2. The Operational Aesthetic

Abstract
The chapter introduces the concept of the operational aesthetic and situates it in the context of the nineteenth century, establishing it as a cyclically recurring aesthetic and mode of engagement with technology, media, and narratives. The chapter correlates newspaper and magazine articles of, for instance, sewing machines, telephones, and nineteenth-century optical toys to unearth an appreciation of process that applies to technological marvels as well as to written accounts and fictional narratives, for instance in crime fiction. By attesting to the serials’ generic relationships to crime fiction, the chapter documents a cultural prehistory of the form beyond the filmic medium while also taking into account how serials relate to the processual character of early film.

Keywords: operational aesthetic, crime fiction, history of technology, tangibility, early film

The mental features discoursed of as the analytical, are, in themselves, but little susceptible of analysis. We appreciate them only in their effects. We know of them, among other things, that they are always to their possessor, when inordinately possessed, a source of the liveliest enjoyment. (Poe 1841a: 404)

Although the narrator of the first of Poe’s ‘tales of ratiocination’ most likely refers to the story’s ingenious protagonist detective, the mid-nineteenth century also saw a more general rise in the enjoyment of analytical endeavors, not only in literary texts. In a study of P.T. Barnum, Poe’s contemporary, who monetized public hoaxes and exhibited similarly examinable curious objects in his American Museum, Neil Harris terms such an enjoyment of analysis the ‘operational aesthetic’. Audiences gathered to witness Barnum’s elaborate hoaxes, and they took pleasure in evaluating whether his curious exhibition pieces were real (1973: 62-67). According to Harris, ‘the American Museum,
then, as well as Barnum's elaborate hoaxes, trained Americans to absorb knowledge. This was an aesthetic of the operational, a delight in observing process and examining for literal truth.' (p. 79). Harris locates this engagement with Barnum's hoaxes and exhibition pieces in a broader public discourse, which considered the analysis of stories—whether supposedly true or admittedly fiction—as well as the study of modernity's scientific and technological feats an enjoyable pastime (pp. 73-74). Visitors to his museum thus engaged in efforts of analysis as a form of entertainment, similar to the analytical affordances described in Poe's detective stories. The era was marked by a similar interest in, and an appreciation of, the technological advancements of the modern world, which could be analyzed correspondingly. This fascination influenced not only the content but also the style of writing published at the time:

Machinery was beginning to accustom the public not merely to a belief in the continual appearance of new marvels but to a jargon that concentrated on methods of operation, on aspects of mechanical organization and construction, on horsepower, gears, pulleys, and safety valves. The language of technical explanation and scientific description itself had become a form of recreational literature by the 1840s and 1850s. Newspapers, magazines, even novels and short stories catered to this passion for detail. (p. 75)

The general fascination with and interest in operationality thus fueled Barnum's success, and the operational aesthetic emerged as a mode of trans-generic writing in both journalism and fictional texts. For Harris, the connection to Poe arises from the latter's own concoction and debunking of hoaxes. Poe devised a newspaper hoax in writing a detailed account of a supposedly factual crossing of the Atlantic Ocean in a hot air balloon, and he uncovered the trick behind a supposedly automated chess player (p. 83). For Harris, the connection between detective fiction and Barnum's hoaxes emerges solely through Poe as an author of both detective fiction and of texts that create or uncover hoaxes. Yet he agrees that in devising C. Auguste Dupin, the protagonist of his detective stories, 'Poe created one of the archetypes of detective fiction, the detached, powerful, analytic intellect who solved crimes of the greatest mystery by logical method and intensive empathizing' (p. 85).1 This logical reasoning, as described in the quote from

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1 Although Harris concedes that Poe's readership enjoyed joining the anonymous narrator in solving the riddle, he stresses that these detective stories are not directly related to the operational aesthetic (1973: 86). I nevertheless argue that Poe's detective tales similarly feature an aesthetic of the operational.
'The Mystery of the Rue Morgue', appears in a text that itself accentuates an aesthetic of the operational. As I will show, this aesthetic applies as much to technical mechanisms as it does to fictional or nonfictional narratives, to detailed descriptions of machines, and to plots that interlink and maneuver in machinic ways.

The following pages will trace the operational aesthetic across the decades and across multiple media. I will thus outline a mode of engaging with technologies and narratives that particularly informs the aesthetics and the related reception practices of film serials, which will be detailed in chapter three. For now, I will first describe how detective fiction acknowledges and caters to an interest in process in ways that foreground its operational aesthetic, from Poe to Arthur Conan Doyle to Dashiell Hammett. Afterwards I will show that the prospering of affordable newspapers and magazines in the United States generated media platforms for a public and publicized engagement with scientific and technological cause and effect. Drawing on these publications as sources of anecdotal evidence for the engagement with novel mechanisms, I will thirdly provide an archaeology of the operational aesthetic as it relates to the culture of a public display of technology in the second half of the nineteenth century. A fourth passage will highlight that although the engagement with mechanisms takes place through media, the operational aesthetic remains related to the tangible and to crafts, even when it appears in the filmic medium. I will thus show, on the one hand, how the interlocking plot elements of crime and detective fiction cater to an audience that cares about process and traceable chains of cause and effect, and on the other hand, how film as it emerges at the end of the nineteenth century accommodates both the mechanical and the narrative aspects of the operational aesthetic, because it enables the narration of process in a medium that can itself be studied as a mechanism and as a technology. The final passage in this chapter will therefore take a meta-perspective and outline how film studies has employed the concept of the operational aesthetic in analyses of films between the mid-1890s and the rise of the film serial in the mid-1910s.

**Operationality and Detective Fiction**

Although the readers of Poe’s short stories are invited to share Detective Dupin’s enjoyment of analytic endeavors, their reading experience does not mirror Dupin’s investigative approach. Readers take a meta-perspective: instead of collecting clues themselves, they analyze those provided by
the text and follow the detective’s explanation of how exactly the puzzle pieces fit together. Therefore, the pleasurable reading experience does not necessarily depend on the readers’ own, often futile attempts to guess the solution to the case. Instead, an attentive following of Dupin’s assessment of the case can suffice to make the reading experience worthwhile. The narrator of ‘The Murders in the Rue Morgue’ elaborates these capacities of observation before the eventual unraveling of the stories’ featured case when he defines a successful chess player:

The *attention* is here called powerfully into play. If it flag for an instant, an oversight is committed resulting in injury or defeat. The possible moves being not only manifold but involute, the chances of such oversights are multiplied; and in nine cases out of ten it is the more concentrative rather than the more acute player who conquers. (Poe 1841a: 405)

In such sequences, the narrator not only describes the approach and investigative qualities of the story’s genius detective but simultaneously outlines a preferred mode of reading. The text constructs an implied reader who appreciates an aesthetic of the operational, and it demands a corresponding, attentive mode of reception. The difference between the story’s detective and its readers results from contingency: within the narrative world of the story, the detective faces the full array of possible metaphoric chess moves, that is, of clues and hints, which he has to register attentively to avoid missing the aspects pertaining to his case. The readers, by contrast, only register the choice of options that are mediated by the text. Again, attention is vital, as now almost the full amount of clues or aspects of information become puzzle pieces of larger chains of events. The enjoyment now lies in the ways in which the clues interlink.

The delineation of clues in such operational stories at times include technical or quasi-scientific descriptions of a given mechanism. Attempting to unravel the locked room mystery at the center of ‘The Murders in the Rue Morgue’, Detective Dupin focuses his attention on a window in the room that constitutes the crime scene. After he learns that a hidden spring served to fasten the sashes from the inside after the murderer’s escape, the detective still needs to explain how the escapist left despite a nail being hammered into the window frame from the inside (Poe 1841a: 427). Thus follows a careful analysis of the nail, in Dupin’s words:

“There must be something wrong,” I said, “about the nail.” I touched it; and the head, with about a quarter of an inch of the shank, came off in my fingers. The rest of the shank was in the gimlet-hole where it had broken
off. The fracture was an old one (for its edges were incrusted with rust), and had apparently been accomplished by the blow of a hammer, which had partially imbedded, in the top of the bottom sash, the head portion of the nail. (p. 427)

This instance not only describes Dupin's identification of the murderer's means of escape, it also presents a close analysis of the window that is cloaked in mechanical jargon, naming shanks, sashes, and gimlet-holes. The length of the passage itself signals the prominence of operationality in Poe's story. On the one hand, such sequences cater to the likes of a readership that cares about observing process. On the other hand, the text passage appeals to the ideal or implied reader that the story created in its earlier remarks on analysis and chess games. Poe's story thus not only caters to an interest in technical or mechanical operations but also trains its readers to appreciate an operational aesthetic. Moreover, with such a detailed description in direct speech, the text allows its readers to share Detective Dupin's perspective for an instant and to arrive at the conclusion with him. The technical language, which resembles the descriptions of mechanisms given in publications such as the *Scientific American*, provides a full account of the individual objects that make the mechanism work, in a sense aligning the readers’ analytic efforts with the detective's. Such and similar descriptions of mechanic constructions and operations are indicative of both the detective’s approach to analytic reasoning and deduction and the overall logic of the narrative. For a short moment, readers take part in detection whereas they watch cause and effect come together on the larger scale of the overall narrative.

