

Paper tensions

From flipbooks to scanners – the role of paper in moving image practices

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Introduction

Let us consider a film when it is screened outside of the context of film exhibition in the cinema auditorium. In this new consideration, we can think of a film in its various aspects of materiality, rather than its exhibition format as either celluloid or digital print. I am proposing here to think about film through another medium, that of paper. A film's cinema release brings forth a graphic display, like a movie poster hanging on a billboard, adverts in newspapers and magazines, stuck to the side of moving buses or on the walls of train stations. Even when filmgoers visit the cinema, they can view large-scale posters and character cut-outs as part of the *mise-en-scène* of the modern cinema experience. Collectors and enthusiasts can collect film postcards on sale or free at cinemas, film shops, galleries and museums. This paper paraphernalia of the moving image has allowed the cinema-goer to take home a non-celluloid aspect of the film. The portability of this form of reproduction allowed cinema to imbed itself in the everyday cultural aspects of our lives long before the digital turn.

The film theorist Thomas Elsaesser asserted the need to rethink cinema to understand film history and cinema's place in our culture. The moment(s) where the perceived rupture of the digital allows us to go beyond seeing the development of the audiovisual as one improvement after another is, for Elsaesser, a moment to rethink 'historical change' as both linear and non-linear change (Elsaesser 2004). This approach to film history as media archaeology is a way to think through how we understand moving image technologies in their materiality. By utilising a media archaeology of paper and relating this to film, we can consider how the material and immaterial interweave to shape our understanding of certain film practices, particularly when it comes to preserving film. Seeing film as part of a more comprehensive network of technologies of the moving image, rather than its pinnacle, is a critical approach to media history, building upon the 'new film history' (Elsaesser 1986) and the variants of media archaeology (Strauven 2013; Parikka 2012).

Paper is a medium that finds itself a converging point for other media, this proposition relates to how paper acts to formalise information into a document. Film

companies reproduced their films as printed matter in early cinematic technologies such as the Kinora or pre-cinematic mediums like flipbooks. Copyrighting films as paper prints formalised the film as a medium. In the afterlife of cinema, its representation and reproduction of film in its archival form reflect the moving image as a document. When we explore several technologies and expressions of cinema that existed in the pre, early and digital cinematic history of film and how they interrelate with paper, we can understand how we validate cinema through technological methods and cultural practices.

Let us set out an archaeology of paper and film, at first concerning early cinema and pre-cinematic technologies, and then practices of archiving film in the analogue and digital realm. We can understand the ontology of film through the production of film documents; through methods such as reproduction and duplication that show how interrelated technological techniques and cultural practices co-produce what film is.

Some critiques of media archaeology argue that its materialism fetishises technology or at least relegates human agency (Winthrop-Young 2013). One of the most critical figures in media archaeology is the theorist Friedrich Kittler. In his analysis of the shift from literature to technological media, he asserted that media ‘determine our situation’ (Kittler 1999). This statement has been taken to highlight a technological determinism that relegates human agency in how we come to understand the world because what is permissible in terms of knowledge, according to Kittler, is determined by the ways technical media transmit and store information. Geoffrey Winthrop-Young, in his opening remarks in the special issue on Cultural Techniques of *Theory, Culture & Society* (2013), reflects how the cultural-technical approach is a ‘viable alternative’ to some of those accusations of Kittler’s ‘pronounced anti-humanism in combination with the scorn Kittler heaped on nebulous constructs like “society”’. Cultural techniques as a corrective to media archaeology attempt to keep the valuable elements of Kittler’s media theory whilst escaping the instrumentalism and determinism of previous forms of media study based on Kittler’s work (Winthrop-Young 2013, 14). The question of how technology impacts culture need not be a binary consideration when thinking archaeologically. In recovering histories of media objects, beyond linear narratives, we can also account for them within social and cultural terms. The approach to media history in the section on *Reproduction and media documents*, through Bernhard Siegert and Lisa Gitelman, aims to ease the dualistic concerns of some methods of media archaeology by considering the cultural practices that co-produce technology. These approaches lend themselves to thinking through different chains of operations, technological and cultural, between film and paper, which lead to specific practices within filmmaking, archival processes and inventions and innovations of film technology. We conclude by focusing on the role of the scanner operator, a protagonist whose subject formation is produced alongside the process of making the archival document.

