

ILM - "DRAGONHEART"

THE CHALLENGE

When I came on board to supervise the effects for "Dragonheart" in May of 1994, director Rob Cohen and the ILM production team were already developing storyboards and a dragon model was being designed by Phil Tippet. Our task was to create a major film actor in the form of "Draco," a mythical dragon. This meant bringing to life one of the most complex CG characters ever seen on film. We knew that the audience wouldn't easily accept this beast and that willful suspension of disbelief would be critical.

We were faced with long scenes of dialogue between the dragon and real actors, in full light of day, where an audience could study and compare computer graphics to reality. Draco would be seen during the day, at night, in firelight, walking through grass, flying, splashing in water, swimming underwater, walking in the rain, holding an actor in his mouth and breathing fire. Most importantly, we needed to make him act, and try to ensure that the audience would develop an emotional tie to him.

The "Dragonheart" crew of over 70 people, produced 182 Dragon shots (covering 23 minutes of screen time), and 30 non-dragon shots. The entire post-production schedule was one year.

ANIMATION

James Straus led our animation team. The amount and complexity of the required facial animation required us to write special in-house software known as Caricature (written by Cary Philips). This allowed the animators more interactivity when dealing with subtle facial expressions and lip sync issues. In addition, the tongue had to move correctly to provide the proper enunciation. Animators studied videotape of Sean Connery (the voice of Draco) and worked with the Rob Cohen to make Draco "act."

MODELS

An enormous amount of detail was put into the Draco computer model as he was going to be seen up close, filling the full screen in broad daylight. He had to have detailed facial muscles in addition to body muscles. This resulted in a model several times more complex than those designed for "Jurassic Park." In addition to skin texture we also had hard skin areas, horns, spikes, scales, teeth and gold scales. Each of these areas had to be painted, skinned and treated differently by the rendering software.

Draco's eyes had iris' (that animated with lighting changes), veins and wetness. His claws had to be fully articulated as in a real actor. His wings needed to be translucent when backlit (with a texture map that shows veins and other details) and iridescent in certain light. They had to be able to fold up and unfold, as well as be animated for him to fly. All the subtle animations had to continue through all shots to keep him alive. This meant creating and animating the nostrils as well as the breathing in his chest. We composited in additional details such as saliva when he opens his mouth wide. Reflections of surrounding scenes, the campfire, or Dennis Quaid ("Bowen") were also added to his eyes.

LOCATION

Shooting for "Dragonheart" took place on location in Slovakia over a 5 month period. All but two weeks was shot outdoors with various weather conditions and terrain. Although most of the camera plates are moving camera shots, no motion control was used. To allow the director, and the director of photography, as much freedom as possible (and to save time), all shots were later matchmoved on the computer.

For this project we used an electronic transit system that provided accurate 3D measurements. This was critical since we were locking a slow-moving or sitting dragon to

a slow-moving camera. Any misalignment would be obvious, much more than the sky replacements or the fast camera moves we would be also be doing. This information was recorded on a PowerBook and then entered into the animation system for matchmoving. This cut down the time to do post matchmoving enormously.

Each shot was different, so we set up an 18-inch posable dragon in front of the camera for the director and actors to see a facsimile of the finished shot in addition to the storyboards. Various targets were used so Dennis and the other actors would have the correct eyeline whether Draco was sitting, standing, etc. Various markers were placed in the scene and measured so these could be used for matchmoving later. All scenes with actors in front of Draco were composited using rotoscoping techniques and no bluescreen was used.

DAYLIGHT

Shots in the light of day are usually difficult to achieve in CG because of the nature of computer lights (no real sun representation, no ambient bounce light). This makes it more difficult to simulate daylight exteriors rather than trying to shoot these on stage. Great pains were taken to match the direction of light and the contrast levels. Shadows from Draco had to be cast onto the real environment, so we modeled the location in the computer to cast the shadows. Likewise, the actor's shadows had to be cast onto Draco and were modeled and animated in the computer. There are a number of long daylight scenes where Draco is alongside the actor and this effect is critical.

CAMPFIRE

The campfire scenes required our team to select lighting references in the shot (Dennis' face, a tree, etc.) and use this to control the flicker on Draco. When you see the fire flare up, and the surrounding area become brighter, Draco's lighting is a direct match including the fire reflection in his eyes. For the shots where the fire is in front of Draco, heat distortion was added to match the same level of the original background. Smoke and sparks were added to several scenes to allow smooth cutting between effects and non-effects scenes. For the shots where Draco starts the campfire, we took footage of a flame thrower and enhanced/manipulated in post. The CG staff wrote a special shader to cause a glow and flicker in his nostrils (if you watch closely during this scene you'll notice soot forming around his nostrils). He then wipes part of it off which leaves a blackened area on his claw.

