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Operative Images

Inroads to a New Paradigm of Media Theory

There is much talk these days about images being somehow *operative*. This notion, which foregrounds the active doing of images, is often invoked to make sense of the disruption in the image economy brought about by computerization. In today's digital media environments, human dealings with the world increasingly take place via various kinds of images and screens that do more than just display visual information. As cameras become ubiquitous, images networked, image data geotagged and databases navigable in real time, the status of images seems to be rapidly changing. Among scholars of the image, there is a growing realization of the shortcomings of existing theories and concepts when it comes to explicating key features of today's digital image applications. The current focus on the operational aspects of images, therefore, is frequently accompanied by a call for conceptual revisions.

This article contributes to the ongoing attempts to develop an operational basis for understanding images. To this end, it considers a selection of contemporary approaches that, each in their own way, grant centrality to the operational aspects of images. In the literature under consideration, there is a great deal of focus on machine vision and automation, as well as on the roles of new media in warfare and political conflict. These topics, of course, are not at all new. They were also at the forefront of 1980s media theory, with Jean Baudrillard and Paul Virilio as notable figures. While these thinkers continue to be influential, the central argument of this article is that there is something new about how today's scholars of operative images approach the topic of mediation. What is new is that there seems to be a shift in underlying assumptions about the nature and roles of media. The thinkers considered in this text, therefore, are treated as transitional figures standing on the verge of a new paradigm of media theory. The emerging, operational paradigm of media theory is characterized by its deeper recognition of the active dimension of images and media.

The new line of research into the agency and efficacy of images is highly promising, breaking new ground by putting image theory on an altogether new track. More work needs to be done, however, when it comes to articulating what is meant by the term *operation* in this context. Addressing this need, the article probes the literature on operative images, discussing and comparing different approaches to operative images along four lines: from the perspective of art (section 1), from the perspective of new media production and use (section 2), from the perspective of media archaeology aspiring to become exact science (section 3), and from the perspective of visual studies (section 4).[1] In

1 These four approaches are certainly not exhaustive of how operative images are conceived in the current literature, but they suffice to unearth systematic differences in how the notion of operation is currently understood.

all these sections, I seek to lay bare how the emphasis on the operational aspects of images puts pressure on established notions of images.

The rough overview of the literature undertaken in sections 1–4 shows that there is a tension regarding the boundaries and scope of operativity. While some approaches conceive operative images as a new kind of images that supplements the larger category of traditional images, other approaches aim for a deeper revision that challenges the very idea of what an image is. The overview also shows that the notion of operation is under-theorized as a media-theoretical concept, since in many cases it is simply imported from other research fields, such as computer science.

One note before I proceed: The reader may have noticed that the question relating to the active doing of images is addressed here in the wider context of media theory. While this may cause some initial confusion, it is certainly no coincidence. As we shall see, the slippage into media theory happens continually in the literature on operative images, and it happens for a reason – indeed, as a consequence of the operational approach: If we are to follow through with the ideas suggested by the thinkers considered in this article – that images are instruments, interfaces, measuring media, manipulable diagrams – the boundaries between *image* and *medium* start to become porous, leaving both terms transformed.

Representation versus Operation

Harun Farocki's three-part installation *Eye/Machine* (2001–2003) is a key reference point in the literature on operative images. The installation, which explores the relation between humans, machines and modern warfare, announces the advent of a new visual regime, and simultaneously of a new stage in the history of machine vision where the machines have started to *see* for themselves. The catalyzing event for the *Eye/Machine* trilogy was the outrage and sensation of the 1990–1991 Gulf War, where point-of-view footage from laser-guided bombs (popularly known as smart bombs) was widely broadcasted to TV audiences. The military deployment of *eye machines* prepared the way for a new type of warfare – a "war at a distance"[2] facilitated by a new kind of images that Farocki terms *operative images* (*operative Bilder*).

Farocki's work addresses the changing status of images in the context of intelligent machines. Commenting on Farocki's work, Trevor Paglen notes: "Instead of simply representing things in the world, the machines and their images were starting to 'do' things in the world".[3] Volker Pantenburg adds that Farocki was "one of the first to examine in depth the various uses of images as instruments".[4] Both aspects, the interventional and the instrumental, are reflected in Farocki's much-cited definition, which holds that operative images "do not represent an object, but rather are part of an operation".[5] Thus conceived, operative images are utility images – working images that typically serve practical purposes tied to specialized tasks, such as, in this case, guiding remote-controlled missiles. Similarly referring to Farocki's work, Thomas Elsaesser goes further by characterizing operative images as "instructions for action" – and not only that, in the digital media environment, Elsaesser

2 Which is also the title of the English single-track film based on the *Eye/Machine* installation. Harun Farocki, *War at a Distance*, Germany 2003.
3 Trevor Paglen, Operational Images, in: *e-flux* 59 (2014), http://e-flux.com/journal/59/61130/operational-images/ (accessed May 27, 2018).
4 Volker Pantenburg, Working Images. Harun Farocki and the Operational Image, in: J. Eder, C. Klonk (eds.), *Image Operations. Visual Media and Political Conflict*, Manchester: Manchester University Press, 2017, p. 49.
5 Harun Farocki, Phantom Images, in: *Public* 29 (2004), p. 17.

maintains, the instructive function seems to have become "the new default value of all image-making".[6]

The example of the smart bomb accentuates another feature of operative images. In the words of Farocki, they provide phantom perspectives on things. The term *phantom* here alludes to the use of phantom shots in early cinema, that is, of recordings taken from positions not normally occupied by humans (Farocki gives the example of a camera hung under a train).[7] The phantom perspective relates, in other words, to the capacity of machine-made images to leap beyond the human scale, reporting on events outside the scope of human sensibility. In this respect, Farocki's *Eye/Machine* series resonates with the exploration of machine vision in art works such as *Man with a Movie Camera* (1929) by the modernist, avant-garde filmmaker Dziga Vertov.[8] Nevertheless, in the current context of intelligent machines, the leap beyond the human scale seems to be of a more radical nature. Hal Foster puts it thus:

> *[The images treated by Farocki] are not authored, and, as they mostly survey the predetermined, they appear to be more automatically monitored than humanly viewed. In this way Farocki intimates that a new 'robo eye' is in place, one that, unlike the 'kino eye' celebrated by modernists like Dziga Vertov, does not extend the human prosthetically so much as it replaces the human robotically.*[9]