Film, flipbooks and postcards

In the history of pre- and early cinematic technologies, many accounts of the overlap with print technologies show that other mediums transformed the emerging cinema. An illustration of the connection between print and moving image technologies includes how entrepreneurs utilised new optical technologies to augment their businesses. By the late nineteenth century, studio photographers such as Bamforth and Co. had recognised opportunities for capitalising on optical technologies such as the magic lantern, by manufacturing magic lantern slides. Bamforth and Co. could further develop their business and diversify into film production with a studio set up to photograph slides (Brown 2005, 237). The company formed a partnership with the Riley Brothers of Bradford, whose moving image technology supplemented Bamforth's photographic skills and the ability for making 'connected narratives' learned from the live model performances of lantern slide productions (Brown 2005, 237). Bamforth's also broadened out into manufacturing postcards through reproductions of their magic lantern slides, attaching words and poems as a supplement. These postcards productions, which Bamforth and Co. developed into sets of images, soon became collectable items. The factory environment of their studio provided the technological means for the production of slides, postcards and film, and the space in which they also harnessed the understanding of their audiences' cravings, to produce a unique set of products. The First World War meant the company stopped making films, but they continued to operate and expand through manufacturing postcards. The story of Bamforth and Co. as one of the largest producers of postcards in the world and their foray into film production via studio photography and magic lantern slide is also a story of their viewers. The expectations and imaginations of audiences helped co-produce these mass entertainments, in the way entrepreneurs, by competing to satisfy viewers' desires, developed content which reflected and played to their audience's wants. In Richard Brown's (2005) recovery of Bamforth's film production history, its importance to British film history was not solely in developing narrative construction in films, but the distinct character of their films. The interplay between magic lantern photography, postcards and film combined with local audience's expectations about the types of characters and behaviours they expected to see based on local knowledge, led to the shaping of films which injected a level of originality to often repeated tropes.

Overlapping print and optical media at the end of the nineteenth and the beginning of the twentieth century was never a one-way enterprise. Optical technologies did not render print media obsolete; instead, they elaborated on new forms and extended old ones. These optical technologies relied upon the audiences and conventions of the older technologies. Visual imagery and motifs of the new optical technologies, such as the dissolves and fades of the phantasmagoria, were reflected in printed texts such as newspapers, postcards and books.

Writers' intra-textual use of optical motifs was replicated by a more material crossover between optical recreations and the publishing industry. The success

of the various optical shows led to many attempts to recreate the same aesthetic effect through games, books, prints and domestic devices.

(Plunkett 2005, 13)

For example, Robert Barker, the seventeenth century inventor who patented the Panorama, saw his invention miniaturised in print for home use. However, the domestication of the medium had a variety of facets to it. The transforming landscape of newspapers in England, which saw new forms emerging, such as illustrated newspapers, also arose alongside experiences of optical technologies that were producing audiences accustomed to a changed sense of their place in the world. The Panorama itself is an example of a technology that transported its viewer through locational imagery.

Another facet of the overlap of print media and optical technologies was in the production of handheld versions of pre- and early cinematic technology such as panoramas or flipbooks, domesticated through their appearance in weekly periodicals such as newspapers and their miniaturisation as toys. Cinematic technologies such as the cinematograph, a hand-cranked film camera and projector, influenced flick books, or flipbooks. Children's books publishers produced flipbooks in large numbers at the end of the nineteenth century and the beginning of the twentieth century (Plunkett 2005). These early moving images or motion picture books used early cinematic films, which enlarged upon specific qualities that emphasised the innovativeness of the technology, namely movement. The earlier film sequences that the flipbooks plundered for the most dramatic effect were those that contained movement, such as dancing.

The Kinora was a small mechanical device; a hand-cranked flipbook, a domesticated early cinematic device developed by the Lumière Brothers. The images were organised as a rotating reel and were displayed where the users could view the consecutive frames of the photographic prints through a small viewfinder. You could turn the handle with enough or as little force as necessary to control the images as they flicked through the device to give the illusion of movement. The Kinora was an apparatus devised for the home, not viewable by more than one or two people at a time. By re-photographing the popular motion pictures reels available in the public arena to a smaller format for use in private, the emerging industry could find another purpose for a medium that was still to find its standardised form as cinema.

