

# The “History of Vision”-Debate Revisited

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## The Modernity Thesis

At least since Karl Marx, cultural critics have claimed that perception has a history, and, since media involve perception, critics of industrial modernity have applied and elaborated this idea in their theories of modern popular culture, which is why this tradition of thought is also known as the “modernity thesis.”<sup>1</sup> The “first generation modernity theorists,” as Ben Singer has usefully called them,<sup>2</sup> e.g., Georg Simmel and Walter Benjamin, claimed that the sensory overload of the modern metropolis changed man’s sensorium profoundly, and that this in turn created the desire for modern forms of art and entertainment. Whereas some of the “second generation modernity theorists,” such as Wolfgang Schivelbusch, have continued to draw upon these ideas, others, such as Jonathan Crary, conceive media as forms of perception and interpret these as well as historical theories of perception as reflections of capitalist ideology (i.e., they address the impact on the viewer less directly). Such theories are still influential today, but they have increasingly been challenged by scholars who, drawing upon cognitive and evolutionary psychology, argue that perception is biologically determined and hence largely unchanging. Early cinema has played a major role in this debate, because the modernity thesis attributes a special importance to vision,<sup>3</sup> because cinema is a typical example of a modern, commercial mass medium, and because the historical emergence of this medium marks a “turn” or even an “upheaval” in popular culture that is comparable to our current “digital revolution.”<sup>4</sup> Hence the most prominent protagonists of the debate, such as Tom Gunning and David Bordwell, can be found in film studies.<sup>5</sup>

Noël Carroll and also Frank Kessler believe that this debate is mostly due to differences in the definition of “perception” (the content vs. the process of perception, sensory perception vs. apperception, etc.).<sup>6</sup> This may be true in part, but at least the “first-generation modernity theorists” really did make statements about physiological change. For example, Simmel claimed that the sensory acuity of modern man had decreased,<sup>7</sup> and that people had developed a protective organ to guard against the sensory overload of the modern metropolis.<sup>8</sup> Later,

Wolfgang Schivelbusch drew upon Walter Benjamin's appropriation of Sigmund Freud's concept of the "stimulus shield" as if it were entirely plausible.<sup>9</sup> The stimulus shield is a rather questionable notion, variously described as an inorganic region of the brain and as a psychic function of the ego. Psychoanalysts have usually preferred the latter description, because there is no empirical evidence for the former.<sup>10</sup> Perhaps not all of the "second-generation modernity theorists" take such physiological claims literally anymore, but if so, they have rarely said so explicitly. Hence media theories should be continually updated with psychological research, and this is a process that scholars who draw upon current psychology, such as Ben Singer, have begun.

However, even the way that media theories are formulated often makes such updating difficult, if not impossible. For example, Edward S. Reed has commented on Donald M. Lowe's book *History of Bourgeois Perception*:

Lowe's discussion of the role played by cinema in changing people's perceiving is completely undercut by his muddling of the objects and processes of seeing. He is unsure whether camera and editing techniques actually produce an objective visual display of a certain sort, or are merely stages in the formation of subjective impressions. [...] Thus Lowe can make such an absurd claim as the camera eye is "mobile, unlike the human eye" (p. 130). It is one of the basic facts of primate seeing that it is an act of looking around, accomplished by a moving binocular system inside a mobile head above a mobile body. Lowe complains that still and motion photography have taught us to "see the world in fragmentation and dislocation" (p. 135). If anything, what we have learned is to see events portrayed in pictures and film despite the selective fragmentation of photographic and cinematographic technique. Like many students of visual art, Lowe consistently – but without explanation or justification – confuses the world that is seen with both the seer (and her subjective processes) and the medium allowing the indirect perception of the world.<sup>11</sup>

If the example of the "mobile eye" is relatively simple and hence easy to dismiss, there are many other tenets of the modernity thesis that are much more complex. The basic problem of approaches like Lowe's is that even though they make strong claims about the relevance and effects of media, they argue on such an abstract level that they practically eliminate the perceiving subject. Without a concept of viewers as real human beings (rather than spectators as "textual positions"), we cannot make a connection with psychology at all, because even though psychologists are also aware that their theories are only constructs, they are theories about human beings rather than cameras (which do not really perceive, but only record).<sup>12</sup>

A further consequence of this line of argument is that, as Carroll points out in the case of Jonathan Crary, there is a tendency toward taking contemporary theories of perception for the perception of contemporaries.<sup>13</sup> One might say that discourse analysis often takes the notion of ideology as “worldview” too literally. For example, in response to remarks by Paul Feyerabend about the historical significance of the telescope, Gernot Böhme insists that it has not only changed knowledge, but perception.<sup>14</sup> With this he does not just mean that the telescope has shown us more things than we are able to see without it, but that we do not see a “Man in the Moon” any longer. I must admit that I still see a shape that reminds me of a face, even though I know that it is formed by craters of rock and dust, and I suspect that I am not alone. As for anecdotal evidence, one might think of one of the most popular films of early cinema, Georges Méliès’s *LA VOYAGE DANS LA LUNE* (1903), as well as the recent discovery of a “face” on Mars. The phenomenon of seeing objects in random visual patterns is known as pareidolia. A psychological explanation for this specific instance is that recognizing faces is important for us as a species, and the basic pattern is therefore imprinted in our brains at a very early age.<sup>15</sup> Knowledge does not override this perceptual impression – which, however, does not make the telescope and the “insights” that it has provided any less important. The “history of vision” thesis tends to overlook that knowledge and perception can often be at odds.

