

# The Restoration Business Part 4: In Black and White—Reel Two

By Grant Lobban

*With the arrival of sound in 1927, the role of the optical printer grew in importance. The restrictions imposed by early sound filming saw an end of most of the in-camera effects, particularly scene transitions like fades and dissolves. For a short while, they almost disappeared altogether. When the French feature "L' Atalante" was restored, researchers found that although dissolves were indicated in the shooting script they never appeared in the prints shown at the time of its original release in 1934. For the new preservation copy, it was decided to include them this time, an act, which many purists may consider to be a case of "over-restoration."*

## Optical effects

Chemical fades were still being employed, but laboratories were now creating them on their newly installed optical printers. They were executed while making a duplicate negative of the scenes requiring the effects. These duped "opticals" were then cut back into the original negative. Unlike their in-camera equivalents, they showed a marked drop in quality. If the scenes on either side of the optical were short, they were usually duped in their entirety. If over about 10 ft, they were cut back to the original negative as soon as possible, whenever practical, using movement to cover the cut. Experienced viewers began to notice the sudden change in quality and register and knew that some form of optical effect was coming up. To help improve the quality, stock manufacturers made available special intermediate duplicating films. They all had a very fine grain structure, and in some types, the emulsion also contained a yellow dye to allow contrast control by placing yellow or violet filters in the printer light.



*Combined picture and sound 'lavender' inter-positive print. Although looking like a rather dense release print, its purpose was for making duplicate negatives. Note the Bell & Howell negative perforations.*

## Lavender prints

They could be used for making both negatives and positives, the latter being known variously as a Dupe-Pos., Master-Pos., Fine-Grain, or a Lavender Print. The last term was due to some being on a pale blue tinted base. The copy negatives made from them didn't always look like the original, usually having a higher overall density.

Proper duplicating films led to better quality prints for foreign release. The practice of shooting a separate negative had already been largely abandoned, with the overseas distributor now having to make do with a "good print" or a duplicate negative made on ordinary stock.

Domestic prints continued to be made from the camera original.

## Sound synchronisation

The coming of sound, both on disc and sound-on-film, meant that the negatives could no longer be arbitrarily cut, or frames lost while making repairs, without losing synchronisation. Many sound-on-disc picture negatives are found to contain blank frames to maintain the sync, as do some sound-on-film negatives, the result of not wishing to mutilate the sound negative to match. Modern prints of early "Laurel & Hardy" sound films, which were originally available for showing using both sound systems, still have the occasional blank frames.

## Special purpose stocks

New special stocks also started to be introduced for recording optical sound tracks. Some of the the early sound systems, like Fox's Movietone, exposed its variable density track alongside the picture in the same camera on the normal negative stock. This was to continue for Newsreels, but for features a second synchronised "sound camera" was used for exposing the track. Although normal picture negative was acceptable for density tracks, it was less suitable for use with the higher contrast needed for the variable area types. Some early recordings were sometimes made on positive film.

## Soundtrack processing

Soundtrack processing was far more critical than for the picture, requiring sensitometric tests and development using the fixed time and temperature methods. This suited machine processing, in which the film passed continuously through a

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series of deep tanks or pipes containing the solutions. Continuous processing machines were already in use during the 1920s, but were rather erratic in operation, so were only used for replaceable release prints. Studios usually insisted that the camera negatives still be processed by hand, due to the fear of damage. During the 1930s, improvements led to greater confidence in the machines and the close processing controls were extended to the picture. Requiring cameramen to be more consistent with their exposures, helped with the growing use of light meters.

### Duplicating films

Also during the 1930s, improved black and white film stocks continued to be introduced, including better duplicating types. The prints made from a duplicate negative moved closer in quality to those made from the original camera negative. It became sensible to make all prints from duplicates and preserve the originals from the danger of damage. In Britain and most of Europe, this became common practice. The bulk printing from a duplicate negative was easier and safer, as it had no joins to fail and offered the option of incorporating all the scene-to-scene light changes while making the inter-positive. The negative made from this now had the same density throughout and is known as a "one-light" printing negative. In the interest of quality, most of the Hollywood studios continued to print from the camera negative, which despite the risks, produced the finest prints possible, complementing the much admired black and white photography of the 1930s and 1940s. Duplicate positives and negatives were still made for sending to laboratories abroad and to act as "protection masters," which, as the name suggests, were kept aside in case the original suffered damage.

