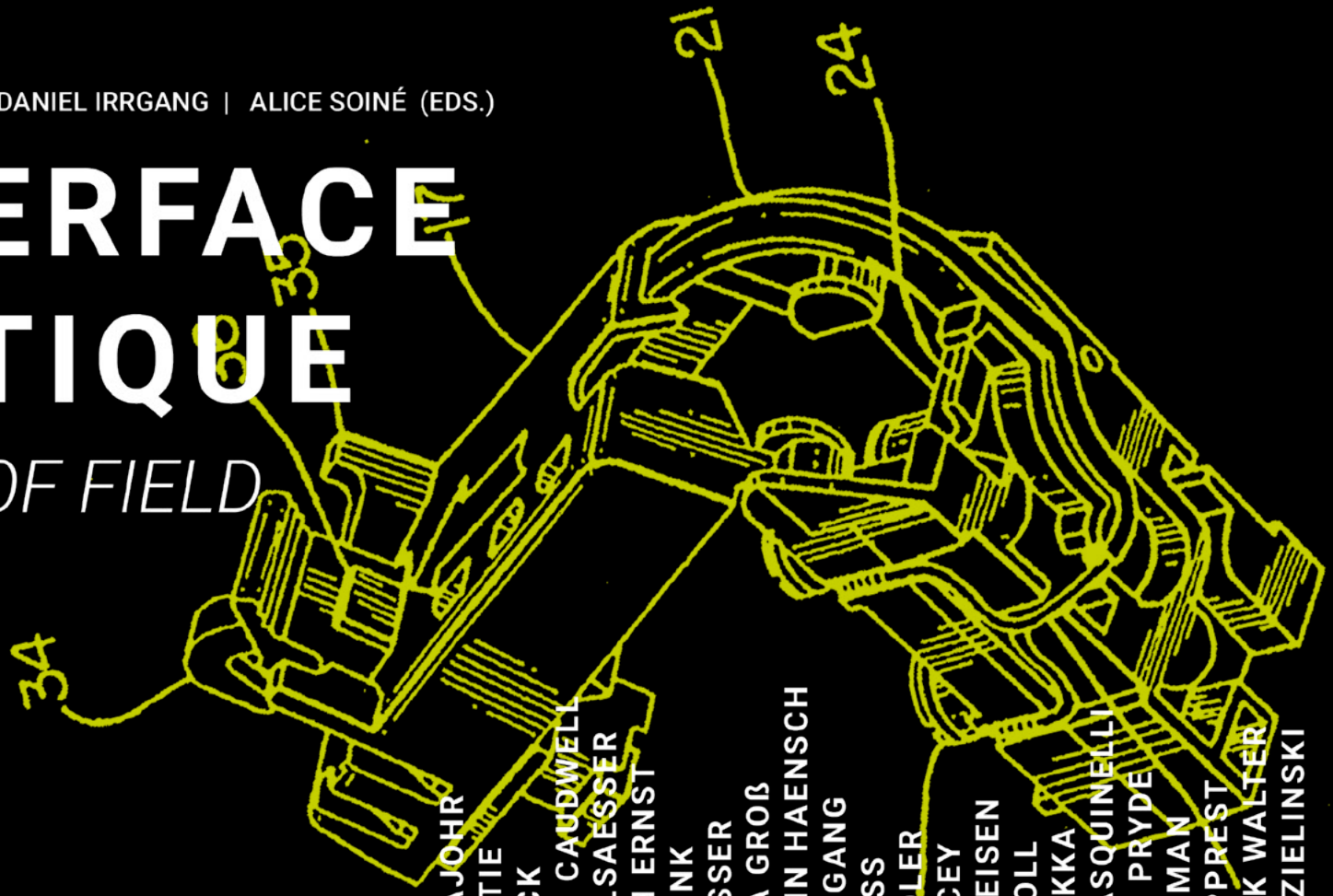
FLORIAN HADLER | DANIEL IRRGANG | ALICE SOINÉ (EDS.)

INTERFACE CRITIQUE

DEPTH OF FIELD



HANNES BAJOHR
ALEX BEATTIE
ULRIKE BECK
CATHERINE CAUDWELL
THOMAS ELSAESSER
CHRISTOPH ERNST
VICTOR EVINK
VILÉM FLUSSER
KATHARINA GROß
KONSTANTIN HAENSCH
DANIEL IRRGANG
MARTIN JESS
VLADAN JOLER
CHERIE LACEY
ELISA LINSEISEN
JOANNA MOLL
JUSSI PARIKKA
MATTEO PASQUINELLI
JOSEPHINE PRYDE
LUCY SUCHMAN
EMILIA TAPPREST
JAN-HENRIK WALTER
SIEGFRIED ZIELINSKI

2021 003

This issue is kindly supported by:

Universität der Künste Berlin

INTERFACE CRITIQUE JOURNAL

2021, VOL. 3: NAVIGATING THE HUMAN

EDITORIAL OFFICE

INTERFACE CRITIQUE

C/O FLORIAN HADLER

GROSSBEERENSTRASSE 50

10965 BERLIN

GERMANY

EMAIL

mail@interfacecritique.net

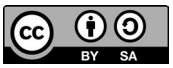
WEBSITE

http://www.interfacecritique.net

Bibliographic information published by the Deutsche Nationalbibliothek

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie.

Detailed bibliographic data are available on the Internet at http://dnb.ddb.de.



Published at arthistoricum.net, Heidelberg University Library 2021.

The electronic open access version of this work is permanently available on http://www.arthistoricum.net.

DOI: https://doi.org/10.11588/ic.2021.3

Design: Florian Hadler, Alexander Schindler

Layout: Daniel Irrgang, Alexander Schindler

ISSN 2570-0472 (Print) | 2570-0480 (Online)

ISBN 978-3-98501-023-3 (Softcover)

ISBN 978-3-98501-022-6 (PDF)

INTERFACE CRITIQUE

DEPTH OF FIELD

Edited by Florian Hadler, Daniel Irrgang & Alice Soiné

Contents

SPECIAL SECTION: MATERIALITIES OF THE INTERFACE

APPENDIX

EDITORIAL: DEPTH OF FIELD

By Florian Hadler & Daniel Irrgang

"There is nothing you can dominate as easy as a flat surface […]."
– Bruno Latour (1990)

Suggested citation:
Florian Hadler and Daniel Irrgang, Editorial: Depth of Field. *Interface Critique* 3 (2021), pp. 7–12.
DOI: https://doi.org/10.11588/ic.2021.3.81535.

In cinema and photography, depth of field marks the spectrum in which the camera can focus on targets with sufficient sharpness.

There are six different categories of depth of field:

Deep focus refers to a technique where all elements in the image, no matter the position in depth, are in focus, thus presenting all details in a vast depth of field and with the same priority or urgency.

Rack focus relates to the point in a continuous shot where the focus is newly adjusted, e.g. in order to highlight a detail in the frame or a significant change in the story.

Soft focus consciously leaves the outlines of entities in the picture slightly out of focus, to give them a gloomy or luminous aesthetic, e.g. to provide pictures with a transcendent atmosphere.

Split diopter as a technique makes it possible to focus on two layers simultaneously to draw the attention to two entities or events at the same time, e.g. for comparison or to highlight their contrasts.

Tilt shift couples the motion of the camera directly with the adjustment of the camera lenses. Usually, this technique makes objects or sceneries appear like miniatures or dioramas.

And last but not least the *shallow focus*, with which one can focus on one specific plane while keeping the others out of focus.[2]

These six different layers of focus may highlight objects, subjects or other elements of spatial depth. The lack of depth of field allows to hide elements or to only subliminally indicate them through blur. In essence, cinematic depth of field actively reveals certain aspects while necessarily concealing others, guiding the perception and aligning the intentions of the film-maker – dramatic composition, suspense, etc. – with the emotions of the spectator. This alignment is often referred to as *suture*, an initially psychoanalytic principle[3] that migrated into film studies,[4] which stitches together the film and its subject. The subject is then put

Quote title page: Bruno Latour, Drawing things together, in: *Representation in Scientific Practice*, ed. Michael Lynch and Steve Woolgar (Cambridge, MA 1990), pp. 19–69.

2 Florian Cramer referred to this technique as *bokeh porn*, a prosumer culture focusing on the aesthetic quality of the blur outside the focus, which is produced by the lens design of DSLR cameras and can have different qualities such as swirly or polygonal shapes: "A great percentage of content on video sharing sites belongs to this genre. As opposed to Hollywood and Andy Warhol's screen tests, cameras have become the new superstars. They fuel a booming contemporary film genre whose medium radically is the message. This talk will focus on the phenomenon of DSLR cinema, as a discourse of no budget empowerment and the tool that gives you instant magic." See Florian Cramer: "bokeh porn poetics: On the Internet Film Genre of DSLR Video Camera Tests", talk at the conference Videovortex #6: Beyondyoutube, Institute for Network Cultures, March 10, 2011.

3 Jacques-Alain Miller, Suture (elements of the logic of the signifier) [1966]. Transl. Jacqueline Rose. *Screen* 18/4 (1977), pp. 24–34.

4 Stephen Heath's adaptation of suture for film studies is also a plea for interdependence (between spectator and film) and for heterogeneity or non-determinacy – a plea valuable for the scope of *Interface Critique*: "The subject of a film is the play between its multiple elements, including the social formation in which it finds its existence, and the spectator; no film which does not grasp the spectator in terms of that heterogeneity, which does not shift the spectator in ties, joins, relations, movements of the symbolic and the imaginary, with the real a constant and impossible limit […]." Stephen Heath, Notes on suture. *Screen* 18/4 (1978), pp. 48–76, here p. 74.

in its place as a spectator. Depth of field helps to create this suture, as it allows elements to disappear or to emphasise them, thus guiding the viewer's perception while sewing together the structure of the film with its intended audience.

These simple dialectics of the hidden and the visible guiding the human subject are well known in interface theory. Visibility implies invisibility, perceptibility implies imperceptibility. But while interfaces create zones between the outside and the inside, where the inside is not only black-boxed but dissolves into the background of networked on-demand resources and globally spread data centres, the cinematic and photographic notion of depth of field implies a much broader range between the obvious and the hidden. It is not only about hiding complexity, but also about revealing depth. It is not only about immediate and intuitive understanding, but also about enigmatic, mysterious or puzzling hints.

The concept of suture is also at work in interface design – User Experience (UX) Design aims at aligning the structure and surface of the service, apparatus or application with the expectations and emotions of the intended user.[5] But while UX mostly focuses on the happiness of the user and is driven by metrics such as conversion rates, involving the users in a seemingless flow of the given surface while fulfilling the tasks the application was designed for, suture addresses a much broader range of relationships between the film-maker and its audience. It is not only about keeping the flow going and the viewer immersed and happy, but also about creating a variety of emotions – fear, relief, tension, anger, compassion and so forth. Thus, it is not only about reaching the goal of a predefined conversion, but about creating a space where the viewer can experience the unforeseen and unexpected while developing their subjectivity.

Considering this terminological strength, depth of field presents itself as a powerful leitmotif to think about interfaces. Where and how can we find or create new and surprising relations between the surface and its depth? Where and how can we design experiences that are open rather than narrowly focused on functional user flow – experiences that allow for unexpected events to occur and which foster serendipity? How can we think about and focus on the depth of the interface? In other words, how can we render visible the numerous layers that are hidden behind the interface?

The perspectives gathered in this volume access the notion of the interface from different angles and in various lev-

5 "It has been a longstanding claim of science and technology studies (STS) of human-computer interaction (HCI) that shaping the user is a central concern of interface design (Woolgar, 1990)*, particularly through forms of embedded and enacted scripting (Akrich, 1992; Suchman, 2007)*." Michael Dieter et al., *Store, interface, package, connection. Methods and propositions for multi-situated app studies*. Working paper series / SFB 1187 Medien der Kooperation 4 (Siegen 2018), p. 4. [*See Stephen W. Woolgar, Configuring the user: The case of usability trials. *The Sociological Review*, 38/S1 (1990), pp. 58–99; Madeline Akrich, The de-scription of technical objects, in: *Shaping Technology/ Building Society: Studies in Sociotechnical Change*, ed. Wiebke E. Bijker and John Law (Cambridge, MA: The MIT Press 1992), pp. 205–224; Lucy Suchman, *Human–Machine Reconfigurations: Plans and Situated Actions* (Cambridge, UK: Cambridge University Press, 2007) – cf. Suchman's article in this issue, pp. 69–85.]

els of depth. Some go deep beyond the surface and look into the algorithms, into the code and shine a light on that which usually remains hidden in the opacity of the inside.[6] Some focus on a specific aspect of the surface, like a long continuous shot that reveals details or significant shifts.[7] And some render the interface transcendent and other-worldly through its appearance.[8]

The epistemic detour towards the interface via cinema we suggest in this editorial is not completely new to us. And it aligns well with Siegfried Zielinski's obituary on Thomas Elsaesser in this volume, which is juxtaposed with the transcriptions of a lecture held by the latter and a subsequent discussion between the two media and cinema archaeologists.[9]

For us, the depth of knowledge in a multitude of fields, revealed during this exchange and in all the other articles in this volume, shows the potential of an approach to interface studies that dismisses predetermined disciplinary boundaries. Interdisciplinary endeavours like the work of Elsaesser and Zielinski, where technology, art and science are acknowledged as deeply intertwined and connected, are important points of orientation for the *Interface Critique* project.