That said, perception, and especially the perception of historical individuals, is very difficult to study. Historical discourses predominantly represent the experiences of the cultural elite rather than those of ordinary people. Furthermore, much of what goes on in perception is subconscious and hence not articulable in the first place,<sup>16</sup> a fundamental epistemological problem that Zenon Pylyshyn has called the “cognitive impenetrability of perception.”<sup>17</sup> Consequently, either we follow Ludwig Wittgenstein’s dictum that, “Whereof one cannot speak, thereof one must be silent,”<sup>18</sup> or we argue on the basis of what is most plausible with the help of current psychological research. However, the range of aspects that one can study is potentially limitless, so I can only discuss a few examples here. Instead of structuring my discussion of the “history of vision”-debate according to its chronological development or the positions of individual theorists, I will present the central arguments according to the perceptual aspects of film viewing to which they relate.

## **The Perceptual Environment of Early Cinema: Overstimulation as the Modern Condition**

The current consensus in the social sciences is that media effects, even those on cognition (e.g., opinions), are relatively small, mostly due to “selective exposure,” i.e., people tend to select media and content in accord with their beliefs, tastes, skills and dispositions, and then process what they see and hear on the

basis of their established cognitive schemata (which only change if they are repeatedly confronted with highly contradictory information).<sup>19</sup> Furthermore, the media industry itself tends to be conservative: There is certainly interest in selling new products, but it is more economical to adapt them to audiences as they are rather than try to change them profoundly. Indications of this are the high failure rates of new products in the media industry as well as the tendency to turn to successful formulas again and again.<sup>20</sup> That is, if there is any deeper, perceptual change, it is neither likely to be quick nor brought about by media directly, but by culture at large. The “first generation modernity theorists” actually argued as much, but nevertheless, they tended to overestimate the effects that even culture as a whole has on perception (and they also judged them too negatively).

Simmel and many other cultural critics around 1900 claimed that the sensory overload of the modern metropolis induced people to seek out highly stimulating leisure activities (which is not unlike complaints today that people are perceptually overwhelmed by an environment of digital media). Several years later, Walter Benjamin still held a similar view, but perhaps one could say that he gave the argument a somewhat more sympathetic twist:

The film is the art form that is in keeping with the increased threat to his life which modern man has to face. Man's need to expose himself to shock effects is his adjustment to the dangers threatening him. The film corresponds to profound changes in the apperceptive apparatus – changes that are experienced on an individual scale by the man in the street in big-city traffic, on a historical scale by every present-day citizen.<sup>21</sup>

In his discussion of this hypothesis, Singer employs the concept of “neuroplasticity.”<sup>22</sup> However, in a wide sense, any learning involves neurological changes, whereas in a narrow sense, processes such as neurogenesis are limited (to critical phases, to certain brain areas and functions, etc.).<sup>23</sup> Hence, it is not that physiological change is not possible at all, but drawing on this concept only shifts the problem to a biological level, it does not in itself answer the question how much psychological change is possible or has actually occurred over time. This question cannot be answered in general; rather, specific hypotheses have to be examined in detail.

Torben Grodal, a proponent of evolutionary psychology in film studies, dismisses Singer's arguments rather harshly:

Ben Singer [...] follows up on Benjamin and other modernity theoreticians by seeing a link between modern psyches, stress-creating films, and stressful environments, as if stress was a kind of modern pleasure-evoking drug condition, although the physiological arousal system that supports active coping

and provides dopaminergic pleasure by moderate activation will cause brain damage in humans and animals by prolonged activation [...].<sup>24</sup>

Even though I agree that Singer ultimately fails to support the psychological claims of the modernity thesis, this summary is not quite accurate. Firstly, contrary to the modernity theorists, Singer points out that increased arousal can be either pleasant or unpleasant, i.e., eustress rather than stress (but he does not make very much of this point). Secondly, he refers to research that shows how an “enriched environment,” which one might regard the modern metropolis to be, enhances sensory acuity and cognitive skills. This may well be true, but it is actually a contradiction to the typical claims of the modernity theorists (see e.g., Simmel’s remark that the acuity of the senses has decreased).<sup>25</sup> Finally, Singer refers to research that shows that prolonged stress causes nervous exhaustion, which is certainly true, but he does not provide any evidence for the central claim that this induces individuals to turn to highly stimulating leisure activities (which, contra Grodal, they might do despite negative “side effects”). In fact, there is a study that clearly contradicts this claim: In a series of experiments Laurent Brondel and Michel Cabanac have shown that people experienced various environments (with low, medium and high levels of audiovisual stimuli, including films shown on a television set) differently depending on their state of arousal; in particular, a low-stimulus environment (a bare room with dim lighting) was rated negatively when subjects were rested, but positively when they were tired.<sup>26</sup>