### Printing complications

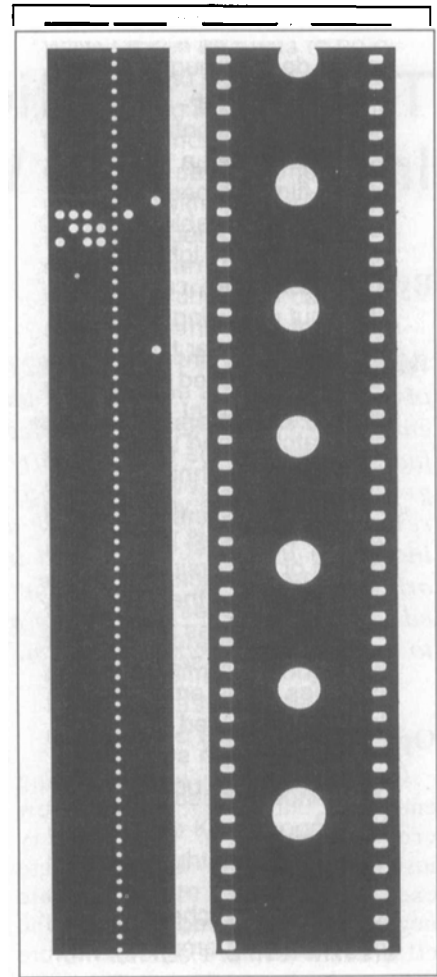
Although the prints from the original cut negative were of enhanced quality, their printing was more involved, as all the light changes had to be repeated for each pass through

the printer. This was automated, with notches cut out of the edge of the film, or metal foil or clips placed between the perforations; these used to trigger the mechanism for varying the lamp voltages or shutter openings. One system used a 35mm strip of opaque black paper, punched with circular holes of different sizes, to control the light. These, together with other various kinds of punched grading cards or tapes, employed by other control systems, are occasionally found in the film's can along with the negatives. Prints are sometimes found, with evidence that the "timing" or "grading" was a little out of sync, with the light changes missing the scene change by a frame or two. This often happened before automation. Then, highly skilled operators watched the illuminated frame in the printer's gate while keeping a finger touching the moving negative to anticipate any change in its density and then make any subsequent light adjustments manually using their "snap judgement."

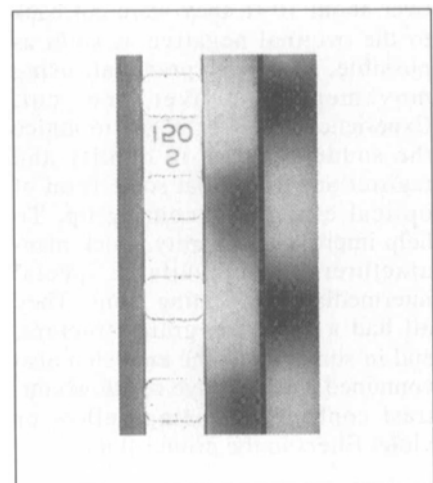
### Different versions

The coming of sound and the making of release prints via duplicates resulted in an increase of the "pre-print" material deposited in film vaults. Along with the cut negative, was selected unused footage held for future uses such as stock shots. Also kept, were the duplicate negatives and positives and a couple of studio show prints for future viewing. The separate sound negatives, not only included the "final mix," but also separate dialogue and music tracks, together with a "music and effects" track (M&E), needed to produce foreign language dubbed versions. Sometimes all the original music recordings were retained and it's not unknown for it to be heard again in later films. To cut down on the total footage, it was common for each roll of sound negative to have two different recordings running in opposite directions down both sides of the film.

Sometimes, the film was actually slit down the middle, creating individual 17.5mm tracks. With no picture to accommodate, original studio recordings were often double-width



negative are paper film strips or punched tapes, used as part of the mechanism for controlling the printer's scene-to-scene light changes.



Separate double-width push-pull optical track on 17.5mm (split 35mm) film. One of the methods used for original studio tracks before the introduction of magnetic recording in the early 1950s.

to improve the quality and background noise.

Starting around 1947, original optical photographic tracks began to be replaced by magnetic recordings on coated 35mm film.