The result is a paradox. On the one hand, the narrative employs a language of technical explanation that suggests a scientifically objective description. On the other hand, the description itself—that is, the fact that the narrative is mediated in textual form, which never provides a full index but always presents a choice of information—defies holistic description. Towards the end of the nineteenth century, Arthur Conan Doyle has Sherlock Holmes address this paradox with respect to literary realism when Holmes, in 'A Case of Identity', first tells Dr. Watson that ‘a certain selection and discretion must be used in producing a realistic effect’, and then adds that police reports tend to omit ‘the details, which to an observer contain the vital essence of the whole matter’ (Doyle 1892: 56). A similar duality surfaces in Ed Wiltse's reading of the Sherlock Holmes stories and their self-reflexive nods towards Holmes' approach at deduction. Doyle's stories describe the detective as a 'perfect reasoning and observing machine', whose scientifically immaculate
approach includes a rule not to theorize before accumulating sufficient data (p. 3, 7; quoted in Wiltse 1998: 116). Yet, as ‘Sherlockians’, that is, organized and devout students of the Sherlock Holmes stories, point out, Holmes himself often breaks his own code of conduct (Wiltse 1998: 116). This early theorizing is necessary because the readers’ interest, as well as the diegetic detective’s, lies in watching the narrative cogwheels fall into place rather than in listing and weeding out endless surplus information and countless red herrings. That is, readers appreciate the operational aesthetic at work rather than watching its plotting. Similarly, the Sherlockian organizations grew out of fans’ and critics’ awareness of inconsistencies in the Holmes stories (pp. 108-9)—an awareness that itself only emerges in relation to the readers’ aim to harmonize all information about the detective, which resonates with the stories’ operational aesthetic and with its own analytic agenda.

This agenda curiously surfaces in an instance in which Holmes imagines flying with Dr. Watson over London and removing the roofs, looking at ‘the strange coincidences, the plannings, the cross-purposes, the wonderful chains of events’ (Doyle 1892: 55; quoted in Wiltse 1998: 118). Wiltse argues that this passage indicates that the interlinkage of events results from the search for connections; that, in his words, ‘to look for it is to produce it’ (Wiltse 1998: 118). The idea is that narrators, detectives, and readers alike search for correlations and draw connections. They appreciate when cause and effect match up, and if they fail to do so they pursue further inquiry, which explains the persistent activities of Sherlockians. It is this kind of appreciation that these so-called ‘classic’ detective stories have in common with their supposed antithesis of the American ‘hard-boiled’ variety. However, the successful hard-boiled detective novels of the 1920s and 1930s replace the former retrospective tracing of cause and effect with a presentist operationality that they share with film serials, as chapter three will show.

Writing about Dashiell Hammett’s epitomic 1929 novel *The Maltese Falcon*, Dennis Porter ascertains that whereas the act of detection as such has an air of strictly target-oriented intent, its interruptions and narrative divertissements constitute much of the novel’s potential for entertainment. In short, ‘the art of literary detection depends largely on the manner in which we are diverted while we wait for the inevitable denouement’ (Porter 1981: 54-55). While classic detective stories include some diversions to illustrate the complexity of the case at hand, hard-boiled novels almost endlessly accumulate new angles to a case as the story proceeds. If Poe or Doyle’s stories can be described with metaphors of the machine, the hard-boiled tradition is their Rube-Goldberg variant: they still proceed towards the
eventual resolution of a case, but they add numerous intermediate and diverting steps. Eventually, the story accumulates so many metaphorical narrative cogwheels that a working theory of how all the aspects interlock suffices to solve a case, with no need for physical evidence. Nick Charles, the protagonist detective of Hammett’s *The Thin Man*, summarizes this approach to detection when his wife urges him to distinguish fact from theory and he replies: ‘Sure we know. It doesn’t click any other way.’ (Hammett 1934: 425). Interestingly, the ‘click’ itself purports a notion of the mechanic.

These diversions in the process of detection emerge particularly from the synchronicity of the crime and its detection in the hard-boiled novel, as opposed to the retrospective analysis and storytelling of the ‘classic’ detective story. As Peter Hühn observes, the detective’s efforts to ‘read’ the story of the original crime—to make it ‘click’, in Nick Charles’ terms—itself creates offenses, as the detective’s pursuit prompts the criminal to commit follow-up crimes (Hühn 1987: 461). Hard-boiled novels thus literalize the suggestion from the Sherlock Holmes stories that chains of events only exist because someone looks for them, as Wiltse claims. That such chains of events can be more interesting than their suspended resolution is also evidenced by Gertrude Stein’s commendation of Hammett’s fiction. In *Everybody’s Autobiography*, she admits: ‘I do like detective stories. I never try to guess who has done the crime… but I like somebody being dead and how it moves along’ (quoted in Raczkowski 2003: 631). In a further analysis of detection in Stein’s works, Brooks Landon suggests that ‘the process itself, the idea of detection, seemed a consistent pleasure for her, with detective stories both involving her in and emblemizing that process’ (1981: 488). Rather than being unique to Stein’s perspective or to the general fascination of American literary modernists with machines, detective stories generally engage their readers in entertaining processes, and they reflect these processes in the self-reflexive remarks of their protagonists and through detailed descriptions of short processes. 2 Detective stories thus simultaneously immerse their readers in narrative processes and explicate the narration of these same...
processes. This integration of immersion and analytics is at the heart of the operational aesthetic with its duality of narrative and mechanism, which continuously invites readers, viewers, or audiences to follow through processual chains while showcasing their own narrative operations, integrating the ‘what’ and the ‘how’ of storytelling.

Detective stories, with their particular operational aesthetic, emerged alongside the rise of popular, serialized narratives in general. Whereas classic detective stories appeared episodically, as self-enclosed short stories with serially returning protagonists, *The Maltese Falcon* was originally published chapter by chapter in the pulp magazine *Black Mask*. Not coincidentally, serialized fiction as such emerged in the broader context of industrialization during the nineteenth and twentieth centuries, simultaneous to the growing interest in technology, mechanics, and processes of cause and effect. Through its constant reiteration of narrative elements and its reiterative plot formulas, serial fiction in general, and highly formulaic detective fiction in particular, foregrounds the organization or set-up of its narrative. The interest in the process of detection coincides with the mesmerizing effect of a highly repetitive plot aesthetic. This aesthetic is operational in the sense that it focuses on serially ongoing processes rather than on outcomes, on the possibility and assurance of continuation rather than on the solution to the crime. Wiltse sees such a foregrounding of seriality at work on multiple levels in the Sherlock Holmes stories, as the succession of criminal cases is interrupted by the detective’s similarly serial drug addiction. Wiltse similarly connects this sequencing of events to industrialization, as ‘the governing discourse of the machine, in the nineteenth century as today, is one of seriality. This discourse points at once to addiction (…) and to production—but, […] to production emptied of agency’ (Wiltse 1998: 116).

The endless, ‘machinic’ seriality therefore applies to detection as much as to addiction and, as Wiltse adds, to the ‘machine-like production’, the ‘cranking out’, of detective narratives. The operational aesthetic as an enjoyment of chains of cause and effect and its serial reiteration thus emerged from a historical and experiential nexus of detection and seriality, both of which were rooted in a nineteenth-century fascination with mechanics, science, and technology. It furthermore depended, both for its creation and dissemination, on the rise of an affordable print culture that was similarly enabled by technological progress and industrialization. That print culture itself disseminated accounts of the public exhibition of new technologies. In other words, the operational aesthetic of detective fiction tapped into a contemporaneous interest in process that surfaced in—but that was also popularized through—descriptions of novel mechanisms in newspapers.
and magazines. Therefore, before explaining how nineteenth-century print culture fostered its readers' interest in and aesthetic appreciation of technology and cause and effect, I will take a short detour to elaborate on the modernization of print culture during the second half of the nineteenth century and its focus on technological modernization, while simultaneously addressing some terminological questions concerning ‘technology’, ‘mechanism’, and ‘machine’.

Science, Technology, and Nineteenth-Century Print Media

According to Calder M. Pickett, it was in the 1840s and 1850s that detailed descriptions of novel technologies began to be published (1960: 399-400). Even earlier, in the 1830s, the New York Sun both covered technological innovation and was ‘itself a creature of technology’, as it employed advanced print techniques. The paper adopted a plain language describing mechanical particularities of new inventions, such as rollers in printing presses or weather-proof telegraph cables (p. 401). Technological innovation, especially the steam-driven printing press, enabled the increasingly faster and cheaper production and publication of print media and fostered the penny press. Newspapers and magazines, which previously had been reserved for comparatively wealthy readerships, were now accessible to a majority of especially the urban population in the United States. The result was the full incorporation of newspapers into North American communities (Spencer 2007: 25). Generally, the nineteenth-century newspaper and magazine culture not only reflected the technological progress of its time, it was also pragmatically dependent on the new technologies. The ongoing expansion of the railroad enabled national markets for newspapers and magazines, and especially with the installation of the transatlantic cable in the 1870s, telegraphy enabled the worldwide sharing of news. Additionally, the invention of celluloid proved important for illustrated journalism (pp. xiv-xv). The introduction of novel technologies in the nineteenth century thus took place in the form of a network structure, in which simultaneously adopted technologies influenced each other’s development, description,

3 Earlier newspapers covered technological innovations differently. The Evening Post, for instance, which was founded in 1801 and preceded the penny press by roughly three decades, hailed the new technologies but did so in romantic metaphoric language, with a disregard for mechanical qualities and detail. The paper neglected to take a close view at new technologies, which went hand in hand with their slowness in efforts to install steam-driven presses and profit from telegraphy (Pickett 1960: 399-400).
and use. Like the Sun, other print media were symptoms of technological progress, mediating innovation by introducing novel technologies in their articles and editorials. The Tribune, for instance, which first appeared in 1841, praised mechanization in lofty terms, and from 1851 onwards, The New York Times stressed the ways in which purely mechanical inventions served to educate audiences, broaden their horizons, and, according to its founder, ‘improved the character of the great masses of the human race’ (Pickett 1960: 398-405).

