Digital HD Production and Post Production in a Film Environment

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The Sony Pictures High Definition Center is a production/post production service facility, located in Culver City, California, that specializes in the use of high definition video equipment. The Center was organized in 1987 as a research and development center by Sony Corporation of America. In 1995, ownership of the Center was transferred to Sony Pictures. At the same time, decisions were made that the Center would have to generate sufficient revenue to pay for itself, including R&D, plus return a profit to Sony Pictures.

Among the organizations of Sony Pictures are Columbia Pictures and TriStar Pictures, companies that produce movies. Normally, when you think of movies, you think of film, especially 35mm film. The High Definition Center, then, exists in the middle of a film production studio.

Indeed, that is the subject of this paper — Digital HD Production and Post Production in a Film Environment. Services provided by the Center include HD production, HD post production, computer graphics, film to tape transfer, tape to film transfer, and film restoration using digital processing. This paper will discuss four projects we have done, and show some HD footage to illustrate our work. The projects that will be used as illustrations are:

1) *The Matinee Idol*, a 1928 silent black and white movie directed by Frank Capra. This project illustrates film restoration services. Restoration tasks include film to tape transfer, post production, computer graphics, and tape to film transfer.
2) *Rainbow*, a 1995 movie directed by Bob Hoskins. This project illustrates HD production, post production, computer graphics, and tape to film transfer.
3) *The Fifth Element*, a 1997 movie directed by Luc Besson. This project illustrates film to tape transfer.
4) *Roller Coaster*, a 1993 stereoscopic, or three-dimensional, ride. This project illustrates computer graphics.

The Matinee Idol

Frank Capra, the legendary Columbia Pictures director, was born in 1897. This year we are celebrating the 100th anniversary of his birth. The celebration began on January 10th by screening the movie *The Matinee Idol* to an audience of more than 1,000 at the Academy of Motion Picture Arts and Sciences in Los Angeles. So, what is the significance of that? *The Matinee Idol* was a “lost” film for more than sixty years, only recently found, and in terrible shape. It was restored, using digital processing, by the High Definition Center, the first time a live-action feature has been restored in its entirety using digital processing.

In 1928 Frank Capra directed *The Matinee Idol* for Columbia Pictures. It was a silent black and white movie starring Bessie Love as Ginger Bolivar, Lionel Belmore as her father Jasper Bolivar, and John Walker in the title role. Not long after the movie was released, there

were no known copies of the film. Two or three years ago a print was found in the collections of the Cinematheque Francaise under its French title, *Bessie a Broadway*. The diacetate print, once the property of a cine-club in the South of France, received first stage restoration at Immagine Ritrovato, a preservation laboratory in Bologna, and was screened at Bologna's festival of restored films. This screening caused the film to come to the attention of Michael Friend of the Motion Picture Academy and Grover Crisp of Sony Pictures. Knowing that the High Definition Center had been developing techniques for restoring damaged films, they asked the Center to apply those skills to *The Matinee Idol*.

The rediscovered film had many scratches and numerous frames with large area damage. It had French inter-titles, and scenes had been re-arranged from the original. An interpositive was made from the preservation duplicate negative. The IP was scanned using the Center's real-time, intermittent motion, pin-registered, 1K x 2K, CCD area-array telecine. Every frame was input to CG workstations for repair. Many repairs were made using automatic software; however, many other repairs had to be made by a digital artist.

After two years of searching, text for the original English inter-titles was found in the archives. The exclamation "A-ha!" appears twice in the film as a graphic, and from this it was possible to identify the original title font of the film. The scenes were placed back in the original order with the re-generated inter-titles. Finally, the HD tape was output to film using the Center's Electron Beam Recorder. This is the film, then, that was screened at the Motion Picture Academy in January to begin the Frank Capra celebration.

Throughout the restoration process, the goal was always to protect the integrity of the original image while removing only those defects that were clearly produced by damage, severe wear, misuse, or deterioration. The goal of the work was always to restore the original achievement of the director; to return the film to a condition as close as possible to the original without changing or "improving" the film.

The HD video shows a restored scene several minutes into the film, another scene comparing the restored version with the un-restored version, and then single frames comparing the restored version with the un-restored version. *The Matinee Idol* is a comedy/romance involving the relationship between a small-time theatrical troupe and a big-time stage star. Keep in mind that the actual product delivered by the HD Center was 35mm film, not video.

[Roll HD Tape, *Matinee Idol*, 01:54]

The second scene on the HD video illustrates the removal of scratches, called tram-line scratches, that run along the film. We are wiping back and forth between the restored version and the un-restored version. The scratch along the left side is particularly bad. The scratch along the right side is more typical. We used automatic software to remove many of these scratches.