1950 saw the rapid switch from nitrate to safety based films. Some productions made during the transition period made use of both types of base. For example the negative may have been shot on nitrate, with all the prints being on safety film.

### Storage

It was always good practice to store a master copy of a film at a different location to guard against a total loss due to fire, flood or earthquake. Again to reduce additional storage space, a "combined" sound and picture fine-grain positive was made to make new negatives if necessary. At first sight, these can be mistaken for a rather dense release print but like all intermediate films, they have Bell & Howell "negative"-type perforations, providing a clue to its original purpose.

### Getting the best copies

All this shows what a variety of material can be used to generate new copies. The aim is to produce a print as close as possible to that made from the original negative, even if this is no longer available. As well as following the normal duplicating routes, laboratories specialising in archive work have become skilled in modifying the grading, printing and processing procedures to deal with the particular needs of archive work. More often, the only surviving copies of early black and white films in danger of being lost are well worn projection prints.

Additional techniques have been devised or adapted to improve the results. An example is the post-treatment of the original or final print using image reduction and intensification processes normally associated with still photography. One snag with combined sound prints is the change in density of the sound track, causing distortion or an increase in noise level. However, if the primary purpose is only to provide a print for video transfer, the sound can be re-

recorded onto magnetic film before the treatment takes place.

### Preparation

For many restoration projects, the greater part of the effort, and ultimately the final cost, is the pre-printing tasks of tracing all the available material and its physical preparation. Cut camera negatives will have the potential of producing the best results, but need the most preparation. Hundreds of individual joins may have to be inspected and if necessary, re-made without the loss of frames. Obsolete grading clips or foil tabs may have to be removed before regrading. As a rule, the original negative is always the first choice but if for example, a largely join free one-light printing master is available it may not only be more economic, but produce a print with picture quality closer to that seen by its original audiences. For example, in recent years, only relatively poor copies of Universal's ever popular "Flash Gordon" serials from the 1930s and 1940s were available. However, there was a dramatic improvement in both the picture and sound quality when they were last broadcast on TV. This was because a set of the British printing masters were discovered deep in the vaults of the Rank Laboratories (now De Luxe). Last used to provide prints for kids Saturday morning shows in the 1950s and 1960s, they were still in good condition and used again to make excellent new prints and perhaps avert the need for a future and more costly restoration using less suitable material.

### Cleaning

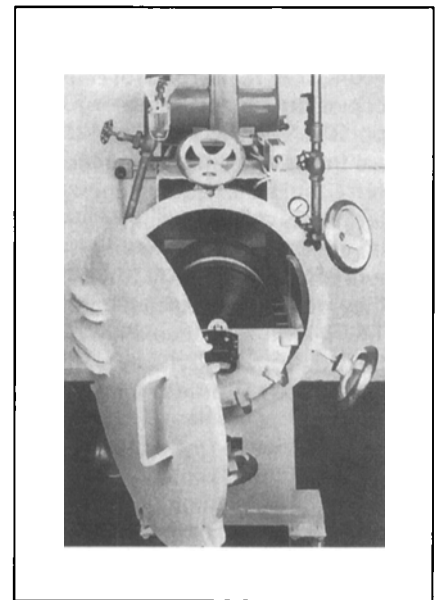
Whatever kind of original, the film is sure to need cleaning. Both well tried hand and machine methods have in some cases been made less effective by the loss of certain chemicals through legislation to protect workers and the environment from hazardous chemicals. The greener alternatives have been found to be less effective, requiring longer treatment times. Cleaning processes range from simple re-washing, to the use of solvents, with or without ultra-sonic agitation. Mechanical dry

methods include the use of brushes and tacky rollers. Still one of the most effective methods for old films, with deeply ingrained dirt, is by hand, pulling the film through a pad of cotton cloth soaked in environment-friendly, fume-free cleaning fluid, without the risk in earlier years of involuntary solvent abuse.

### Shrinkage correction

Old nitrate films will have inevitably shrunk due to the loss of moisture during many decades of storage. In severe cases, they are now so brittle and warped that they are no longer able to run through a printer. Remedial work can range from re-washing, to proprietary processes like Redimension, in which the rolls of film spend between two days and three weeks in a vacuum chamber, while fluid vapour impregnates the film.