Such an understanding of the power and impact of mechanical inventions and their description was not unique to newspapers. Among the most prominent publishing venues for the detailed description of technological and scientific progress was the Scientific American. Its mission statement particularly highlights the magazine’s educational objective, stressing that the working class will benefit from taking part in progress and sharing the excitement it entails:

We shall endeavor to encourage and excite a spirit of enterprise and emulation in artists, manufactures and mechanics, while we present such instruction and useful intelligence in arts and trades, practical science and new discoveries, inventions and improvements, as will add to the facilities of enterprise, and conduce to the prosperity and independence of the working class in particular. (Scientific American, 1846a)

In the same column, the editors highlighted the weekly’s status as a family publication. The Scientific American thus pursued a democratic vision of scientific and mechanical education that had the capacity to increase the prosperity of the working classes. Throughout the nineteenth century and well into the twentieth, each issue began with an article explaining a new invention, which featured a drawing of the respective mechanism that assigned letters to its pivotal parts, to which the article referred. The magazine thereby enabled detailed, matter-of-fact examinations of mechanisms, and it offered drawings that themselves suggested a modern aesthetic.4 Nevertheless, and similar to the New-York Daily Tribune, the Scientific American also published sensational accounts of instances that (supposedly) occurred throughout the United States. It frequently mixed explanations of machines or how-to processes with short anecdotes or jokes, and it questioned whether seemingly scientific things were based on ‘superstitious faith’ or ‘real science’ (Scientific American, 1846b). These kinds

4 See for example “The Voil Seraphine” (Scientific American, 1846c).
of sensational interludes demonstrate that the magazine targeted a general readership that approached inventions in ways that resembled the critical analysis of Barnum’s curiosities. Both cases heavily drew on an aesthetic of the operational, which, as the mission statement of the *Scientific American* shows, exists at the nexus of art and science—a distinction that was far less rigid in the mid-nineteenth century.

The explanation of scientific and technological advancement to a broad readership was not restricted to the *Scientific American*—rather, the magazine’s approach corresponds to the more widely held contemporaneous belief that progress should be conveyed to the general public. Nina Baym explains that especially before the Civil War, scientists engaged in open educational conversations, disseminating knowledge at a time when science could be understood without prior knowledge of higher mathematics (2002: 3). The founding of the *Scientific American*, the numerous editions of books by prestigious European scientists, and the well-attended scientific lectures all attest to mid-nineteenth-century Americans’ interest in modern science. These publications not only conveyed scientific knowledge itself, they also spread an ‘aura of scientific advance’ (pp. 8–9). For readers and audiences, an interest in technology and science was thus not exclusively pragmatic but meant taking part in a shared, democratic advancement. In this context, individual inventions were, as Baym explains with reference to John Kasson, ‘theorized as the concretization of scientific knowledge’ (p. 2). It was only in the second half of the nineteenth century that scientific knowledge became increasingly limited to a professional audience (pp. 2–3). However, the broader public interest in it remained, as the print culture of the era proves. Contemporaneous audiences thus understood individual mechanisms as anecdotal evidence of more general societal and scientific advancement. This anecdotal concept of technology corresponds to a tendency to define technology—as historian of technology Thomas J. Misa observes—to this day by means of providing examples of specific technologies (e.g. trains), which are themselves situated within broader technological systems such as electricity or transportation (Misa 2013: 8).

Nevertheless, technology as a term at times also describes a discourse in magazines and newspapers. In the first half of the nineteenth century, ‘technology’ referred to both the practical application of science in novel inventions as well as to published descriptions of technical mechanisms (Misa 2013: 9; Marx 2008: 24). A similar ambiguity is still evident today, as we use the term to describe both knowledge and objects, such as when both cell phones and the knowledge behind their digital set-up is at times interchangeably termed ‘technology’. Richard Li-Hua argues that technology
in fact entails four components: the product, the knowledge, and additionally the technique (that is, machinery, tools, materials, and labor) and the organization of the production (2013: 19-20). These four elements constitute what technology is, even when they are at times individually referred to as technologies themselves. Li-Hua further argues that ‘technology must be applied, testified and maintained’ (p. 19). This connection of application and maintenance includes a sense of being constantly updated, negotiated, and always in becoming. In this sense, technology exists both as an idea and as an object, and it is always subject to change. In the present context, technology will serve to describe the ideas, techniques, and artifacts that are actualized in the life-world (like a train) and that can be experienced (for example, in the form of a train ride). The operational aesthetic then describes the appreciation of a technological aesthetic, which can surface both in the physical working of an object and through its close description in publications such as the *Scientific American*, in museum or fairground exhibitions, in possibly ‘hoaxing’ journalism, and in Poe’s detective fiction.

Such a view of technology resonates with some definitions of the machine and the mechanic, both of which inevitably inform a study that concerns an aesthetic of the operational. According to Félix Guattari, common usage of the term often implies that the machine is a ‘subset of technology’. His concept of machines, by contrast, reverses this dependency so that ‘the machine would become a prerequisite for technology rather than its expression’ (1995: 33). Guattari’s understanding of the machine then subsumes the ‘material apparatus’, but it also highlights that even this most basic denotation of the machine is not thinkable without ‘the functional ensemble which associates it with man’ (p. 34). The entire complex of machinism then includes much more, namely its ‘technological, social, semiotic, and axiological avatars’ (ibid.). The notion of a mechanism, by contrast, is much more concrete: Deleuze and Guattari explain that ‘from machines, mechanism abstracts a structural unity in terms of which it explains the functioning of the organism’ (Deleuze & Guattari: 284). Or, as Brian Massumi explains, ‘mechanical refers to a structural interrelating of discrete parts working harmoniously together to perform work’ (quoted in Mayer 2014: 7). Mechanisms are thus smoothly functioning structures of cause and effect that work in unison to perform a certain outcome. As a rather simplified statement, it can be said for now that the operational aesthetic is manifest as the phenomenological experience of mechanisms, which can be technological or narrative. Considering the operational aesthetic as the phenomenological experience of mechanisms, we have to remind ourselves that the emergence of a novel technology not only influences its users’ lives
practically, it also changes their perception of the life-world. In other words, the emergence of new technology not only changes our habits because we use it, but it simultaneously shapes how we think about technology, about ourselves, and about the world around us. The increasing dissemination of newspapers and magazines thus fostered a discursive engagement with, and a similarly discursive construction of, technology through a popular medium that served to both educate and entertain its audiences. In addition to all educational appeals, this dissemination provoked an experience and appreciation of technology—both as objects and in textual forms—as aesthetic. This operational aesthetic, as the following passages will show, surfaces from the correlation of newspaper and magazine accounts that describe and introduce particular novelties.

An Anecdotal Archaeology of the Operational Aesthetic

In 1846, the *New-York Daily Tribune* featured a short piece titled ‘New Motive Power’ that introduced Perry's Gas Engine, which was on display in New York at the time. The article first summarizes the engine’s commercial value in contrast to regular steam engines. Afterwards, a detailed description of the machine’s mechanical design follows the author’s acknowledgment of his or her own and the readerships’ probable inability to understand the technical details:

> The following account of it [the engine] is necessarily in good part but a transcript of the inventor’s explanation, but we understand that several eminent authorities on the subject have concurred in expressing a high opinion of the value of the Gas Engine. In this engine the creation of power is effected by the combustion within a cylinder of a mixture of inflammable vapor or gas and atmospheric air—the expansive action of which in the state of inflammation is made to bear directly and alternately upon opposite sides of the piston in the same manner as steam in the Reciprocating Steam Engine. (*New-York Daily Tribune*, 1846)

Additionally, the *Tribune* explains the engine’s advantages in terms of its size, weight, cost, operability, and safety, and it informs the readers that the engine will be shown to ‘any one interested in the progress of the Arts, or desirous of seeing it’ (*New-York Daily Tribune*, 1846). The *Tribune* thus provides a rather detailed explanation of an engine, which the article’s author has difficulties understanding, difficulties that the author assumed the readers share. However, this acknowledgment of the readers’ various levels of proficiency
did not seem to diminish the interest in seeing the engine at work. In other words, even though the newspaper assumed its readers would have trouble understanding the detailed description of the gas engine, it nevertheless provided these details. Similarly, the incomplete understanding might not lessen their interest in seeing the engine. In short, full comprehension is no direct prerequisite for the appreciation of both the written description and the physical exhibition of the gas engine. This appreciation in a sense corresponds to the Tribune’s reference to scientific progress as ‘the Arts’—a term that itself hints at the aesthetic dimension of technology.