Farocki himself also alludes to the idea of replacement, characterizing today's picture-processing apparatuses as "sensory automatons" destined to replace and outperform the work of the human eye.[10] The main novelty of operative images, then, seems to be that they, in the words of Martin Blumenthal-Barby, "require neither human creators nor human spectators".[11] What sets operative images apart from other images is that they are "not originally intended to be seen by humans"; instead they are "supposed to function as an interface in the context of algorithmically controlled guidance processes".[12]

The last remark, that operative images function as interfaces, is a key observation to which I will return. For now, I will focus on the "posthuman"[13] aspects of operative images, which have lead scholars to question their very status as images. Pantenburg, for example, comments:

> *[T]he operational image emulates the look and feel of traditional images, but on closer inspection, this turns out to be a secondary function, almost a gesture of courtesy extended by the machines: The computer does not need the image.*[14]

6 Thomas Elsaesser, Alexander Alberro, Farocki: A Frame for the No Longer Visible. Thomas Elsaesser in Conversation with Alexander Alberro, in: *e-flux* 59 (2014), http://e-flux.com/journal/59/61111/farocki-a-frame-for-the-no-longer-visible-thomas-elsaesser-in-conversation-with-alexander-alberro/ (accessed May 27, 2018).

7 Farocki 2004 (as fn. 5), p. 13, p. 20.

8 The continuity between these works has been explored in the literature. As pointed out by Volker Pantenburg, the connection is made explicit by Farocki in his installation *Counter-Music* (2004). Pantenburg 2017 (as fn. 4), p. 59, fn. 3; For a detailed exploration of the connection, see David Tomas, *Vertov, Snow, Farocki. Machine Vision and the Posthuman*, New York: Bloomsbury Academic, 2013.

9 Hal Foster, The Cinema of Harun Farocki, in: *Artforum* (November 2004), p. 160.

10 Farocki 2004 (as fn. 5), p. 17.

11 Martin Blumenthal-Barby, 'Cinematography of Devices'. Harun Farocki's *Eye/Machine* Trilogy, in: *German Studies Review* 38.2 (May 2015), p. 329.

12 Ibid.

13 The term *posthuman* is sometimes invoked in the discussion of machine vision. See for example Tomas 2013 (as fn. 8).

14 Pantenburg 2017 (as fn. 4), p. 49.

In the strictest sense, therefore, operative images "would have to be characterized as visualisations of data that could also take on other, different guises".[15] Fortunately, Pantenburg does not leave it at that. He goes on to call attention to how Farocki's work is deeply influenced by the philosopher Vilém Flusser and his ideas about technical images. According to Flusser, "technical images" (such as photographs and television images) differ from "traditional images" (Flusser gives the example of cave painting) in that they "owe their existence to technical apparatuses".[16] Consequently, technical images and traditional images *mean* in completely different ways: While technical images are "computations of concepts" that arise "through a peculiar hallucinatory power that has lost its faith in rules"; traditional images are "observations of objects" that arise through "depiction".[17]

While Flusser's category of technical images comprises pre-digital images such as photographs and television images, contemporary scholars typically draw the line in a different place. William Uricchio, for example, in his attempt to conceptualize the distinguishing features of digital images, emphasizes the "algorithmic construction of the image", which is understood to disrupt "the long regime of three-point perspective".[18] In applications such as Microsoft Photosynth and augmented reality systems, the interventions of algorithms between the viewing subject and the object viewed introduce "cracks in the façade of the subject-object relationship characteristic of the modern era".[19] A similar idea is exposed by Ingrid Hoelzl and Rémi Marie, who conceptualize the digital transformation of the image in terms of a shift from geometry to algorithm, and from projection to processing. Because of this shift, the image is "no longer a passive and fixed representational form, but is active and multiplatform, endowed with a signaletic temporality that is not only the result of digital screening (or compression), but also a transfer across digital networks".[20] This implies that the image is "no longer a stable representation of the world, but a programmable view of a database that is updated in real-time", and hence, that it "no longer functions as a (political and iconic) representation, but plays a vital role in synchronic data-to-data relationships".[21]

The answer to Pantenburg's question, whether operative images are images at all, depends, of course, on how one chooses to define the term *image*. Thanks to the frequent use of a contrasting rhetoric by scholars of the image, we get a rough sense of what the default notion of images might be: depictions based on an observation of objects, passive and fixed representations based on stable subject-object relationships. Farocki, too, provides clues to such a default notion of images through his numerous negative definitions of operative images. In the intertitles of the *Eye/Machine* series, for example, we learn that operative images are devoid of social intent, that they are not meant for edification, and nor for contemplation. We learn further that operative images are not really intended for human eyes, and that they exceed the human scale. Elsewhere, he adds that operative images are made "neither to entertain nor to inform", building toward

15 Ibid., pp. 49–50.
16 Vilém Flusser, *Into the Universe of Technical Images*, translated by Nancy Ann Roth, introduction by Mark Poster, Minneapolis/London: University of Minnesota Press, 2011, p. 7.
17 Ibid., p. 10.
18 William Uricchio, The Algorithmic Turn. Photosynth, Augmented Reality and the Changing Implications of the Image, in: *Visual Studies* 26.1 (March 2011), p. 26.
19 Ibid., pp. 25–26.
20 Ingrid Hoelzl, Rémi Marie, *Softimage. Towards a New Theory of the Digital Image*, Bristol, UK: Intellect, 2015, p. 3.
21 Ibid., p. 4.

what seems to be the main negative characteristic given in his most-cited definition: operative images "do not represent an object".[22] A traditional image, then, seems to be an image that represent an object in a way that, somehow, conforms to the human scale.

The characteristics of operative images that have been unearthed so far are already starting to show signs of inconsistency. Operative images are utility images, and as such they belong to a wider family of instruments and tools, which are constructed by humans to serve practical human purposes. Yet, in the literature under consideration, image-instruments are typically identified with intelligent machines and automated systems, and as such they are conceived as images that no longer cater to human eyes, that disrupt the human scale and that roam about freely as if in defiance of petty, human intentions. Humans constructed them, but we no longer know whose purposes they serve. Even if he sometimes alludes to the imminent replacement of humans by machines, Farocki himself, however, is reluctant to take the human completely out of the loop. The ambiguity is marked already in the title of Farocki's installation, namely by the slash separating *Eye* and *Machine*. As noted by Foster, the slash raises the question of relation: "Does the slash signify a split between eye and machine [...] or a new elision of the two, or somehow both – a split that has produced an elision?"[23] As we shall see, the ambiguity prevails in the literature on operative images.