Re-humidification can bring the dimensions back to near that of fresh stock, so they can be run together through a step contact printer, still the first choice for older silent films. With careful pitch adjustment and running slowly, the still somewhat shrunken and buckled film, can be eased, if only once, through the printer's gate and onto its registration pins. There is the option of using an



*Redimension's rehumidification vacuum chamber constructed using parts from a redundant torpedo tube.*

optical printer, without the need for the old and new stock to travel over the same sprockets. A more recent type, without the strains of intermittent transport, is the continuous optical printer. The films run separately, with the image transferred via a relay lens system which, like a conventional optical printer, can be adjusted to restore the image size and position. Separate sound negatives often have to be rejuvenated too. These have to be printed on a continuous contact-type printer. If shrunken, they can end up on the combined print out of alignment and the reproduction marred by flutter and interference from the sprocket holes. Also, the track may go in and out of focus, due to loss of contact when being printed, with a loss of the higher frequencies.

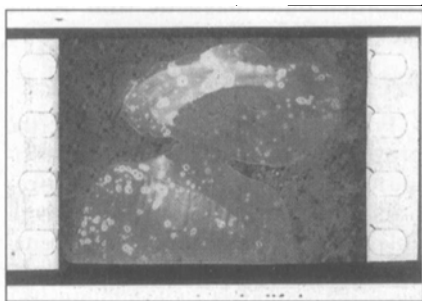
Special film joiners are available with movable pins for shrunken film, although many skilled archive workers still prefer to make hand joins. Missing perforations can be reconstructed using patches made from old scrap film, with the same degree of shrinkage.

### Scratch concealment

All but the worst scratches and other abrasions can be removed or disguised. Negative scratches, printed along with the picture, appear white on the screen. Those on positives are usually black, unless deep enough to have reached the base. "Cinch" marks are horizontal scratches caused when a loosely wound film has been pulled tight, most noticeable at the ends of reels. Lighter base, or cell-scratches, can be polished out using spinning glass rollers, after the base has been softened with acetone. Less radical, is to leave the scratches and use wet-gate printing techniques to render them less visible to the printer's light. This works by coating or immersing the film in a fluid having the same refractive index as the base, which fills in the scratch. For scratches in the emulsion, the film can be treated in a caustic solution which swells the gelatine, closing up the scratch.

### Infestation

Apart from scratches, the image carrying emulsion can show signs of



*'It's a bug's life' What remains of a stencil colour image after becoming a meal for bacteria.*

infestation by bacteria, fungus and even larger creepy-crawlies, with legs on!

These unwanted guests and growths find the largely organic gelatine structure an ideal meal. This is usually due to the films being stored at high temperature and humidity, or having been in a flood. The growth of mould seems sensitive to pressure and on tightly wound film, its effect can be seen mostly in the thinnest parts of the image, such as light sky areas and white titles. Treatment usually involves the film being sterilised in fungicide, or a mild acid solution, and the worst stains and spots removed by hand using swabs of pure alcohol. Any remaining marks are treated in the same way as scratches.

### Digital processing

At the moment, digital image processing is usually too costly for most day-to-day restoration work. However, if, in the future, prices fall, we may see it increasingly used to alter scene contrast, remove scratches and other signs of damage, and even recover detail lost as a result of decomposition.

All this effort continues as film companies, commercial libraries and collections have to maintain their assets in good condition and deal with new acquisitions. However, many labour intensive and expensive projects involve the saving of non-commercial films. These include historically important documentaries, old silent films and long forgotten and uninspiring features, which are long out of copyright and no longer have an "owner" to help foot the bill.

### Archives

The restoration of this kind of material is usually undertaken by National archives, like our own National Film & Television Archive, which receives government funding and now lottery money to help save our film heritage. Not to forget, the contribution made by benefactors, like J. Paul Getty Jnr., after whom the NFA's Conservation Centre at Birkhampstead is named. In the U.S., funding often comes from educational foundations, business corporations and sometimes individuals, with a particular interest in a specific film or subject.

### The Lost World

To illustrate how all these aspects of conservation work come together, it's worth looking at a particular restoration project. While computer generated dinosaurs were being created for Steven Spielberg's, "Jurassic Park: The Lost World," another much earlier creature-feature was being restored, the 1925 silent version of Conan Doyle's "The Lost World."