In contrast, another Tribune article in 1870 conveys an apprehension regarding the competence of its readers: the newspaper’s account of a new electric engine leaves out information in order to prevent product piracy. The detailed description focuses not only on the mechanics of the engine but also on the technical and chemical process used to create the strong magnet upon which the technology is based. The article thus both praises and protects this secret formula:

It [the engine] varied but little in general principles from the ordinary electric engine, the novelty being in the magnet, which is first formed by taking an even-grained piece of horse-shoe wire and turning it down to the required proportions—the one shown being three inches in diameter and about 18 inches in length. The ends of the magnet or the poles are turned out so as to leave a face of five inches in diameter. The iron is not hammered but turned in a lathe, and afterward bent in the shape of an ‘U’. The iron then passes into the hands of the inventor, who treats it to a series of bakings in various temperatures, the process being a secret. (New-York Daily Tribune, 1870)

Again, the newspaper engaged readers with a detailed description of a mechanism that they know will not suffice to fully understand its set-up or build their own prototype—this time thwarted by the patent holders’ interest rather than the readers’ capacity to understand. This conflict between the appraisal and secrecy of a new technology surfaces almost half a decade later when the Keystone film company both advertised its intricate stunt mechanisms and aimed to keep them a secret (cf. King 2009). In both cases, the readers’ or viewers’ interest faced limits, which nonetheless did not lessen their interest in the mechanism itself. On the contrary: the existence of a secret formula added a certain sensational element to the technology, augmenting their interest and fascination. As the Tribune’s explained, burglars had entered the house of Monsieur Emile
Prevost, the French inventor of the new engine, and stole only the strong magnet, ‘although articles of greater intrinsic value were scattered around the room’, leaving Prevost to assume that this was a case of product piracy (New-York Daily Tribune, 1870). This story not only highlights the importance and lucrativeness of technological innovation in the nineteenth century, it adds a narrative element to the description of technological marvel. It first provided a detailed description of a mechanism and then added an account of a crime, both of which work with an operational aesthetic. In a way, the crime story fills the hole left by the otherwise detailed description: the burglar needs the magnet because the description of the engine lacks the formula for its manufacture. The secret formula, which drove many film serials of the silent and sound eras, is itself the enigma of both the technological description of the engine and of the crime story. In either case, the formula is the missing puzzle piece that completes the chain of cause and effect, and its absence provokes interest.

The interest in mechanics at the time not only fostered a public understanding of technology, it also fed back into readers' and viewers' perceptions of themselves, particularly their physical bodies. Thus, in 1849 the Jeffersonian Republican printed a vitamin pill advertisement that compared the living organism to a steam engine: ‘Both require attention to keep them in good condition; each have governors, condensers, escapements, valves, &c’ (Jeffersonian Republican, 1849). The advertisement is a prime example of how vital structures of cause and effect were framed in a language of the steam engine. It utilizes the readers’ awareness of the fragility of the steam engine and its need to be maintained. Simultaneously, it caters to the idea that readers may want their bodies to function as dependently as a steam engine. Most directly, however, the advertisement demonstrates that the public interest in the processes of the steam engine was great enough for advertisers to employ and channel it for their own purposes, rerouting an engagement with the body via the engagement with a technical mechanism.

A similar understanding of the body as mechanism surfaces in studies of the impact of railroad travel on a passenger’s physique. In 1862, the English medical journal The Lancet published a pamphlet entitled ‘The Influence of Railway Travelling on Public Health’, which describes the railroad journey as a ‘series of small and rapid concussions’ (quoted in Schivelbusch 1977: 116-117). According to the pamphlet, the muscles of railroad passengers have to absorb the shocks caused by the rigid train mechanism. Human muscles thus work throughout the journey and eventually become tired. Additionally, the rapidly passing landscapes and the continuous noise of the train was thought to exhaust a passenger’s eyes and ears, cause fatigue and
sleep, and, if it affected the railroad employees, could even cause accidents (pp. 109-117). Describing the effects in materialistic terms, the pamphlet essentially extends the concept of material fatigue—which emerged in the second half of the nineteenth century and referred to the decay of trains and railroad tracks—to a train’s passengers.

Generally, the pamphlet equates the physical body and the technological mechanism in ways that are similar to the vegetable pill advertisement in the Jeffersonian Republican. Additionally, it bears evidence of a skepticism towards railroad travel, which resulted from the individual, physical experience of the train ride as strenuous and from a projection of that experience onto the mechanism of the train. The idea of material fatigue, as it results from this projection, then becomes a metaphor for the explanation of the passenger’s own tiredness during or after the journey. Both human and material fatigue thus relate in a circular argument that reads the mechanism through the body and the body through the mechanism. However, this argument considers the body as a part of a larger machine, that is, of a chain of cause and effect that impacts the train as much as it impacts its passenger. As the train ride transposes the engagement with the technology from a purely analytic to an experiential level, the body enters into a relationship with the train that combines both of them into a single machine, which the passenger then studies from within rather than from without.

However, such a coalescence of body and mechanism is not necessarily to the disadvantage of either. Humans are always related to and often part of a mechanism, especially when they operate it. When I.M. Singer & Company, the manufacturer of sewing machines, advertised their products to Victorian women, Singer addressed them not as purchasers of a commodity but as operators of a sewing machine. Grace Rogers Cooper references an engraving from the 25 June 1853 issue of the Illustrated News, which states:

The sewing machine has, within the last two years acquired a wide celebrity, and established its character as one of the most efficient labor saving instruments ever introduced to public notice.... We must not forget to call attention to the fact that this instrument is peculiarly calculated for female operatives. They should never allow its use to be monopolized by men. (Rogers Cooper 1968: 31, fig. 29)

First and foremost, Singer’s advertisement highlights the industrial efficiency that the sewing machine offered for domestic chores. In its insistence that sewing machines should be operated exclusively by women, the ad implies that men might be interested in operating it in the first place. The
advertisement may thus be symptomatic of a contrast between sewing as a chore traditionally done by women and the presumption that machine operators were typically male. The reassurance of sewing as a woman’s task then impacts the notions of the machine and of the operator, both of which move from the public and work spheres into the private sphere of the Victorian home. Whereas technological mechanisms were established in farm work or in industrial facilities, both times performing functions that in one form or another translate into monetary value for its operator, sewing machines provide their home-based operators with surplus time instead of money.

Additionally, the presence of the sewing machine in the home impacted how individuals engaged with complex mechanisms. Men and women now encountered mechanisms outside of the hours of the day that were reserved for paid labor. The sewing machine, however much it was still a mechanism for household chores, enabled an unsupervised engagement with modernity’s marvels. The moment technology moves away from the museum, the fairground, or the factory, and undergoes a certain normalization as part of the home—that is when an aesthetic of the operational emerges. New technologies and technical mechanisms first enter the households as novelties. They attract the attention of the family members, who may be interested in how a mechanism works. The normalization process takes away this initial awe, but it also fosters the family’s engagement with the mechanism, for example during cleaning or repair.

Nevertheless, the place and placement of the sewing machine in the home was far from uncontested. Diane M. Douglas describes the cultural implications of sewing machines by considering the change of their designs (1982: 20). In the 1850s, design options varied between an ornamental style and machines that resembled furniture. Eventually, the furniture type became the norm, as the alternative was meant to symbolize an upper class taste even though wealthy Americans often employed servants for sewing. The furniture-like design, by contrast, served to hide the machine and consequently lessened its symbolic implications of an invasion of industrialization into Victorian homes. The design ‘depoliticized’ and ‘domesticated’ the sewing machine and allowed for its placement in the living room, dining room, bedroom, or in a sewing room (pp. 25-27). Douglas thus describes the normalization of the sewing machine as a process in which its mechanical nature needed to be hidden. The consequence is a chain reaction: the public’s ambivalence resulted in the concealment of the sewing machine, and the machine’s concealing design fostered its normalization. Such a design thus hid the machine’s operational aesthetic, yet also enabled the placement of the mechanism close
to its users, who marveled its mechanics during use. The sewing machine as one of the first complex mechanical systems to enter the living room represents a leap in terms of the normalization of technological mechanisms that fostered an appreciation of their operational aesthetic, yet it also shows that the operational aesthetic is not free of ideological implications.

Technology was thus increasingly incorporated into middle-class lives outside of the work sphere: in housework, in the evening newspaper, and in the form of public exhibitions. Additionally, the new media emerging in the second half of the nineteenth century offered new ways to experience and to appreciate technology. Telephony, for instance, emerged as a technology that not only depended on an operator but also served to establish a mechanical relationship between two human agents. On 3 March 1877, the *Scientific American* published an article that pinpoints the interconnection of various communications technologies at the time. Appearing a month after the magazine had first introduced its readers to Bell's telephone, the article narrates how a journalist had for the first time used a telephone to transmit his news dispatch to his employer, the Boston *Daily Globe*. Quite self-referentially, the journalist reported from Bell's lecture on telephony in Salem, Massachusetts. In his lecture, Bell demonstrated the use of the telephone by calling his assistant in Boston. The assistant first sent Morse code that he played on an organ, secondly he played ‘Auld Lang Syne’, andthirdly he addressed the lecture audience in a short speech (*Scientific American*, 1877).5 The article thus describes how Bell’s assistant exemplified the use options of the telephone by reference to other established media: telegraphy and phonography. The display and demonstration of the telephone was a didactic effort, and the lecture therefore first demonstrated the similarities between telephone and telegraph before presenting its more rigorously novel aspects. In short, the lecture aimed to slowly acquaint its audience with the new technology. Nevertheless, the article purports a rather paradox view on telegraphy. On the one hand, the use of the telephone to contact the *Daily Globe* suggests that the telephone could replace the telegraph, as telegraphs were the dominant means for newspapers to obtain their news. On the other hand, the assistant’s transmittance of Morse code frames the telephone as merely a more advanced form of the telegraph, that is, as a new hardware to transmit the ‘software’ with which Morse had made telegraphy efficient (cf. Winston 1998: 25).