## The Perceptual Basis of Film Viewing

### Motion Perception

Famously, Henri Bergson called the modern concept of time as a sequence of static images – as it was employed, for example, in astronomy – the “cinematographic method.”<sup>27</sup> However, in contrast to the time series photography of Eadweard Muybridge and Étienne-Jules Marey, the inventors of film were not interested in breaking down movement that was too fast for the naked eye to see into static images, but rather wanted to create a realistic representation of motion. This was achieved in several variants around 1895, even though the contemporary theories of motion perception were incomplete and even mistaken in some points.<sup>28</sup> As so often, technology was not the product of theory, but practical experiment. As Harro Segeberg put it:

[T]he term “emergence” [...] is taken to imply that in media history, not only manifest technological and economic conditions need consideration, but also cultural configurations, which consist of autonomous, irreducible elements

(e.g., epistemes and aesthetics). Such elements cannot be derived or interconnected on the principle of strict causality, which is precisely why they are “creative,” but they develop in complex co-evolution, rather than being merely contingent.<sup>29</sup>

We still do not know how motion perception works exactly, but it is possible to correct a few errors that one occasionally still finds today in descriptions of film technology.<sup>30</sup> Firstly, the perception of motion in film viewing is not based on the “aftereffect.”<sup>31</sup> This is a perceptual effect that is experienced after fixating on one object for a while and then fixating on another object that is complementary in certain characteristics, so that it will produce a specific visual illusion (e.g., looking at a green square for a time and then at a white surface will create the illusion of a red square appearing, or fixating on a moving pattern of lines will create the illusion that a corresponding static pattern moves in the opposite direction). Such a situation is the exception rather than the rule (i.e., it hardly exists in nature), and not the one that film creates. Secondly, the “stroboscope effect” is not sufficient. The continuous motion of the filmstrip is not only interrupted by the alternation of light and darkness, but also by short stops. The stops are necessary, because otherwise only a blur would be perceived rather than the objects represented by the images. The rotating shutter that intermittently interrupts the light may show each image twice or even three times and thus reduce flickering. (Incidentally, there was no standard speed before sound film, and a flicker-free image was achieved long before synchronous sound.) The basic perceptual effect that is created in film viewing is called a phi effect, an illusion of motion that arises when similar static objects are shown in close spatial proximity and temporal succession. Depending on the arrangement of the objects, different phi effects can be created, some looking quite “unnatural.”<sup>32</sup> For example, contrary to common belief, the wagon-wheel effect, i.e., the impression of wheels turning backwards, does not arise only in films, but may also happen when looking out of the window of a moving vehicle at the wheels of another moving vehicle.<sup>33</sup>

We still do not know whether our visual apparatus only samples images, which are then combined into an impression of movement in the brain (as Bergson assumed). Even if this is the case, then this sampling is much more complex than that of a film camera (due to the constant voluntary and involuntary movements of the eyes, the fact that only the center of the retina has receptors for sharp color vision, etc.).<sup>34</sup> Interestingly, people with a rare perceptual defect who are unable to recognize static objects in reality are able to do so when watching television.<sup>35</sup> It seems that the light changes of the television screen are not consciously perceived, but sufficient to excite motor neurons. Furthermore, moving images of objects cause higher arousal than static images of the same objects.<sup>36</sup> Hence, artificially created moving pictures seem to stimulate some sub-

conscious nervous excitement already with their technological features, similar to what Benjamin claimed, but it is hardly on the level of “shock” (and, as the research mentioned above suggests, prolonged exposure is more likely to cause fatigue rather than desire for more stimulation).

### Spatial Perception

Film creates an impression of space in a similar way as central perspective does in painting, which had been discovered centuries earlier. This discovery was also made long before it was completely understood. Even though the practical discovery and the theoretical understanding required learning, the similarity to the perception of space in reality is good enough, so that seeing such a painting “correctly” does not require learning. There are at least two significant differences between central perspective and natural human vision: 1) Natural human vision is binocular, whereas central perspective, as the name says, only has one focal point; 2) Natural human vision is subject to “constancy scaling,” which means that with increasing distance the size of objects decreases less than proportionally. This is a specific instance of the more general principle of “object constancy,” which makes it possible to identify objects as the same under changing conditions (e.g., lighting).<sup>37</sup> Hence, central perspective is not a perfect representation of natural vision, but this does not necessarily mean that the differences reflect a particular “worldview,” as has often been claimed.<sup>38</sup> For example, contrary to common belief, René Descartes was aware of the phenomenon of constancy scaling, so central perspective was not “the measure of all things” for his philosophy.<sup>39</sup>