Acknowledgements

This third issue of our journal relies, as does the whole *Interface Critique* project, on an economy of friendship, which is far more valuable (albeit more exhausting in terms of planability) than any publication grant. We want to express our gratitude to anyone involved, either directly through the contribution of articles or artworks, or indirectly by providing guidance and support.

For graphic design advice we thank Alexander Schindler, who has already supported us during the second volume. For editing assistance we thank Jan Willem Marquardt, who is also supporting us on the upcoming book series (stay tuned!). For checking the English spelling and grammar of this editorial we thank Fliss Bage. And we thank Clemens Jahn, who kindly put us in touch with Josephine Pryde and assisted us with her photographic contribution to this volume.

Just as with the last issue, Mari Matsu-

6 Hannes Bajohr, The Gestalt of AI: Beyond the holism–atomism divide, pp. 13–35; Jussi Parikka, Working for systems that do not do the work; Joana Moll's The hidden life of an Amazon user, pp. 81–85; Matteo Pasquinelli and Vladan Joler, The Nooscope manifested: AI as instrument of knowledge extractivism, pp. 37–68; Lucy Suchman, Talk with machines, Redux, pp. 69–85.

7 Daniel Irrgang, The Flusser-Hypertext: "Electronic Book Prototype 2," pp. 103–114; Cherie Lacey, Alex Beattie and Catherine Caudwell, Wellness capitalism and the design of the perfect user, pp. 127–150; Elisa Linseisen, Girls and their cats: Zooms – high resolution – Making a difference, pp. 301–311.

8 Ulrike Beck and Martin Jess, How a technical innovation in ancient textile industry pioneered a new way of thinking, pp. 151–169; Josephine Pryde, lapses in Thinking By the person i Am, pp. 171–183; Emilia Tapprest and Victor Evink, Ambitopia and affective atmospheres.How world-building and cinema can help unpack ideology inside pervasive systems, pp. 87–101; Jan-Henrik Walter, Aesthetics of High-tech Intimidation. F-35 Lightning II and a Design for Human Reception, pp. 227–206.

9 Thomas Elsaesser and Siegfried Zielinski, Conversations on Cinema and Media Archaeology, pp. 227–271. The lecture and discussion took place at Peking University, two days before Thomas Elsaesser's sudden passing.

toya has again been an invaluable support with her language skills and terminological knowledge in art and science. We thank her for the transcription and careful copy-editing of the comprehensive lecture by Thomas Elsaesser and his subsequent talk with Siegfried Zielinski. For providing us with the audio recording of the lecture and talk at Peking University we are indebted to the event organiser Hongfeng Tang.

We thank our colleagues at the Vilém Flusser Archive at Berlin University of the Arts for the manuscript and the publication permission for Vilém Flusser's embodied phenomenological observation of *Skin*.

In volume 2 of *Interface Critique* we initiated the format of a special section with contributions provided by the Working Group "Interface" of the German Society for Media Science (GfM), and we are glad to now call this almost a tradition. The special section in this volume is dedicated to the "Materiality of the Interface". Stay tuned on the special section for the next volume, which is already in the making.

We thank the Berlin University of the Arts, particularly Norbert Palz and Claudia Assmann, for the financial support that enables us to acquire the author's copies of this volume.

And, as always, we are grateful to our publisher, arthistoricum.net, and the Heidelberg University Press, especially Bettina Müller, Frank Krabbes and Anja Konopka, for their ongoing support, patient advice and access to the Open Journal System.

Last but not least, we want to thank all contributors to this issue – neither this journal nor the *Interface Critique* platform as a whole would be possible without your commitment, patience and trust.

Stay tuned for the upcoming book series that will complement this journal by offering a platform for more comprehensive single author positions. The series bridges gaps between the HCI community and research in arts and humanities and publishes artistic positions, theoretical and historical groundwork as well as exceptional qualification papers. The first volume, which is already in production and scheduled to be published in summer 2021, will be by the net art pioneer Olia Lialina and is titled "Turing Complete User. Resisting Alienation in Human Computer Interaction". Just like the journal, it will be available as Open Access and as Print on Demand. Please get in touch if you want to inquire about our publishing opportunities.

Looking forward to all things to come.
– Berlin, June 2021

References

Cramer, Florian, "bokeh porn poetics: On the Internet Film Genre of DSLR Video Camera Tests." Conference talk at Videovortex #6: Beyondyoutube, Institute for Network Cultures, March 10, 2011, https://vimeo.com/21344060, access: June 7, 2021.

Dieter, Michael, Carolin Gerlitz, Anne Helmond, Nathaniel Tkacz, Fernando van der Vlist and Esther Weltevrede, *Store, interface, package, connection. Methods and propositions for multi-situated app studies*. Working paper series / SFB 1187 Medien der Kooperation 4 (Siegen: University of Siegen, 2018). DOI: https://doi.org/10.25969/mediarep/3795.

Heath, Stephen, Notes on suture. *Screen* 18/4 (1978), pp. 48–76.

Latour, Bruno, Drawing things together, in: *Representation in Scientific Practice*, ed. Michael Lynch and Steve Woolgar (Cambridge, MA: MIT Press, 1990), pp. 19–69.

Miller, Jacques-Alain, Suture (elements of the logic of the signifier). Transl. Jacqueline Rose. *Screen* 18/4 (1977), pp. 24–34.

THE GESTALT OF AI: BEYOND THE HOLISM-ATOMISM DIVIDE

By Hannes Bajohr

"One could therefore argue that neural networks do not only produce outputs that humans perceive as Gestalten, but that, as statistical models, they internally already operate according to a Gestalt logic."

Suggested citation:
Hannes Bajohr, The Gestalt of AI: Beyond the Holism-Atomism Divide. *Interface Critique* 3 (2021), pp. 13–35.
DOI: https://doi.org/10.11588/ic.2021.3.81304.

Fig. 1, left to right: Output and input of Mario Klingemann's application of the Pix2Pix deep learning model (2017, https://twitter.com/quasimondo/status/934709314375372801) compared to Leonardo da Vinci's *La Gioconda* (*Mona Lisa*, ca. 1502/03).

Let me start with a face: In the fall of 2017, media artist Mario Klingemann posted a picture on Twitter that, at first glance, looked quite familiar, indeed clichéd (fig. 1, left). The smile was there, as was the slight turn of the head to the right and the familiar look directed at or slightly behind the viewer. And yet, a closer look raised doubts whether this was indeed the often- and over-reproduced likeness of the Gioconda. In fact, it was Klingemann's own creation, the result of applying the recently published deep-learning model Pix2Pix to a blurry image file of Leonardo's painting.

Klingemann's version of Pix2Pix achieves what until then seemed possible only in science fiction movies like *Bladerunner*, in which a character points to a grainy CCTV image and orders the computer to "enhance" it.[1] What was previously fictitious is now reality: image enhancement makes it possible to compensate for the loss of data that occurs when an image is down-sampled to a lower resolution, and to highlight details that were not visible in the original. Indeed, Klingemann's input did not consist of the real *Gioconda*, but a blurred black-and-white version of the painting (fig. 1, center). From *this* image, in which the features of the face are all but invisible, Pix2Pix produced the output. The direct comparison with the original clearly shows the differences between Klingemann's and Leonardo's *Mona Lisa* (fig. 1, right) – notice the over-exact details, the glitchy eyelids, the flowing hair more reminiscent of a shampoo commercial than the painted likeness of a sixteenth-century Florentine woman. The output is not truly an *enhancement* of

1 This text first appeared in German as "Die 'Gestalt' der KI: Jenseits von Atomismus und Holismus," *Zeitschrift für Medienwissenschaft* 23, No. 2 (2020), pp. 168–181. It is based on a lecture I gave at the conference *Things Beside Themselves: Mimetic Existences* at the IKKM Weimar in March 2020. I would like to thank the participants for their comments, Mario Klingemann for the kind permission to reproduce his images, and Julia Pelta Feldman, Florian Sprenger, and Jana Mangold for helpful suggestions.

The architectures of neural networks are usually published as PDFs on the open access repository arXiv.org and are not peer reviewed. This allows for the fastest possible publication and makes the provided exemplary results and the code available via GitHub an additional basis for evaluation. For Pix2Pix, see: Phillip Isola et al., Image-to-Image Translation with Conditional Adversarial Networks. *ArXiv*, November 21, 2016; arxiv.org/abs/1611.07004, access: June 6, 2020.

Fig. 2: Generated portraits, *thispersondoesnotexist.com*, 2019.

the original, but a *new creation* based on a few features of its overall appearance. Pix2Pix thus does not restore details that were blurred out – by the principle of entropy, lost information remains lost – but rather, it plausibly interpolates a face from the input image by drawing on its knowledge of what faces usually look like.[2] It does this not by being fed explicit rules about which elements constitute a face – where the eyes go, what an eyebrow looks like and so on – but by learning, without any guidance, what likely constitutes "face-ness." Thus, Klingemann's painting is not a composite picture. It is not a collage, made of isolated elements, nor is it simply a mean of other faces, in the style of Francis Galton, that converges towards the features that the majority of objects of a class share by way of linear regression.[3] This is made obvious by another face-generating artificial neural network (ANN) called StyleGAN2, developed by the graphics card manufacturer NVIDIA, that is on display on the website thispersondoesnotexist.com (fig. 2). As the URL indicates, these images do not show real people. Rather, the "photos" are generated anew each time I refresh my browser window. These faces have enough individual features to suggest that they are neither a collage nor a mere collection of the most common features in a series. Whatever generates the faces in this process prioritizes the *whole* over its constituent *parts*. It seems as if Pix2Pix and StyleGAN2 have learned and then reproduced the *Gestalt* of a face.

In what follows, I would like to take up the concept of Gestalt, but neither as a technical description nor as a phenomenon of human perception, which is usually the focus of Gestalt psychology. Instead, I will talk about the conceptual preconditions that play a role in the representation and emergence of non-derivable entities in discrete systems. The term Gestalt is intended to help to

2 In this case, however, the training data set only included female faces according to Klingemann; https://twitter.com/quasimondo/status/934546438507376640, access: June 6, 2020.

3 See Suzanne Bailey, Francis Galton's Face Project: Morphing the Victorian Human. *Photography and Culture* 5, No. 2 (2012), pp. 189–214.

discuss some of the assumptions that underlie the theorization of a particular type of artificial intelligence, which is summarized under the term "deep learning" and implemented by means of multi-layer perceptrons.[4] I will argue that we should place the conceptualization of current state-of-the-art machine learning technology *beyond* or maybe *beside* the two philosophical lineages that usually are mobilized to explain the possibility or impossibility of artificial intelligence: What one can very broadly call atomistic theories on the one side and holistic theories on the other are both unfit to describe the particular type of 'Gestalt' effects Klingemann's Gioconda and the technology of its production display. Instead, it is more illuminating to speak either of a "mixed type" or of something different altogether. To make this argument, I will briefly outline the division between atomism and holism, show its appearance in the competing approaches to AI, and delve into the mechanics of deep neural nets themselves. In a final step, I will suggest that one may use the mixed type as a conceptual tool for nontechnical domains – as an intuition pump, as Daniel Dennett calls it.[5]

My use of the face as an example of Gestalt effects is no coincidence. "[T]he human face with its unequalled situative meaning"[6] is – from Georg Simmel's aesthetic unifying function, to Emmanuel Lévinas' constitutive connection of "face and ethics," to Hans Belting's image anthropology – an object of investigation with its own philosophical, art historical, and cultural genealogy.[7] As a prime example of maximally irreducible meaning, and even as an "anthropogenetic primal type" of significance in general,[8] it is particularly well suited for investigating the possible correspondences and incongruences of technical structures and life-worldly expectations of meaning.

4 Helpful for the recent discussion: Christoph Engemann and Andreas Sudmann (eds.), *Machine Learning: Medien, Infrastrukturen und Technologien der Künstlichen Intelligenz* (Bielefeld 2018), as well as the special issues of *Zeitschrift für Medienwissenschaft* 11, No. 2 (2019) and *spheres* 5, No. 5 (2019).