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5 A similar connection of the telephone and a newspaper appears, for example, in the *New-York Tribune* on 31 March 1877, when a comparison of Bell’s and Gray’s mechanisms is followed by an account of how Bell’s telephone was presented to a number of professors in Philadelphia, who tested it by means of reading from the *Tribune* through the apparatus (*New-York Daily Tribune*, 1877).
This curious clinging to the use of Morse code may additionally be understood as a refusal to dismiss the human translator. Telegraph operators interrupt a continuous flow of electrical current in tap motions, which can be translated into written messages (DeMarinis 2011: 219–20). Telegraphic communication thus necessitates a human operator’s proficiency in the code, and the tangible engagement with the telegraph apparatus was reserved for telegraph operators. The general public experienced the telegraph only in a mediated form—through the written sentences they received from the operators—or in its effects, such as a safer railroad system or the availability of newspaper coverage of the latest overseas events. Paul DeMarinis highlights the competence of telegraph operators at the time, who learned to listen to the Morse alphabet as words and sentences without relying on a complicated translation process. They were trained for the machine and by the machine. This training takes place as the direct, physical engagement with the apparatus, that is, the telegraph operator experiences the apparatus as a tangible mechanism: ‘The entry of touch, via tapping, into long-distance text transmission reaffirms the unifying role of that physiological sense in the formulation of knowledge within the physical medium of transmission’, DeMarinis explains (p. 218). Human agents are trained to become operatives, just like they were when using a sewing machine. As a consequence, the successful transmission of a message relies on the communication between the machine and its operator, which becomes intuitive over time. As DeMarinis ascertains, ‘the acts of encoding, storage, retrieval, and interpretation exist as stages, acts that are at the whim of unspoken conventions and habits and forms of attention, both human and systemic’ (p. 214). Following partially unarticulated guidelines, operator and mechanism work in concert and become one machine, whereas eighteenth-century proposals had originally envisioned a self-sufficient technology (p. 219). The introduction of the telephone to an extent fulfills this promise of fully electronic communication, and in this context the transmittance of Morse code via telephone appears rather ironic, almost as if mocking the telegraph and its code before exemplifying telephony’s ability to convey spoken language. At the same time, however, the reference to telegraphy

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6 One important innovation in Morse’s telegraph was that the signals were transmitted by means of disrupting an electrical current that flowed continuously. This continuity allowed for a constant testing of the wires, which at the time were frequently broken or cut (DeMarinis 2011: 219–220). As the telegraph is continuously on standby, operator and apparatus enter into a democratic relationship in which the operator does not rule over the telegraph in terms of starting and stopping it. In a metaphorical sense, the telegraph is both a live agent and a medium that transmits information live, at all times.
establishes multiple technologies as related in a networked structure, in which new technologies are envisioned to exist in a chain of cause and effect, where they emerge from earlier ones. As a consequence, although the telephone could be used by an unskilled operator with no need for an intermediate agent, the telephone also stands in a line of developments that disconnected operators from the mechanical apparatuses. The use of Morse code over the telephone can therefore also be understood as a clinging to the human translator, to the human agent within the machinic ensemble.

With earlier inventions such as the sewing machine, the chains of cause and effect were visible and explainable, and the entire mechanism stayed in a single place and time—even when in motion, the steam engine remains one single object. The telegraph, however, made an observance of the structure of the mechanism at one time in one place impossible. The telephone furthered this alienation of the observer from the mechanism by excluding the human agent from the process. An article from the *New-York Daily Tribune* in March 1877 highlights this exclusion of the human agent in an explanation of Gray's telephone:

The fingers of the hand holding the telegraph wire are to be pressed against the rotating metallic plate; then the faster the plate revolves, the louder is the produced sound. It can be easily heard throughout a large hall. There is evidently a limit to the loudness of the sound, as with high speed the operator’s fingers will be too hard rubbed. Why must the human hand intervene? [...] But when Mr. Gray took his contrivance with him to England and got Prof. Tyndall’s aid in experimenting upon it, another discovery was made which wholly changed the aspect. It was shown that neither the human hand, nor living nerve, nor vitality itself was needful as a medium of communication. Prof. Tyndall reproduced the musical sound when he substituted a piece of salt pork for the human hand! (*New-York Daily Tribune*, 1877)

The article thus expresses astonishment about the fact that communication can work without the intervention of a person who adds some form of ‘live vibe’. This implies a general belief that communication must relate to ‘live-ness’, not in the sense of simultaneity but in a very literal, carnal sense of adding something alive to the mechanism. The account of the *Tribune*, by contrast, addresses the fact that human operators in this case even harm the telephone, as the human fingers will limit the volume of the sound to be heard. The loss of the human element is thus astonishing but not unwelcome.
This physical dissociation of user and apparatus depersonalizes the engagement in ways that will become even more pronounced with the introduction of projected visual media. The apparatus assumes a life of its own, working without human aid and supposedly unharmed by human intervention. Nevertheless, the telephone introduces a non-tactile but audible means to begin a self-reflexive study of the sound transmittance process. In other words, the operational aesthetic of the telephone apparatus surfaces through its indexical character, through the noises and background sounds it produces. Such an engagement with telephony also appears in the Scientific American's coverage of Bell's demonstration of his telephone when it mentions that ‘the receivers of the message also heard the applause of the audience which attended the lecture’ (Scientific American, 1877). Whereas the telegraph produces a noise that is hearable only to the operator, the telephone transmits a broad sound spectrum in addition to its intended message, including applause but also a machinic rattle or hiss. These extra sounds provide a starting point for a listener’s engagement with the mechanism and its recording capacity, granting them an ability that was previously reserved for a select group of telegraph operators. The telephonic mechanism can thus be analyzed both in the physical presence of the apparatus and through the audible forms that it produces. These two means of a self-reflexive engagement with media become added layers of an operational aesthetic: cause and effect can be foregrounded in the explanation of a technology, for instance in a spoken lecture or written description, through additional elements in that lecture such as the sounds of applause or a machinic hiss, and through the physical presence of the mechanism. These numerous angles to or layers of the operational aesthetic similarly inform late-nineteenth-century visual media before eventually influencing an operational engagement with film.

On 19 October 1878, the Scientific American published Eadweard Muybridge’s famous series of photographs depicting a horse in motion. At the time, the magazine’s front-page illustration of Muybridge’s findings was accompanied by a short but detailed description of the process that was used to capture the individual images. Before pointing to the possible impact of the new insights on the fine arts and on studies of physiology, the article explains the process of taking pictures with the ‘automatic electro-photographic apparatus’ (Scientific American, 1878). The Scientific American details the velocity of the horse, the exposure time for each image, and the distance between the horizontal and vertical lines behind the horse. These lines enable a detailed study of the horse in motion, which the article exemplifies by deducting the length of the horse’s stride at a particular speed from the
images. At the end of the description, the magazine advises its readers to cut the images from the magazine and to reanimate them in a zoetrope:

We would suggest that for popular use the photographs should also be mounted on strips for use in the zoetrope. By such means it would be possible to see not only the successive positions of a trotting or running horse, but also the actual motions of the body and legs in passing through the different phases of the stride. *(Scientific American, 1878)*

This suggestion resembles Muybridge’s own praxis of showing his series of photographs by means of his Zoopraxiscope when he travelled Europe (Newhall 1944: 43), the difference being that the much smaller zoetrope was devised for home use. It was part of a whole series of nineteenth-century optical devices like thaumatropes, phenakisticopes, and praxinoscopes, which were all designed for individual use in private spaces (Strauven 2011: 149). When readers animate Muybridge’s photo series in such a mechanism at home, they have full control and can operate, touch, and study the apparatus. They are likely to interrupt the spinning movement of the zoetrope’s drum and thereby to disrupt and restart the optical illusion of movement. In other words, spectators who mount the photo series from the *Scientific American* into their zoetropes now have a moving image that they can operate. They thus re-create the original study in the sense that Muybridge, too, saw a horse in motion, arrested its movement by means of capturing individual photographs, and re-created the movement by means of the Zoopraxiscope.

Both Muybridge and the readership’s activities recall what Vinzenz Hediger describes as a three-step process. First, movement and time are divided into individual units, each unit being represented in one picture of the horse. Second, the individual time-units or quite literally ‘motion-pictures’ are arranged in a series, which entails a multiplication of the depicted object, that is, of the horse. Third, the images are combined in a succession that is quick enough to create the optical illusion of movement (Hediger 2006: 162). Users of nineteenth-century optical toys as well as later film viewers were most likely well aware of the fact that movement was an optical illusion resulting from the rapid succession of individual images. The *Scientific American* helped foster this awareness by drawing attention to the three-step process, inviting its readers to practically and tangibly cut the series of images into individual elements and recreate the illusion of movement. Readers thereby engage with the operations of the zoetrope, with the corporal operations of a horse’s limbs, and with the creation of an optical illusion. Watching the drum of the zoetrope and the
limbs of the horse in motion thus presents two layers of operationality, both of which invite further study because of their relentless repetition, which directs attention away from the image to the fact of its creation or ‘created-ness’.

The appreciation of this process resonates with Nicolas Dulac and André Gaudreault’s more general description of the engagement with optical toys, which rely on ‘rotation, repetition, and brevity’ and render the experience of time mechanical, as a moving image of very short duration runs repetitively without beginning or end, similar to the endless working of machines (Dulac & Gaudreault 2006: 228). However, whereas the authors claim that such repetitive short clips are ‘resolutely a-narrative’ (p. 229), the article from Scientific American provides the zoetrope with a history and a narrative—as long as the optical toy shows Muybridge’s horse in motion. Instead of showing just a horse, the zoetrope shows ‘Occident’, the racehorse owned by railroad tycoon Leland Stanford in California (Hediger 2006: 167). Additionally, the zoetrope does not just show any image but the still from the Scientific American that ‘I’ cut and glued and mounted into the zoetrope and with which ‘I’ can become a scientist, a witness, and a judge finding out about the motion of horses and the truth or falsity of the claims from the magazine. Scientific American’s presentation of Muybridge’s findings to an interested amateur audience thus relies on both the layered mechanical and narrative dimensions of an aesthetic of the operational, as well as on the related questioning of a truth claim.