The manufacturers of early moving image works could feed into the print media market by creating derivations of their films to produce crossover products and technologies. The focus of these 'cross-media' products (Brown 2005) reflected the cognitive appeal of the optical technologies, such as the illusion of movement and the ability to transport the viewer to other locations and times. The above considerations of the interplay of paper and film outline the technological overlap, how print technologies could reproduce the moving image, and how film derived images extending the vistas of established print audiences. From postcards to panoramas, not only were new sights co-opted into existing print forms, but also producers could bring new motifs of the moving image into literature and print culture.

Creators were embedding new techniques of seeing into this print culture, changing narrative structures and disciplining the viewer, as outlined in works such as Jonathan Crary's, *Techniques of the Observer* (Crary 1992). The techniques of flipbooks and Kinoras require hand and eye coordination to produce the illusion of the moving image through the pliable thumb or the hand-cranked machine. The choice to use sequences of movement, such as people dancing in these domestic reproductions of film technologies, materially embedded through tactile activity an immaterial aspect of the concept of the moving image, producing it as both metaphor and actuality. This activity yields not only an idea of the technology, but also the subject who utilises the technology.

Reproduction and media documents

Within the context of cinema, copying film has developed through several technologies and practices. Duplication has been a significant factor in formalising cinema, particularly as a concern for pirating or 'duping' films. The Bamforth and Co. films were often reproductions of well-known recent films (Brown 2005), as an effective business strategy given the lack of copyright protection for movies at the time of their original productions. Delineating ownership of the content and artefact helped develop different elements in the network of technologies that latterly comprised cinema. Yet, as Elsaesser critiqued, a history of cinema technologies does not fully express how the uses of cinematic instruments become culturally embedded, particularly considering the impact of digital practices. The legal copy or original document poses a question of who may copy and how they copy. Reproduction in this sense falls into the category of professional and amateur practices, or domestic and commercial. Lisa Gitelman's and Bernhard Siegert's insights into technologies of reproduction offer a framework to articulate this concern as a chain of cultural and technological operations that interact rather than a cause-and-effect model. These operations produce objects: artworks, documents and make subjects: artists, designers, archivists and historians.

Examples of reproduction in the history of art highlight the interplay of technologies and techniques that permeate artworks and art practices. Siegert's concern for what design is, in the context of art history and the Renaissance workshop, aims to resist the idea of the artist as the centre of the creative impulse. By considering how the concept of design is permissible, Siegert's approach articulates the space in which visualising strategies, technologies and codes come to form the artist, the act of art making and the artefact (Siegert 2015, 123). Siegert's example gives a framework for thinking how the Renaissance workshop as a space is like the photographic studio in the exposition of Bamforth and Co.'s utilisation of optical and print technologies. Bamforth and Co.'s studio is a space where technology and technique interweave; what is permissible as a film can be viewed as a cross-medium exchange of evolving practices, people, protocols and technologies.

Artists in the Renaissance workshop used mechanical means of projection to copy drawings onto surfaces. Artists would reproduce drawings by placing a Velo (or veil) between the artist and the object. The artist could use the Velo to trace the outline of objects on walls or windows, seeing that object and the world divided into a grid of horizontal and vertical vectors. Dürer, Alberti and Leonardo also constructed similar developments of the Velo to produce images with perspective, techniques that used charcoal and powder, and the punctuation of holes on a cloth to help create guiding lines. These techniques, according to Siegert, were not just for reproduction but also disciplined the artist's eye and hand. These practices involved hosts of assistants working on frescos and paintings and included specialists in drawing particular elements such as clouds, skies or backgrounds. For Siegert, this 'trace of material culture' (Siegert 2015, 139) highlights how drawing as a medium calls into existence spaces such as workshops, collaborators and specialists, becoming an instrument for disciplining the body by offering control and correction mechanisms in the act of drawing.

New cinematic technologies, as seen with the photographic studio of Bamforth and Co. similar to the Renaissance workshop, drew in new collaborations, specialists and techniques that spanned photographic, print and the latest cinematic realms. To consider how the material culture also disciplined both hand and eye, a further look into the reproduction of paper documents discloses the co-production of subjects and technologies.

