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## Toward a Science of Film and Moving Image Restoration

Ulrich Ruedel

As the technology of creating and presenting moving image works moves into the realm of digital technologies, visual characteristics that have shaped more than a century of moving image culture and film grammar become divorced from their roots in materials chemistry. For the archives, this presents an unprecedented challenge as much as an opportunity. More than keepers of individual works, archives become the repositories for an entire craft, culture, and technology. The original moving image materials gain in cultural and historical value, whether as pieces of art, as best surviving master materials, as remnants of how the works were originally seen, or even as rare archaeological samples of their materials chemistry and related visual properties. But saving the works only will not suffice.

One approach in the maturing of the youngest branch of museology is to become, as other areas of cultural heritage already have, more scientific. Moving images are arguably the most technical of art forms, with properties deeply rooted in the applied science of photographic chemistry. In order to address the imminent loss of this technology and tradition, archives can support and encourage its collection and study in a threefold approach, encompassing science, history, and conservation science and imaging science, by:

1. saving and studying the *history of the photographic sciences and motion picture technologies* of more than a century of moving image culture by collecting scientific and technical documentation, research files, and the archaeological film samples themselves—ranging from single frames to entire test reels exemplifying and documenting the different film materials, photographic chemistries, color systems, and motion picture formats;
2. encouraging the application of scientific approaches established in other areas of cultural heritage to moving image artefacts, in particular, those of *conservation science and archaeometry* but also, for instance, an "experimental archaeology" of topics such as early applied color techniques in order to study their visual properties and restoration behavior; and
3. deepening the understanding of the subjective, psychovisual moving image experience and of the analog and digital techniques used to provide it by integrating the knowledge and approaches of *imaging and color science*.

This is vital not only to preserve history but also because of the necessity of access to born-analog works via digital versions and the potential digital restoration indeed does offer. Precisely because it is outside and beyond the original technology's realm, the expanded "vocabulary" of digital imaging might offer opportunities to be more faithful in some regards to a particular heritage image than analog technologies allow. But like any translation, a deep understanding of the original language is a prerogative. As archivists, we can embrace the potential of modern imaging technologies to explore the richness of historic techniques to research. The science of imaging past and present and of the materials chemistry of heritage images need to be an inherent and essential part of this.

## The Academy's New Clothes

Leo Enticknap

The scholarly establishment's response to the adoption of digital technologies for archival film restoration and access, and specifically the implications of that response for the archival community, suggests a rather depressing answer to the editors' question. In short, scholars



(with a small number of honorable exceptions) have shown that they cannot provide a needed service to archivists, primarily because they lack the professional competence to do so.

There is little doubt that we are in the teeth of a revolution in the technologies that provide access to archivally preserved moving images. It has precipitated an intense and polarized debate among moving image archivists as to the ethical and cultural implications of what appears to be the final decline of analogue photochemistry as a mainstream storage and distribution medium. While it has been rumbling on for the best part of a decade, the issue was recently given short-term prominence by the Chapter 11 bankruptcy filing of Eastman Kodak, the company that manufactures approximately 90 percent of the world's film, on 19 January 2012. Industry commentators are broadly agreed that if Kodak survives the restructuring process as a corporate entity, it will emerge from it having quit the film business.

The use of digital technology first for origination, then for consumer access, then for restoration, and now, finally, for theatrical exhibition has led, on the one hand, to claims by its celebrants that it has broadened possibilities, improved quality, and reduced costs (e.g., in Giovanna Fossati's *From Grain to Pixel: The Archival Life of Film in Transition* [Amsterdam: Amsterdam University Press, 2009]) and, on the other, to assertions by its detractors that the digital representation of images originated using photochemical technology is fundamentally inauthentic and thus unethical (e.g., Paolo Cherchi Usai's claims of a "digital dark age"). Film scholars have been caught in the middle of this conversation within the archiving community like rabbits in front of headlights. In general terms, they have either resorted to obtuse cultural theory in order to speculate as to the cultural implications of digitally mediated access to archival moving images or betrayed their ignorance of the empirical functions of media technologies through a series of untrue and misleading assertions.

For career preservation purposes, I do not intend to name and shame the authors of prominent examples. In the last two years, I have encountered eminent and widely respected professors in print and mainstream media interviews claiming that "all film restoration is now digital," that the projection of a 35mm film-out from the digital restoration of an early cinema classic represents an authentic viewing experience, whereas a

DCP cannot, that any and all copying of a digital audio-visual asset is analogous to cloning (i.e., totally ignoring the role of codecs in the creation of image data), and a series of other misunderstandings, oversimplifications, and half-truths.

In short, what we have is another embarrassing example of a group of scholars who, trained in the humanities, find themselves out of their depth when events and public debate force them to address questions of science and engineering but yet feel compelled to pass themselves off as experts on the subject when the occasion demands it. It is partly for this reason that the archival community has, in the last decade and a half or so, evolved its own infrastructure for researching the cultural and practical effects of its work, represented principally by a series of monographs and the journals the *Moving Image* and the *Journal of Film Preservation*. The pertinent question is how this work can inform the film studies establishment, not the other way round if that establishment is prepared to take it on board.

### Scholarly Archivists/Archival Scholars: Rethinking the Traditional Models

*Oliver Hanley and Adelheid Heftberger*

The question of how scholars can provide a needed service to film museums and archives can only be answered by taking a step backward. Archivists and scholars tend to be placed in separate camps. However, if we were to take a close look at the current generation of archivists or lab technicians, we would find very little that separates them from what we would consider "traditional" scholars. Given that many of today's archivists have gone through the "traditional" academic route, and many film archives and museums themselves—as institutions—are heavily involved in academic programs if not departments in universities, it may not be an exaggeration to suggest that every archivist nowadays is a potential scholar (and every scholar a potential archivist).

An archivist is more than the person who lifts cans off a shelf: we, and many people we know working in other archival institutions, manage to combine the benefits of a job in an archive with our own scholarly interests. Likewise, scholars are more than just people who create havoc in archives. If they can appreciate that watching a film on DVD is not enough and put genuine archival film prints "under