Tangibility and Crafts

The anecdote of the publication of Muybridge’s findings in the Scientific American encourages a specifically manual engagement with science, photography, and optics. Instead of inviting readers to see photographs as art, the magazine places Muybridge’s series of images in the realm of crafts. Self-proclaimed art photographer Peter Henry Emerson therefore inadvertently states the obvious when he argues that ‘nothing is more inartistic than some positions of a galloping horse, as are never seen by the eye but yet exist in reality, and have been recorded by Mr. Muybridge’ (Emerson 1890: 161; also quoted in Newhall 1944: 44). According to Emerson, the aim to arrest motion can never produce artistic photographs: ‘The artist, he knows what to record and what to pass over, while the craftsman, full of himself and his dexterity, tries to take a train going at sixty miles an hour’ (Emerson 1890: 161). While such a strict distinction of arts and crafts will
not be a premise of the present analysis, the placement of studies such as Muybridge’s on the ‘crafts’ side of the fence resonates with the fact that the operational aesthetic most often appears outside of the realms of what is considered art or ‘high culture’. Umberto Eco considers this distinction a staple of ‘modern theories of art’, which dissociate innovative art from crafts—the latter encompassing industrial production and the manufacture of items that resemble a predetermined model. The neglect of crafts then led to a disavowal of cultural products with uniform traits, such as Westerns, comic strips, and detective novels, all of which rely on repetition and series production (Eco 1985: 161-62). As a consequence, the relation of the operational aesthetic to repetition, seriality, brevity, the mechanical, and crime fiction establishes it quite firmly as a mass culture phenomenon in the ‘crafts’ category. Not incidentally, crafts as a term connotes a tactile engagement with a tangible object.

Wanda Strauven similarly considers nineteenth-century optical toys a breeding ground for the tactile perception of visual media, and she traces how the impact of such a reception practice is detectable in projected visual media of an emerging film culture. First, she highlights the human, manual agency that is needed to set in motion the visual illusion provided by an optical toy:

Instead of passively absorbing images, the nineteenth-century observer actively grasped them. The verb to grasp should be understood here in both its figural and its literal meanings, that is, of mental (cerebral) comprehension and manual (corporeal) grip. In the modernist vein, (historical) studies tend to focus on the fragmentation of the human body and to ignore the human presence in the wide range of nineteenth-century media devices, ranging from optical toys and other entertainment applications (such as the phonograph) to telecommunication technologies (such as the telegraph and the telephone). (Strauven 2011: 150)

Mechanisms of what Dulac and Gaudreault call ‘the cultural series of animated pictures’, such as the phenakisticope, the zoetrope, or the praxinoscope, rely on the observer’s ability to ‘manipulate’ the toy rather than being confined to a remote position of spectating (Dulac & Gaudreault 2006: 228; Strauven 2011: 152). In general, the engagement with optical toys includes an awareness of the toy as mechanism as well as the observation of the image illusion, with its capacity to speed up and slow down according to the operator’s wishes. As the example of Muybridge’s pictures illustrates, the manual operation of optical toys also entails the adding or cutting of
images, the arrest of movement, and therefore a deconstruction of the illusion, down to a literal dismantling of the mechanism.

On a diegetic level, the series of images that, once set in motion, create the optical illusion of movement may itself depict a mechanical process. A number of nineteenth-century phenakistiscope discs show gears and levers in motion. Such a depiction is symptomatic of modernity's fascination with 'eternal and unbreakable machines', in Dulac and Gaudreault's terms (2006: 232). The machine-themed phenakistiscope disc thus caters to a fascination with the complex interdependencies of mechanical parts, which it captures in reduction, repeating the split-second depiction of the endless motion of interlocking gears. The resulting image owes much of its brevity and repetitiveness to the phenakistiscope as a medium, which is marked by 'the absence of any temporal configuration (that is, the impossibility of identifying the beginning or the end of the action), the brevity of the series of images and its ad nauseam repetition, its purely monstrative value' (p. 229).

The machine-themed phenakistiscope disc therefore bears two layers of an operational aesthetic, as it is an aesthetic object in itself and simultaneously points to the mechanical nature of its apparatus. The disc thus combines two monstrative values. It furthermore foregrounds the mechanical, almost compulsive repetition that is inherent in machinic movement, which is a shared characteristic of the factory and of the optical toy. As a reference to the factory, the disc has the capacity to address a viewer's subversive aim to stop the machine. The optical toy, after all, is subject to the control of an operator who may otherwise work at an endlessly moving assembly line. On the one hand, the phenakistiscope disc is thus symptomatic of an urge that Charlie Chaplin's MODERN TIMES addressed in 1936, when the Tramp eventually causes the assembly line to rewind (MODERN TIMES, 1936). On the other hand, the need to stop the machine may also be a prerequisite to studying its motions, just like nineteenth-century newspaper articles provided decelerated, detailed descriptions of technical mechanisms.

Although the ways to engage with moving images changed from the operation of hand-held devices to the perception of remotely placed, projected images with the inauguration of the optical theater, the spectators' reception experiences were nevertheless informed by the tangibility included in the earlier reception practice. Strauven stresses that optical toys continued to be popular as viewers saw optical theater projections and later frequented nickelodeons and film theaters. Instead of replacing each other, these multiple media existed simultaneously for decades (Strauven 2011: 155). Strauven argues that as perception moves from the 'player mode of attraction' to a refined space of observance, 'the perception of optical illusions is not
taking place outside the body, even when the observer is kept at a distance’ (pp. 153-154). ‘The nineteenth-century observer’, she highlights,

had become familiarized with some basic optical principles thanks to the conversion of science tools into optical toys. I believe that in the case of the optical theater this “knowledge” was not suddenly erased; on the contrary, it enriched the viewing experience and turned the player more consciously into a perception maker. (p. 154)

In turn-of-the-century cinema, this continuous impact of the tangible surfaced in the form of nostalgia, which Strauven detects in Edwin S. Porter’s 1902 film **UNCLE JOSH AT THE MOVING PICTURE SHOW**. In the film, Uncle Josh, a so-called ‘country rube’, loses his nerves in a film theater after having watched a number of shorts. Eventually, he jumps on the stage and tears down the rear-projected screen. In addition to showcasing the famous newbie to motion pictures, **UNCLE JOSH AT THE MOVING PICTURE SHOW** also includes a reference back to the days of touch-able screens (Strauven 2011: 157). In the film, Uncle Josh not only touches the screen but tears it down and exposes the exhibitor behind it. Porter’s film thus references a spectator’s urge to stop the projection and lay bare the mechanism that enabled its coming into being. Even though Uncle Josh’s ecstatic frenzy counteracts a detailed analysis in terms of an operational aesthetic, the fact that the country rube stops the screening and reveals the projector that created it resembles the interruption of phenakistiscope or zoetrope illusions and may thus evince a longing for the analytic possibilities offered by these optical toys. The film therefore gestures towards the existence of an operational aesthetic without necessarily bearing such an aesthetic itself.

This ideal of the touchable, tactile operation of mechanical constructions surfaces pointedly in another popular medium of the era: the so-called 10-20-30 melodrama, the most popular stage tradition in the 1890s and 1900s (Singer 2001: 150). At the time, sensationalist rush-to-the-rescue stage plays increasingly featured elaborate stunts by employing ‘new technologies of mechanical-electrical stagecraft’ (p. 149). These productions familiarized audiences with telegraphs and telephones, automobiles, air-ships, and other technologies. At the same time, they featured elaborate hand-operated, electrical, or steam-driven mechanisms that enabled elaborate sensational stunts (ibid.). They combined an exhibition of technology with a clever incorporation of technological and mechanical feats, enabling the use of cars, trains, planes, windmills, fires, and collapsing bridges in plays that ‘challenged the physical and spatiotemporal boundaries of the indoor stage’
(p. 157). According to Ben Singer, especially the elaborate mechanical and technological stage designs constituted the appeal of 10-20-30 melodrama to contemporaneous audiences, although the construction of these elements often appeared somewhat unsophisticated (p. 177). Whereas this crudity may have been the result of budget constraints or the lack of proficiency of individual set designers, the audience's unimpaired appreciation of such mechanisms may in fact result from their crude constructions, that is, from the ability to understand the set-up of the mechanisms and from the feeling that they could similarly be constructed in local barns and backyards. The difference in comparison to manually operated optical toys, however, is not only the remote situated-ness of the stage action but also the fact that the mechanisms were embedded in a narrative context. As a result, the engagement with mechanical stagecraft took place alongside the immersion in the story. Singer highlights this coexistence of reflection and immersion, which manifests itself in the form of ‘an apperceptive aesthetic of medium-awareness, a fascination with what technique and artifice can do, [which] operated alongside an aesthetic of absorptive realism’ (p. 178).

