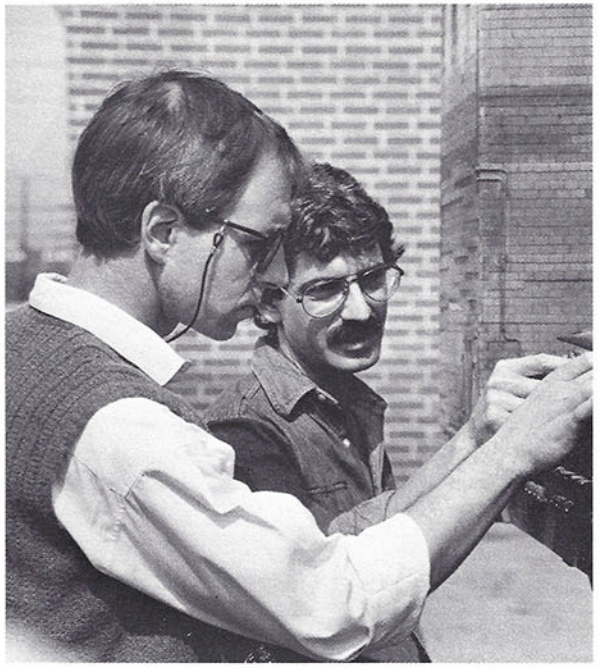
Assisted by technician William Reilly, motion control supervisor Hoyt Yeatman checks lighting and lineup on the Lizardo ship for a fixed shot inside the Yoyodyne hangar — subsequently deleted from the film. / Some of the bluescreen shots involved two or more passes. In the first, the model would be lit with production lighting while the blue screen behind it would be draped in black velvet. Then the film would be rewound, and the model returned to its start position and silhouetted against the blue screen for a second pass on the same piece of film. The result was an image essentially identical to a single-pass bluescreen element, but without the accompanying risk of blue spill, which would have caused holes in the mattes. / Using single-pass bluescreen, cameraman David Hardberger previews a motion control move on the oyster-shaped Lizardo ship.



