



Copy regarding the "Pseudopod Sequence" from THE ABYSS:

The Pseudopod was the strange, gentle creature that undulated, snakelike, through the labyrinth of the underwater drilling complex in THE ABYSS. In a key scene, the Pseudopod encounters Lindsey (Mary Elizabeth Mastrantonio) and Bud (Ed Harris), reconfiguring its face in a three-dimensional mirror image of theirs. Enchanted, Lindsey dips her finger in the creature's face to discover it is made entirely of sea water.

Director James Cameron wanted the pod to appear completely realistic, and felt computer graphics was the only way to achieve this effect. "It was a leap of faith to use computer graphics," admits Cameron. "But it was a unique scene. We were trying to create something that had never been seen before." With one day's notice, the computer graphics team from Industrial Light & Magic, the special effects division of Lucasfilm, did a test on their modeling and animation system, building several still models of a tubular shape going through a snakelike move.

Cameron was enthused with the results, and with his vote of confidence, the team moved ahead with project designer John Knoll maintaining the aesthetic component of the Pseudopod, and computer graphics supervisor Jay Riddle supervising the project's complex technical demands. In the early stages of the project, the art department sculpted a clear resin maquette of the Pseudopod, as it was critical to see a three-dimensional model of the pod.

The shape of the Pseudopod was not complicated -- a snakelike tube with a rounded tip. The animators gave the pod an imaginary spine, basically a line through the center, connecting a series of pivot points. By manipulating the points, the animator was able to create whatever snakelike movement he desired.

Although the Pseudopod was built in three-dimensional computer space, it had to be incorporated with the two-dimensional background plate material shot on stage in Gaffney, South Carolina. To provide the computer graphics team with the exact spacial parameters, Knoll meticulously documented every background plate as it was photographed, noticing the position, pan, and tilt angle of the camera, the focal length of the lens, and the location of the lights. Back at ILM, the team digitized the data, essentially creating three-dimensional scale models of each set in a computer environment for the Pseudopod to move in, making everything easier to visualize.

Creating the Pseudopod's texture -- making it consistently look and move like water -- proved to be the tough part. Cameron wanted the surface of the pod to be constantly undulating with a sort of random rippling..like the surface of a swimming pool. The texture was created by "bumping" the pod's surface, using specially written software, and then animating and timing the bumps to react and look like water.

Maintaining the aesthetics of the pod was a major challenge. "It was a blend of things, playing with the scale and speed of ripples, determining the right mix of reflection and refraction," says Knoll. "If the ripples weren't the right scale and speed, the surface looked like jello or molten glass. With too much reflection, the surface of the pod looked like chrome."

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In the scene where the pod reconfigures its face to mimic Lindsey and Bud, the team used a 3-D digitizer to make a separate scan of each of the actors' expressions. The raw data was fed into the ILM computer graphics system and manipulated electronically. Only the key frames were digitized, with the computer interpolating or filling in the inbetween frames, using a "morph" program designed for WILLOW.

"The exciting thing," summarizes Knoll, "is that we discovered we can get computer graphics to do things that were once thought to be impossible. Computer graphics used to have a reputation for being slow, expensive, not looking real. Now we have the tools in place to allow for high quality effects, with fast turn-around and realistic, even organic, results. Almost anything can be modeled and brought to life."

The successful creation of a real looking creature via computer graphics has major implications for the motion picture industry. For visual effects master, Dennis Muren, it is the opportunity to expand the filmmaker's storytelling palette. "I'm hoping writers, directors, and artists will create more stories, more characters using this technology. It's there."

Director Cameron concurs: "The end goal of effects technology should be a situation where the only limit is the filmmaker's imagination. Computer graphics will fill in that last gulf of information, where the only limit is imagination."

-- Gini David --