The first still frame illustrates repaired damage where the film was torn and then taped back together. Note how the emulsion curled up because of the tape.

The second still frame illustrates repaired damage where a large "X" was scratched onto the film to mark an edit.

The third still frame illustrates repaired damage where the emulsion was blistered.

The fourth still frame illustrates another "X" that was scratched onto the film to mark an edit.

The fifth still frame illustrates repaired damage where there were a number of black spots on the film.

Rainbow

The second business area of the High Definition Center that will be illustrated in this presentation is high definition production. The television mini-series *World War II, When Lions Roared* is one example. Directed by Joseph Sargent and starring Michael Caine as Stalin, Bob Hoskins as Churchill, and John Lithgow as Roosevelt, this TV movie was shot by John Alonzo in Prague and at CBS Studio City in Los Angeles. A down-converted version was aired by NBC on the 50th anniversary of D-Day two years ago.

In some of our projects, the HD production has been output to film. As an example, *Rainbow* is a Bob Hoskins film that was shot in Montreal by Freddie Francis using high definition video equipment, edited in high definition, then output to film for theatrical exhibition. The film has been released in Europe and Canada. It premiered in London last summer.

In *Rainbow* some children discover the end of a rainbow and are carried inside. When one child steals the light source, which becomes nuggets of gold, the rainbow collapses, "color" begins to fade, and violence and hatred reign. The children have to set things right again with the rainbow. This movie lends itself to special effects. Indeed, the special effects were a part of the high definition post production. There were 140 visual effects shots.

The HD video shows one of the effects shots near the end of *Rainbow*. Again, keep in mind that the actual product delivered by the HD Center was 35mm film, not video.

[Roll HD Tape, *Rainbow*, 01:13]

The High Definition Center has been involved in several projects where a movie was shot with 35mm film, but an effects shot, involving high definition, was incorporated. Examples are *The Power of One* produced by Alcor Films, Le Studio Canal+, and Regency Enterprises, Disney's *Honey I Blew Up the Kid*, and *Eight Seconds* produced by Jersey Films and New Line Cinema. In these cases, we usually transfer some of the 35mm film to HD, add the effect, and then transfer the HD video back to 35mm film to be cut into the movie.

The Fifth Element

The third business area of the High Definition Center that will be illustrated in this presentation is telecine mastering. In 1995 Sony Pictures decided that new telecine transfers would be high definition transfers. In the past two years, more than 130 Columbia Pictures and TriStar Pictures films have been transferred to high definition. The HD master is a letterbox 16:9 transfer in which we retain the theatrical aspect ratio. The HD master is down-converted to NTSC and PAL; actually to the ITU-R 601 standard on D1 tape format. The 50 Hz down-conversion contains no 60 Hz artifacts, even though the HD master is 60 Hz. In the down-converter, the redundant field is dropped to make a 48 Hz recording, then the tape is played at 50 Hz.

When transferring a film, we usually make a best-light transfer to tape, then perform scene-to-scene color correction on the recording. This allows greater throughput with the telecine. We soon will have two more scanners. With these machines, we plan to perform scene-to-scene color correction from the film rather than from a best-light transfer. Of course, we could continue to perform best-light transfers. In fact, when we are restoring a film, we prefer a best-light transfer because we wish to reproduce the original film.

As an illustration of our telecine transfer business, the HD video shows the Columbia Pictures trailer for *The Fifth Element*, the opening film for the 50th Cannes Film Festival last month. Directed by Luc Besson and starring Bruce Willis and Milla Jovovich, the film was produced by Columbia Pictures and Gaumont.

[Roll HD Tape, *The Fifth Element*, 01:48]

Roller Coaster

The fourth business area of the High Definition Center that will be illustrated in this presentation is computer-generated ride simulations. Often, ride attractions are computer generated, then transferred to 35mm film. Many of these films are transferred to high definition video, then a high definition laser disk is pressed for permanence and reliability. The High Definition Center has been involved in ride simulation work for Showscan, Iwerks, Doron Precision Systems, Warner Brothers, and Disney. Some of the work has been stereoscopic. Some of the work has been for 360° theatres.

The HD video example is *Roller Coaster*, a stereoscopic computer graphic project undertaken by the High Definition Center in 1993. Because the video projection is not set-up for stereoscopic viewing, the HD video shows only one channel of *Roller Coaster*. I suggest you hold on tight, now, while we roll the tape.

[Roll HD Tape, *Roller Coaster*, 00:31]