Richard Nisbett has found that Asians and Europeans tend to perceive pictures differently: Europeans concentrate on objects, whereas Asians are more aware of the context.<sup>40</sup> If this is due to individualist vs. collectivist socialization, then this might explain why the preference for central perspective emerged along with the rise of individualism in Western countries. However, calling this a “change in perception” implies inevitability: When Europeans are instructed to pay more attention to the context, they are able to do so, as Asians are when they are asked to pay more attention to the details of objects. Significantly, the central perspective was known in Asia before the influence of Western culture,<sup>41</sup> whereas conversely, European modernism was later inspired by Asian art. Hence a “mode of representation” on the side of the artist and a “mode of perception” on the side of the viewer might be more appropriate terms. When psychologists attempted to explain the individual styles of modern artists with perceptual defects,<sup>42</sup> art historians expressed reservations, and understandably so, due to the potential of individual creativity that may deliberately diverge from everyday perception. One should grant the corresponding degree of freedom to viewers, because audiences often reject representations that they do not like, and tastes differ considerably.



The mode of representation that became less common, i.e., depicting figures according to their social importance rather than their physical distance from the viewer (*Bedeutungsperspektive*), may also have a socio-psychological interpretation: We actually do tend to estimate people that we regard as important as taller than they actually are.<sup>43</sup> However, this is probably better conceived as cognitive judgment rather than perception, because it is not an optical illusion: We may be surprised when we actually meet a celebrity in real life to see that he or she is much shorter than we expected, but as soon as we have this opportunity to compare, we do perceive their actual height. Historical sources show that Western artists were also aware of the fact that the perceived size of objects decreases with distance long before the central perspective was commonly employed. Hence, even though it cannot be proven, it is plausible to assume that the viewers of medieval paintings did not perceive them as “realistic,” but understood them as conventional, symbolic representations – just as they are likely to have recognized the sky as blue, even though in religious paintings it was often depicted in gold. Collapsing all of these complex processes into the single concept of “perception” tends to imply that media lock viewers into “ideological apparatuses” from which there is no escape.

## **Technological Features of Images: Analog vs. Digital**

As important as the technological characteristics of images may be in many regards (production time and cost, reproducibility, etc.), their influence on perception is often overstated.<sup>44</sup> For example, the camera obscura may well have been a revolutionary device for the production of paintings, but not even art historians are certain whether or not Jan Vermeer used it for his paintings.<sup>45</sup> If the material structure of an image is invisible to the eye, then as far as perception is concerned it makes little difference whether it consists of brush strokes, halftone grids or pixels (or only insofar as this structure produces unique, visible effects). What we perceive in each case on a higher (cognitive) level are the depicted objects, and on a lower (sensory) level light emitted from matter (i.e., in the case of digitally created images from a computer screen or a paper printout). Furthermore, in a manner of speaking, the human eye has always converted “analog” images to “digital” ones: The receptors of the retina encode the continuous stimulus of light into discrete impulses from a very large, but limited number of neurons. This causes a great loss of information, but has the advantage of faster processing.

## **The Future of the History of Perception**

Carroll asks the question why the “history of vision”-debate exists, but does not answer it (he defers it to a later text, but as far as I know he has not returned to



the question),<sup>46</sup> so I would like to suggest an answer here. In addition to the practical difficulty of researching perception, the humanities are often extremely critical of the social sciences as such,<sup>47</sup> whereas conversely, the social sciences have almost completely lost interest in historical topics. Most scholars who have applied psychology to historical questions, regarding both their training as well as their institutional affiliation, are based in the humanities, not the social sciences. I do not think that the paradigms that currently dominate psychology, such as cognitivism and evolutionary psychology, are fundamentally opposed to the idea of historical change or unable to conceptualize it in principle. In fact, even evolutionary psychology is currently developing a new interest in environmental influences.<sup>48</sup> These trends do not seem to be concrete enough yet to be readily applicable to media, but if culture has more influence than has previously been thought, especially in the long term, how else could this be researched than by looking at cultural history? Comparison of cultures in different stages of “development” might come to mind as an alternative, but due to many confounding factors, this is only an approximation. So far, however, the social sciences, and psychology in particular, have hardly contributed to the study of history themselves. I believe that there are two reasons for this: Firstly, the social sciences are more interested in practical applications than the humanities. Secondly, many social scientists believe that only the direct study of people with their established methods (questionnaires, experiments, etc.) is properly “empirical.” Consequently, historical questions may not be forthcoming from the social sciences, but I do believe that psychology is useful – and even necessary – for trying to answer the historical questions that the humanities pose. Furthermore, many more theories and studies exist in psychology than have so far been applied to media history.