In paper reproduction, the photocopier is one of the most ubiquitous copying instruments in the past century. In Gitelman's media history of the photocopier, 'xeroxing' became a co-production of user and technology. The photocopier was as an office device that sat between carbon paper and the Photostat, in that it would produce between 5 and 20 copies. It went, however, beyond those numbers, as users found an array of applications that far outweighed the initially proposed usage (Gitelman 2014).

Photocopying, until its digital convergence, that is, its technological and conceptual shift, had been a single operation. The Pentagon Papers exemplifies this concept. The Pentagon Papers being both the name for the US Department of Defence report into the Vietnam War and the case of the military analyst Daniel Ellsberg, who copied and leaked these documents. *The New York Times* published the leaked papers in 1971 due to the increasing resistance to the US's military activity. Ellsberg's role was to copy, edit and curate his version of the Pentagon Papers through his use of the xeroxing machine in a friend's office (Gitelman 2014). The curated and edited version of the government documents came about as Ellsberg and his helpers used scissors and masks to remove notes, page numbers, margins and 'top secret' markings from their copies. The report they were re-versioning had already been a process of collected copies and 'photocopies of photocopies, photocopies of transcripts of cables, photocopies of mimeograph copies, and so on' (Gitelman 2014, 89). This making and remaking made the document a flexible copy that Ellsberg archived and copied again and again. Photocopying became a

large part of US office life from the 1960s, making documents became a structuring practice of life, with copy shops proliferating high streets and office blocks. To read documents was to do so through ‘the disciplinary structures of modern bureaucracy, including its media of documentary reproduction’ (Gitelman 2014, 103).

The analysis of how the photocopier makes documents through the Pentagon Papers case goes beyond media histories that see only stories of innovation to the diffusion of technology. With the Renaissance workshop or Bamforth and Co., the technology used new spaces, interactions and techniques. Photocopying understood within its bureaucratic and legalistic frameworks, the sets of operations and processes chained together allow us to understand the Pentagon Papers as a co-creation. It is a history that produces a ‘subject’ who pushes the button, crops the page and reconfigures pages in the context of office workflows. The Pentagon Papers gained its validity as a document, created through the process of duplication and editing. Gitelman’s subject comes out of the bureaucratic world of office work. Technology and the subject are filters through which the document passes. Evidence of the material cultural trace is through the Pentagon Papers and the immaterial in Ellsberg the xeroxing whistle-blower. In the account of the Velo, we find the trace of the workshops, through the artistic practices, that produce the material documents, drafts, designs and the immaterial artist. This subject has their vision and hands disciplined through the technique. The intangible here becomes the performative and gestural practices of the button-pushing, redrafting and editing through masking with the photocopier, or the use of light and cloth, punctuation and charcoal powder with the Renaissance workshop and the Velo. The approach here lends itself to Bamforth and Co. and how the new cinematic technologies produced new subjects and practices, not only in optical technologies but also in their overlap with print technologies such as postcards and newspapers. This approach opens up ways of considering the impact of the digital shift in terms of reproduction practices with archival film.

Archival film, paper and printers

Early in the development of film as a business, it was necessary to duplicate the negative of a film (original film) to screen it for an audience. The two earliest forms of reproduction were contact printing and optical printing. The Contact Printer works by exposing the original negative onto the raw stock of film by bringing the emulsions of both films together through contact. The other form of duplication is optical printing; the raw stock has an image focused onto it via an intervening lens system to duplicate the negative (Read and Meyer 2000). Like the Velo mentioned above, the Optical Printer acts as a projector system that reproduces the image. Rather than drawing by hand, the added camera records a copy. Reproducing the film image may be utilised to produce a copy that is adequate for distribution purposes, used to make additional copies in other formats. While duplication in the film archive context is about preserving the image, producing a print that maximises and matches the material information of the original print.