WATER

A number of our most challenging scenes came when Draco interacts with water. The burst out of the waterfall required Kit West and his team to rig a waterfall explosion with offsets to match Draco. Additional water blast elements were added to enhance this. When his tail goes into the waterfall, a mechanical black form was built and rigged to move through the waterfall. The animation was done to match and the digital artist adjusted the distortion around the tail to get the final blend. Every time Draco's foot touches the water we added not only a splash, but water ripples as well (and additionally wet his foot in rendering). In the fake death scenes, his actions were matched to the practical splash, and then the splash rotoscoped to put him in the center.

When Draco emerges from the water, we used the location footage of churning water, then re-created the water waves in the computer to provide us with the moving matte edge of his neck to the water. We added a membrane to his eyes (a white translucent covering like a reptile) that opens up as if he'd been swimming with the membrane in place. Additional splash elements were placed and timed to match the animation and drips were tracked to his motion. Special programming functions were written to provide the look of water actually flowing down Draco's face and head.

In the Swamp Village sequence, Draco is supposed to fall into shallow water and hit the mud/silt at the bottom. Once the animation was timed to match, the digital artist had to muddy the surrounding water. For every motion of Draco we had to see a correlating motion in the water surface and ripple specific areas corresponding to a moving arm or leg. This was done using displacement techniques. Large and small splash elements were timed and color-adjusted to match into the scene then layered step-by-step. A new texture map for Draco was painted with the mud splatter. Additional programming was done to provide the texture and thickness of the mud to move down his body. To escape from the villagers, Draco attempts a running start in the water with his feet still sticking to the muddy bottom. Difficult animation splashes had to be placed for every step and motion. The dragon hits a deep pocket in the riverbed and loses his footing, which causes a large splash and ripple in the water. As he finally lifts off, he kicks his feet which throws off water from additional elements placed and timed to match.

In the scene where Draco is swimming underwater, the water surface was used as a starting point to displace the actual image of him, so it appears you're looking down through the water. Color timing, contrast adjustment and image depth cueing merge him into (and under) the water plate.

RAIN

In the Tor sequence (Draco on the tower) Draco emerges from the darkness in a rainstorm. He then extends his wing over Bowen and shields him from the rain. Special shaders were written so that the raindrops would actually splash on his face and body and run down in sheets. This is especially evident in the wider shots where the water is running off his wings. The water that comes off his wings is real but all the wetness and water motion on his wing and body is done entirely in CG. Multiple rain elements were shot so we have rain behind and in front of Draco, and are able to remove it from the area that Bowen is standing. In addition, there are splashes for his footsteps.

GRASSLANDS

In the Grasslands sequence, Draco flies circles around Bowen and then lands into the tall grass. Anytime his wings get close to the ground this causes the grass to wave and ripple. When he lands and starts to walk you see the grass being pushed down for each step he takes. Most of the blowing grass was done by taking sections of elements shot with large fans (ritters) blowing on the grass. These were layered and a patchwork of pieces was built up to match his wing motion. For the trampling grass, I had a person walk with a black flag through the grass. This provided some of the grass mattes and the grass being pushed over. Bits and pieces of this footage were used in addition to some distortion done on the "Flame" system.

FIRE

For the scene where Draco creates a wall of fire in the wheat fields, Kit West provided the wall of fire on the ground. Animation was done to match this motion, and the fire that Draco breaths was created using layers of flame thrower footage that was further manipulated and matched to Draco.

In the next scene, the dragon flies through a big black smoke area. The area where he comes flying out was distorted with 2D and 3D techniques to get the smoke to react to his flying. In addition, special work was done to add a vortex or two to the smoke to match what a real flying object would create in smoke.

There are three scenes where Draco shoots fireballs. These were done using stills and moving footage of real fire and then applied to a special program that was written to simulate fireballs. This program also created most of the churning and tail of the fireball as

it's passing through the air. All scenes with fire had heat distortion added to match to the background plate.

CG HUMANS

There are a few scenes where the actors had to be re-created in the computer. When Draco is fighting with Bowen, he bends down and picks him up into his mouth. Because of the action involved we decided to use a digital stunt person for this shot. The CG person was modeled, clothed, and painted to match the actor. The animator then created all the motion and the digital artist did the final rendering adjustment to make this transition as seamless as possible. This same CG person is seen later in the wide shot, still in Draco's mouth.