In the course of my article, I have focused mainly on refuting common hypotheses about perceptual change rather than contributing new ones. Reed has summed up:

Perception has a history because what people typically are aware of changes, because the information on which awareness is based changes (especially because media – methods of displaying information – change) and because how people go about perceiving changes.<sup>49</sup>

I believe that even most of this is better conceived as “representation” on the one hand and “cognition” (or behavior) on the other, rather than “perception.” Even though there is certainly a “gray area” between the “higher” and “lower” aspects of perception, and this “territory” is precisely where culture and biology meet,<sup>50</sup> which, among other things, creates potential for change, the term “perception” seems to produce confusion and exaggeration all too easily. Consequently, I prefer to be careful with it. New hypotheses and knowledge about perceptual change

may well emerge in the future, but we should not content ourselves any longer with employing perception as a pseudo-psychological metaphor. Furthermore, I do not think that change is the only question for which psychology is of interest: Whether we are studying contemporary or historical audiences, understanding the basic psychological processes of media reception is important, whether they change or not.

In 2004, motivated by the finding that the understanding of media-related behavior is still frustratingly inadequate, John L. Sherry called for a “paradigm shift” in communication studies. Sherry believes that media studies are still more or less explicitly influenced by theories of human behavior that have long since lost their dominance in the social sciences at large, because they do not adequately account for biological factors (such as behaviorism). Instead, Sherry envisions a “neuroscience paradigm,” a systemic model of behavior that would investigate the interaction of biology and culture:

Such a perspective attempts to account for the contribution of biology (e.g., sex, temperament, hormones, physical appearance, etc.) and of the social environment (e.g., parents, peers, culture, etc.). The neuroscience paradigm assumes that (a) all human behavior is rooted in neurophysiological processing, (b) one’s neurophysiological makeup is genetically determined, but (c) is plastic across the life span (including *in utero*) and is therefore susceptible to environmental influence. [...] The concept of embeddedness states that humans exist within a context made up of multiple levels of being (inner biological, individual psychological, dyadic, social network, community, societal, cultural, outer ecological, and historical). [...] The system is also characterized by dynamic interaction in which influence occurs across levels of being with variables at different levels having more or less influence at different times. Hence, the individual has the potential for plasticity or change across the life span. [...] Importantly, this perspective stresses that the person is the producer of his or her own development. As such, individuals have the potential to interpret stimuli in ways that are consistent with their needs, drives, and desires. Therefore, people actively shape their environment.<sup>51</sup>

As Sherry’s remarks show, a paradigm that is informed by biological psychology does not necessarily entail that culture is regarded as unimportant or that historical change cannot be accounted for in principle. Sherry’s “neuroscience paradigm” is a theoretical framework rather than a unified theory of behavior, to which approaches from different disciplines, including the humanities, could contribute with various subjects and methods. The “history of vision”-debate has been a step in this direction, and this is why I hope that it will continue.

## What Are Media?

1. Boris Groys, *Unter Verdacht: Eine Phänomenologie der Medien* (Munich: Hanser, 2000).
2. Maurice Merleau-Ponty, *The Prose of the World*, ed. Claude Lefort, trans. John O'Neill (Evanston, IL: Northwestern University Press, 1973), 9-10.
3. See Maurice Merleau-Ponty, *The Visible and the Invisible*, ed. Claude Lefort, trans. Alphonso Lingis (Evanston, IL: Northwestern University Press, 1968), 30.
4. Christian Bermes, "Medialität – anthropologisches Radikal, oder ontologisches Prinzip? Merleau-Ponty's Ausführung der Phänomenologie" [Mediality – Anthropological Radical or Ontological Principle? Merleau-Ponty's Elaboration of Phenomenology], in *Die Stellung des Menschen in der Kultur: Festschrift für Ernst Wolfgang Orth*, ed. Christian Bermes, Julia Jonas and Karl-Heinz Lembeck (Würzburg: Königshausen und Neumann, 2002), 49.
5. Matthias Vogel, *Medien der Vernunft: Eine Theorie des Geistes und der Rationalität auf Grundlage einer Theorie der Medien* (Frankfurt a.M.: Suhrkamp, 2001), 13, 136, 133.
6. Georg Christoph Tholen, *Die Zäsur der Medien: Kulturphilosophische Konturen* (Frankfurt a.M.: Suhrkamp, 2002), 50, 8, 19.
7. Vogel, *Medien der Vernunft*, 144.
8. Edmund Husserl, *Logical Investigations*, trans. J.N. Findlay, ed. Dermot Moran (London: Routledge, 2001), pt. 1, chap. 8, § 46, 110.
9. *Ibid.*
10. *Ibid.*, 109.
11. *Ibid.*, pt. 1, chap. 7, § 36, 80.
12. [The distinction between *das gleiche* (What is equal, equivalent, or the same) and *dasselbe* (What is the same and identical with itself) can only insufficiently be rendered in English. The example in the next paragraph, however, will clarify the point. – Trans.]
13. Husserl, *Logical Investigations*, pt. 1, chap. 7, § 36, 80.
14. *Ibid.*, pt. 1, chap. 8, § 46, 109.
15. Lorenz Engell and Joseph Vogl, "Vorwort," in *Kursbuch Medienkultur: Die Maßgeblichen Theorien von Brecht bis Baudrillard*, ed. Claus Pias, Joseph Vogl, Lorenz Engell, Oliver Fahle and Britta Neitzel (Stuttgart: DVA, 1999), 8-11, 10.
16. Hans Jonas, "Homo Pictor and the Differentia of Man," *Social Research* 29, no. 2 (Summer 1962): 201-220, 207.
17. Husserl, *Logical Investigations*, pt. 1, 5th Investigation, supplement to §§ 11 and 20, 126 [entirely retranslated].