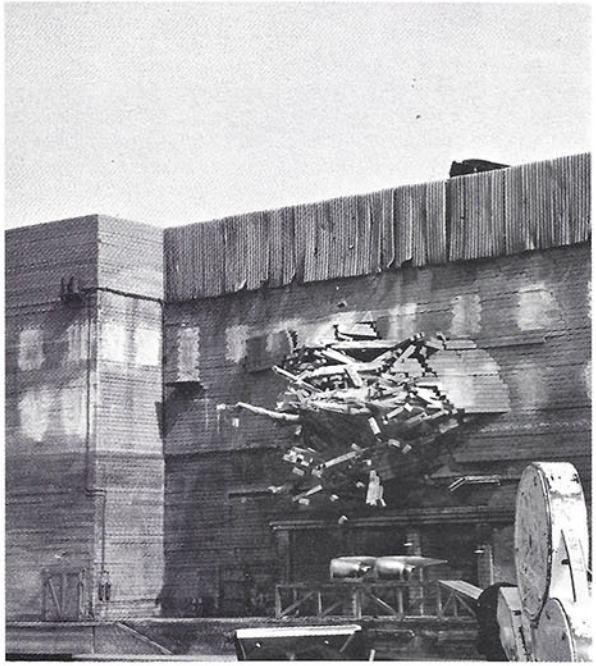


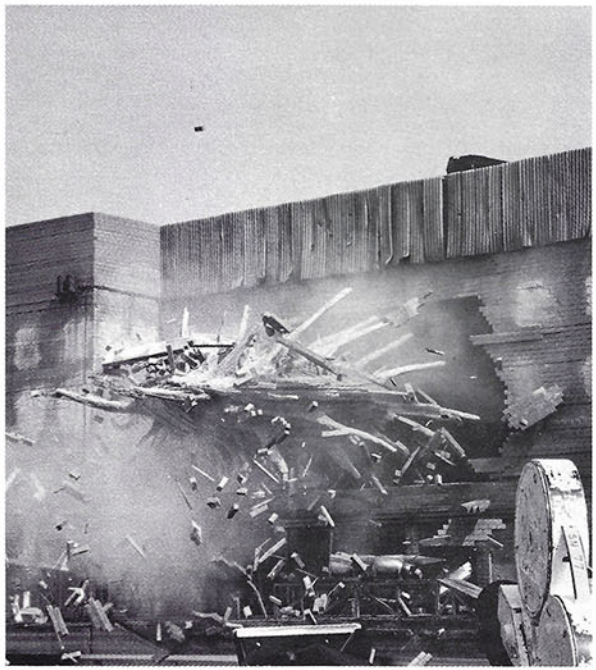







YOYODYNE





in earnest to create a microscopic representation of an other-dimensional world. Even though the electron microscope was incapable of real movement, Scheele was able to simulate sweeping camera moves by rigging the specimen mount to a motion control unit developed by Bill Tondreau. Thus, by tumbling and turning the specimen, in conjunction with the microscope's built-in zoom capability, a strong sense of movement in depth could be suggested. The system was not without its limitations, however. "Scanning electron microscopes are not made for motion control," Fink continued. "They are made to be tweaked by hand. Their works have little nylon gears and little delicate parts, and they do not react particularly well to being exercised over and over again by a motion control system. By the end of the shoot, John was doing everything he could just to keep the shots going. The work was painfully slow. We tried everything — mouse tongues, liver specimens, fungi of all sorts. Of the things we thought would be successful as specimens, it was amazing how many we did not like. And it would take hours to prepare the specimens, which had to be freeze-dried. You have to suck out all the moisture or the specimen disintegrates — which sometimes happened. Apparently, the ice crystals break it down. Then the move had to be programmed, which was considerably more difficult than a routine motion control model shot."

Scheele found the recording of electron microscope footage to be roughly comparable to that of computer generated imagery. Both, for instance, are scanned first onto high-resolution black-and-white monitors — which, in the case of the electron microscope footage, required ninety seconds per frame. Fortunately, however, as with computer animation, the move could first be previewed on a low-resolution monitor in real time. "John programmed most of the shots," Fink continued, "and Mike Beard photographed them, shooting off the high-resolution monitor on color film because color is sturdier. As a result, we got this incredibly highlighted, weird blue image. It would take hours and hours to do a move. Everything had to be done in pieces. We did one move that was 110 frames long, and it was just phenomenal — the only problem was that half of it was out of focus. The electron beams couldn't be kept in focus. Finally, everything worked out."

The scanning electron microscope footage, unique and thoroughly interesting in its own right, would still require doctoring before it could be incorporated into the film. First, the basically monochrome footage needed to be colored in some way. "The only way to get the colors in," said Fink, "was either to animate it or make film elements that could be generated in sizes sufficiently different that you could actually get some kind of color in as if you were doing color separations. We tried the latter and it was a dismal failure. We would put color into areas that had been highlights and they went flat. They lost their dimensionality and their real interesting look, and they began looking like cardboard cutouts. They weren't scary anymore — and they were supposed to be scary." At this point,

A Tom Cranham illustration of the Lizardo ship about to penetrate the Yoyodyne wall provided the major conceptual guidance for Mark Stetson and his team of modelmakers. / Director W. D. Richter and visual effects supervisor Michael Fink examine a portion of the Yoyodyne wall miniature — also constructed by the Stetson unit, using individual bricks fashioned from urethane foam and laid together with clay slip. / Stagehands position the fragile, breakaway miniature in the Dream Quest parking lot. / Under the supervision of Richard Helmer, a second Lizardo ship was mounted on a DC servo cart capable of traveling down a thirty-foot section of track and into the wall at about thirty miles an hour. After much testing and numerous dry runs, the actual crash was filmed at 240 frames per second.

John Scheele began considering the approach that had been used to produce the majority of *Tron's* electronic world footage. "Ultimately, John realized that the only way to do this was to photoroto every frame we were going to use in the eighth dimension. That meant that every frame of the eighth dimension had to be rephotographed onto an animation cel."

Though time-consuming, the photoroto technique afforded a great deal of flexibility, and also simplified the incorporation of animation effects. Since electricity was a key conceptual element in the eighth dimensional world, it was decided that the microscopic environment should be ablaze with electrical flashes, pops and explosions — provided via cel animation generated by John Van Vliet. Animation techniques were also employed to enhance the sense of dimensional space within the frame by isolating certain shapes and elements and then inserting animated light hits behind them.