The other significant use of the Optical Printer beyond special effects and standard copying is in the film archive, where 'duplication' may be a necessary step in the restoration or preservation process, facilitated by a range of printers (Read and Meyer 2000). The Optical Printer offers advantages over the Contact Printer in its ability to allow for the duplication of damaged films, the ability to enlarge and reduce the image, to reframe horizontally and vertically. Due to wear and tear, improper storage, or numerous other reasons that have led to a damaged original, the archivist aims to produce a print from the film by printing it onto another roll of film. The process of re-photographing rather than a simple contact print offers options to the archivist to overcome challenges such as the shrinking of film, damaged perforations, scratches and deterioration of the original film negative. Film archives differ between contexts of national archives to local niche archives and are not only concerned with the duplication of a film. Archives are aware of the creative dimension in the reproduction process of a film in their collection. The archivist does not pragmatically reproduce and duplicate. There is always a concern for what is changed, the difference engendered by the new photographic process. Intangibles can't immediately be pointed at when considering reproduction as a mirror of the original film. The creativity involved in restoring a film includes those decisions made even in the process of duplicating it. It prompts further questions similar to those raised by Siegert concerning design and the Velo and by Gitelman regarding photocopying and the document. What is at stake in the duplication of the film image? One consideration is the historiography of film.

As mentioned in the introduction, the film archive has played an essential role in understanding film history. Elsaesser's 'new film history' developed from the re-evaluation of early cinema that deconstructed the teleological myths of film origins (Elsaesser 1990). One area of interest in film history has been the Paper Print Collection¹ (Grimm 1999). This collection of over 3,000 films preserved on paper came about first as part of Edison's attempts to copyright the film technology that he developed alongside his assistants such as WKL Dickson in the latter part of the nineteenth century. By registering their first film tests as a series of photographic images, that is, a contact copy of a film on card paper, they could secure the copyright of their efforts. Between 1894 until 1912, the US protected movies as paper versions (Op den Kamp 2018; Grimm 1999; Loughney 1988). After 1912, the process of making paper copies and depositing them for copyright purposes became redundant as the US Library of Congress could store films as nitrate copies at this point. However, long after these initial copies on nitrate film had deteriorated through decay or the film material reused for other purposes, this enterprise of making paper copies of films emerged as a resource for a history of the earliest experiments in film.

In the 1940s, the Library of Congress began to bring these paper prints back to the screen. Carl Gregory, a cinematographer and engineer, used his expertise to help with the Paper Print Collection. Gregory repurposed an Optical Printer utilised for conveying film, to manage the handling of the paper prints (Gregory 1944). Much like the archival practices of today, the Optical Printer had to cope with wear,

shrinkage and different film standards. Projects to reanimate the paper prints have occurred many times in their lifespan. Each effort has seen the development of film technologies applied to the reproduction of viewable prints. Duplication of the paper prints onto 16 mm film occurred between 1953 and 1967 and, in the 1980s, was printed onto 35 mm film. It was in 2003 that the US Library of Congress sought a digital alternative. Archivists were using computers to automate processes where possible. The Kinetta film scanner was an option that shifted the strategy from frame-by-frame registration of the image to one that utilised a continuous film movement to capture the image in 2K resolution (Kreines 2009). The Optical Printer, like the photocopier, proliferates within its oeuvre of the film industry. It brings with it the development of specific skills and techniques for producing its output. The growth of such technologies mirrors those of the Velo mentioned above, a process of bespoke elaboration before the process becomes more standardised and industrialised. The user at this stage is an artist engineer, developing techniques that connect the technology to both new affordances and older regimes of operation. The process becomes discernible with the optical printer as the technology shifts towards a digital framework, to scanners.

Scanners and pixels

Returning the Paper Print Collection to projectable films is a history of the shifting technologies of film duplication, moving from paper registration to digital files. The move to scanning allowed for gentler treatment of the paper prints while still being able to output to 35 mm. Scanning works differently from the process of the Contact and Optical Printer because it creates a digital file. With a scanner, the source of light that illuminates the film is ‘refracted by an optical system to be focused on a sensor that is composed by a set of independent photosensitive elements, which correspond to the pixels of the digital representation’ (Flueckiger et al. 2018). The digital scanner stores colour information with three values, for example, RGB or YUV. It gains correct colour through three digital images that correspond to specific spectral regions of the visible range. Digitisation of film in this way aims to have the most accurate reproduction of a film’s colours translated digitally to the image projected on the screen. This translation highlights the significant difference between the optical and contact forms of reproduction of the film image.