Five years in production, the film featured prehistoric monsters animated by pioneer stop-motion model animator, Willis O'Brien and was to be a forerunner to his later triumph, "King Kong" (1932). To bring his dinosaurs to life, he used up to seven cameras at one time, with the single frames triggered simultaneously. This arrangement provided for a choice of camera angles and the extra footage needed for the foreign negative, with the additional live-action footage for this being made up of second camera, or alternative takes. The domestic version was ten reels (9,209 feet) long, lasting nearly two hours at around 20 frames per/sec, which was the average projection rate at the time, although the film itself was photographed nearer to 16 frames/sec.

After a successful worldwide release, the Kodoscope library bought up the non-theatrical 16mm rights and cut down the domestic version from ten reels to five, with the discarded negative eventually becoming lost. The all-action monster footage was retained, with the

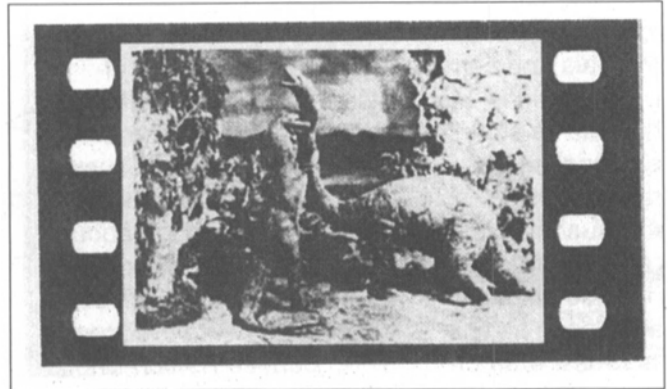


The availability of digital processing now allows for the possibility of recreating frames lost through decay.

losses coming from the less exciting plot development and the inevitable romantic situations. Later, the story rights were renegotiated, with a view to making a sound remake. But in 1932, RKO purchased "The Lost World," to make sure it stayed lost to prevent any possible copyright difficulties killing off their own King Kong prematurely. Orders went out to destroy any remaining prints and the foreign negative.

For sixty years, the only version available for re-prints was the Kodascope five-reel version. The original 16mm prints were of excellent quality, but over the years this dropped, as dupe negatives of these were used to generate subsequent 16mm, 8mm, and eventually Super-8 prints for home movie collectors. Back in 1948, Kodak's five-reel nitrate 35mm negative was preserved at George Eastman House in Rochester, together with a new 16mm master positive. By the 1970s, the 35mm negative was beginning to decompose, with three of the five reels "going sticky," the first stage of the decay. Just in time, funding from The National Endowment for the Arts, allowed a 35mm fine-grain master positive to be made on acetate safety film.

Unlike many old silent films, "The Lost World" was not entirely forgotten, and in 1991, it was released on laserdisc, for the benefit of fantasy film buffs and collectors. The source was Eastman's five-reel version and although only being half its original length, it proved successful. To help compensate for the lost footage, the disc included an added music score and the original 1925 theatrical and promotional trailers, these being provided by the UCLA and Pacific Film Archives. Included too, were production stills from the missing footage. Some of these showed scenes which although actually shot,