22 Farocki 2004 (as fn. 5), p. 17.
23 Foster 2004 (as fn. 9), p. 160.

Cultural Operations

The next approach to be considered, that of Lev Manovich, differs from Farocki's in that it no longer revolves around the idea of automation. The relevance of Manovich's work is confirmed by Werner Kogge, who, in an article discussing Manovich's *The Language of New Media* (2001), proposes operative images as a "paradigm of new media".[24] While Manovich himself does not use the term *operative image*, Kogge's suggestion is not unwarranted. According to Manovich, new media "calls for a new stage in media theory": If we want to understand the logic of new media, we need to turn to computer science, borrowing terms such as "interface", "database" and "operation".[25]

As Kogge points out, Manovich's approach is refreshing in that it avoids sweeping generalizations about media, which seemed to be the trademark of 1980s media theory, exemplified, say, by Baudrillard's ruminations about total simulation.[26] Manovich also avoids overemphasizing the newness of new media, sketching "archaeologies" that connect computer screens with classical screens, or computer-based techniques of media creation with previous techniques of representation and simulation.[27] Still, as Manovich makes clear, there are aspects of new media that lack historical precedents. The newness of new media relates to their "programmability",[28] which results from the merging into one of two separate historical trajectories, that of modern

24 Werner Kogge, Lev Manovich. Society of the Screen, in: A. Lagaay, D. Lauer (eds.), *Medientheorien. Eine philosophische Einführung*, Frankfurt/New York: Campus Verlag, 2004, pp. 297–315, p. 302.
25 Lev Manovich, *The Language of New Media*. Cambridge, MA: The MIT Press, 2001, pp. 11–12, p. 48.
26 Kogge 2004 (as fn. 24), p. 303.
27 Manovich 2001 (as fn. 25), pp. 95–103, pp. 145–160.
28 Ibid., p. 47.

media and that of the computer. This meeting changes the identity of both, giving rise to a "universal media machine".[29]

The programmability of new media relates to how all new media objects are numerical representations.[30] Composed of digital code, all new media objects can be described formally in mathematical terms, making them susceptible to algorithmic manipulations. This means that if the contents of old media are to be stored, displayed or distributed via computers, they must be converted into numerical representations through a process of digitization. This requirement relates to what, in Manovich's view, is the most consequential effect of computerization: the transformation of media into computer data.[31] As a result, new media objects in general can be said to consist of two distinct layers: a "cultural layer" whose structural organization "makes sense to its human users" and a "computer layer" whose structural organization instead "follows the established conventions of the computer's organization of data".[32] He gives the example of a digital image, which on one level is a "representation"[33] that "belongs on the side of human culture", and which on another level, is a "computer file" that belongs, rather, to the "computer's own cosmogony".[34] Since today, media are for the most part created and accessed via computers, we can expect the computer to influence the traditional cultural logic of media by imposing its own distinct computer logic. Importantly, however, as Manovich sees it, this influence is not a one-way street. Just like traditional artists before them, new media designers and users perceive the world and approach media through various cultural filters and representational schemes.[35] Moreover, like all media, the computer works by "remediating"[36] older media.[37] Beyond that, Manovich reminds us that the computer level is not fixed and finished once and for all but continues to evolve as the computer is set to perform new tasks. The influence between the levels, therefore, goes both ways, which means that the "new computer culture" is best conceived as a "blend of human and computer meanings, of traditional ways in which human culture modeled the world and the computer's own means of representing it".[38]

Manovich's idea about the two layers may seem reminiscent of the split between the human and the machinic as discussed in the previous section. Still, it is interesting to note that, in Manovich's case, the computer is not really outside the human as such. When he talks about the cultural layer, the term *culture* is taken in a narrow sense, reflecting his focus on "cultural software" – software that supports cultural actions such as "creating cultural artifacts and interactive services which contains representations, ideas, beliefs and aesthetic values".[39] Furthermore, when he says that a digital image on the level of representation "belongs on the side of human culture", he means that it belongs to the historical trajectory of visual representation with its characteristic cultural forms, languages and conventions.[40] Thus, when the cultural layer is contrasted with the computer layer, the implication is not that the latter exists beyond

29 Ibid., p. 4, pp. 25–26, p. 69.
30 Ibid., p. 27.
31 Ibid., p. 45.
32 Ibid., p. 45.
33 It is a representation in the sense of featuring recognizable objects. Ibid., p. 45.
34 Ibid., pp. 45–46.
35 Ibid., pp. 117–118.
36 Jay D. Bolter, Richard Grusin, *Remediation. Understanding New Media*, Cambridge, MA: The MIT Press, 1999.
37 Manovich 2001 (as fn. 25), p. 89.
38 Ibid., p. 46.
39 For a longer list, see Lev Manovich, *Software Takes Command*, New York: Bloomsbury, 2013, p. 23.
40 Manovich 2001 (as fn. 25), p. 45.

human culture in a wider sense. The point is, rather, that the computer layer belongs to a separate historical trajectory with its own distinct conventions – which is why the "language of cultural interfaces", as we encounter it on most of today's computer screens, is often an "awkward mix between the conventions of traditional cultural forms and the conventions of HCI – between an immersive environment and a set of controls".[41]

Manovich's refusal to draw a sharp line between the two layers – the human and the machinic – also informs his approach to the notion of operation. While he acknowledges that operations behind computer programs can be automated, and hence that "human intentionality can be removed from the creative process, at least in part",[42] he refrains from identifying the notion of operation with the machinic. Instead, "operations" are defined more widely as "typical techniques of working with computer media".[43] As Manovich sees it, in the computer age, typical operations such as copy, cut, paste, search and filter are also used outside the computer, as "general cognitive strategies" employed in the culture at large.[44] Operations, in other words, are conceived as "technologically-based cultural practices" that, despite being embedded in software, are not tied to it.[45] Thus, when he sets out to analyze operations, Manovich focuses on general techniques (or "commands") that are common to many different software programs, such as selection, which relates to how in computer culture authentic creation tends to be replaced by selection from predefined menus, and compositing, which relates to the fitting together of heterogeneous elements into a single, seamless object.[46] The operations of selection and compositing both center on media production and use. It is only when he turns to teleaction that Manovich addresses the kind of operations that are topical in the literature on operative images. Manovich admits that teleaction is "qualitatively different" from selection and compositing in that it no longer concerns the "traditional cultural domain of representation".[47] Teleaction results from another meeting of historical trajectories, this time between media, computers and telecommunication.[48] In Manovich's view, "teleaction" is a more precise term of what is commonly referred to as "telepresence", which he defines "as one example of *representational technologies used to enable action, that is, to allow the viewer to manipulate reality through representations*".[49]