## The "History of Vision"-Debate Revisited

1. See Karl Marx, "Private Property and Communism" [1956], in *Economic and Philosophic Manuscripts of 1844* (Mineola, NY: Dover, 2011); Walter Benjamin, "The Work of Art in the Age of Its Technical Reproducibility: Third Version," in *Selected Writings, Volume 4: 1938-1940*, ed. Howard Eiland and Michael W. Jennings (Cambridge, MA: Harvard University Press, 2003), 251-283; and *The Arcades Project* (Cambridge, MA: Belknap Press, 1999); Georg Simmel, "The Metropolis and Mental Life"

- [1903], in *Simmel on Culture: Selected Writings* (London: Sage, 1997), 174-186, and "Sociology of the Senses" [1907], in *Simmel on Culture*, 109-119.
2. Ben Singer, *Melodrama and Modernity: Early Sensational Cinema and Its Contexts* (New York: Columbia University Press, 2001).
  3. See e.g., David M. Levin, ed., *Modernity and the Hegemony of Vision* (Berkeley: University of California Press, 1994).
  4. See Annemone Ligensa and Klaus Kreimeier, eds, *Film 1900: Technology, Perception, Culture* (New Barnet: Libbey, 2009). This collection is based on a conference of the research project "The Industrialisation of Perception," which was a part of the research center *Medienumbrüche* at the University of Siegen, Germany, between 2002 and 2009. As separate publications of the various members reveal, even within the research project itself there was no consensus regarding the "modernity thesis."
  5. For an overview, see, e.g., Singer, *Melodrama and Modernity* and Wanda Strauven, ed., *The Cinema of Attractions Reloaded* (Amsterdam: Amsterdam University Press, 2006).
  6. Noël Carroll, "Modernity and the Plasticity of Perception," *Journal of Aesthetics and Art Criticism* 59, no. 1 (2001): 11-17; Frank Kessler, "Viewing Change, Changing Views: The 'History of Vision'-Debate," in *Film 1900: Technology, Perception, Culture*, ed. Annemone Ligensa and Klaus Kreimeier (New Barnet: Libbey, 2009), 23-36.
  7. Simmel, "Sociology of the Senses," 118-119.
  8. Simmel, "The Metropolis and Mental Life," 175-176.
  9. Wolfgang Schivelbusch, *The Railway Journey: Trains and Travel in the 19th Century* (Oxford: Blackwell, 1980). Simmel's "protective organ" is similar to Freud's "stimulus shield," but preceded it; Simmel never mentioned sources, but Freud usually did; he did not refer to Simmel or anyone else in this case, so the genealogy of the idea is unknown.
  10. See, e.g., Malcolm MacMillan, *Freud Evaluated: The Completed Arc* (Amsterdam: North Holland, 1991), 528-530.
  11. Edward S. Reed, "Seeing through History," *Philosophy of the Social Sciences* 16, no. 2 (June 1986): 242. See also Donald M. Lowe, *History of Bourgeois Perception* (Chicago: University of Chicago Press, 1982).
  12. On the general issue of the subject in post-structuralist theory, see, e.g., James Heartfield, *The Death of the Subject Explained* (Sheffield: Sheffield Hallam University Press, 2002). The concept of "media as perception" seems to be particularly popular in Germany, see, e.g., Ralf Schnell, *Medienästhetik: zur Geschichte und Theorie audiovisueller Wahrnehmungsformen* (Stuttgart: Metzler, 2000).
  13. Carroll, "Modernity and the Plasticity of Perception." See also Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, MA: MIT Press, 1990), and *Suspensions of Perception: Attention, Spectacle, and Modern Culture* (Cambridge, MA: MIT, 1999).
  14. Gernot Böhme, "Technisierung der Wahrnehmung: zur Technik- und Kulturgeschichte der Wahrnehmung," in *Technische Zivilisation: zur Aktualität der Technikreflexion in der gesellschaftlichen Selbstbeschreibung*, ed. Jost Halfmann (Opladen: Leske und Budrich, 1998), 31-47. See also Paul Feyerabend, *Against Method: Outline of an Anarchistic Theory of Knowledge* (London: NLB, 1975).