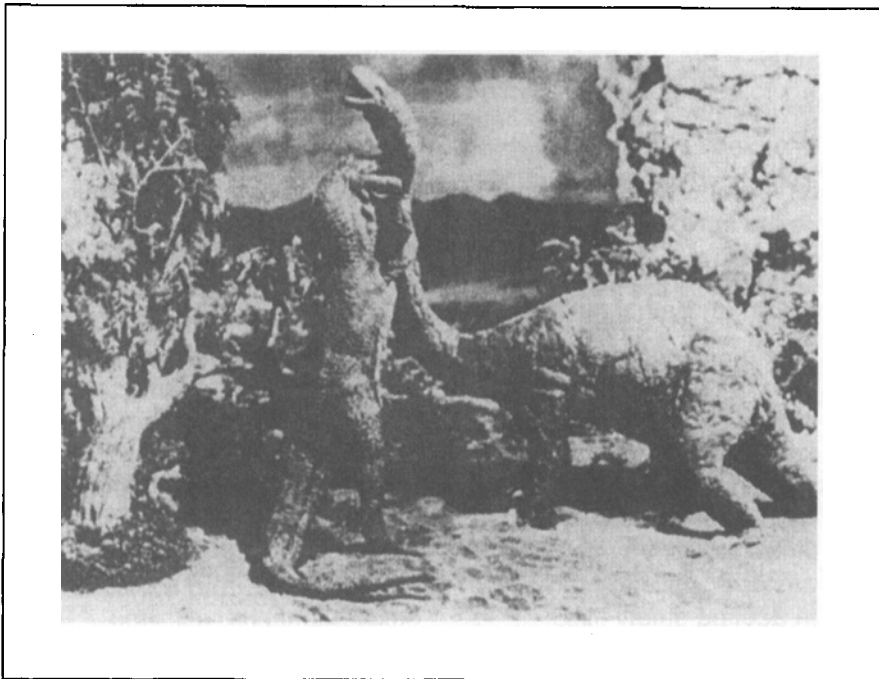


were never used in the original release. They were for protection, in case Willis O'Brien didn't come up with convincing monsters, and could be used to turn the film into a conventional jungle melodrama.

#### A complete version

The appearance of the laser disc, inspired the Eastman House Archives to attempt a 35mm restoration of the full-length version. An international appeal was mounted for any additional material and the all-important funding, now with the help of the ubiquitous website. The film was out of copyright and no longer had a corporate owner, so patrons and benefactors were needed to adopt "The Lost World" and to help subsidise its restoration and continued existence. Fortunately, in this case, major funding came from Hugh Hefner, whose interests not only include the Playboy empire, but he is also a great Conan Doyle fan. He had previously helped save the original nitrate negatives of twelve Basil Rathbone Sherlock Holmes films. These had been abandoned by their copyright owner, not wishing to continue the responsibility of storing them.

News of the first additional footage came from a U.S. stock-shot company, who found a reel of positive animation out-takes left over from "Lost World." These showed the common mishaps of stop-motion work, including fogged frames, animators caught in shot and the miniatures falling over. Another find came from The Library of Congress Archive, who discovered in their



*The Lost World discovered—again*

collection, a roll of nitrate tinted print fragments from the film. Although only 150 feet long, it contained several unique shots. In both cases, preservation negatives were made and deposited at George Eastman House. However, the restoration became a reality, when word came from the Filmovy Archive in Czechoslovakia, that they had a full-length copy of "The Lost World." This was not the first time that the Czech Republic has come up trumps in the search for films lost in the West. Before the First World War, Prague was the last stop for film distribution in Eastern Europe, with well-worn copies being abandoned, rather than being shipped back to the distributors. Many of the films eventually found their way into the National Archive, which has become a treasure trove for lost films. More recent discoveries

include, John Ford's first film as a director, "Straight Shooting" (1917), and the Technicolor sequences from the silent "Ben Hur" (1925).

Their written description of the "Lost World" print, stated that it was made from the original foreign camera negative. This was required to make literally hundreds of prints for all over Europe and Asia, and their surviving copy must have been among the last to be printed, with many repairs and scratches printed in. The local inter-titles were joined in later, and did not show so much damage. Apparently, the print itself was also physically well-worn, being badly scratched, with missing footage at the beginning and ends of the reels. The country's censors had also demanded cuts to the scenes which included the violent deaths of both the humans and model monsters. Fortunately, these scenes

remained intact in the Kodascope version and between the two of them, around 90 to 95% of the narrative and action could be reconstructed.

As it turned out, the Czech's nitrate print had in fact decomposed. A previously made copy negative, although the best possible, was unfortunately done without the aid of a liquid gate printer.

This restoration project was to show the international nature of Archive work. After all the negotiations for the use of the material were completed, the actual reconstruction and printing work was undertaken at the Haguefilm Laboratory in the Netherlands, in collaboration with George Eastman House. The final result is not an exact match to the original U.S. domestic version. The foreign prints were always slightly different, having different camera angles and shot lengths. Without an original shot list, the only guidance for the final cut, was the scenario and the logic of the remaining footage. Without knowing for certain what the original looked like, the aim was to produce the most entertaining and watchable version possible, from all the available sources, to the extent of adding 800 extra feet from the animation out-takes, which never appeared in either the domestic or foreign versions. Whether, a true replica or not, another silent classic has been saved from extinction, returning in a new 35mm tinted print.

Although only photographed in black and white, "The Lost World," like the great majority of silent films, had colour tints added. Among the scenes tinted, was a volcanic eruption highlighted in red.

Next time, we will look at 100 years of colour in the motion pictures and the problems of its restoration.