True to his habit of questioning the newness of new media, Manovich emphasizes that today's action-enabling images also have a prehistory. The common focus on "the history of visual representation in the West in terms of illusion", makes us prone to overlook the separate history of image-instruments.[50] To support his case, Manovich draws on the work of Bruno Latour,[51] who, interestingly, uses perspectival images as well as photographs as examples of image-instruments. Paraphrasing Latour, Manovich maintains that image-instruments are characterized by their "precise and reciprocal relationship between objects

41 Manovich 2001 (as fn. 25), p. 91.
42 Ibid., p. 32.
43 Ibid., p. 118.
44 Ibid., p. 118.
45 Ibid., p. 118, p. 121.
46 Ibid., pp. 123–35, pp. 136–60.
47 Ibid., p. 161.
48 Ibid., p. 162.
49 Ibid., p. 165 [original emphasis].
50 Ibid., p. 167.
51 More precisely on Bruno Latour, Visualization and Cognition. Thinking with Eyes and Hands, in: *Knowledge and Society. Studies in the Sociology of Culture Past and Present* 6 (1986), pp. 1–40.

and their signs".[52] By systematically capturing features of reality, a perspectival image, for example, is "more than just a sign system that reflects reality – it makes possible the manipulation of reality through the manipulation of signs".[53] Yet, in the history of image-instruments, the convergence with the trajectory of telecommunication makes a difference, since the electronic transmission of video images and the instantaneous construction of representations enable real-time remote control – something that provides a unique kind of power: "I can drive a toy vehicle, repair a space station, do an underwater excavation, operate on a patient, or kill – all from a distance".[54] This is why, seen from the history of action-enabling images, teleaction is a more radical technology than, say, virtual reality, because it "allows the subject to control not just the simulation but reality itself".[55]

It is worth noting that, the way Manovich defines image-instruments (as representations that systematically capture features of reality), it is not a requirement that the representations in question be produced mechanically. Leaning on Latour, Manovich seems rather to assume a continuity between perspectival images and photographs (characterizing the latter as perspectival images *par excellence*).[56] By emphasizing such a continuity, Manovich differs from thinkers like Flusser as well as from thinkers like Friedrich Kittler and Wolfgang Ernst (to be considered in the next section), for whom the introduction of technical images involves a momentous, cultural rupture. Manovich, on his side, instead of identifying the operational and the instrumental with the machinic, concentrates on the establishment of a systematic and reciprocal relation between objects and signs, which is what enables humans to use images to manipulate reality. Yet there are tensions in Manovich's approach to image-instruments. While he continues to refer to them as "representations" and "signs", his explorations of image-instruments lead to the realization that an image-instrument is "more than just a sign system that reflects reality".[57] Manovich, however, stops there and does not take the further step of considering *why* the traditional notions of representation and sign seem unable to properly account for the reciprocity between instrument and reality – not to speak of their shortcomings when it comes to elucidating the interventional and instructional aspects of instrumental mediation.

There is also a second way that Manovich's considerations about image-instruments puts pressure on the traditional notion of images. While telepresence is typically associated with live video images, Manovich shows that teleaction does not depend on video. Instead, he observes that "different kinds of teleaction require different temporal and spatial resolutions".[58] In the case of radar-images, for example, "the image is so minimal that it hardly can be called an image at all".[59] Lacking information about shape, texture and color, radar-images record nothing but the position of an object – which, however, suffices to destroy it.[60] It seems, then, that for image-instruments to perform their operational roles, the visual aspect is not really needed. If they do not reflect reality, and if they are no longer visual, in what sense are image-instruments still images? Manovich does not answer this question. Overall, his investigation of

52 Manovich 2001 (as fn. 25), p. 167.
53 Ibid., p. 168.
54 Ibid., p. 169.
55 Ibid., p. 166.
56 Ibid., p. 167.
57 Ibid., p. 168.
58 Ibid., p. 170.
59 Ibid.
60 Ibid.

image-instruments remains an excursion, the bulk of his work being geared towards new media production. Thus, while his investigation of image-instruments certainly puts pressure on received notions of images, Manovich himself never explicitly questions their status as representations. Consequently, in Manovich's account of teleaction, the *action* is conceived as human action: Teleaction is the manipulation of reality *by* humans (the viewer, the subject, the teleoperator) *through* representations. Images themselves are not considered actors.[61]

Technical Operations

While in *The Language of New Media* Manovich experiments with terms borrowed from computer science (including *interface* and *operation*), he later comes to criticize this work for its tendency to regard computer science "as a kind of absolute truth".[62] Emphasizing even more strongly than before that "computer science is itself part of culture", he now aligns himself with the emerging field of software studies that approaches software as something more than a matter of engineering: "computers and software are not just 'technology' but rather the new *medium* in which we can think and imagine differently".[63] A very different approach to the notion of operation is found in the work of Wolfgang Ernst, who seems to go in the opposite direction: Emphasizing the technical and engineering aspects of images and media, Ernst dissociates the notion of operation from the human-computer interface, seeking instead to explicate the operational processes that play out below the "surface" of software.[64]

Ernst's approach belongs to a line of research that is commonly referred to as "German media theory"[65] and that was opened by Friedrich Kittler, another notable figure of 1980s media theory. Kittler's work stands out due to its strong focus on the materiality and technicality of media. Taking inspiration from Michel Foucault's 1969 treatise *Archaeology of Knowledge*, Kittler concerns himself with epistemic ruptures in systems of knowledge, which in Kittler's view are related to media shifts. Hence, in Kittler's work, the "historical apriori" of Foucault turns into a "technical apriori".[66] As Kittler sees it, "media determine our situation"[67] by providing the material conditions under which something may become knowledge. Focusing less on discourses and more on the material substrates of media, he conceives media as inscription systems. According to Kittler, the introduction of the first technological media ("phonographs and cinematographs") marks a major epistemic rupture in that they, in contrast to previous media ("texts and scores"), were able to store time.[68] The introduction of technological media marks a rupture, more precisely, in that

61 Which they might have been, say, if Manovich had engaged more closely with Latour's work and adopted the broader notion of agency advanced by actor-network theory. Bruno Latour, *Reassembling the Social. An Introduction to Actor-Network-Theory*, Oxford: Oxford University Press, 2005.

62 Manovich 2013 (as fn. 39), p. 10.

63 Ibid., p. 13 [original emphasis].

64 Wolfgang Ernst, *Digital Memory and the Archive*, edited and with an introduction by Jussi Parikka, Minneapolis/London: University of Minnesota Press, 2013, p. 71.