Insistent upon obtaining a truly unique look for their eighth dimensional world, Richter and Fink turned to John Scheele and Greenlite Effects. Scheele's first step was to motion control a scanning electron microscope in such a way that by tumbling and turning the specimen, in conjunction with the microscope's built-in zoom capability, a strong sense of movement in depth could be suggested. From there, it was a matter of experimenting with various materials until a suitably interesting microscopic environment was discovered. Although a wide range of materials was tested, the most workable specimens proved to be crystalline deposits and plant fungi. Using a photoroto technique, each frame of film — recorded from the microscope's high-resolution, black-and-white monitor — was enlarged onto an animation cel, enhanced with hand-drawn lightning effects by John Van Vliet, and then rephotographed with appropriate coloring.

"We went through two phases, so that we actually had two photo animation cels," Fink continued. "One was a continuous-tone and one was a high-con. Then we would do animation on the cels. After that, everything could be put together right on the animation stand. That way, it was basically first generation and we were only down one generation on the background stuff — which we would have been, anyway. By using this system, we were also able to do things like slip sync on the two phases of cels and actually put color in that we couldn't have done on the printer because we didn't have that kind of control. John and his people were also able to make frame by frame exposure corrections, which turned out to be important because the scanning electron microscope did not give us the same exposure in every frame. Some frames were four stops darker or two stops darker, and we would have to pick those frames out and change the exposures on them."

John Scheele and Greenlite Effects were on the show for about eight months, producing in the process about a minute-and-a-half of footage — later cut down to some twenty-five seconds in the final film. The work was excruciatingly time-consuming. "About halfway through the eighth dimension work," said Fink, "David Begelman (president of Sherwood Productions, the film's parent company) saw the footage and said that it was great, but where were the Lectroids? Where were the people from Planet 10? Shouldn't we be able to see them? So we brought in Rick Heinrichs from Disney, and Rick did a claymation figure which Tom Polizzi and Bill Hayward at Greenlite shot in stop-motion on 4x5 transparencies that could be composited with the photorotos on the animation stand. So now, in the middle of the eighth dimension, you see these two strange creatures fly through the air and glom onto the car."

With the exception of the bluescreen POVs, everything in the eighth dimension was composited on the animation stand. In fact, even in the bluescreen shots, the eighth dimensional backgrounds were assembled on the animation stand and then delivered to VCE for optical compositing with the live-action foreground material. "Pete's bluescreen work in the jetcar was so good," said Michael Fink, "that you cannot tell that you're not driving across the desert about to head into the eighth dimension. And when you are in the eighth dimension, you can't tell that you aren't there. The work is impeccable. There are cracks in the windshield and he managed to keep the cracks and the glints in the glass."

There were numerous problems on *Buckaroo Banzai,* just as there are on every film. But Michael Fink thought that one problem was particularly difficult, and it had nothing to do with the technology available for doing special effects. "Probably the hardest thing in *Buckaroo* was creating those things that nobody has ever seen before. Everybody has already seen everything. Everybody has seen *Star Wars* and *Indiana Jones* and every other movie ever made, and they know all the tricks. You can't shoot slitscan and tell them it is something new. You can't shoot a spaceship and say this is really a spaceship. The audience knows it's a model, and they go along with it because it's part of the story. There's an awful lot of suspension of disbelief when you are creating special effects and the weight of that is a lot greater than it used to be."

Rick Richter also felt the weight of the expectations for special effects — his own not the least among them. "Nothing is ever as good as you hoped it would be. I think that is the first thing you have to accept. That is true for everything. Your expectations change. When you first think of electron microscopes and motion control, in a flash you have this astonishing image of being able to dive between little particles and come up. Well, those expectations are just never met, because they can't be done. The specimens are so small that the moves cannot be very long. Once you realize what is possible, you start to change your expectations. Nobody had done motion control on electron microscope specimens. I don't know that anyone will even realize what it is. They may think the whole thing was drawn — which would be a wonderful irony. I don't know what it would look like if it were drawn. It's crazy, it's maddening. Special effects are not very satisfying while they are in the process of being created. You are at the mercy of these machines, and you just hope and pray that all these ideas work out. Some of them do and some of them do not. That's just the nature of the beast. With *Buckaroo,* we were trying to create a world. Not a serious, dark world, but a place where you could go to laugh and get scared and meet a lot of interesting characters — to have a good time at the movies. There is no message in the film that you can put in a sentence. There *is* a POV in the movie. It's a constant theme in the film — nothing is what it seems. Look carefully. Enjoy the world around you. It is very strange."

Nora Lee has written in the areas of visual effects and film production for American Cinematographer *and* Panorama City *(Japan). A former production coordinator for Gregory Jein, Inc., she has worked on such features as* One from the Heart, Wargames *and* Buckaroo Banzai.