15. See, e.g., Nouchine Hadjikhani et al., "Early (N170) Activation of Face-Specific Cortex by Face-Like Objects," *Neuroreport* 20, no. 4 (March 2009): 403–407.
16. This is not to be confused with subconscious perception, see, e.g., Philip M. Merikle and Meredyth Daneman, "Psychological Investigations of Unconscious Perception," *Journal of Consciousness Studies* 5 (1998): 5–18.
17. Zenon Pylyshyn, "Is Vision Continuous with Cognition? The Case For Cognitive Impenetrability of Visual Perception," *Behavioral and Brain Sciences* 22, no. 3 (June 1999): 341–365.
18. Ludwig Wittgenstein, *Tractatus Logico-Philosophicus* (London: Kegan Paul, 1922), 90.
19. See, e.g., Michael Schenk, *Medienwirkungsforschung* (Tübingen: Mohr Siebeck, 2012).
20. See, e.g., Arthur De Vany, *Hollywood Economics: How Extreme Uncertainty Shapes the Film Industry* (London: Routledge, 2003).
21. Benjamin, "The Work of Art in the Age of Its Technical Reproducibility: Third Version," 28on42.
22. Singer, *Melodrama and Modernity*.
23. See, e.g., Charles Gilbert, "Neural Plasticity," in *The MIT Encyclopedia of the Cognitive Sciences*, ed. Robert A. Wilson and Frank C. Keil (Cambridge, MA: MIT Press, 1999), 598–601.
24. Torben Kragh Grodal, *Embodied Visions: Evolution, Emotion, Culture, and Film* (Oxford: Oxford University Press, 2009), 17.
25. Singer mostly refers to research conducted with animals, but regarding cognitive skills one might add the observation that general intelligence has increased during the last 100 years, despite the fact that it is influenced by genetic factors. This phenomenon is known as the "Flynn effect," named after its discoverer, who argues that it is not merely due to changes in measurement. See Robert R. Flynn, *What Is Intelligence? Beyond the Flynn Effect* (Cambridge: Cambridge University Press, 2007).
26. Laurent Brondel and Michel Cabanac, "Alliesthesia in Visual and Auditory Sensations from Environmental Signals," *Physiology and Behavior* 91 (2007): 196–201.
27. Henri Bergson, *Creative Evolution* [1907] (New York: Holt, 1911).
28. Michael Chanan has already pointed this out, but his own account of how film creates the impression of motion is not quite accurate; see *The Dream That Kicks: The Prehistory and Early Years of Cinema in Britain* (London: Routledge, 1980).
29. Harro Segeberg, "'Is Everything Relative?' Cinema and the Revolution of Knowledge around 1900," in *Film 1900: Technology, Perception, Culture*, ed. Annemone Lignensa and Klaus Kreimeier (New Barnet: Libbey, 2009), 67.
30. Examples of this kind are David A. Cook, *A History of Narrative Film* (New York: Norton, 2004) and Ralf Schnell, "Medienästhetik," in *Handbuch der Mediengeschichte*, ed. Helmut Schanze (Stuttgart: Kröner, 2001), 72–95.
31. Joseph and Barbara Anderson have already pointed this out, but there is some new research to add. See Joseph Anderson and Barbara Anderson, "The Myth of Persistence of Vision Revisited," *Journal of Film and Video* 45, no. 1 (Spring 1993): 3–12, and Joseph Anderson and Barbara Fisher, "The Myth of Persistence of Vision," *Journal of the University Film Association* 30, no. 4 (Fall 1978): 3–8.