65 Anthony Enns, Foreword. Media History versus Media Archaeology, in: Wolfgang Ernst, *Chronopoetics. The Temporal Being and Operativity of Technological Media*, translated with a foreword by Anthony Enns, London/New York: Rowman & Littlefield, 2016, p. xiv.

66 Bernhard Siegert, Cultural Techniques. Or the End of the Intellectual Postwar Era in German Media Theory, in: *Theory, Culture & Society* 30.6 (2013), p. 50.

67 Friedrich A. Kittler, *Gramophone, Film, Typewriter*, translated with an introduction by Geoffrey Winthrop-Young and Michael Wutz, Stanford, CA: Stanford University Press, 1999, p. xxxix.

68 Ibid., p. 3.

they involve a shift from inscription systems whose time is "(in Lacan's term) symbolic" to systems whose time runs "on a physical or (again in Lacan's terms) real level".[69] Furthermore, the shift from the *symbolic* to the *real* implies that humans are no longer the ones doing the inscribing. The introduction of technological media, in other words, occasions a displacement of "so-called man" (as Kittler tends to put it): machines, he maintains, and especially the intelligent machines introduced by digital technology, "are not there for us humans".[70] This idea, that the machines are not there for us, ties into Kittler's anti-humanist take on history, whose ultimate subject is not humans but technology. With the advent of intelligent machines, the self-processing of nature[71] no longer needs human intermediaries: "Instead of wiring people and technologies, absolute knowledge will run as an endless loop.[72] Again according to Kittler, the introduction of digital technology also has the effect of erasing the differences among individual media, due to the way that it reduces sound and image, voice and text to "surface effects, known to consumers as interface".[73] This, clearly, undermines the role of the human senses just as much as it undermines meaning: "Sense and the senses turn into eyewash".[74]

Since the heyday of Kittler's anti-humanist theory, many of his followers have gradually moved away from the exclusive focus on the material properties of media technologies, centering instead on the notion of "cultural techniques".[75] Other followers seem intent, rather, to "out-Kittler Kittler"[76] by affirming even more strongly the anti-humanist tendencies in Kittler's work. This is the case with Ernst, whose resolute focus on machine agency is what makes his approach particularly relevant.

Ernst's approach to media has been characterized as an "operative media archaeology".[77] In his own efforts to explicate his approach, Ernst positions himself against media archaeology as cultural history on the one hand, and against media phenomenology on the other. As Ernst sees it, historical discourse and human perception are both prone to interpretation and ridded with subjectivity, which is why he seeks instead a "technoascetic" approach that "takes the point of view of the machine itself".[78]

This implies that, in the work of Ernst, *archaeology* does not mean *genealogy*. Drawing on Foucault's notions of archive and archaeology,[79] media archaeology is defined, rather, as "a kind of epistemological reverse engineering, and an awareness of moments when media themselves, not exclusively humans anymore, become active 'archaeologists'

69 Ibid., p. 4.
70 Kittler cited in Enns 2016 (as fn. 65), pp. xiv-xv.
71 Kittler's idiosyncratic take on history (including the role of technology) is succinctly summarized by Geoffrey Winthrop-Young as follows: "the ultimate subject of history is technology, understood in a very broad sense as the processing of nature that for an extended period of time was dependent on human intermediaries, but that now, with the arrival of digital technology, is closer to a self-processing of nature that leaves humans behind". Geoffrey Winthrop-Young, *Kittler and the Media*, Cambridge, UK: Polity, 2011, p. 80.
72 Kittler 1999 (as fn. 67), pp. 1–2.
73 Ibid., p. 1.
74 Ibid.
75 Enns 2016 (as fn. 65), p. xvi; For an overview of approaches centering on the notion of *cultural techniques*, see Bernhard Siegert, Cultural Techniques. Or the End of the Intellectual Postwar Era in German Media Theory, in: *Theory, Culture & Society* 30.6 (2013), pp. 48–65; and Geoffrey Winthrop-Young, Cultural Techniques. Preliminary Remarks, in: *Theory, Culture & Society* 30.6 (2013), pp. 3–19.
76 Winthrop-Young 2013 (as fn. 75), p. 15.
77 Jussi Parikka, Operative Media Archaeology. Wolfgang Ernst's Materialist Media Diagrammatics, in: *Theory, Culture & Society* 28.5 (2011), pp. 52–74.
78 Ernst 2013 (as fn. 64), p. 24, p. 72.
79 For definitions, see ibid., p. 211, note 4.

of knowledge".[80] In contrast with Manovich, who, according to Ernst, remains on the surface by investigating "monitors and interfaces" and what they "offer to the human user", Ernst is concerned with "technoepistemological configurations underlying the discursive surface".[81] Thus conceived, the archaeology of media "is not simply an alternative form of reconstructing beginnings of media on the macrohistorical scale", it describes, rather, "technological 'beginnings' (*archai*) of operativity on the microtechnological level".[82] These technological beginnings relate to the very essence of technical media, which Ernst conceives in operational terms: "It belongs to the specificity of technical media that they reveal their essence only in their operation".[83] The essence of technical media relates to "microtemporal processes" that are critical for the operations of technical media, that is, for their performance as "processual hardware".[84] This means that, with a view to their operational essence, technical media are not arbitrary or subject to discursive cultural relativization; they have an "epistemological existence" of their own, due to the way they produce their own machine-specific time – what Ernst refers to as their "*Eigenzeit*".[85] Thus, the primary focus of Ernst's kind of media archaeology is "time-criticality", the time-giving and time-differentiating aspects of technical media – the way technical media "do not simply exist *in time* but result in *timing* agencies".[86]

80 Ibid., p. 55.
81 Ibid.
82 Ibid., p. 57.
83 Ibid.
84 Ibid. p. 50, p. 177.
85 Ibid. p. 57.
86 Wolfgang Ernst, *Chronopoetics. The Temporal Being and Operativity of Technological Media*, translated with a foreword by Anthony Enns, London/New York: Rowman & Littlefield, 2016, p. vii [original emphasis].

This implies that the operational lifespan of technical media objects is not identical to their cultural lifespan. He gives the example of an old radio found in a museum, whose outer world has vanished. If such a radio, a historical museum object, is reactivated so as to broadcast today's radio programs, it undergoes a change in status from "*historical* to *processual* hardware".[87] Operationally speaking, therefore, the radio is still present, since "[t]here is no 'historical' difference in the functioning of the apparatus now compared to then".[88] Thus, when the radio is reactivated, it truly becomes a medium again, which means that "there is a media-archaeological short circuit between otherwise historically clearly separated times".[89] This then is why, for Ernst, traditional historical approaches will not do: By subjecting media processes to a literary narrative, they misread and misrepresent the *Eigenzeit* of technical media.