5 Daniel C. Dennett, *Consciousness Explained* (New York 1991), p. 440.

6 Hans Blumenberg, Prospect for a Theory of Nonconceptuality, in: *History, Metaphors, Fables: A Hans Blumenberg Reader*, ed. Hannes Bajohr, Florian Fuchs and Joe Paul Kroll (Ithaca, NY 2020), p. 242.

7 Georg Simmel, *The Aesthetic Significance of the Face, in: Essays on Art and Aesthetics*, ed. Austin Harrington (Chicago 2020), pp. 231–235; Emmanuel Lévinas, *Totality and Infinity: An Essay on Exteriority*, trans. Alphonso Lingis (Dordrecht 1991), pp. 194–219; Hans Belting, *Face and Mask: A Double History*, trans. Thomas S. Hansen and Abby J. Hansen (Princeton 2017). For a cultural studies approach, see also Thomas Macho, *Vorbilder* (Munich 2011), and Sigrid Weigel (ed.), *Gesichter: Kulturgeschichtliche Szenen aus der Arbeit am Bildnis des Menschen* (Paderborn 2013) – by the same author on the digital aspect of faciality, see Der konventionelle Code als buckliger Zwerg im Dienste der Emotion Recognition. Überlegungen zu einer Urgeschichte der digitalen Kultur, in: *Internationales Jahrbuch für Medienphilosophie* 6, no. 1 (2020), pp. 47–79; for an evolutionary approach see Terry Landau, *About Faces* (New York 1989).

8 Blumenberg, Prospect, 242.

Holism, Atomism, Gestalt

To apply the term "Gestalt" to Klingemanns Gioconda means, first, to call up the definition of Gestalt psychology, and I will talk about it in a moment. However, the relationship between parts and whole is also used metonymically beyond Gestalt theory to describe a bifurcation in the history of philosophy between two traditions or schools of thought that are usually called holism and atomism.[9]

Atomism is the belief that every object and its specific properties can be explained by breaking that object down to its constitutive elements, and that such an explanation is exhaustive. Modern adherents of atomism stand in the tradition of Gottlob Frege; Bertrand Russell's logical atomism, the picture theory of the early Wittgenstein, the logical positivism of the Vienna Circle, and the sense data theory of G. E. Moore and A. J. Ayers are the most important positions of this tradition. Atomism is, on the whole, objectivist, reductionist and empiricist. It tends to look at the semantic rather than the pragmatic dimension of knowledge, at "knowing-that" rather than "knowing-how," as Gilbert Ryle put it.[10]

Holism is the reverse belief that the properties of a thing cannot exhaustively be explained by the properties of its constitutive elements. In this line of tradition, the whole is conceptually or causally prior to its parts. Related are terms like "structure" or, in Kant's case, "system" as opposed to the atomistic "aggregate."[11] Holism in the 20th century is represented above all by the hermeneutic phenomenology of Heidegger and Merleau-Ponty as well as by the late Wittgenstein and his followers.[12] Such a holism engages less with explicit propositional than with implicit pragmatic and world-constitutive knowledge.[13]

The notion of Gestalt is holistic in

9 In the following I will limit myself to a (general) discussion of atomism and holism in philosophy. However, these terms have also been applied to many other fields (physics, biology), see Michael Esfeld, Holismus und Atomismus in den Geistes- und Naturwissenschaften: Eine Skizze, in: *Holismus und Individualismus in den Wissenschaften*, ed. Alexander Bergs and Soelve I. Curdts (Frankfurt/Main 2003), pp. 7–21; Georg Toepfer, Ganzheit, in: *Historisches Wörterbuch der Biologie* (Stuttgart 2011), pp. 693–728.

10 Gilbert Ryle, Knowing How and Knowing That. *Proceedings of the Aristotelian Society* 46, No. 1 (1946), pp. 1–16.

11 Immanuel Kant, *Prolegomena to Any Future Metaphysics*, trans. Gary Hatfield (Cambridge 2004), p. 74 (4: 322).

12 The distinction atomistic/holistic is not to be equated with the questionable distinction analytical/continental. The analytic tradition, too, has a strong anti-atomistic current, most importantly in the criticism of the sense data theory as a "Myth of the Given" in Wilfrid Sellars, *Empiricism and the Philosophy of Mind* (Cambridge, MA 1997), pp. 68–79.

13 Charles Taylor formulated an influential application of the atomism/holism separation for the theory of meaning. He contrasts the theory of meaning of the atomistic tradition, which he calls the *enframing* theory, with the theory of the holistic lineage, which he calls the *expressive-constitutive* theory. For the latter, to articulate something means to make possible the perception of this feature in the first place. One is constitutive for the other, however only because the context of this operation is not neutral, but rather already shaped by a complex background knowledge that is not propositional in nature, but is rooted in an expressive practice, in forms of life, Charles Taylor, Theories of Meaning, in: *Human Agency and Language: Philosophical Papers I* (Cambridge 1985), pp. 247–292; see also Charles Taylor, *The Language Animal: The Full Shape of the Human Linguistic Capacity* (Cambridge, MA 2016).

this sense.[14] Christian von Ehrenfels, who coined the term "Gestalt qualities" in 1890, famously noted that the perception of what constitutes a melody is a unit that cannot be reduced to the sequence of individual notes. He turned away from a mere psychology of association, which argued in a purely atomistic and causal manner.[15] The sense of sight quickly advanced to become the central field of investigation of 20th century Gestalt psychology, as it was repeatedly explained, above all, in the Berlin School around Wolfgang Köhler, Kurt Koffka, and Max Wertheimer, as well as by their second generation students, e.g., Wolfgang Metzger.[16] Köhler remarked, similar to Heidegger at the same time, that we "do not perceive an undifferentiated mosaic; rather, it is characteristic of our seeing, hearing, etc., that it constantly shows units and groups that, being in themselves solid, appear relatively isolated from their surroundings."[17] Such units, the "Gestalten," exhibit an inner coherence and stability that Wertheimer called "concisiveness" (*Prägnanz*).[18] These are not based on "independent elementary sensations" – an aggregate of atomistic sensory data – but are made up of "local conditions," which are "dependent on their affiliation, position and role in the Gestalten."[19] Further, "insight" (*Einsicht*), the sudden perception of Gestalt configurations, became a measure of intelligence in Köhler's ape experiments.[20] Such Gestalten, both as visual figures and as constellations of insight, are non-derivable units of significance that must be understood *holistically*.

One of these non-derivable units is the face. Metzger thus states that in order to perceive a face in its expressive significance, one must look at it as a whole. And while it may help to attend to the movement of the brows or the mouth, to "zoom in" any further and isolate parts is detrimental to the perception of this whole:

> *The individual pores, hairs, wrinkles of the lips, freckles, etc., which the further focusing of attention brings to light, contribute nothing more to the understanding of the face. Each of these details could also be different without changing the face. And none of them says anything about what a face is really about in life; whether it is, for example, an arrogant, domineering, hard, closed, hostile or a soft, warm, open-minded and compassionate face. These decisive features become most clearly visible, or only visible*

14 Gestalt psychology is part of the holistic line, but not all holists are followers of Gestalt theory, see for example, despite some undeniable influences, Merleau-Ponty's critique of Husserl's reception of Gestalt psychology and of Gestalt psychology itself, Maurice Merleau-Ponty, *Phenomenology of Perception* (London 2005), pp. 58–9.

15 Christian von Ehrenfels, On "Gestalt Qualities" [1890], in: *Foundations of Gestalt Theory*, ed. Barry Smith (Munich 1988), pp. 82–116.

16 On the history of Gestalt psychology (including its history of emigration and collaboration under National Socialism), see Mitchell G. Ash, *Gestalt Psychology in German Culture, 1890–1967: Holism and the Quest for Objectivity* (Cambridge 1995). Exemplary for the focus on the sense of sight is Wolfgang Metzger, *Laws of Seeing* [1936], trans. Lothar Spillmann (Cambridge, MA 2006).

17 Wolfgang Köhler: Bemerkungen zur Gestalttheorie. *Psychologische Forschung* 11, no. 1 (1928), pp. 188–189.

18 Max Wertheimer, Untersuchungen zur Lehre von der Gestalt II. *Psychologische Forschung* 4, no. 1 (1923), pp. 301–350.

19 Köhler, Bemerkungen, p. 189.

20 Wolfgang Köhler, *Mentality of Apes* (New York 1927).

> *at all, when viewed as a whole [als ganzes] from a sufficient distance.*[21]

If Pix2Pix and StyleGAN2 are able to derive faces as wholes, as Gestalten seen from a distance, might it make sense to assume that they are based on a holistic logic? But how should a digital system that is based on the symbolic operation of discrete signs and, not least of all, makes use of a discrete pixel matrix (which is nothing other than Köhler's "mosaic") create non-derivable units? To answer this question, one has to take a look at the history of AI systems, of which ANNs are just one paradigm, and at the concepts underlying them.

Gestalt vs. AI

The classic account of the history of AI highlights its emergence as a research field in the 1940s and 1950s in the United States. It appeared in a climate of neobehaviorist, reductionist, and empiricist psychology, which entered into a productive confluence with the methods and concerns of cybernetics. The Macy Conferences between 1946 and 1952, the Hixon Symposium in 1948, and particularly the Dartmouth Workshop on Artificial Intelligence in 1956 are important milestones in this history. Especially the last, organized by Marvin Minsky and John McCarthy, established AI research as an independent field and determined the parameters under which it would be pursued in the years to follow.[22]

The distinction between two types of AI, symbolic and subsymbolic – which is still in use today – has its origin in this workshop.[23] The symbolic approach, favored heavily at Dartmouth,[24] is the most classically atomist attempt at creating AI. It conceives reasoning as the manipulation of symbols representing atomic facts. The symbolic approach was implemented in so-called expert systems, which combine a knowledge base of such facts with an inference engine containing rules that allow it to draw conclusions from the combination of these facts.[25] Expert systems initially showed great promise, but their development came to a standstill in the 1970s during the first "AI winter," in which AI research

21 Wolfgang Metzger, Was ist Gestalttheorie?, in: *Gestalttheorie und Erziehung*, ed. Kurt Guss (Darmstadt 1975), pp. 2–3.

22 Proceedings are available for the former: Claus Pias (ed.), *Cybernetics: The Macy-Conferences 1946–1953* (Zurich 2003); Lloyd A. Jeffress (ed.), *Cerebral Mechanisms in Behavior: The Hixon Symposium* (New York 1951). The Dartmouth Workshop did not see a publication of its own, however see Ronald R. Kline, Cybernetics, Automata Studies, and the Dartmouth Conference on Artificial Intelligence. *IEEE Annals of the History of Computing* 33, no. 4 (2011), pp. 5–16. For a, somewhat limited, historical overview, see Nils J. Nilsson, *The Quest for Artificial Intelligence: A History of Ideas and Achievements* (Cambridge 2010); Steve Joshua Heims, *The Cybernetics Group 1946–1953: Constructing a Social Science for Postwar America* (Cambridge, MA 1991).

23 For a very useful overview, see Melanie Mitchell, *Artificial Intelligence: A Guide for Thinking Humans* (New York 2019), pp. 17–34.

24 However, the conference proposal already envisaged research on "neuron nets," see John McCarthy et al., A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence. *AI Magazine* 27, no. 4, 2006, pp. 12–14.

25 The most influential system of this kind was the General Problem Solver (GPS), Allen Newell, J. C. Shaw and H. A. Simon, Report on a General Problem-Solving Program, in: *Proceedings of the International Conference on Information Processing* (Paris1959), pp. 256–264.