32. See Robert M. Steinman et al., "Phi Is Not Beta, and Why Wertheimer's Discovery Launched the Gestalt Revolution," *Vision Research* 40 (2000): 2257-2264.
33. See Dale Purves et al., "The Wagon Wheel Illusion in Movies and Reality," *Proceedings of the National Academy of Science (USA)* 93 (April 1996): 3693-3697.
34. See, e.g., Oliver Braddick, "The Many Faces of Motion Perception," in *The Artful Eye*, ed. Richard L. Gregory (Oxford: Oxford University Press, 1995), 205-231.
35. See Anderson and Anderson, "The Myth of Persistence of Vision Revisited."
36. Benjamin H. Detenber, "The Effects of Picture Motion on Emotional Responses," *Journal of Broadcasting and Electronic Media* 42, no. 1 (1998): 113-127.
37. See, e.g., Richard L. Gregory, *Eye and Brain: The Psychology of Seeing* (Oxford: Oxford University Press, 1966).
38. See, e.g., Joachim Paech, "Das Sehen von Filmen und filmisches Sehen: Anmerkungen zur Geschichte der filmischen Wahrnehmung im 20. Jahrhundert," in *Sprung im Spiegel: Filmisches Wahrnehmen zwischen Fiktion und Wirklichkeit*, ed. Christa Blümlinger (Vienna: Sonderzahl, 1990), 33-50.
39. See, e.g., Nicholas Pastore, *Selective History of Theories of Visual Perception, 1650-1950* (Oxford: Oxford University Press, 1971).
40. Richard Nisbett, *The Geography of Thought: How Asians and Westerners Think Differently ... and Why* (New York: Free Press, 2003).
41. See, e.g., Timothy Screech, "The Meaning of Western Perspective in Edo Popular Culture," *Archives of Asian Art* 47 (1994): 58-68.
42. See, e.g., Dahlia W. Zaidel, *Neuropsychology of Art: Neurological, Cognitive, and Evolutionary Perspectives* (Hove: Psychology Press, 2005).
43. See, e.g., Gordon L. Patzer, *The Power and Paradox of Physical Attractiveness* (Boca Raton, FL: BrownWalker Press, 2006).
44. For examples see, e.g., Frank Kessler, "What You Get Is What You See: Digital Images and the Claim on the Real," in *Digital Material: Tracing New Media in Everyday Life and Technology*, ed. Marianne van den Boomen et al. (Amsterdam: Amsterdam University Press, 2009), 187-97.
45. See, e.g., Arthur K. Wheelock, *Perspective, Optics and Delft Artists around 1650* (London & New York: Garland, 1973).
46. Carroll, "Modernity and the Plasticity of Perception."
47. See, e.g., Ien Ang, *Desperately Seeking the Audience* (London: Routledge, 1991) or Irme-la Schneider, "Zur Archäologie der Mediennutzung: zum Zusammenhang von Wissen, Macht und Medien," in *Kulturindustrie Reviewed: Ansätze zur kritischen Reflexion der Mediengesellschaft*, ed. Barbara Becker and Josef Wehner (Bielefeld: transcript, 2006), 83-102. For example, along the lines of Michel Foucault's critique of knowledge as control, Schneider compares the questionnaire methods of empirical audience research to the Spanish Inquisition.
48. See, e.g., Richard C. Strohmman, "The Coming Kuhnian Revolution in Biology," *Nature Biotechnology* 15 (March 1997): 194-199.
49. Reed, "Seeing through History," 244.
50. As John R. Searle argues, mind-body dualism is still a logical and practical necessity even for materialists. See "How to Study Consciousness Scientifically," *Philoso-*

phical Transactions of the Royal Society of London, Part B 353, no. 1377 (1998): 1935-1942.

51. Sherry, "Media Effects Theory and the Nature/Nurture Debate," 92-93.

## **Will the 3D Revolution Happen? A Brief Perspective on the Long History of Stereoscopy (with special thanks to Eisenstein and Bazin)**

1. In his lengthy and well-informed survey of the state of 3D cinema, Thomas Elsaesser records the view that 3D may have been little more than a ploy to finance wholesale digital conversion: Elsaesser, "The 'Return' of 3-D: On Some of the Logics and Genealogies of the Image in the Twenty-First Century," *Critical Inquiry* 39 (Winter 2013): 221-222.
2. Roger Ebert, "Why I Hate 3-D (and You Should Too)," *Newsweek*, May 20, 2010, available at <http://www.thedailybeast.com/newsweek/2010/04/30/why-i-hate-3-d-and-you-should-too.html>. See also Mark Kermode: "3D exists not to enhance the cinematic experience, but as a pitiful attempt to head off piracy and force audiences to watch films in overpriced, undermanned multiplexes," in "No, Your Eyes Aren't Deceiving You – 3D Really Is a Con," *The Observer*, April 11, 2010, available at <http://www.theguardian.com/commentisfree/2010/apr/11/3d-avatar-hollywood>.
3. Ebert, "Why I Hate 3-D..."
4. Northern Alliance and Ipsos MediaCT study *Opening Our Eyes: How Film Contributes to the Culture of the UK* (London: UK Film Council/British Film Institute, 2011), available at <http://www.bfi.org.uk/about-bfi/policy-strategy/opening-our-eyes-how-film-contributes-culture-uk>, 58-61.
5. See T. Troscianko, T.S. Meese, and S. Hinde, "Perception While Watching Movies: Effects of Physical Screen Size and Scene Type," *i-Perception* 3, no. 7 (2012): 414-425; also later unpublished work by Hinde comparing responses to AVATAR in 2D and 3D, which record greater feeling of "presence" with the latter. Kermode claims that "as anyone who has watched AVATAR in both 2D and 3D versions will know, the wow factor of this sci-fi *Smurfahontas* is more the result of adventurous digital landscaping than any forced stereoscopic illusion." *loc cit*.
6. Kermode, "No, Your Eyes Aren't Deceiving You."
7. Elsaesser, "The 'Return' of 3-D...", 318.
8. Editorial "As Is" by Kenneth Macpherson, in: *Close Up* 3, no. 3 (1928): 13.
9. O. Winter, "The Cinematograph," *New Review*, May 1896; reproduced in *Sight & Sound* (Fall 1982): 51-54.
10. See for instance, Rudolf Arnheim, *Film* [1933], partially reproduced in *Film as Art* (London: Faber, 1969), 129.
11. André Bazin, "The Myth of Total Cinema," in *What Is Cinema?* vol. 1, ed. Hugh Gray (Berkeley & Los Angeles: University of California Press, 1967), 20.
12. Relief can be translated as "depth," "relief" (as in raised), or referring to stereoscopy, which was clearly the sense intended by Bazin in this case.