According to Ernst, time-critical media provide a different (and better) kind of evidence of the past than the evidence provided by historical-discursive accounts. As Ernst sees it, machines have the power to "temporarily liberate" us from the limitations of literary narrative and human perception.[90] The unique evidential power of technical media is directly connected with their time-giving agencies, which, according to Ernst, induce "disruptions in human temporal perception" due to their "asynchronous being in what is known as 'historical' time".[91] Technical media (including computers) differ from the "traditional symbolic tools of cultural engineering (like writing the alphabet)" in that they register and process "not just semiotic signs but physically

87 Ernst 2013 (as fn. 64), p. 177 [original emphasis].
88 Ibid., p. 57.
89 Ibid.
90 Ibid., p. 56.
91 Ernst 2016 (as fn. 86), p. vii.

real signals".[92] Like Kittler before him, he articulates this opposition in terms of the *symbolic* versus the *real*: Technical media "emancipate" the object from "an exclusive subjection to textual analysis", and in so doing, they remind us about "the insistence and resistance of material worlds".[93]

Ernst further develops the idea of the unique evidential power of technical media by invoking the Peircean notion of "index": Media archaeology is "on the side of the indexical",[94] which is seen as opposed to the side of the iconic and the symbolic.[95] Hence, when it comes to photography, he agrees with Roland Barthes, who "emphasizes photography as a decisive mutation in informational economies".[96] According to Ernst, photography is an example of a "true media-archaeological tool" due to its "automatic registration and self-inscription of light".[97] A similar rupture is found in gramophonic recording, "which can record as well the accompanying noise (i. e., the index) of the physically real within and outside the recorded voice".[98] Technical media such as these provide a unique kind of evidence due to the way that they "immediately couples human perception with the signal flow [...], with or without their translation into the iconological regime of cognition".[99] The immediate coupling occasioned by technical media is then contrasted to the "indirect, arbitrary evidence symbolically expressed in literature and musical notation".[100] Hence, as Ernst sees it, media archaeology is "media studies as exact science": an approach that investigates "media-induced phenomena on the level of their actual appearance", that is, as "physically real (in the sense of indexical) traces of past articulation".[101]

Ernst's kind of media-archaeology, then, as pointed out by Jussi Parikka, is conceived as a "a way of stepping outside a human perspective to the media-epistemologically objective mode of registering the world outside human-centered sensory perception".[102] Technical media (including computers) are conceived by Ernst as "measuring media" – media that, in contrast to mass media, are "able to decipher physically real signals technoanalogically".[103] In Ernst's view, measuring media are closer to reality because they "behave 'analogously' to physics itself".[104] More precisely, they are assumed to be closer to reality because they operate on the level of numbers and not on the "phenomenological multimedia level" of text, image and sound.[105] Media archaeology as conceived by Ernst is "close to mathematics", which in turn is seen as close to nature.[106] Hence, when human senses are coupled with technological settings, "man is taken out of the man-made cultural world".[107] In this way, Ernst aspires toward a "cool" media-archaeological gaze, which can be performed by algorithmic machines better than by

92 Ernst 2013 (as fn. 64), p. 58.
93 Ibid., p. 43.
94 Ibid., p. 45.
95 In Ernst's treatment, the iconic and symbolic tend to be lumped together, since they are both associated with culturally variant human perception and history.
96 Ernst 2013 (as fn. 64), p. 38; see also Barthes Roland, Rhetoric of the Image, in: Roland Barthes, *Image Music Text*, essays selected and translated by Stephen Heath, London: Fontana Press, 1977, p. 45.
97 Ernst 2013 (as fn. 64), p. 47.
98 Ibid., p. 64.
99 Ibid., p. 67.
100 Ibid., p. 173.
101 Ibid.
102 Jussi Parikka, Archival Media Theory. An Introduction to Wolfgang Ernst's Media Archaeology, in: W. Ernst, *Digital Memory and the Archive*, edited and with an introduction by Jussi Parikka, Minneapolis/London: University of Minnesota Press, 2013, p. 9.
103 Ernst 2013 (as fn. 64), p. 178.
104 Ibid., p. 62.
105 Ibid., p. 71.
106 See ibid., pp. 71–73 for more details about how this (problematic) argument goes.
107 Ibid., p. 177.

human perception, since it is no longer dominated by "semiotically iconic, musically semantic, literally hermeneutic ways of seeing, hearing, and reading".[108] Thus, in contrast to Manovich, who emphasizes how the cultural layer and the computer layer mutually influence each other, resulting in a "blend of human and computer meanings", Ernst pursues a firm anti-humanist approach that seeks instead to rid the analytical gaze of everything human.[109] What is gained by this approach is that the non-human and time-critical agencies of technical media come into view. However, again as noted by Parikka, by pursuing a "happy positivism", Ernst comes close to "mythologizing the machine as completely outside other temporalities, including the human".[110] Moreover, by defining the operational in a strictly technical sense, he seems to bracket out the very mediating aspects of media: their roles as interfaces to the world and other people, their status as meaningful forms of expression (images, texts, sounds).

Efficacious Images

While Harun Farocki's artistic explorations of operative images opens a complex array of questions relating to pressing social, political and ethical issues, the approaches of Lev Manovich and Wolfgang Ernst both stay "close to the machine"[111] – focusing on software and hardware, respectively. In this section, I consider operative images from the perspective of visual studies,[112] where the discussion revolves around the efficacy of images, which, as we shall see, need not necessarily be identified with new media or the machinic.

When it comes to visual studies approaches to operative images, an interesting case in point is the international conference *Image Operations*,[113] which, together with other recent academic events,[114] have contributed to the establishment of the field of "image operations studies".[115] In an edited volume following the conference, image operations are discussed with a special emphasis on their roles in warfare, insurgency/counterinsurgency and political activism. In the introduction, Jens Eder and Charlotte Klonk consider three cases where imagery has been directly involved in highly charged political situations: Kevin Carter's Pulitzer Prize winning photograph showing a starving and collapsed Sudanese child with a vulture in the background; a classified US military video released by WikiLeaks showing gunsight footage from an attacking helicopter that opens fire against a group of men including two Reuters news staff; and a YouTube video showing the beheading of the American journalist James Foley by a member of the militant jihadist group ISIS. In what sense are these cases to be considered as image operations? Eder and Klonk provide some indications: they are image operations, first, in that they all provoked "a whole series of largely uncontrollable events" that went "beyond