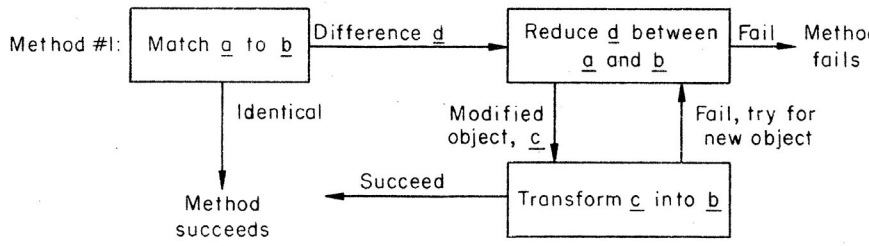


Fig. 3: Flow chart of a method for "means-ends analysis" in Allen Newell, John C. Shaw and Herbert A. Simon, Report on a General Problem-Solving Program, in: *Proceedings of the International Conference on Information Processing* (Paris: UNESCO, 1959), pp. 256–264.

virtually ground to a halt.[26]

Today's ANNs like Pix2Pix and StyleGAN2 do not belong to the symbolic but to the subsymbolic family of AI, which is, abstractly, based on the model of the brain as a network of neurons and synapses. Building on the preliminary work of Warren McCulloch and Walter Pitts, Frank Rosenblatt designed the perceptron in 1958, the first artificial neural network capable of recognizing simple visual patterns.[27] While "learning" in expert systems means the expansion of the knowledge base, perceptrons are dependent on repetitions within the domain to be learned; whereas the expert system follows linear if-then structures (fig. 3), the architecture of the perceptron has a parallel structure and does not require the separation of facts and rules (fig. 4). Already in its structure, the paradigm of the symbolic AI follows an atomistic logic, while the paradigm of the subsymbolic AI approaches a holistic or Gestalt logic.[28]

This difference was obvious from the start. As David Bates and Steve Joshua Heims have shown, American AI research, after a brief initial interest, soon became hostile to the Gestaltist ideas.[29] In a 1951 review of Norbert Wiener's book *Cybernetics*, Wolfgang Köhler – who had participated in the 1948 Hixon Symposium alongside AI pioneer Warren McCulloch – spoke out against the idea of the computer as a useful analogy for human intelligence because the former, as a discretely operating system, lacked the creative "insight" of the latter.[30] He

26 See Pamela McCorduck, *Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence* (Natick 2004), pp. 417–521.

27 Frank Rosenblatt, The Perceptron: A Probabilistic Model for Information Storage and Organization in the Brain. *Psychological Review* 65, no. 6 (1958), pp. 386–408; Nilsson, T*he Quest for Artificial Intelligence*, 64–74; see also Matteo Pasquinelli, Machines that Morph Logic: Neural Networks and the Distorted Automation of Intelligence as Statistical Inference. *Glass Bead* 1, no. 1 (2017); www.glass-bead.org/article/machines-that-morph-logic, access: June 6, 2020.

28 Taking the technical difference between the two approaches as a starting point, I also develop aesthetic criteria for comparing the artworks they produce, see Hannes Bajohr, Algorithmic Empathy: On Two Paradigms of Digital Generative Literature and the Need for a Critique of AI Works. *BMCCT working papers* 1, no. 4 (2020); https://doi.org/10.5451/unibas-ep79106.

29 See in particular the excellent study by David Bates: Creating Insight: Gestalt Theory and the Early Computer, in: *Genesis Redux. Essays in the History and Philosophy of Artificial Life*, ed. Jessica Riskin (Chicago 2007), pp. 237–260; Heims, *The Cybernetics Group 1946–1953*, 201–247; Wolfgang Köhler, Relational Determination in Perception, in: Jeffress (ed.): *Cerebral Mechanisms in Behavior*, pp. 200–243.

30 Wolfgang Köhler, review of *Cybernetics, or Control and Communication in the Animal and the Machine*, by Norbert Wiener. *Social*

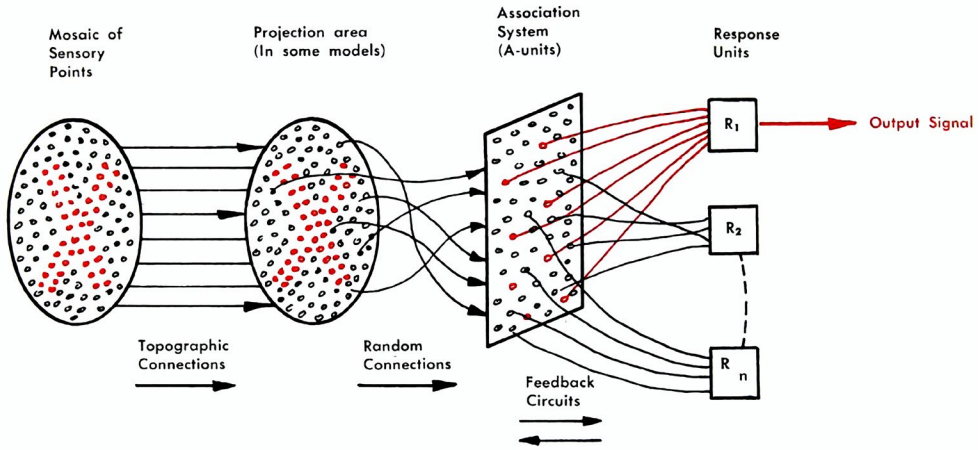


Fig. 4: Frank Rosenblatt, The Design of an Intelligent Automaton. *Research Trends* 6, no. 2 (1958), pp. 1–7.

saw the atomistic psychology of the AI researchers as a return to the empiricist psychology of the 19th century, which Gestalt psychology had initially sought to replace.[31] Nevertheless, the subsymbolic models, such as Rosenblatt's perceptron, soon lost out to the symbolic approach. Marvin L. Minsky and Seymour Papert, two of the most important symbolists, published a (factually incorrect) critique of the perceptron in 1969 that cast it aside until the 1980s.[32] They formulated their objections as a defense of an atomistic against an "unscientific" holistic theory of knowledge – a reversal, as it were, of Köhler's reservations – intending "to dispel what we feared to be the first shadows of a 'holistic' or 'Gestalt' misconception that would threaten to haunt the fields of engineering and artificial intelligence as it had earlier haunted biology and psychology."[33]

One of the first *philosophers* to formulate a holistically informed critique of the symbolists was the late Hubert L. Dreyfus. In a series of essays and in his book *What Computers Can't Do* (1972), he argued that the symbolic approach is fundamentally incapable of producing human-like intelligence.[34] Dreyfus mobilized a number of holistic arguments. His central point was that humans not only possess an embodied

Research 18, no. 1 (1951), pp. 125–130.

31 Bates, *Creating Insight*, pp. 239–249.

32 Marvin L. Minsky and Seymour Papert, *Perceptrons: An Introduction to Computational Geometry* (Cambridge, MA 1969).

33 Minsky and Papert, *Perceptrons*, pp. 19–20.

34 Hubert L. Dreyfus: *What Computers Can't Do: A Critique of Artificial Reason* (New York 1972). Symbolism, according to Dreyfus, is based on a number of atomistic assumptions: the *biological* assumption that the brain can be identified with a digital computer, the *ontological assumption* that the world consists of isolatable facts, and the *epistemological assumption* that the mind processes such facts. For such an atomism, thinking can be formalized by explicit rules – knowing-how can be expressed as knowing-that, Dreyfus, *What Computers Can't Do*, 67–142. See in general on Dreyfus's approach Setargew Kenaw, Hubert L. Dreyfus's Critique of Classical AI and its Rationalist Assumptions. *Minds and Machines* 18, no. 2 (2008), pp. 227–238.

intelligence, but also draw on a tacit, implicit background knowledge that is constitutive for action – they perceive and cognize from their embeddedness within a given situation. Here, Dreyfus (not by chance one of America's most important interpreters of Heidegger) appropriated Being-in-the-world as "being-in-a-situation."[35] The way humans intelligently interact with the world is more often, as Charles Taylor (an important ally of Dreyfus) interprets Heidegger, based on "task-rightness," situational appropriateness, than on semantic rightness, the logically formalizable congruence of data and abstract world model.[36] One could only attribute intelligence to a computer possessing this implicit background knowledge, which can only be gained through actually encountering the world via "being-in-a-situation." For Dreyfus the conclusion is that "being-in-a-situation turns out to be unprogrammable in principle using presently conceivable techniques."[37]

This objection was convincing as long as atomistic assumptions formed the basis of the "presently conceivable techniques" of AI research. However, Dreyfus was less certain in his criticism when it came to the architecture of the perceptron. When ANNs, which are in essence multi-layered perceptrons, regained popularity in the 1980s,[38] Dreyfus also admitted that they came closer to a holistic notion of perception. But he remained skeptical as to whether they were really suitable as a building block of artificial machine intelligence.[39]

However, if the capabilities of today's ANNs are taken into account, even Dreyfus would have had to admit that progress has been made in principle, not just in degree. In *What Computers Can't Do* he had listed a series of tasks that a system would have to master in order to be considered intelligent. One of the most important of these was a version of the Gestalt problem that he called "perspicuous grouping," by which he meant the ability to form series of objects on the basis of similarities between them – to grasp their collective Gestalt, so to speak. In addition to Wittgenstein's concept of family resemblance, he used Köhler's

35 Dreyfus, *What Computers Can't Do*, p. 200.

36 Charles Taylor, Heidegger on Language, in: *A Companion to Heidegger*, ed. Hubert L. Dreyfus and Mark A. Wrathall (London 2007), pp. 435–436.

37 Dreyfus, *What Computers Can't Do*, p. 215.

38 They did so after the publication of David E. Rumelhart, James L. McClelland, PDP Research Group: *Parallel Distributed Processing: Explorations in the Microstructure of Cognition* (Cambridge, MA 1986), which corrected Minsky's and Papert's misrepresentations – especially the alleged inability of perceptrons to model the exclusive disjunction (XOR). Dreyfus' brother Stuart was partly responsible for allowing this new generation of neural nets to "learn" by co-developing the backpropagation algorithm that efficiently calculates the gradients of the loss function through which the weights of the network can be adjusted iteratively.

39 Hubert L. Dreyfus and Stuart E. Dreyfus, Making a Mind versus Modeling the Brain: Artificial Intelligence Back at a Branchpoint. *Daedalus* 117, no. 1 (1988), pp. 15–43: "Neural network modeling may simply be getting a deserved chance to fail, as did the symbolic approach" (37). One contemporary position stating exactly can be found in Brian Cantwell Smith, *The Promise of Artificial Intelligence: Reckoning and Judgment* (Cambridge, MA 2019). Most recently, Dreyfus gets an update in Ragnar Fjelland, Why General Artificial Intelligence Will Not Be Realized. *Humanities and Social Sciences Communications* 7, no. 10 (2020); https://doi.org/10.1057/s41599-020-0494-4, access: October 10, 2020.

notion of insight to describe such group schemes. Family resemblances as well as collective Gestalten cannot be grasped by counting up atomistic properties and comparing lists of characteristics:

> *Patterns as complex as artistic styles and the human face reveal a loose sort of resemblance which seems to require a special combination of insight, fringe consciousness, and ambiguity tolerance beyond the reach of digital machines.*[40]

This brings us back to the face and again to the question: If the Gestalt of a face, its family resemblance with other faces, cannot be conceptualized by a digital machine or summarized as a list of features, how is an ANN, executed on a digital machine, capable of doing this?

Gestalt as latent space

At this point it is necessary to take a step back again. For Dreyfus's overriding focus – human-like artificial intelligence – is irrelevant to answering the question posed. As Matteo Pasquinelli points out, ANNs are aimed not so much at simulating cognition but perception.[41] Today, it is mainly "deep" ANNs that show their capabilities in pattern recognition tasks. Indeed, Dreyfus's "perspicuous grouping" is only a particularly demanding type of such pattern recognition able to detect family resemblance without having explicit knowledge about it. Rosenblatt's perceptron was modeled after the optic nerve of the eye, not the cerebrum, and was composed of three main elements: the input layer, a hidden layer and the output layer. Modern ANNs, deep neural networks, still follow this structure, but possess a multitude of hidden layers, which consist of artificial "neurons" that act as logical gates and are connected by "synapses." These synapses in turn have an influence on the activation strength of the next neuron by being weighted in the training process.[42] The goal of a neural net is to create a function that fits the input data onto a desired output, and apply this function to future inputs to predict their outputs. As far as StyleGAN2 is concerned, the ANN is here trained to output variations of its input: its input being a large set of faces, while its output consists of new faces. In fact, StyleGAN2 and, to a certain extent, Pix2Pix, use a special architecture of ANNs, a generative adversarial network (GAN), in which these processes are separated but the basic structure is the same.[43]

40 Dreyfus, *What Computers Can't Do*, 32. It is astonishing how rarely the proximity of Gestalt psychology to neural networks in particular is investigated. An exception is Uwe Seifert, Randolph Eichert, Lüder Schmidt, Logic, Gestalt Theory, and Neural Computation in Research on Auditory Perceptual Organization, in: Marc Leman (ed.), *Music, Gestalt, and Computing: Studies in Cognitive and Systematic Musicology* (Berlin 1997), pp. 70–88.

41 Pasquinelli, Machines that Morph Logic. ANNs are, using John Searle's distinction, still examples of a weak, not a strong AI, John R. Searle, Minds, Brains, and Programs. *Behavioral and Brain Sciences* 3, no. 3 (1980), pp. 417–457.

42 See for this and in the following: Pedro Domingos, *The Master Algorithm: How the Quest for the Ultimate Learning Machine Will Remake Our World* (New York 2015), pp. 93–120; Ethem Alpaydin, *Machine Learning: The New AI* (Cambridge, MA 2016), pp. 85–110.