10-20-30 melodrama thus catered to a combined interest in sensationalist stories and technology's marvels. Moreover, mechanical marvels were both directly displayed on stage—for instance, telephones, telegraphs, or cars—and became visible in their effects as part of elaborate stage mechanics, for example when rain showers poured down on actors, water currents flowed on stage, or bridges collapsed under speeding cars or trains. Turn-of-the-century stage melodrama explored the multi-faceted spectrum of the operational aesthetic, with its combination of an awareness of the medium as mechanism and mechanisms showcased within the medium and the narrative. From its earliest days onwards, film adopted a similar aesthetic and added the narrative operationality that surfaced for instance in detective fiction. Such a fascination with mechanisms and cause and effect in film has been noticed and described, and it surfaces especially in the repeated adoption of the term ‘operational aesthetic’ in film studies, from the identification of early film as the ‘cinema of attractions’ to complex television series of the twenty-first century.

Both Sides of the Attraction Equation: The Operational Aesthetic in Film Studies

Film as a mechanical object and a storytelling medium embodies the duality that informs the operational aesthetic. This duality materializes in immersive
reception experiences, when film engages its viewers in coherent narratives and/or provides diegetic portrayals of physical mechanisms on screen. Additionally, film has the capacity to simultaneously invite a self-reflexive awareness of the cinematic apparatus itself. The late-nineteenth-century ‘new medium’ thus facilitated a complexly layered reception experience that can appropriate an aesthetic of the operational in multiple ways, all of which take place on a scale between the transparency and the opacity of the film screen. These multiple layers of an operational aesthetic appear pointedly in arguments about an audience’s engagement with films from the 1890s and 1900s. Both Tom Gunning, in his description of the ‘cinema of attractions’, and Charles Musser’s counterargument employ the term ‘operational aesthetic’ with reference to Harris’ original study of P.T. Barnum. Both authors thereby exemplify how the term can denote a focus on narrativity or on mediality—or, as I argue, how it can integrate both.

Gunning mentions the operational aesthetic particularly as an appreciation of cinema in terms of a marveling of its apparatus. This use of the term corresponds to his epochal classification of films made between 1895 and 1907 as an ‘exhibitionist’ cinema that demonstrated its ability to show rather than aiming to display particular visual content (1986: 64). Early films predominantly served to illustrate the functioning of the cinematograph, which was displayed to contemporary audiences at exhibitions resembling the public displays of telephones two decades earlier. These exhibitions attracted audiences who enjoyed seeing new marvels and were eager to learn. Film’s operational aesthetic thus partially results from its emergence in the context of public displays of novel inventions during the nineteenth century, in which audiences paid to see the cinematograph in action rather than any particular turn-of-the-century film. As Gunning points out,

these early demonstrations of the filmic apparatus [...] came out of a tradition that has nearly been forgotten, the display of new technologies as entertainment. Cinema simply joined a long list of new inventions that had been presented to a paying public. During the latter part of the nineteenth century, audiences had gathered to listen to concerts given over the phonograph and the telephone, and to watch demonstrations of such new scientific marvels as X rays or incubators. [...] Likewise, L’arroseur arrosé may have provoked laughter from its first spectators, but it was the Cinematograph rather than the film which received praise. This show-biz strategy, called the “operational aesthetic” by Neil Harris, reflected a fascination with the way things worked, particularly innovative or unbelievable technologies. (1995a: 88)
Nevertheless, the filmic apparatus relied on individual films for its exemplification, and Gunning mentions the operational aesthetic in relation to a particular film, namely the Lumière brothers’ 1896 *L’Arroseur arrosé*. The film shows a short gag sequence in which a gardener is prevented from watering his plants by a boy who steps on the hose. When the gardener inspects the nozzle, the boy steps off the hose, causing the water to spout in the gardener’s face. The viewers’ interest in film as a mechanism is thus doubled within the film, which itself showcases the hose as a mechanism. Nevertheless, even when mechanisms are part of a short narrative, the audience’s interest, according to Gunning, is focused on the way the mechanisms work (1995a: 91; see also Trahair 2004). He links his understanding of the operational aesthetic to Rube Goldberg’s comics of elaborate funny machines: ‘These devices [...] also make a direct appeal to the tinkerer and bricoleur, and the operational aesthetic. Like such magazines as *Popular Mechanics*, they come from a time when technology was still primarily a matter of the hand and the tool, and within reach of most folks.’ (1995a: 101).

In a critical reading of Gunning’s text, Lisa Trahair points out that the hose as a diegetic mechanism in *L’Arroseur arrosé* facilitates a narrative thread:

A basic narrative structure is formed by the construction of the gag, a gag that is itself constructed on the basis of the deployment and redeployment of an apparatus. [...] The narrative emerges from the apparatus mediating between the two characters and inscribing action with temporal development in the operation of the device. The gag, Gunning quite rightly suggests, emerges from the deployment of an apparatus which creates a detour of character action through an inanimate object, and of course from the man, initially oblivious to the boy’s intervention, being caught unawares. (2004: n.p.)

The hose thus serves as a prop that organizes the boy and the gardener in a relationship of cause and effect, and by delaying the effect, it provokes a short narrative thread. A similar chain reaction marks the film itself, as the demonstration of the filmic apparatus effects the portrayal of the diegetic apparatus, which in turn instantiates a short narrative sequence—either of which has the capacity to amaze the viewer. In this sense, both the film and its narrative become attractions. Such demonstrative narratives almost always co-occur with the showcasing of a mechanism, because the latter, not functioning fully independently, has to be started by a character and works to provide a certain outcome. The operator thus remains an important
agent for an operational aesthetic and its narrative connotation. In this context, even the public display of the cinematograph would be part of a live narrative for nineteenth-century audiences—as a machine that is set in motion by a film exhibitor and then operates to achieve an outcome, that is, the screening of a film. In this manner, the general fascination with technology brings about a film experience that always combines multiple layers of mechanical and narrative operationality.

Gunning extends his argument to 1920s classic Hollywood comedy, taking Buster Keaton's Our Hospitality (1923) as an example. The protagonist's romantic relationship with inventions of the past, such as trains and steamboats, allows Gunning to trace the presence of the operational aesthetic from turn-of-the-century short films to comedy of the 1920s. As a consequence, he concludes that the ‘fascination with the way things come together, visualizing cause and effect through the image of the machine, bridges the end of the nineteenth century and the beginning of the twentieth, shaping many aspects of popular culture’ (1995a: 100). The appreciation of an aesthetics of mechanic operations is therefore not exclusively tied to film's novelty status but continuously impacts the film experience even in the institutionalized, consolidated context of studio-era film production.

Gunning’s approach primarily locates the operational aesthetic in an engagement with film as a mechanism and with mechanisms on screen, whereas the narrative connotation remains a side-effect. Interestingly, Charles Musser, whose research at times challenges Gunning’s focus on film as an attraction, employs the same terminology when describing the emergence of narrative film. Musser finds an aesthetic of the operational apparent in The Great Train Robbery (Porter, 1903), which is one of the first longer narrative films and a film that concerns a story of crime and pursuit. According to Musser,

The Great Train Robbery is a remarkable film not simply because it was commercially successful or incorporated American myths into the repertoire of screen entertainment, but because it incorporates many trends, genres, and strategies fundamental to cinematic practice at that time. Porter's film meticulously documents a process, applying what Neil Harris calls “an operational aesthetic” to the depiction of a crime. With unusual detail, it traces the exact steps of a train robbery and the means by which the bandits were tracked down and killed. (2004: 90)

Musser aims to trace the historical shift from the cinema of attractions to film as a storytelling medium. But that shift, which can be said to have
happened anywhere between The Great Train Robbery and 1920, always entails a change from looking at to following through, that is, from marveling the novelty of the medium to focusing on a particular film's story content. This general shift can also be grasped as a movement from the cinema of attractions to an audience's immersion in the film experience. When considered in terms of an aesthetic of the operational, however, this binary opposition is far less rigid. After all, the close examination of an 'attractive' machine entails a following through, as spectators do not simply gawk but try to understand the causes and effects that enable a particular machine to work. Vice versa, a particular storyline can itself appear as an attraction when spectators admire a narrative construction that works in terms of a similar chain reaction.

Thus, despite referencing opposite extremes of an operational aesthetic, with Musser looking at the development of cinematic narrative and Gunning examining the mechanisms employed in gag films of the attractions type, both authors prove the entanglement of narrative and mechanism as two intricate aspects of the operational aesthetic. Paul Young focuses on this connection in a study of the frequent depictions of telegraphs in films that register a transition towards longer, increasingly complex narratives in the 1900s and 1910s. Just as the Scientific American explained Muybridge's photographs with reference to the zoetrope and Bell's public lecture demonstrated the telephone by transmitting Morse code, films employ diegetic telegraphs and telephones to help audiences understand the relation between different cinematic settings and the technique of crosscutting. Films such as The Lonedale Operator (Griffith, 1911) employed telegraphy as a ‘technological model for imagining the capabilities' of cinema (Young 2003: 229), exploiting it 'as if it were a novel medium' (p. 231). Reference to well-known media thus served to train an audience in the perception of the comparatively recent form of narrative film. Diegetic telegraphs or telephones called for audiences to understand the actions in different settings during crosscutting not only as taking place simultaneously but as existing in a cause and effect relationship that spectators must decipher. By reference to these working technologies, cinema furthermore encouraged an allegorical understanding of the new medium as a mechanism that never broke down, that maintained a 'public mode of address', and that belonged to 'instantaneous' media such as the telegraph or the telephone (p. 231).