108 Ibid., p. 27.
109 Manovich 2001 (as fn. 25), 46.
110 Parikka 2013 (as fn. 102), p. 7, p. 10.
111 Interestingly, both thinkers use this exact phrase, see Manovich 2001 (as fn. 25), p. 117 and Ernst 2013 (as fn. 64), p. 59.
112 In the German-speaking parts of the world, more frequently referred to as *Bildwissenschaft*.
113 The conference took place at the Institute for Cultural Inquiry in Berlin on April 10–12, 2014.
114 These events include the conference *Media Acts* (Trondheim 2011), the conference *What Images Do* (Copenhagen 2014), a series of three conferences *Dynamis of the Image: An Archaeology of Potentialities* (Düsseldorf 2014, Basel 2014 and Paris 2015), the workshop *Screen operations: Conditions of Screen-based Interaction* (Berlin 2016) and the PhD course *Operative Images* (Berlin 2017).
115 Zoya Brumberg, Book Review. Jens Eder and Charlotte Klonk (eds), Image Operations: Visual Media and Political Conflict, in: *Journal of Visual Culture* 16.3 (2017), p. 391.

the original intentions of their producers".[116] In these cases, the series of events lead to, among other things, Carter's suicide, the imprisonment of the soldier who was charged for disclosing the military video, and a rigorous ban on the footage showing Foley's beheading. Furthermore, they are image operations in that the production and circulation of images "led directly or indirectly to the physical death of real people".[117] Even if the images "operated within the seemingly disembodied digital sphere of the Internet", they all had "serious consequences", affecting bodies in "vital ways".[118] Finally, they are image operations in that, in all three cases, the images were "crucial factors in the dynamics" of the conflicts in question, and as such, "the *agens et movens* in the unfolding of events".[119] Thus, as conceived by Eder and Klonk, image operations are primarily defined in terms of their consequences, which in turn seem to be based primarily on the representational function of the imagery. Due to their disturbing contents, the images incite a series of uncontrollable events that have serious, real-world effects. At the same time, Eder and Klonk repeatedly emphasize that, in all these cases, images do more than "just reflect or represent conflicts"; rather, they "play performative and constitutive roles within them".[120] They also call attention to how, in the digital media environment, the performative and constitutive roles of images grow stronger, amplifying "the volume, speed, reach and level of conflictual involvement".[121]

After having proposed these characteristics, Eder and Klonk proceed to ask the pertinent question: "So who or what is operating in image operations?".[122] They answer by pointing to a "complex network of agencies" in terms of actor-network theory.[123] Certainly, people and organizations use images as tools, but there is an important sense that "images themselves also act".[124] This idea, that images have a "dynamic of their own", is key to a highly influential line of research in contemporary visual studies.[125] It is somewhat surprising, therefore, that, when they go on to clarify the notion of images, they choose to focus their book on the rather traditional idea of "visual pictures" understood as "anything that visually represents or expresses something else without being written language".[126] In fairness, Eder and Klonk present a range of very different conceptions of images, including "image games" (invoking Wittgenstein's notion of language games) and "image acts" (invoking Searle's notion of speech acts) – the overall impression being that the introduction wavers between established approaches to images in terms of representation and revisionist approaches centering on the idea of image agency. The implication of this all-embracing approach is that the operational comes across as a mere supplement to the more established approaches. This becomes clear, for example, when Eder and Klonk set out to clarify the specific powers of images, listing the operational – which is now, rather unexpectedly, defined in terms of the interactive use of images in digital media – as a fourth potential of images following their

116 Jens Eder, Charlotte Klonk, *Image Operations. Visual Media and Political Conflict*, Manchester: Manchester University Press, 2017, p. 1, p. 4.
117 Ibid., p. 3.
118 Ibid., pp. 3–4.
119 Ibid., p. 3 [original emphasis].
120 Ibid., p. 4.
121 Ibid., p. 4.
122 Ibid., p. 6.
123 Latour 2005 (as fn. 61).
124 Eder, Klonk 2017 (as fn. 116), p. 6.
125 W. J. T. Mitchell, *What Do Pictures Want? The Lives and Loves of Images*, Chicago/London: The University of Chicago Press, 2005; Gottfried Boehm, Ikonische Differenz, in: *Rheinsprung 11. Zeitschrift für Bildkritik* 1 (2011), pp. 170–176, http://rheinsprung11.unibas.ch/archiv/ausgabe-01/glossar/ikonische-differenz.html (accessed May 27, 2018); Horst Bredekamp, *Der Bildakt*, Berlin: Klaus Wagenbach, 2015.
126 Eder, Klonk 2017 (as fn. 116), p. 9.

mimetic, symbolic and aesthetic (including sensual and affective) potentials.[127]

Like Farocki and Ernst, Eder and Klonk accentuate that images have an agency of their own, which implies that images cannot be fully understood by reconstructing the intentions of their producers.[128] In Eder and Klonk's view, this is because, when images start to circulate, they have unforeseen effects that may even go against the original intentions of their producers. Hence, in contrast with Farocki and Ernst, the operational is identified with the real-world performative effects of images as they circulate in society, and not so much with their machinic element. The advantage of this approach is that it brings prominence to the ethical dilemmas that arise on the level of images, pointing to the need for a renewed focus on image ethics. The notion of image operation, however, is rather vaguely defined and remains, as noted by Zoya Brumberg, a "nebulous concept".[129]

While Eder and Klonk for the most part approach the operational as a supplement to more established approaches to images, they also at times seem to push in the direction of a deeper revision of the image category. If followed through, the idea that images have an agency of their own profoundly challenges received notions of images in terms of representation. Some thinkers, therefore, such as Sybille Krämer, regard the current focus on the operational as an occasion for a much-needed rethinking of the very idea of images. While in line with contemporary research advocating the agential powers of images, Krämer's approach stands out in its explicit focus on "operational iconicity" (*operative Bildlichkeit*).[130] Krämer's take on operative images emphasizes two interrelated points: the necessity of going beyond the text-image dichotomy, and the promise of the diagrammatic approach.[131] The background here is that traditional notions of images, including classical ways of distinguishing between semiotic modalities, are intimately bound up with more fundamental divisions – a highly influential example being Immanuel Kant's opposition between the two stems of human knowledge: sensibility and understanding. While the classical ways of conceptualizing the boundaries between images, texts and numbers typically conform to such long-established, fundamental oppositions, recent attempts to rethink images are *deep revisions* in that they no longer assume the dualist worldview at the basis of the old distinctions – challenging received notions of images, therefore, at their very root. Krämer contributes to the ongoing revisionist endeavors, showing how the old philosophers themselves provide resources to overcome unproductive dualisms, such as Kant with his notion of schema[132] and Charles S. Peirce with his notion of diagram.[133]