43 See for the original formulation of the GAN architecture Ian Goodfellow et al., Generative Adversarial Networks. *ArXiv*, June 6,

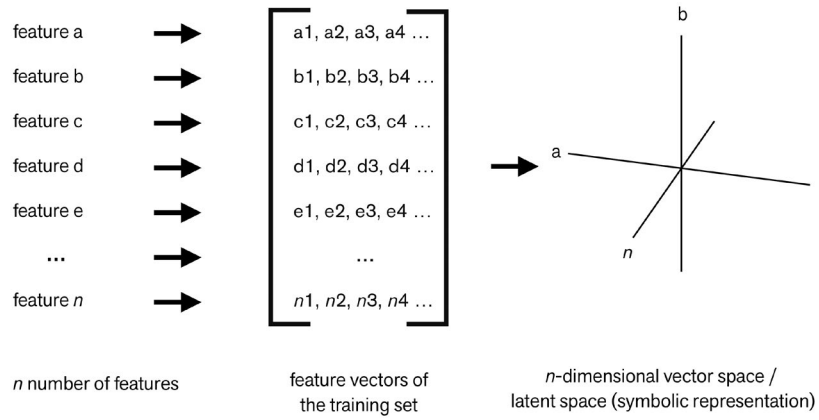


Fig. 5: Feature extraction and latent space mapping.

However, the data on the basis of which this function is generated must first be prepared for processing and a limited number of features must be selected from all possible features present. In supervised learning techniques, this is done manually by the programmer, for example when images in a data set of portraits are marked depending on whether a person is smiling or not. With unsupervised learning, on the other hand, such features are found automatically by the ANN. Each of the layers of the ANN is tasked with extracting salient patterns – *Prägnanz*, one could say – from the input of the previous layer. Since this happens progressively between layers, a process of abstraction is at work: The first layer may look at a combination of a few pixels, and then pass the result on to the next layer, which now looks at a combination of a combination of pixels, and so on. And while the first layer may only detect edges (high contrast between pixels), the second layer already groups edges into simple shapes (straight lines or curves), the third into parts of objects, the fourth into objects, and so on.[44] The n features derived from the input are mapped onto an *n*-dimensional vector space (fig. 5). In this vector space, it is possible to calculate the interdependence of all features and to reduce the number of features to a lower-dimensional space or "latent space." This process of abstraction is called dimensionality reduction and "it reduces a large number of visible [or explicit] dimensions (the pixels) to a few implicit ones (expression, facial features)."[45]

In the case of faces, mapped onto two dimensions, one could imagine the latent space as shown in fig. 6. The model can now recreate the explicit dimensions of the input from the implicit ones available in the model. This is what Pix2Pix does when it interpolates the facial features of

2014; arxiv.org/abs/1406.2661, access: June 6, 2020.

44 See Yann LeCun, Yoshua Bengio and Geoffrey Hinton, Deep Learning. *Nature* 521 (May 2015), pp. 436–444; Alpaydin, *Machine Learning*, pp. 75 and 99–100.

45 Domingos, *The Master Algorithm*, p. 211.

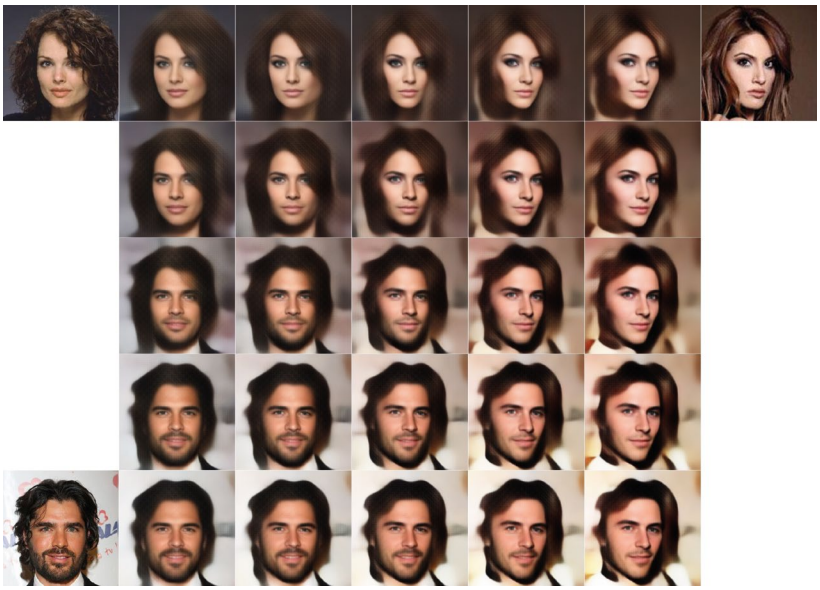


Fig. 6: Example for latent space interpolation. Top left: the input image; top right: the first target image; bottom left: the second target image; the remaining images are the interpolations of the model. Visualization as J-Diagram in a paper by Tom White, 2016, https://arxiv.org/pdf/1609.04468.pdf

the blurred input image and fills its gaps with the probable states from its model. It can also, simply by randomly selecting feature values, produce new outputs from the dimensions of the latent space. In this way, StyleGAN2 generates a new face every time I refresh thispersondoesnotexist.com. What both operations have in common is that their basis is the *overall structure* of what is modeled – in this case, a face.[46]

"Quasi-analog" and "quasi-holistic"

With regard to Dreyfus's criterion of "perspicuous grouping," these capabilities of deep neural nets seem impressive indeed. While no single one of the extracted features here represents a face as such, one may argue that "face-ness" – the abstraction that is the overall Gestalt of a face – is located in the totality of the latent space itself.

There are a few points that support this observation: First, as indicated, an ANN does not contain any explicit knowledge. Unlike in the case of knowledge base and inference engine, a neural

46 Another way to imagine the latent space is as a series of slide controls for changing any feature of the face – from the overall color tone to the direction of the light source to the facial expression – containing all degrees of abstraction that have taken place during feature extraction. It is also possible to "travel" through this high-dimensional latent space ("manifold traversal") and to interpolate any possible configuration, Robert Luxemburg, StyleGAN2 Interpolation Loop, December 12, 2019; youtube.com/watch?v=6E1_dgYlifc, access: June 5, 2020.

network's "knowledge" is not localized in some particular place, but is distributed throughout the whole system as a statistical dependency.[47] ANNs thus generalize without forming concepts.[48] Secondly, a neural network does not follow the paradigm of logical deduction or explicitly stated rules that are executed sequentially; rather, it operates by statistical induction, and it is the system as a whole that does the computing.[49] Third, one could therefore argue that neural networks do not only produce outputs that humans perceive as Gestalten, but that, as statistical models, they internally already operate according to a Gestalt logic – producing neither a mere collage nor just a mean of existing images.

From all this, it appears that ANNs cannot plausibly be described as atomistic. However, they possess a number of characteristics that disqualify them from being considered truly holistic. First, the network, at least on the operational level, is still hierarchically structured: Even if the resulting latent space contains more or less abstract features, in the process of abstraction it nevertheless proceeds from parts to wholes, and not the other way around. Second, the fact that neural networks do not use symbolic representation does not mean that they do not use any representation at all; statistical models, too, represent. Third, the latent space can show any possible interpolation of a face. However, what is possible is dependent on the breadth of features present in the training set as well as on the selection of features, which may exclude some that could be relevant; dimensionality reduction is, after all, reductive. Thus, beyond the "face-ness" stored in the latent space, there would still be faces that humans would recognize as such which the model could not interpolate. And finally, one may argue that a central feature of the Gestalt concept is that it implies an understanding rather than just a recognition of the thing. Metzger held that a Gestalt says something "about what a face is really about in life," whether it is arrogant or friendly and so on; of course, this knowledge is not represented in the latent space of the model. At this point the distinction between perception and cognition becomes blurry again.[50] This either brings us back to Dreyfus's doubt about whether a strong AI is possible at all, or draws our attention to the fact that even with a weak AI, and even if it learns unsupervised, there is cognition at play that is encoded in the parameters set by humans – that no training is truly unsupervised.[51]

ANNs can therefore neither be con-

47 Pasquinelli, Machines that Morph Logic; Andreas Sudmann, Szenarien des Postdigitalen: Deep Learning als MedienRevolution, in: Engemann, Sudmann (ed.), *Machine Learning*, pp. 66–68.

48 If each layer provides an abstraction of the features of the previous layer, this is not yet conceptual work and does not result in a theory, Dreyfus and Dreyfus, Making a Mind versus Modeling the Brain, p. 36.

49 Pasquinelli points out that Rosenblatt himself in *Principles of Neurodynamics* already considered this whole as an emergent quality in the sense of Gestalt.

50 This is also pointed out in Smith, *Promise*, pp. 7, 24–27 and 56–7.

51 See Matteo Pasquinelli: How a Machine Learns and Fails – a Grammar of Error for Artificial Intelligence. *spheres* 5, no. 5 (2019), spheres-journal.org/how-a-machine-learns-and-fails-a-grammar-of-error-for-artificial-intelligence; access: June 5, 2020.

ceptualized as completely atomistic nor as completely holistic. They seem to be something in between. John von Neumann called this in-between a "mixed system." Von Neumann coined the term in 1958 when, in his posthumous book *The Computer and the Brain*, he discussed the differences and similarities between the titular nervous system and the digital automaton. Von Neumann believed that the brain transmits information digitally between synapses, and that its make-up was fundamentally one of discrete states. But while the computer, as an instance of Turing's Universal Machine, is serial and deterministic, the brain has a parallel structure and its operations are based on statistical states. The brain is therefore a "mixed system."[52] While neuroscientists today are cautious about calling the operations of the brain digital, von Neumann's "mixed system" describes ANNs rather well.

German media theorist Andreas Sudmann recently elaborated this conclusion in more detail. He emphasizes that neural networks are still based on the digital architecture named after von Neumann, which is based on analog structures. They also function in parallel rather than serially. While their "neurons," as logical gates, indeed operate discretely, the weights distributed in their "synapses" are not binary states but are rather stored as floating-point numbers. Because of this, Sudmann proposes to call ANNs neither completely digital nor completely analog, but "postdigital" or – more clearly, as I think – "quasi-analog."[53]

If "quasi-analog" denotes the technical structure of modern artificial neural networks, "quasi-holistic" would be the term to describe their conceptualization. Neural networks neither completely follow the atomistic paradigm, nor are they really holistic. They are, conceptually speaking, a quasi-holistic mixed system and combine properties of both paradigms. ANNs clearly show that the distinction between atomism and holism is too rigid to really capture this phenomenon adequately. This would require a third class.

One concept that comes into question for such a third option is that of "assemblage." Following Gilles Deleuze and Félix Guattari's notion of "agencement" – which has been translated into English as "assemblage" – Manuel DeLanda proposed this term to conceptualize something between the atomistic and the holistic approach. If "atomism" describes wholes as mechanical aggregates of isolated elements, "holism" denotes "relations of interiority" in which each element is in an organic constitutive relationship to the whole. In contrast to both, DeLanda interprets assemblages as characterized by "relations of exteriority."[54] An assemblage still forms a whole with properties

52 John von Neumann, *The Computer and the Brain* (New Haven 1958), pp. 58–60.

53 Sudmann, Szenarien des Postdigitalen, p. 66. The term "post-digital" for quasi-analog structures is an unhappy choice, I believe, since it already means so many other things that a further extension is not desirable, see Hannes Bajohr, Experimental Writing in its Moment of Digital Technization: Post-Digital Literature and Print-on-Demand Publishing, in: *Publishing as Artistic Practice*, ed. Annette Gilbert (Berlin 2016), pp. 100–115.

54 Manuel DeLanda, *A New Philosophy of Society: Assemblage Theory and Social Complexity* (London 2006), pp. 9–10.

that are not necessarily present in its elements – but the elements also retain a degree of autonomy for which the holistic view does not allow. For this reason, according to DeLanda, assemblages exhibit nonlinear causalities that are rather statistical than deterministic in nature. While his example is a chemical process like catalysis, the weight model of a neural network would be another case of nonlinear and statistical behavior.[55] Although one may not agree with DeLanda in everything, one must concede that the term assemblage is at least *one* candidate for describing a third option between holism and atomism that is already available. Thus understood, an artificial neural network is, as Deleuze and Guattari put it in *A Thousand Plateaus*, quite literally a "machine … to produce faces."[56]

Addendum: Reversing the Perspective – ANNs as "intuition pumps"

In my discussion of the Gestalt properties of artificial neural networks, I have tried to extract conceptual assumptions from a technical system, which I called quasi-holistic assemblages. However, I find it likewise possible and possibly productive to take the reverse route: The assemblage-like, quasi-analog, quasi-holistic view of ANNs can serve as an "intuition pump,"[57] as Daniel Dennett called it, to rethink some more traditional problems of non-atomistic concepts.