In the village sequence, where Draco swoops down and picks up a cart with a girl tied in it, the live-action was shot with the cart being lifted up and out. The action with the cart being lifted out wasn't dynamic enough for the animation, so we decided to do a switch in the middle of the scene from the real cart to a CG cart. Both the cart and the girl in the cart (who would be animated) fall back. The cart and girl were modeled to match the live-action.

When the three main actors (and the horse they're riding on) are picked up in the Swamp Village sequence, we had to build the actors and the horse in the computer. We switched between real and CG when the dragon flaps his wings. These same digital actors (and horse) were used in the following flying shots.

MECHANICAL MOUTH

There were very few full-size dragon props. A claw was used in a few scenes where Bowen is pinned. The main sequence where we used a full-size prop, was when Bowen is in the dragon's mouth. The interior of the mouth, including tongue and teeth, was built in the creature shop. This was mounted on a crane arm and four puppeteers manipulated the numerous servos to lip sync the mouth and tongue to the dialog with the actor inside. Markers were placed around the jaw and were later tracked frame-by-frame in the computer. We modified the CG Draco model slightly to wrap around the full-size jaw and then matched it's motion exactly. This was a tricky matting process since sections of the CG dragon had to be in front of the full-size jaw, while other areas had to be behind the jaw. Here we took full advantage of what both practical and CG effects had to offer.

CG PROPS

There are a number of scenes where the complexity of interaction of Draco with objects required the use of computer model props.

Bolo

In the First Fight sequence Draco is being chased and fought by Bowen. Bowen "launches" a bolo that wraps around Draco's foot. The scene of the flying bolo, and the bolo wrapped around his foot, were all done in CG. Each scene required the animator to continue moving the bolo balls as his foot moves and as real physics dictate. The rope in most scenes is CG as well.

Log

When Draco tries to strike and hits a log, his tail becomes stuck in the log. Earlier scenes were shot with the real log, but for the hit and following shots the log was modeled and textured to exactly match the real log. Even the debris flying off and losing bark were done in CG.

Grappling Hooks

In another sequence, grappling hooks are fired at the flying dragon. These and the ropes were done in CG to allow as much freedom to the animator as possible.

Chains

One of the most difficult sequences with CG props was in the scene where the chains bind Draco to the courtyard. Here, there is a mix of real and CG chains. Bowen comes up to Draco and undoes one of the chains connected to a cleat. The chain and cleat Bowen is undoing is real but the chains continuing to the dragon are CG. When he lifts the chain from Draco's head, Bowen picks up a real chain on a pipe rig. CG chains were used and matched to Dennis' hands. During the actual dropping we switched to the real chains. In the following scene Draco yanks his arm and breaks one of the chains and its pin from a cleat. All of this action and all of the animation of the chains had to be done using the real physics of chains. The rust and glint on our CG chains had to match any real chains within the scene.

Rocks

At the waterfall we see Draco standing and moving on river stones at the side of the river. Some of the plate was painted and manipulated to give the sense of his feet leaving depressions in the rocks. In addition, some of the rocks are CG and move and shift as he shifts his weight and turns. Most of the rocks in the Tor are real. These were rigged to fall off the edges and the animation of Draco's feet were done to match. Notice how the dust was extracted and goes over Draco's feet.

SPIRIT LIGHT

When Draco changes from a physical to a spiritual being we created the spirit light using Dynamation. Much research and development was done to find the right look that was suitable for the ending in keeping with what the director wanted. For the first transition we filmed the original plate with multiple lights on the ground that fade up. These were painted out on the computer. During the dissolve the CG chains were animated to fall to the ground. The close-ups of Dennis were done with an interactive light unit on the location. This was a little harsh at times so we did some image processing and compositing to give a more ethereal look to him. As the spirit moves across the courtyard it casts a moving light and shadows onto the surrounding area. David Eggby, Director of Photography, had a large "light box" built. This was a translucent box with large bulbs that was rigged by wires overhead to move across the courtyard. We removed the wires and did background replacement for where the box had been.

STARS

Once the spirit light rises up to the stars it becomes a star itself through a process of changing into star dust. In addition to animation of the stars, additional software was written to change the stardust to match Draco's outline and then to return them back into stars.

ADDITIONAL WORK

Illusion Arts created two matte paintings for the movie and Perpetual Motion Pictures provided additional wire removal.