So why, then, this renewed interest in Peirce and diagrammatics? Late in his career, Peirce developed a broadened notion of diagrams that is highly relevant to the current attempts to conceptualize operative images, for two reasons: First, because it provides a dynamic and operational notion

127 Ibid., pp. 9–10.
128 Ibid., p. 1.
129 Brumberg 2017 (as fn. 115), p. 389.

130 Sybille Krämer, *Operative Bildlichkeit. Von der 'Grammatologie' zu einer 'Diagrammatologie'? Reflexionen über erkennendes 'Sehen,'* 2009, http://userpage.fu-berlin.de/~sybkram/media/downloads/Operative_Bildlichkeit.pdf (accessed May 27, 2018).
131 Ibid., pp. 1–3, pp. 10–12.
132 Ibid., pp. 12–15.
133 Ibid., pp. 10–12; In fact, Peirce's notion of diagram takes its inspiration from Kant's notion of schema. Charles S. Peirce, *(PAP) [Prolegomena for an Apology to Pragmatism]*, in: Charles S. Peirce, *The New Elements of Mathematics*, Vol. IV: Mathematical Philosophy, The Hague: Mouton, 1976, p. 318; Ibid., pp. 10–12.

of iconicity[134] that pushes beyond static ideas of images in terms of similarity (including Peirce's own previous definitions of iconicity); and second, because it provides a new notion of evidence that overcomes mechanistic accounts (including those based on indexicality). The diagrammatic approach, in other words, provides a fresh take on images that scrambles the icon-index-symbol trichotomy as we know it from textbooks in semiotics. Beyond that, the true merit of a Peircean diagram is that it has the unique power to generate new and surprising information when manipulated in systematic ways.[135] Thus conceived, a diagram is not necessarily visual. It is not a "visual picture" in the terms of Eder and Klonk because the iconic element of diagrams has more to do with their demonstrative powers.[136] The diagrammatic structure is not exclusive to images and does not serve to distinguish them from texts or numbers, since, as Peirce sees it, there is iconicity at the heart of linguistic propositions and mathematical formulas, just as there are rules at the heart of images.[137] The diagrammatic approach, in other words, redraws the boundaries between images, texts and numbers as we have come to know them, emphasizing interconnections rather than oppositions. In the same vein, it is the diagrammatic structure that connects images to the wider family of instruments. For these reasons, Peirce's dynamic and operational notion of iconicity promises to throw new light on the nature and workings of image-instruments, whether we are interested in how and why perspectival images or photographs are "more than just sign systems that reflect reality" (to paraphrase Manovich), or more concerned with the evidential and instructional powers of digital image applications.[138]

Concluding Remarks

By maintaining that operative images are not representations but rather instruments that form part of operations, Harun Farocki sets the stage for the ensuing discussions presented above. Identifying the notion of operation with automation, he frames the human-machine relationship as antagonistic. Farocki's *Eye/Machine* installation and its commenters also introduce the idea of the imminent replacement of humans by machines: Disrupting the human scale, sensory automations outperform the human eye. Having no need for human spectators, operative images serve, rather, as interfaces in algorithmically controlled processes. Issues relating to the human-machine antagonism continue to resonate in the subsequent two sections. While Lev Manovich seeks to resolve the antagonism by domesticating the machine, Wolfgang Ernst instead chooses the opposite strategy of bracketing everything human to secure the purity of machinic operations. Jens Eder and Charlotte Klonk, on their side, identify the notion of operation with the performative effects of images as they circulate in society, articulating the active dimension in terms of distributed networks of agencies.

134 A key source for Peirce's operational notion of iconicity is an unpublished manuscript that is referred to as "PAP". See ibid. For a more detailed discussion, see Frederik Stjernfelt, *Diagrammatology. An Investigation on the Borderlines of Phenomenology, Ontology, and Semiotics*, Dordrecht: Springer, 2007, pp. 89–116; Aud S. Hoel, Lines of Sight. Peirce on Diagrammatic Abstraction, in: F. Engel, M. Queisner and T. Viola (eds.), *Das bildnerische Denken. Charles S. Peirce*, Berlin: Akademie Verlag, 2012, pp. 253–271; Aud S. Hoel, Measuring the Heavens. Charles S. Peirce and Astronomical Photography, in: *History of Photography* 40.1 (2016), pp. 49–66.

135 Stjernfelt 2007 (as fn. 134), p. 90.

136 Eder, Klonk 2017 (as fn. 116), p. 9.

137 These rules are generative rules, and not the arbitrary rules of semiological structuralism.

138 Manovich 2001 (as fn. 25), p. 168.

While all four approaches, each in their own way, strongly confirm the idea of images having an active dimension, none of them provides a developed account of the operational as a media-theoretical concept. In this respect, the accounts considered in sections 1–4 remain too ambiguous, too cultural, too technical and too wide, respectively. An indication that the notion of operation remains under-theorized as a media-theoretical concept can be seen in that none of the approaches in question gives a satisfactory account of the new role of operative images as interfaces – as interfaces, that is, not only in the HCI sense discussed by Manovich, but in the epistemological and ontological sense as intermediaries to the world and other people. In their operational role as intermediaries, images cannot be reduced to Kittlerian "surface effects".[139] Moreover, a developed account of the notion of operation as a media-theoretical concept would also have to include a more satisfactory take on the relation between technology and the human senses, not relegating the latter to the "phenomenological multimedia level" (as Ernst does).[140] The tendency in the literature to distinguish between images and media that supposedly conform to the human senses and those that induce a disruption in the familiar patterns of perception is yet another instantiation of an unproductive opposition between human and machines. Observing that the boundary between the two can be drawn in several ways, Manovich raises a pertinent question: "But what is human nature, and what is technology?"[141]

The guiding idea of this article is that there is something new in the way that the scholars of operative images approach the topic of mediation, which has to do with a deeper recognition of the active dimension of images and media. Moreover, as already hinted in the final paragraphs of the previous section, if the idea that images have a dynamic of their own is followed through, we may come to question the classical ideas of images at their very root – including their underlying assumptions. This, then, is why, to the extent that we are currently standing on the verge of an emerging, operational paradigm of media theory, this paradigm will have to be a comprehensive one, not restricted to technical images, digital images or new media.

139 Kittler 1999 (as fn. 67), p. 1.
140 Ernst 2013 (as fn. 64), p. 71.
141 Manovich 2001 (as fn. 25), p. 171.

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