The face serves as the leitmotif of this essay, but in the citation quoted above, Hubert L. Dreyfus also assigned *style* to the domain of Gestalt recognition.[58] In fact, style – where it is not understood in a purely formalistic way – is often thought of as an irreducibly holistic phenomenon, which may be hermeneutically accessible but is opposed to the atomistic listing of features.[59] However, StyleGAN2 already brings ANNs and at least visual style together. It not only encodes a quasi-holistic statistical mod-

55 Ibid., 13–15.

56 Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* (Minneapolis 1987), pp. 173.

57 Dennett, *Consciousness Explained*, p. 440.

58 Dreyfus, *What Computers Can't Do*, p. 32.

59 Style as a perceptual phenomenon with an irreducible subjective quality that resists quantification is described ironically but concisely by George Kubler: Style, he writes, is "like a rainbow. It is a phenomenon of perception governed by the coincidence of certain physical conditions. We can see it only briefly while we pause between the sun and the rain, and it vanishes when we go to the place where we thought we saw it." George Kubler, *The Shape of Time: Remarks on the History of Things* (New Haven 1962), p. 129. For a historical overview see Hans Ulrich Gumbrecht, Schwindende Stabilität der Wirklichkeit: Eine Geschichte des Stilbegriffs, in: *Stil: Geschichten und Funktionen eines kulturwissenschaftlichen Diskurselements*, ed. Hans Ulrich Gumbrecht and K. Ludwig Pfeiffer (Frankfurt/Main 1986), pp. 726–788. The semiotic theory of style emphasizes its constitutive expressiveness, which is rooted in life forms, see for example Dick Hebdige, *Subculture: The Meaning of Style* (London 1979). The difficulty of defining and cataloguing style is best illustrated in Susan Sontag, Notes on Camp, in: *Against Interpretation and Other Essays* (New York 1978), pp. 275–292.

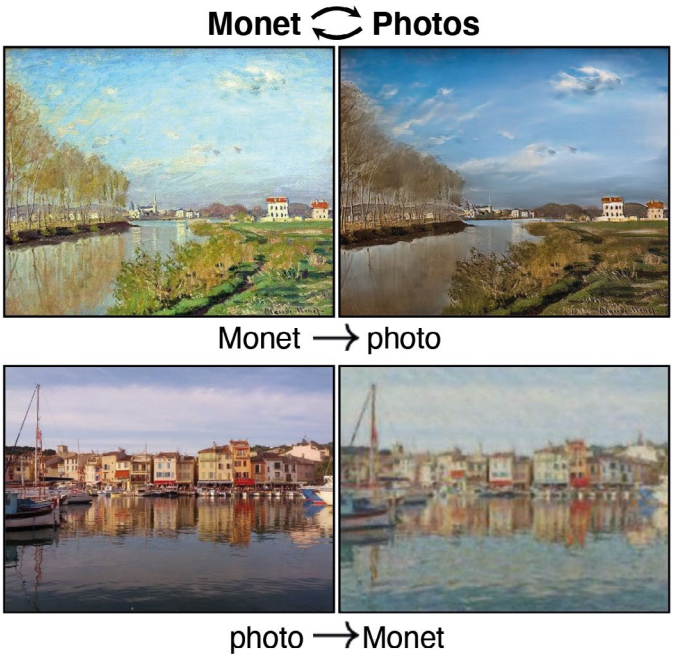


Fig. 7: Style transfer with CycleGAN; from a paper by Jun-Yan Zhu et al., 2018. https://arxiv.org/abs/1703.1059.

el of faces, but also makes it possible to transfer a certain configuration of a latent space – a "style" – to another image by first extracting the specific feature distribution of the input and then mapping it to the feature vectors of the reference image. This method is also used by another GAN implementation called CycleGAN, which transposes styles of certain painters onto photos and vice versa (fig. 7).[60]

This process suggests that "style," understood as a Gestalt-like family resemblance, need not necessarily be a purely irreducible, holistic affair. This is not to say that style can be quantified entirely in an atomistic, empirical manner, as stylometry attempted to do in the 1970s and as the digital humanities do today, nor does it mean an easy separation of form and content in the sense of a mere *ornatus*. But to rethink style not as a truly holistic, but only as a quasi-holistic concept – as an assemblage with *some* moving parts that to *some extent* can be pinned down – could make it possible to reassess this concept so often treated as suspect.[61]

60 Jun-Yan Zhu et al., Unpaired Image-to-Image Translation using Cycle-Consistent Adversarial Networks. *ArXiv*, March 30, 2017, arxiv.org/abs/1703.10593; access: June 6, 2020. Corresponding attempts for textual style transfer are less powerful, see Xiangyang Li et al., Review of Text Style Transfer Based on Deep Learning. *ArXiv*, May 6, 2020, arxiv.org/abs/2005.02914; access: June 6, 2020, although the more advanced approaches in GPT-2 and, although not open-source, GPT-3 suggest that great strides are possible here.

61 It would be possible, for example, to understand Ernst Gombrich's answer to "the riddle of style," the "schema," as a quasi-holistic assemblage. Gombrich, too, argues nonatomistically, since the knowledge of schemata is still restricted to humans, i.e. to systems that already process Gestalten, see Ernst H. Gombrich: *Art and Illusion* (London 1961), pp. 3, 60. I thank Jana Mangold

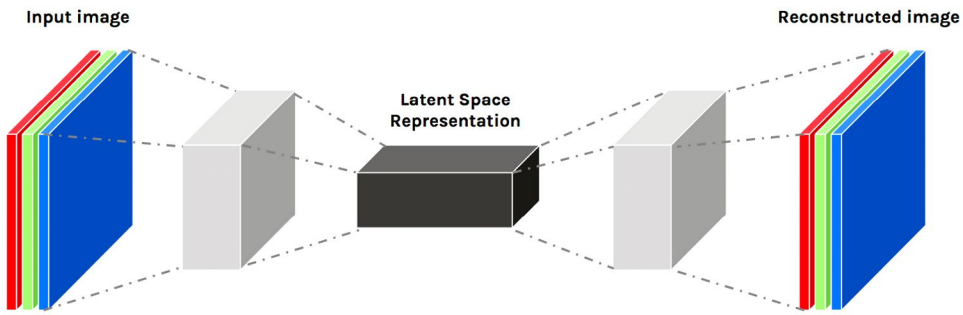


Fig. 8: Symbolic depiction of an autoencoder; from Grietzer, A Theory of Vibe, https://www.glass-bead.org/article/a-theory-of-vibe

Another of those seemingly irreducible holistic terms is "mood."[62] The fact that it also plays a role in Heidegger's existential analysis and is thus firmly anchored in the holistic tradition makes this case particularly interesting. In his essay "A Theory of Vibe," the literary scholar and mathematician Peli Grietzer has approached ANNs as conceptualization models. Grietzer uses a specific neural network, the autoencoder (fig. 8), as an intuition pump for the holistic concept of mood – or, as he prefers to call it, "vibe."[63] An autoencoder is a very simple type of neural net that is trained to exactly output its inputs. However, since its hidden layers are "smaller" than the outer layers, and the data passes through a bottleneck of maximum dimensional reduction, the auto-encoder compresses the characteristics of the input to an extreme degree before restoring them.

If one now imagines, according to Grietzer's thought experiment, that a set of aesthetic objects is compressed in this way so that it can be reproduced without error, the compression model would simply consist of a list of possible variations of its general features. This, as a collective, Grietzer describes as "vibe." The vibe is present in all aesthetic objects of this set, but never in its pure form – while they are complex on their own, they are collectively simple. Although we can imagine the vibe in this way through the metaphor of the autoencoder, it is never encountered on its own: "A vibe is … an abstractum that cannot be separated from its concreta." This is, he argues, a reversal of Goethe's symbol understood as concretum that expresses an abstraction. For Grietzer, vibe describes a particularly modernist, materialist quality of aesthetic works: instead of representing something abstract concretely (symbolism), the "canon" of a modernist work discloses a vibe and represents abstrac-

for the reference. For a practical application of a "neural reading" of poetry and its style, see Boris Orekhov and Frank Fischer, Neural Reading: Insights from the Analysis of Poetry Generated by Artificial Neural Networks. *Orbis Litterarum* 75, no. 5 (2020), pp. 230–46.

62 See Hans Ulrich Gumbrecht, *Atmosphere, Mood, Stimmung: On a Hidden Potential of Literature* (Stanford 2012).

63 Peli Grietzer, A Theory of Vibe. *Glass Bead* 1, no. 1 (2017), www.glass-bead.org/article/a-theory-of-vibe; access: June 6, 2020.

tion through the repetition of structural similarities present in all of the canon's works. Conversely, grasping a real-world vibe through its idealization as the vibe of a literary work – an obvious example is the Kafkaesque – is itself a type of mapping that takes place in an autoencoder; the reader, too, encodes.[64]

Like the double face of the Gioconda with which this text began, style and mood are examples of how phenomena usually understood in a holistic way can also be thought of as quasi-holistic assemblages. Even though I could only give a sketch of this idea here, these forms point to a whole host of areas in which the strange third position of ANNs – beyond the dichotomy of holism and atomism – not only denotes a technology, but can be a conceptual tool in its own right.

64 Grietzer, "A Theory of Vibe." See in more detail: Peli Grietzer, *Ambient Meaning: Mood, Vibe, System*, PhD Diss., Harvard University, 2017.

References

Alpaydin, Ethem, *Machine Learning: The New AI* (Cambridge, MA: MIT Press, 2016), pp. 85–110.

Ash, Mitchell G., *Gestalt Psychology in German Culture, 1890–1967: Holism and the Quest for Objectivity* (Cambridge: Cambridge University Press, 1995).

Bailey, Suzanne, Francis Galton's Face Project: Morphing the Victorian Human. *Photography and Culture* 5, no. 2 (2012), pp. 189–214.

Bajohr, Hannes, Algorithmic Empathy: On Two Paradigms of Digital Generative Literature and the Need for a Critique of AI Works. *BMCCT working papers* 1, no. 4 (2020); https://doi.org/10.5451/unibas-ep79106.

Bajohr, H., Die "Gestalt" der KI: Jenseits von Atomismus und Holismus. *Zeitschrift für Medienwissenschaft* 23, no. 2 (2020), pp. 168–181.

Bajohr, H., Experimental Writing in its Moment of Digital Technization: Post-Digital Literature and Print-on-Demand Publishing, in: *Publishing as Artistic Practice*, ed. Annette Gilbert (Berlin: Sternberg, 2016), pp. 100–115.

Bates, David, Creating Insight: Gestalt Theory and the Early Computer, in: *Genesis Redux. Essays in the History and Philosophy of Artificial Life*, ed. Jessica Riskin (Chicago: University of Chicago Press, 2007), pp. 237–260.

Belting, Hans, *Face and Mask: A Double History*, trans. Thomas S. Hansen and Abby J. Hansen (Princeton: Princeton University Press, 2017).

Blumenberg, Hans, Prospect for a Theory of Nonconceptuality, in: *History, Metaphors, Fables: A Hans Blumenberg Reader*, ed. Hannes Bajohr, Florian Fuchs and Joe Paul Kroll (Ithaca, NY: Cornell University Press, 2020).

DeLanda, Manuel, *A New Philosophy of Society: Assemblage Theory and Social Complexity* (London: Continuum, 2006).

Deleuze, Gilles, and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* (Minneapolis: University of Minnesota Press, 1987).

Dennett, Daniel C., *Consciousness Explained* (New York: Little, Brown, and Co., 1991).

Domingos, Pedro, *The Master Algorithm: How the Quest for the Ultimate Learning Machine Will Remake Our World* (New York: Penguin, 2015).

Dreyfus, Hubert L., and Stuart E. Dreyfus, Making a Mind versus Modeling the Brain: Artificial Intelligence Back at a Branchpoint. *Daedalus* 117, no. 1 (1988), pp. 15–43.

Dreyfus, H. L., *What Computers Can't Do: A Critique of Artificial Reason* (New York: Harper & Row, 1972).

von Ehrenfels, Christian, On "Gestalt Qualities" [1890], in: *Foundations of Gestalt Theory*, ed. Barry Smith (Munich: Philosophia, 1988), pp. 82–116.

