



INDUSTRIAL LIGHT & MAGIC BREAKS NEW GROUND WITH COMPUTER GENERATED DINOSAURS IN *JURASSIC PARK*

The computer graphic dinosaurs in *Jurassic Park* are the culmination of experimentation and progress that began at Industrial Light & Magic 14 years ago, when George Lucas set up the computer graphics department. It is now their most potent creative tool. Yet, the work in *Jurassic Park* is more than that: it is a quantum leap forward, forever changing the way films will be made.

Spielberg consulted with ILM early in the process, having collaborated with this effects house on several of his previous films. ILM's effects supervisor Dennis Muren, a seven-time Academy Award winner, was anxious to participate in *Jurassic Park*, but since Spielberg hoped to use full scale dinosaurs and Go-Motion, Dennis was unclear about ILM's role in the project.

A year later, when Spielberg was working closely with ILM as the director of *Hook*, a new conversation began. As the industry leader in the area of 3D computer graphics for film, ILM had only recently devised ground-breaking computer generated imagery and astonishing morphing techniques under Muren's direction in the making of *Terminator 2: Judgement Day*.

"By the time we finished T-2, I thought that it might be feasible to make the most incredible dinosaurs you'd ever seen. And we did," says Muren. Muren had the ILM computer graphics team begin experimenting with an idea for *Jurassic Park* -- they built the dinosaur bones and skeleton in a computer,

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and from that, they created a herd of Gallimimus dinosaurs and a walking T-Rex.

Initially, Spielberg planned to use full-size robotic dinosaurs for the majority of the shots, along with stop-motion puppet animation for more detailed movements. But Muren's work convinced him that computer graphics could offer a new level of performance, mobility and realism. With computer graphics, the animator can literally move or pose the computer-generated creature in any way imaginable: running, jumping, being forceful, curious or frightened.

Impressed with ILM's test results, Amblin Entertainment soon gave ILM the green light to take on several additional test shots, including a stampede and several wide-angle scenes that illustrate a herd of dinosaurs against a sweeping vista. When Muren next returned to Amblin, he astounded the filmmakers with a computer-generated sequence of the T-Rex walking in daylight. It appeared that with the advent of computer-generated images, Go-Motion might soon be extinct.

Over the next 18 months, a team of over a hundred ILM creative and technical artists brought computer graphics to new heights, ultimately contributing over fifty dinosaur shots.

Each dinosaur was literally created inside out, within the computer, starting with a wire-frame skeleton which was then embellished in several stages with skin covering, coloration and texture.

One of the most critical tasks the ILM team faced was making sure these dinosaurs moved naturally. They wanted them to come across as real animals, not movie monster stereotypes. The dinosaurs were not just computer-generated beasts, they were real characters with heart and soul and a distinctive attitude. To accomplish this, the ILM team, under the guidance of Dinosaur Supervisor Phil Tippett, studied animal behavior, including the movements and body language of

elephants, alligators, ostriches and lions. ILM's animators received special training, including movement lessons, so their animation would capture these behavioral nuances. In addition, Phil Tippet's shop in Berkeley supplied animation for over a dozen of ILM's *Jurassic* shots.

Great pains were also taken to depict subtle physical features of the dinosaurs: the way their skin slides and stretches over muscles and bones, and the way their bellies sway back and forth when they walk.

"People will never believe our dinosaurs were made in a computer. Notice that as the bigger animals walk, their bellies sway to and fro from the weight. When they run, their entire body reverberates with each footstep," Muren explains. "Look for subtleties in the way the velociraptor tenses her body when she is startled. She looks alert and intelligent."

It became necessary for the ILM team to continually create new software to achieve these effects. This kind of attention to detail was enormously time-consuming, but the end result was computer-generated dinosaurs that were thoroughly believable.

"Working on *Jurassic Park* has been the most exciting and challenging experience I've had in all my years as a visual effects supervisor," concludes Muren. "The results we achieved on this film exceeded my wildest expectations. Using computers to create full-motion dinosaurs -- creatures that look, move and behave like real dinosaurs -- was immensely satisfying. The fact that viewers can not tell these creatures were computer-generated is the strongest evidence of our success."