A survey of the current range of scanners in use in the digitisation and restoration process of archival films was carried out by the DIASTOR project (DIASTOR 2013).² It was apparent that most commercial scanners performed well in scanning subtractive three-colour processes. These represented the dominant technology in film production since the 1950s, matching the reflection that the bulk of film heritage fit this parameter. This observation, that the technology, once it is at a diffusion stage of development, tends towards a more generic broad standardisation, also means it obscures the wider range of techniques, gestures and collaborations necessary to trace the interconnections that brought the technology into being. Standardised scanners pose a problem for historical films with different

colour profiles, such as tinting, as well as for archival processes, as they cannot capture and render variation. The elements of film practice that involve tinting, which required dyeing the film and reassembling it, are akin to the drafts of the assistants and associates working with the Velo in the Renaissance workshop, or the cropping and masking with the photocopier in the example of the Pentagon Papers. Understanding whether a piece of archival footage was tinted instead of some other colour process requires exploring the film material itself. It involves a consideration of the different practices of tinting, alongside the use of colour in the specific narrative flow of the film. The standard scanner flattens out the technical experience from the detail and gesture needed in contemplating the archival print. It obscures the collaborations and overlaps of disciplines that produce the technology and the creative decisions in the film's structure.

To judge a set of properties across the range of archival film scanners, including the Kinetta film scanner, the DIASTOR study (Flueckiger et al. 2018) created a set of properties. These included the scanners' ability to handle different film formats to their framing options and the quality of the light source and sensor. The DIASTOR approach to film scanning considered not only the objective factors for rating the qualities of the various scanners, but also the subjective factors. It did this through independent tests and a group of 'qualified' individuals, who could make subjective decisions on the quality of the final projected image, thus providing a combination of material properties and industry workflows (Flueckiger et al. 2018, 82). The analysis points to an acknowledgement that scanners, like the Velo or the photocopier, produce a set of immaterial traces in the actions and gestures of the scanner operator. The DIASTOR project example also creates a material trace in the production of a film document, the outputted file represents the ingested knowledge and scanner operator know-how. This knowledge, such as colour depth, sprocket hole distances, marks on the border of frames and damaged film, registers both material concerns and operational traces of cultural spaces and practices.

The subject formed in this archival film digitisation process, the scanner operator, is disciplined through the structure of their activity. The commercial workflows of scanning echo the office workspaces and Renaissance workshop that produced their specific techniques of identity. The workflows of the scanner operator are disciplining, through the technologies of colour depth and frame positioning, aligning and adjusting, utilising the scanners user interface and moveable parts to correct and adapt, in the Velo's fashion. They do not need these techniques in the standardised machine; mass production obscures these gestures through ready-made scripts and user interface design. We can consider amateur gestures as a partial corrective of the disciplined professional subject. However, in the archivist's lab, the document only comes into being through the interplay of the document and user. The performative technological exchange in the practices of duplication outlined above highlights that the document and user, the technology and cultural artefact are in constant interaction. Immaterial cultural practices are informed by and inform material concerns for techniques and technology within this space.

Conclusion

Elsaesser's request to rethink the mapping of audiovisual culture presents an opportunity to readjust our thinking from linear narratives of films' history or technological determinations of the relationship between subject and object, between film technology and user. Instead, tracing the materiality of our film culture can help expose how we can link various techniques to gain a different insight into what film is in other contexts. The approach taken throughout this chapter has been to utilise media history and cultural techniques to consider the forming of film documents and film practices such as duplication through shifts in technology, such as digitisation, and how this shift has material and immaterial aspects.

Examples of the photocopier or Velo illustrate a critical conceptualisation of the subject. This subject is formed through the exchange of technical and cultural operations. Siegert's historical exploration of Renaissance design practices has chains of operation that demarcate the varying notions of design. In Gitelman's exposition of the photocopier, a more careful reading of subject formation is rendered. It offers a way to disentangle more deterministic analysis of techniques that produce documents. In building upon their approaches, we have sought to consider the shift to the digital in film practice, *apropos* Elsaesser's instruction to think anew the relationships of technology to practice.

The shift from a general history of paper and film to a narrower conception of film practices within the archive reveals how media archaeological approaches can broaden out our understanding of the digital shift in media, without turning to technological determinism. Instead, a reading that sees the flow of exchange between networks such as print and optical helps us discern a medium's performative and technological material or immaterial aspects. The always interwoven relationship of paper and film, illustrated by print media technologies and their overlap with early cinematic technologies, highlights that a history of such mediums is not a teleological one. A focus on duplication allows us to understand what types of operations it permits in the flows of culture and technology of digitisation, specifically when considering this process with archival film.