Engemann, Christoph, and Andreas Sudmann (eds.), *Machine Learning: Medien, Infrastrukturen und Technologien der Künstlichen Intelligenz* (Bielefeld: Transcript, 2018)

Esfeld, Michael, Holismus und Atomismus in den Geistes- und Naturwissenschaften: Eine Skizze, in: *Holismus und Individualismus in den Wissenschaften*, ed. Alexander Bergs and Soelve I. Curdts (Frankfurt/Main: Lang, 2003), pp. 7–21

Fjelland, Ragnar, Why General Artificial Intelligence Will Not Be Realized. *Humanities and Social Sciences Communications* 7, no. 10 (2020); https://doi.org/10.1057/s41599-020-0494-4.

Gombrich, Ernst H., *Art and Illusion* (London: Phaidon, 1961).

Goodfellow, Ian et al., Generative Adversarial Networks. *ArXiv*, June 6, 2014; arxiv.org/abs/1406.2661, access: June 6, 2020.

Grietzer, Peli, A Theory of Vibe. *Glass Bead* 1, no. 1 (2017), www.glass-bead.org/article/a-theory-of-vibe; access: June 6, 2020.

Grietzer, P., *Ambient Meaning: Mood, Vibe, System*, PhD Diss., Harvard University, 2017.

Gumbrecht, Hans Ulrich, *Atmosphere, Mood, Stimmung: On a Hidden Potential of Literature* (Stanford: Stanford University Press, 2012).

Gumbrecht, H. U., Schwindende Stabilität der Wirklichkeit: Eine Geschichte des Stilbegriffs, in: *Stil: Geschichten und Funktionen eines kulturwissenschaftlichen Diskurselements*, ed. Hans Ulrich Gumbrecht and K. Ludwig Pfeiffer (Frankfurt/Main: Suhrkamp, 1986), pp. 726–788.

Hebdige, Dick, *Subculture: The Meaning of Style* (London: Routledge, 1979).

Heims, Steve Joshua, *The Cybernetics Group 1946–1953: Constructing a Social Science for Postwar America* (Cambridge, MA: MIT Press, 1991).

Isola, Phillip et al., Image-to-Image Trans-

lation with Conditional Adversarial Networks. *ArXiv*, November 21, 2016; arxiv.org/abs/1611.07004, access: June 6, 2020.

Jeffress, Lloyd A. (ed.), *Cerebral Mechanisms in Behavior: The Hixon Symposium* (New York: Hafner, 1951).

Kant, Immanuel, *Prolegomena to Any Future Metaphysics*, trans. Gary Hatfield (Cambridge: Cambridge University Press, 2004).

Kenaw, Setargew, Hubert L. Dreyfus's Critique of Classical AI and its Rationalist Assumptions. *Minds and Machines* 18, no. 2 (2008), pp. 227–238.

Kline, Ronald R., Cybernetics, Automata Studies, and the Dartmouth Conference on Artificial Intelligence. *IEEE Annals of the History of Computing* 33, no. 4 (2011), pp. 5–16.

Klingemann, Mario, https://twitter.com/quasimondo/status/934546438507376640, access: June 6, 2020.

Köhler, Wolfgang, *Mentality of Apes* (New York: Harcourt, Brace, 1927).

Köhler, W., Relational Determination in Perception, in: *Cerebral Mechanisms in Behavior: The Hixon Symposium*, ed. Lloyd A. Jeffress (New York: Hafner, 1951). pp. 200–243.

Köhler, W., review of *Cybernetics, or Control and Communication in the Animal and the Machine*, by Norbert Wiener. *Social Research* 18, no. 1 (1951), pp. 125–130.

Köhler, W., Bemerkungen zur Gestalttheorie. *Psychologische Forschung* 11, no. 1 (1928), pp. 188–189.

Kubler, George, *The Shape of Time: Remarks on the History of Things* (New Haven: Yale University Press, 1962).

Landau, Terry, *About Faces* (New York: Doubleday, 1989).

LeCun, Yann, Yoshua Bengio and Geoffrey Hinton, Deep Learning. *Nature* 521 (May 2015), pp. 436–444.

Lévinas, Emmanuel, *Totality and Infinity: An Essay on Exteriority*, trans. Alphonso Lingis (Dordrecht: Kluwer, 1991).

Li, Xiangyang et al., Review of Text Style Transfer Based on Deep Learning. *ArXiv*, May 6, 2020, arxiv.org/abs/2005.02914; access: June 6, 2020.

Luxemburg, Robert, StyleGAN2 Interpolation Loop, December 12, 2019; youtube.com/watch?v=6E1_dgYlifc, access: June 5, 2020.

Macho, Thomas, *Vorbilder* (Munich: Fink, 2011).

McCarthy et al., John, A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence. *AI Magazine* 27, no. 4, 2006, pp. 12–14.

McCorduck, Pamela, *Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence* (Natick: A K Peters/CRC Press, 2004).

Merleau-Ponty, Maurice, *Phenomenology of Perception* (London: Routledge, 2005).

Metzger, Wolfgang, *Laws of Seeing* [1936], trans. Lothar Spillmann (Cambridge, MA: MIT Press, 2006).

Metzger, W., Was ist Gestalttheorie? in: *Gestalttheorie und Erziehung*, ed. Kurt Guss (Darmstadt: Steinkopff, 1975), pp. 1–17.

Minsky, Marvin L., and Seymour Papert, *Perceptrons: An Introduction to Computational Geometry* (Cambridge, MA: MIT Press, 1969).

Mitchell, Melanie, *Artificial Intelligence: A Guide for Thinking Humans* (New York:

Farrar, Straus and Giroux, 2019).

von Neumann, John, *The Computer and the Brain* (New Haven: Yale University Press, 1958).

Newell, Allen, J. C. Shaw and H. A. Simon, Report on a General Problem-Solving Progra, in: *Proceedings of the International Conference on Information Processing* (Paris: UNESCO, 1959), pp. 256–264.

Nilsson, Nils J., *The Quest for Artificial Intelligence: A History of Ideas and Achievements* (Cambridge: Cambridge University Press, 2010).

Orekhov, Boris and Frank Fischer, Neural Reading: Insights from the Analysis of Poetry Generated by Artificial Neural Networks. *Orbis Litterarum* 75, no. 5 (2020), pp. 230–46.

Pasquinelli, Matteo, Machines that Morph Logic: Neural Networks and the Distorted Automation of Intelligence as Statistical Inference. *Glass Bead* 1, no. 1 (2017); www.glass-bead.org/article/machines-that-morph-logic, access: June 6, 2020.

Pasquinelli, M., How a Machine Learns and Fails – a Grammar of Error for Artificial Intelligence. *spheres* 5, no. 5 (2019), spheres-journal.org/how-a-machine-learns-and-fails-a-grammar-of-error-for-artificial-intelligence; access: June 5, 2020.

Pias, Claus (ed.), *Cybernetics: The Macy-Conferences 1946–1953* (Zurich: Diaphanes, 2003).

Rosenblatt, Frank, The Perceptron: A Probabilistic Model for Information Storage and Organization in the Brain. *Psychological Review* 65, no. 6 (1958), pp. 386–408.

Rumelhart, David E. , and James L. McClelland, PDP Research Group, *Parallel Distributed Processing: Explorations in the Microstructure of Cognition* (Cambridge, MA: MIT Press, 1986).

Ryle, Gilbert, Knowing How and Knowing That. *Proceedings of the Aristotelian Society* 46, No. 1 (1946), pp. 1–16.

Searle, John R., Minds, Brains, and Programs. *Behavioral and Brain Sciences* 3, no. 3 (1980), pp. 417–457.

Seifert, Uwe, Randolph Eichert and Lüder Schmidt, Logic, Gestalt Theory, and Neural Computation in Research on Auditory Perceptual Organization, in: *Music, Gestalt, and Computing: Studies in Cognitive and Systematic Musicology*, ed. Marc Leman (Berlin: Springer, 1997), pp. 70–88.

Sellars, Wilfrid, *Empiricism and the Philosophy of Mind* (Cambridge, MA: Harvard University Press, 1997).

Simmel, Georg, The Aesthetic Significance of the Face, in: *Essays on Art and Aesthetics*, ed. Austin Harrington (Chicago: The University of Chicago Press 2020), pp. 231–235.

Smith, Brian Cantwell, *The Promise of Artificial Intelligence: Reckoning and Judgment* (Cambridge, MA: MIT Press, 2019).

Sontag, Susan, Notes on Camp, in: *Against Interpretation and Other Essays* (New York: Octagon, 1978), pp. 275–292.

Sudmann, Andreas, Szenarien des Postdigitalen: Deep Learning als Medien-Revolution, in: *Machine Learning: Medien, Infrastrukturen und Technologien der Künstlichen Intelligenz*, ed. Christoph Engemann and Andreas Sudmann (Bielefeld: Transcript, 2018), pp. 66–68.

Taylor, Charles, Heidegger on Language,

in: *A Companion to Heidegger*, ed. Hubert L. Dreyfus and Mark A. Wrathall (London: Blackwell, 2007), pp. 435–436.

Taylor, C., *The Language Animal: The Full Shape of the Human Linguistic Capacity* (Cambridge, MA: Cambridge University Press, 2016).

Taylor, C., Theories of Meaning, in: *Human Agency and Language: Philosophical Papers I* (Cambridge: Cambridge University Press, 1985), pp. 247–292.

Toepfer, Georg, Ganzheit, in: *Historisches Wörterbuch der Biologie* (Stuttgart: Metzler, 2011), pp. 693–728.

Weigel, Sigrid (ed.), *Gesichter: Kulturgeschichtliche Szenen aus der Arbeit am Bildnis des Menschen* (Paderborn: Fink, 2013)

Weigel, S., Der konventionelle Code als buckliger Zwerg im Dienste der Emotion Recognition. Überlegungen zu einer Urgeschichte der digitalen Kultur, in: *Internationales Jahrbuch für Medienphilosophie* 6, no. 1 (2020), pp. 47–79.

Wertheimer, Max, Untersuchungen zur Lehre von der Gestalt II. *Psychologische Forschung* 4, no. 1 (1923), pp. 301–350.

Zhu, Jun-Yan et al., Unpaired Image-to-Image Translation using Cycle-Consistent Adversarial Networks. *ArXiv*, March 30, 2017, arxiv.org/abs/1703.10593; access: June 6, 2020.

THE NOOSCOPE MANIFESTED: AI AS INSTRUMENT OF KNOWLEDGE EXTRACTIVISM

By Matteo Pasquinelli and Vladan Joler

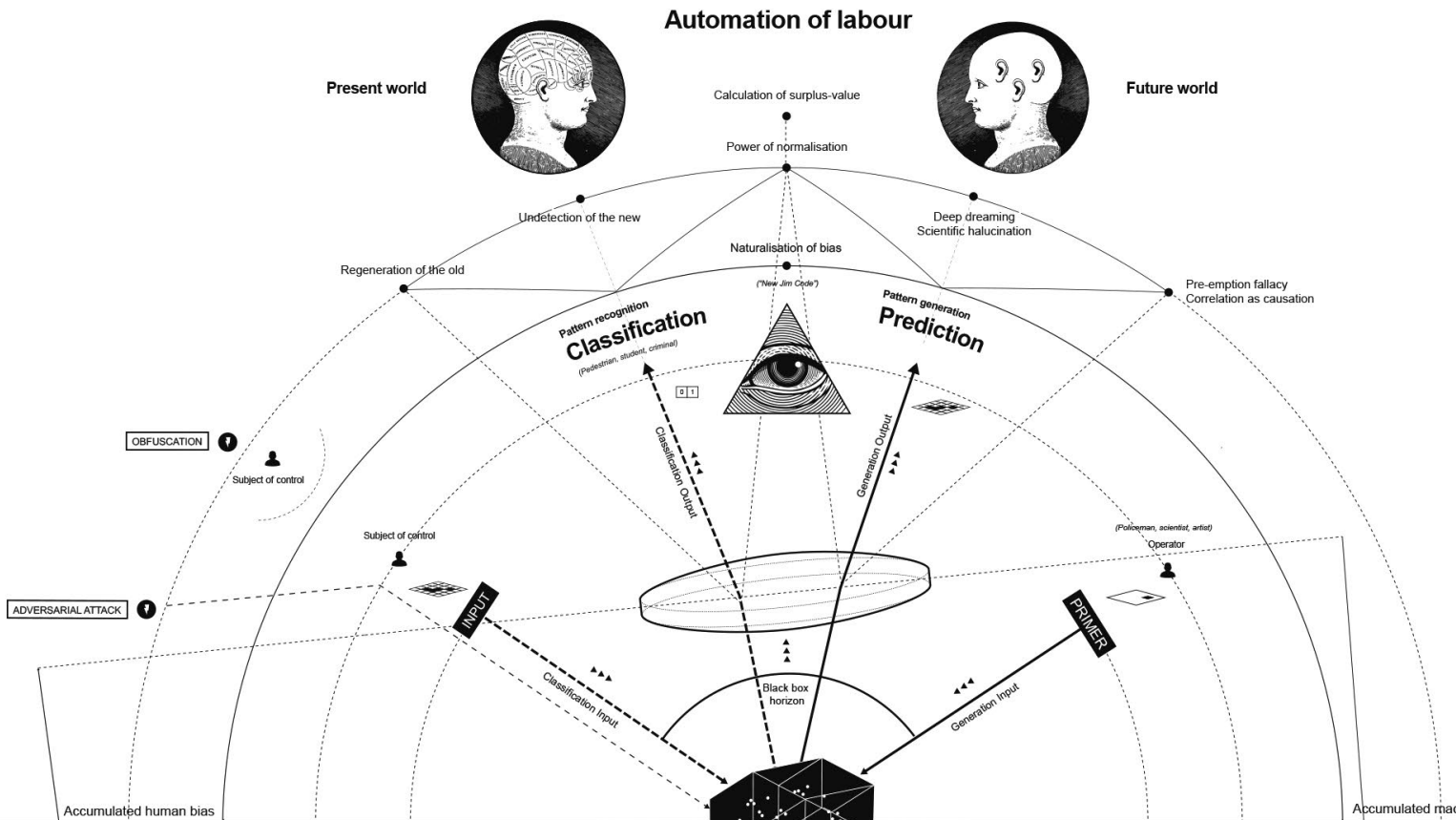
"Today, an Intelligent Machinery Question is needed to develop more collective intelligence about machine intelligence, more public education instead of 'learning machines' and their regime of knowledge extractivism […]."