Young uses the term operational aesthetic exclusively with reference to the nineteenth-century culture of presenting new and supposedly genuine technologies to a general public (p. 232). He describes visitors of such exhibitions as having an ‘antiauthoritarian’ appropriation of technology, which
combined the display of novel inventions with entertainment. He uses the example of the display of a ‘comic telegraph’—which consisted of a puppet head moving endlessly via electrical remote control and which was on display at the 1851 Great Exhibition in London—to illustrate ‘a tradition of antiauthoritarian humor in media display that operated around, and in tandem with, the operational aesthetic’ (p. 234). He then compares the comic telegraph to cinema, which achieved ‘a synergy between communication and amusement comparable to that suggested by the comic telegraph. For one thing, the cinema not only demonstrated the globe-encircling powers of new media; it showed them at work.’ (p. 235). In other words, cinema achieved a unification of communication and amusement that is similar to the ‘comic telegraph’ as well as to nineteenth-century displays of technology more generally. Cinema thus enables a contemplation of the structure of the new medium that is itself mediated by and organized according to the new medium. A return to an ‘old’ medium such as telegraphy therefore seems to make that new structure more graspable—it enabled audiences to sort cinema into a metaphorical box. The engagement with cinema in terms of an operational aesthetic thus allows for entertainment as well as for an understanding of the mechanism’s structure. This view also confirms Young’s decision to place the operational aesthetic in direct opposition to the occult and mystifying discourses that circulated at the time. He states that ‘the operational aesthetic debunked the metaphysical aura floating about each medium’ (p. 236).

The occurrence of telegraphs in films such as The Great Train Robbery or The Life of an American Fireman (Porter, 1902-03) does not solely function to structure the films in terms of cause and effect, it also highlights the process of ‘media transmission’ by framing the link between cause and effect through the telegraph as an interesting narrative in itself. ‘But this time’, Young concludes, ‘the kinetograph is the medium whose power demands the most attention’ (2003: 246). The films thus play up their enabling mechanism, the ability to project moving images, and particularly film’s capacity to tell stories as well as a broad spectrum of the possibilities of editing and cinematography. In a sense, transitional-era film shifted from demonstrating film to demonstrating narrative technique. Therefore, as Young holds, ‘the pleasures of classicality were founded not simply on the transparency of storytelling, as is sometimes argued, but equally and specifically on the pleasures of watching the cinema work, communicating information and arranging that information into a meaningful story.’ (p. 232).

Rob King charts a related mode of film reception in his study of comedies produced by the Keystone film company between 1915 and 1917. At the
time, Keystone experimented with complicated stunt mechanisms. The resulting films catered to an operational aesthetic that is based on the depiction of modern technology and complex mechanisms in combination with trick filming and elaborate physical stunts (King 2009: 184). The films thereby tapped into a more general trend of a time when ‘the spectacle of modern technology […] formed a crystallizing point for a new mass culture that engaged the interests and experiences of an overwhelming majority of the population’ (p. 190). As late as the mid-1910s, a pleasurable film experience resulted from the viewers’ awe of the seemingly endless possibilities of filmmaking as exemplified in Keystone’s comedies, as viewers enjoyed ‘being “taken in” by skillful trickery’ (p. 186). Audiences thus recognized filmic scenes as creations of skilled trick photography and advanced mechanical set contraptions, and they were interested in the constructions and the know-how behind the films. As it had in earlier newspaper descriptions of electric and gas engines, the audience’s interest clashed with the producer’s aim to conceal company secrets as well as with their own limited technological education: ‘Like Houdini’s impossible escapes, Keystone’s operational aesthetic addressed the amateur’s desire to understand technical process at a time when technological advancement far outstripped the average individual’s understanding or control’ (p. 188). King here points to the limits of an operational aesthetic, which are highlighted when the audience’s interest in a particular mechanism is stymied either by a company’s unwillingness to reveal its tricks or by its claim that details of technical process went beyond the audience’s capacity to understand—however accurate or inadequate that claim might be. A filmic instance that embraces an audience’s interest in how things work simultaneously has the capacity to lay bare its limitations. Whereas the 1870 Tribune article relieved the tension created by its concealment of the secret formula for the production of the electric engine by turning that concealment into the enigma of a crime story, Keystone cloaked its refusal to reveal company secrets by taking recourse to slapstick comedy. The studio’s comedies continuously fostered the audience’s technological interest only to respond with a refusal to unveil its tricks, and this lack of technological explanation often coincides with a loss of narrative logic. In Keystone’s films, ‘technology thus became a model for comic action in which narrative logic was replaced by the haywire circuitry of modern technology’ (p. 189). In this manner, Keystone’s comedies in fact rely on the mass-cultural interest in modern technologies to then employ these for a comic effect.

Although the following chapters will describe the operational aesthetic as it featured in film serials from the mid-1910s to pre-World-War-II sound
serials, the term has also been used in analyses of television drama series produced during and after the 1990s. Jason Mittell detects an aesthetic of the operational in moments when audiences pay respect to the narrative construction of what he calls ‘complex television’ (2006: 29). Mittell explains that narratively complex television series offer another mode of attractions: the narrative special effect. These moments push the operational aesthetic to the foreground, calling attention to the constructed nature of the narration and asking us to marvel at how the writers pulled it off; often these instances forgo realism in exchange for a formally aware baroque quality in which we watch the process of narration as a machine rather than engaging in its diegesis. (p. 35)

Series can foreground narration by including complexly interwoven storylines, reboots of a story, or violations of storytelling conventions. In this sense, the operational aesthetic describes an audience’s admiration for the mechanics of narrativity rather than picturesque spectacle. It is thus not the display of a visible mechanism that constitutes the televisual operational aesthetic in Mittell’s account but a machinic quality of narration that spins networks of cause and effect like tiny cogwheels of clockworks. Moreover, this self-reflexive admiration for narratively complex moments does not work against the audience’s immersive engagement with the story. Instead, Mittell aims to consolidate immersion and self-reflexivity in the operational aesthetic—a consolidation that resembles the appreciation of narrative construction that informs the reading experience of stories by writers such as Poe or Conan Doyle. As Mittell maintains, ‘operational reflexivity invites us to care about the storyworld while simultaneously appreciating its construction’ (p. 35). The operational aesthetic therefore does not necessarily entail a step back from emotional engagement with a film, but it can be understood as a spectator’s response to the construction of a given scene without provoking Brechtian alienation.

If we take Harris’ study of P.T. Barnum as a starting point, it offered two argumentative directions for a study of the operational aesthetic: one as based on the exhibition of technology, curious objects, and visual hoaxes, and the other as it emerges in hoax narratives such as Poe’s article of a supposed balloon crossing of the Atlantic or, by extension, in detective fiction—the latter being the route that Mittell’s study takes. These two argumentative strands effect a duality of visual and narrative mechanics, of media technologies and technologies as displayed in media on the one hand and the mechanics of narratives—that is, the causes and effects
within storytelling—on the other. What these strands share is a similar activity performed by appreciative spectators. From a reception-oriented perspective, the operational aesthetic in its full complexity urges readers, viewers, or audiences to appreciate the construction of chains of cause and effect in both narrative and/or technological mechanisms. Instead of asking what (as in: what is the protagonist going to do? What is going to happen in the ending?), spectators question the how (as in: how does this machine work? How does this narrative fit into the framing story? How is the series going to resolve this incoherence?). Consequently, any use of the term takes place on a scale that moves between attraction and immersion, cool detachedness and emotional engagement, mechanical and narrative cause and effect. On this scale, the reception experience never takes place on either end but always combines aspects of both.

It is important to emphasize that the appreciation of connectivity that the operational aesthetic describes often takes place on a micro-scale and is located quite radically in the present tense. That is, readers or viewers value technical or narrative mechanisms in their moment of becoming, as with both the metaphorical and at times literal beauty of smoothly interlocking gears. This appreciation focuses on the fact that something works momentarily, regardless of whether it will achieve an outcome in the future, and regardless of whether the present mechanism will be necessary for that outcome. Again metaphorically and literally, it is important that the machine works, regardless of what it produces (which, in a way, crops up again in Chaplin’s Modern Times, as the film never explains what the factory it showcases is meant to produce). It was for this reason that Barnum’s visitors had a pleasurable experience when he invited them to witness a Buffalo hunt in Hoboken. The visitors to New Jersey returned to Manhattan satisfied, although the hoax itself was easily identifiable as such. Barnum’s story aroused their interest and, feeling sufficiently hoaxed, they paid tribute to the hoaxer (Harris 1973: 61–62). Similarly, when television audiences gathered online to discuss the resolution of Lost in 2010, the engagement with the series as it progressed and the contributing discussions and blog entries sufficed to make up for the lack of a full resolution in the series’ last episode. Even though fans called the resolution disappointing, they discussed the series’ outcome on online platforms, which suggests that they nevertheless considered the earlier experience of watching the series worthwhile (Mittell 2012: n.p.). In summary, the operational aesthetic describes a spectator’s or reader’s engagement with a mechanism, whether technical or narrative, and the appreciation of the working connections even if she arrives at a negative evaluation of the overall outcome. For this reason,
the phenakistoscope disc with its image of interlocking gears is, in a way, symbolic of an aesthetic of the operational, as its depiction always takes place in the present, it demonstrates its own workings, and it foregrounds process as entertainment. Moreover, as was to become especially significant with film serials, the repetitious movement of the disc and its endless seriality spotlight the how of its workings, as any viewing after the initial one already presupposes a knowledge of what is going on. Seriality and repetition foster an awareness of a given cultural product’s operational aesthetic and a consumer’s adoption of a corresponding mode of reception. Thus it is not incidental that the presence of an operational aesthetic in American popular culture coincided with increasing industrialization and the rise of serialized popular culture in the mid-nineteenth century. By the time film serials appeared on American cinema screens, the operational aesthetic was firmly established as an attribute of technological objects and of popular-cultural texts.

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