

# The Film Scanning and Reanalysis Project

For Lawrence Livermore National Laboratory's weapon-physicist Greg Spriggs, leader of the Film Scanning and Reanalysis Project, the work has become a search-and-rescue mission. He has to find thousands of scientific test films and digitize them before they deteriorate beyond usefulness.

## Lost and Found

Old and imprecise records told Spriggs how many original films there were, but not where they were. In fact, they were stored in several different archives. He has now found most of them at Livermore; the Defense Threat Reduction Information Analysis Center on Kirtland Air Force Base in Albuquerque, New Mexico; and Los Alamos National Laboratory. Los Alamos had the most, about 7,000. About 2,500 remain missing.

Spriggs had to not just hunt them down but also verify that they were, indeed, the original negatives as opposed to the plethora of duplicates, called prints. To scientifically reanalyze the films he needed the original negatives that were in the cameras on test day to capture the original, undistorted data.

## Near Perfect

To digitize the films, Spriggs is using a high-resolution, sprocketless scanner that moves the film through the scanner without gripping the holes on a filmstrip's edges. Running one of the old films, now shrunken and buckled, through a sprocket-type scanner would just rip it up.

He also worked with the manufacturer to ratchet up the scanner's ability to capture a wider range of optical density—a measure of the film's capacity to respond to extremely dim and bright light. A nuclear detonation's light output is important data for measuring yield, especially the double flash of light, one of a nuclear explosion's most significant effects.

No film stock can capture the full range light emitted by a nuclear explosion—12 orders of magnitude. The film normally used by Hollywood can only capture two orders of magnitude of light variation. But the film stock, especially designed for the atmospheric tests, was capable of capturing four orders of magnitude. The scanner used by Spriggs now matches that number, producing near-perfect copies.

## Critical Analysis . . .

Spriggs is doing computer analyses on the newly digitized films—a good thing because the original analyses were cursory at best, partly because the work had to be done quickly. Yield estimates were required in as little as an hour after a test, so a few films were developed in on-location film-lab trailers and analyzed immediately.

## . . . and Reanalysis

Computers with image-processing software have eliminated guesswork. "For measuring the radius of the fireball," says Spriggs, "we don't have to look at a grid and hope we read it right. We can detect the exact edge now. And we can sample optical density on millions of points on every frame."

In addition, on the newly digitized images, the shock wave is traceable much longer—over hundreds of frames—because the contrast between shock-wave front and background can be greatly enhanced.

## A Team Effort

Spriggs is not alone. He has scientists at Los Alamos, Livermore, Sandia National Laboratories, and Britain's Atomic Weapons Establishment supplying theoretical fireball calculations, against which Spriggs checks his own analyses. In addition, students from the Air Force Institute of Technology and the military academies are helping reanalyze the digitized films either as summer-student projects or as part of their graduate studies.

The project also boasts two film consultants with Hollywood credentials: Peter Kuran and Jim Moyer. Kuran is a film historian, filmmaker, and technical film expert who won an Academy Award for his film preservation technology. Kuran produced the movie *Trinity and Beyond*, about the atmospheric tests, and wrote *How to Photograph an Atomic Bomb*, about how the tests were filmed. (See [atomcentral.com](http://atomcentral.com).)

The National Archives entrusted Moyer, a film expert with 40 years of experience in the film industry, to perform full preservation work of the famous "Zapruder film" that captured the assassination of President Kennedy.

Spriggs says, "Because these films represent a unique set of important data that are irreplaceable, they are being handled and preserved with great care by film professionals like these. They know the importance of their work and are dedicated to ensuring these data will be there for future use in national security science." ✦

~Eileen Patterson

*Lawrence Livermore's Greg Spriggs (foreground) and Alan Carr, Los Alamos National Laboratory historian, dig through boxes of films in the vast Los Alamos archives. Each box may hold up to 50 films that may or may not be test films. All must be checked. (Photo: Los Alamos)*