We understand the scanner operator and how the film document comes into being through the differentiation and elaboration of prior and evolving practices. The document and the subject substantiate themselves through *doing*, through standardised machines and operator techniques. Paper, scanners and optical printers implicated in methods of duplication and reproduction always produce interlinked documents and subjects; the shift to the digital may represent an opportunity to trace past techniques by developing new gestures and in so doing bypass the notion that human agency is relegated. It will be necessary to draw out these same gestures again through new practices when future standardisation renders them invisible.

Notes

- 1 Paper prints were the mechanism by which copyright of motion pictures was first established in the US by depositing a paper copy of the film at the Library of Congress in 1893. The collection of the surviving 3,000 plus prints continues to be housed at the Library of Congress Motion Picture, Broadcasting, and Recorded Sound Division.
- 2 The DIASTOR project is a collaboration between academic research institutes and the Swiss film industry concerned with digitisation and restoration of archival film. The project's main research was carried out between 2013 and 2015 and aimed to bridge 'the gap between analog film history and film technology' (DIASTOR 2013).

References

- Brown, R. (2005) 'Film and Postcards – Cross Media Symbiosis in Early Bamforth Films', in Toulmin, V. and S. Popple (eds), *Visual Delights Two: Exhibition and Reception*. Eastleigh: John Libbey, pp. 236–252.
- Crary, J., (1992). *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century*. Cambridge, Massachusetts. MIT Press.
- DIASTOR (2013) *KTI DIASTOR*. Available at: <https://diastor.ch/> [accessed 19/08/2021].
- Elsaesser, T. (1986) 'The new film history', *Sight and Sound*, 55(4), pp. 246.
- Elsaesser, T. (1990) *Early Cinema: Space Frame Narrative*. London: BFI Publishing.
- Elsaesser, T. (2004) 'The new film history as media archaeology', *Cinemas: Revue d'études Cinématographiques Cinémas: Journal of Film Studies*, 14(2–3), pp. 75–117.
- Flueckiger, B., Pflüger, D., Trumpy, G., Croci, S., Aydın, T. and Smolic, A. (2018) *Investigation of Film Material? Scanner Interaction*. Zurich, Report Ver. 1.1.
- Gitelman, L. (2014) *Paper Knowledge: Toward a Media History of Documents*. Durham, North Carolina. Duke University Press.
- Gregory, C.L. (1944) 'Resurrection of early motion pictures', *Journal of the Society of Motion Picture Engineers*, 42(3), pp. 159–169.
- Grimm, B.C. (1999) 'A paper print pre-history', *Film History*, 11, pp. 204–216.
- Kittler, F.A. (1999) *Gramophone, Film, Typewriter*. Stanford, California: Stanford University Press.
- Kreines, J. (2009) *Preserving Early Motion Picture History with the Kinetta Archival Scanner*. Available at: <http://kinetta.com/download/files/PaperPrintf2008forWeb.pdf> [accessed March 2019].
- Loughney, P. (1988) *A Descriptive Analysis of the Library of Congress Paper Print Collection and Related Copyright Materials*. PhD dissertation, George Washington University.
- Op den Kamp, C. (2018) *The Greatest Films Never Seen: The Film Archive and the Copyright Smokescreen*. Amsterdam: Amsterdam University Press.
- Parikka, J. (2012) *What Is Media Archaeology*. Cambridge: Polity.
- Plunkett, J. (2005) 'Optical Recreations and Victorian Literature', in Seed, D. (ed), *Literature and Visual Media*. London: Essays and Studies, pp. 1–29.
- Read, P. and Meyer, M. (2000) *Restoration of Motion Picture Film*. Oxford: Butterworth Heinemann.
- Siebert, B. (2015) *Cultural Techniques: Grids, Filters, Doors, and Other Articulations of the Real*. New York: Fordham University Press.

Strauven, W. (2013) 'Media Archaeology: Where Film History, Media Art, and New Media (Can) Meet', in Noodegraaf, J., C.G. Saba, B. Le Maitre and V. Hediger (eds), Amsterdam: Amsterdam University Press, pp. 59–79.

Winthrop-Young, G. (2013) 'Cultural techniques: Preliminary remarks', *Theory, Culture & Society*, 30(6), pp. 3–19.