Suggested citation:
Matteo Pasquinelli and Vladan Joler, The Nooscope manifested: AI as instrument of knowledge extractivism. *Interface Critique* 3 (2021), pp. 37–68.
DOI: https://doi.org/10.11588/ic.2021.3.81326.

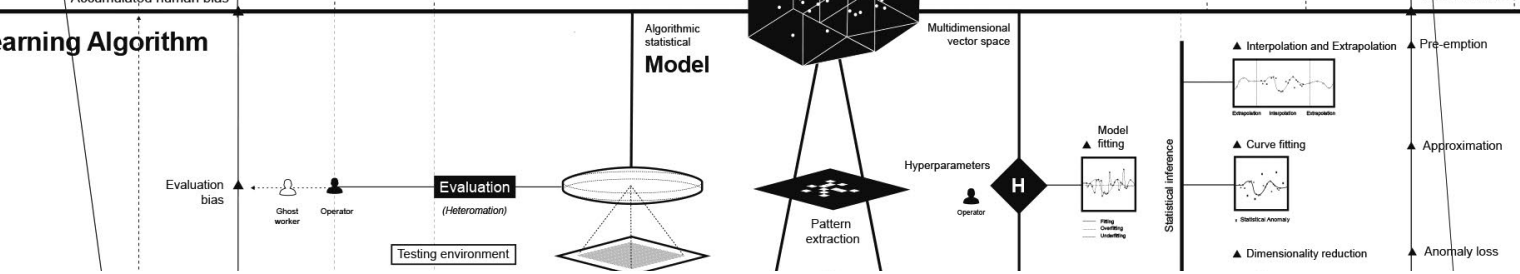
VLADAN JOLER AND MATTEO PASQUINELLI (2020)
WWW.NOOSCOPE.AI

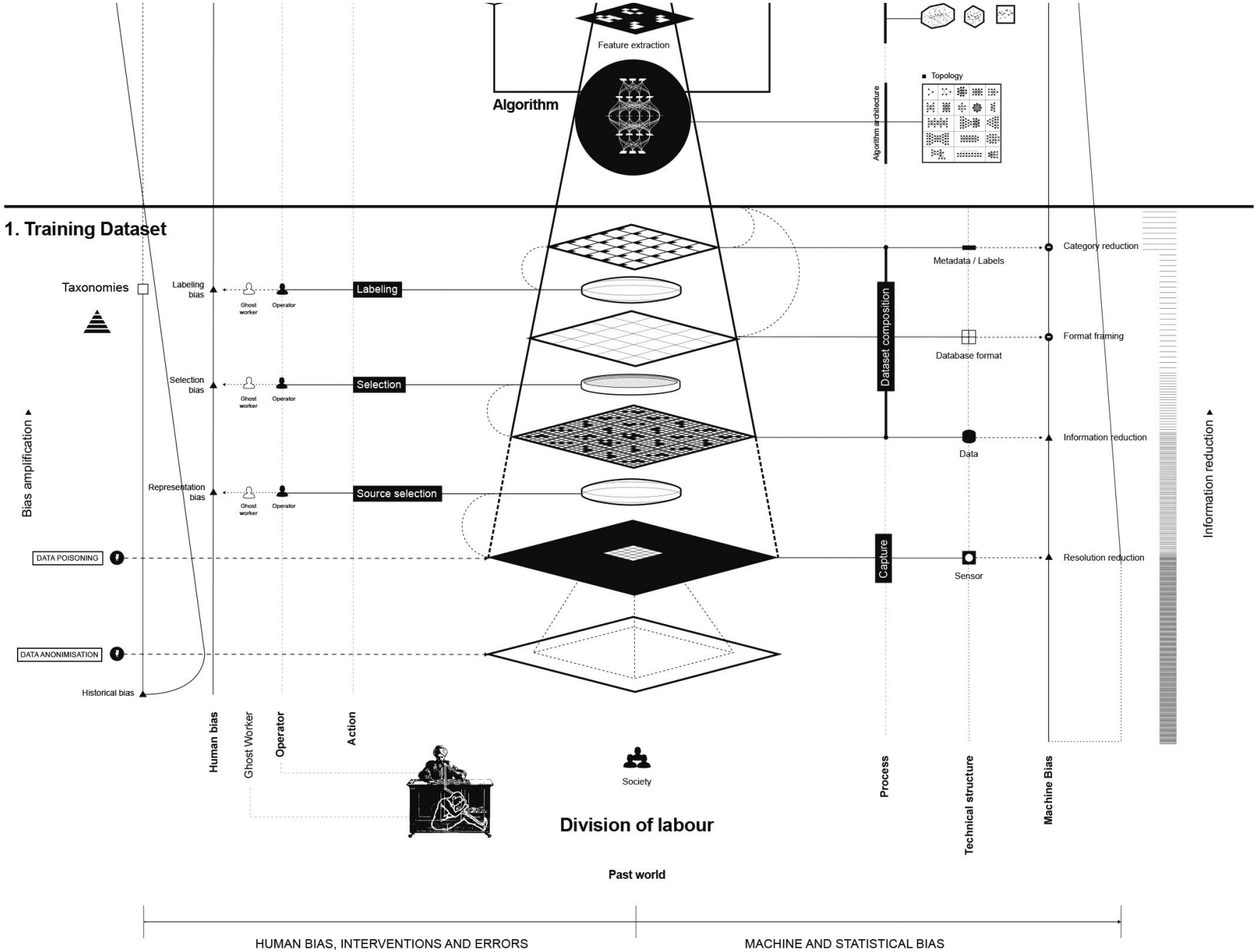
3. Model Application

CLASSIFICATION MODALITY — GENERATION MODALITY



2. Learning Algorithm




Feature extraction
Algorithm
Algorithm architecture
Topology
1. Training Dataset
Taxonomies
Labeling bias
Ghost worker
Operator
Labeling
Selection bias
Selection
Representation bias
Source selection
Bias amplification
DATA POISONING
DATA ANONIMISATION
Historical bias
Dataset composition
Capture
Metadata / Labels
Database format
Data
Sensor
Category reduction
Format framing
Information reduction
Resolution reduction
Information reduction
Human bias
Ghost Worker
Operator
Action
Society
Division of labour
Process
Technical structure
Machine Bias
Past world
HUMAN BIAS, INTERVENTIONS AND ERRORS
MACHINE AND STATISTICAL BIAS

Some enlightenment regarding the project to mechanise reason

The Nooscope[1] is a cartography of the limits of artificial intelligence, intended as a provocation to both computer science and the humanities. Any map is a partial perspective, a way to provoke debate. Similarly, this map is a manifesto – of AI dissidents. Its main purpose is to challenge the mystifications of artificial intelligence. First, as a technical definition of *intelligence* and, second, as a political form that would be *autonomous* from society and the human.[2] In the expression 'artificial intelligence', the adjective 'artificial' carries the myth of the technology's autonomy; it hints to caricatural 'alien minds' that self-reproduce in silico but, actually, mystifies two processes of proper alienation; the growing geopolitical autonomy of hi-tech companies and the invisibilization of workers' autonomy worldwide. The modern project to mechanise human reason has clearly mutated, in the twenty first century, into a corporate regime of knowledge extractivism and epistemic colonialism.[3] This is unsurprising, since machine learning algorithms are the most powerful algorithms for information compression.

The purpose of the Nooscope map is to secularize AI from the ideological status of 'intelligent machine' to one of knowledge instruments. Rather than evoking legends of alien cognition, it is more reasonable to consider machine learning as an *instrument of knowledge magnification* that helps to perceive features, patterns, and correlations through vast spaces of data beyond human reach. In the history of science and technology, this is no news; it has already been pursued by optical instruments throughout the histories of astronomy and medicine.[4] In the tradition of science, machine learning is just a *Nooscope*, an instrument to see and navigate the space of knowledge (from the Greek *skopein* 'to examine, look' and *noos* 'knowledge').

Borrowing the idea from Gottfried Wilhelm Leibniz, the Nooscope diagram applies the analogy of optical media to the structure of all machine learning apparatuses. Discussing the power of his

1 **Editorial Note:** The Nooscope diagram and its accompanying paper have been published on the research project website https://nooscope.ai and in *AI & Society* (received: March 27, 2020, accepted: October 14, 2020, published online: November 21, 2020); https://doi.org/10.1007/s00146-020-01097-6. It is here published as a slightly revised version, with kind permission by the authors.

2 On the autonomy of technology see: L. Winner, *Autonomous technology: technics-out-of-control as a theme in political thought* (Cambridge, MA 2001).

3 For the colonial extensions of the operations of logistics, algorithms and finance see S. Mezzadra and B. Neilson, *The politics of operations: excavating contemporary capitalism* (Durham 2019). On the epistemic colonialism of AI see M. Pasquinelli, Three thousand years of algorithmic rituals. *e-flux* 101 (2019).

4 Digital humanities term a similar technique distant reading, which has gradually involved data analytics and machine learning in literary and art history. See F. Moretti, *Distant reading* (London 2013).

calculus ratiocinator and 'characteristic numbers' (the idea to design a numerical universal language to codify and solve all the problems of human reasoning), Leibniz made an analogy with instruments of visual magnification such as the microscope and telescope. He wrote: "Once the characteristic numbers are established for most concepts, mankind will then possess a new instrument which will enhance the capabilities of the mind to a far greater extent than optical instruments strengthen the eyes, and will supersede the microscope and telescope to the same extent that reason is superior to eyesight."[5] Although the purpose of this text is not to reiterate the opposition between quantitative and qualitative cultures, Leibniz's credo need not be followed. Controversies cannot be conclusively computed. Machine learning is not the ultimate form of intelligence.

Instruments of measurement and perception always come with inbuilt aberrations. In the same way that the lenses of microscopes and telescopes are never perfectly curvilinear and smooth, the *logical lenses* of machine learning embody faults and biases. To understand machine learning and register its impact on society is to study the degree by which social data are diffracted and distorted by these lenses. This is generally known as the debate on bias in AI, but the political implications of the logical form of machine learning are deeper. Machine learning is not bringing a new dark age but one of diffracted rationality, in which, as it will be shown, an episteme of causation is replaced by one of automated correlations. More in general, AI is a new regime of truth, scientific proof, social normativity and rationality, which often does take the shape of a *statistical hallucination.* This diagram manifesto is another way to say that AI, the king of computation (patriarchal fantasy of mechanised knowledge, 'master algorithm' and *alpha machine*) is naked. Here, we are peeping into its black box.

Fig. 1: On the invention of metaphors as instrument of knowledge magnification. Emanuele Tesauro, *Il canocchiale aristotelico* [The Aristotelian Telescope], frontispiece of the 1670 edition, Turin.

The assembly line of machine learning: data, algorithm, model

The history of AI is a history of experiments, machine failures, academic controversies, epic rivalries around military

5 G.W. Leibniz, Preface to the general science [1677], in: G.W. Leibniz, *Selections*, ed. P. Wiener (New York 1951), p. 23.

funding, popularly known as 'winters of AI.'[6] Although corporate AI today describes its power with the language of 'black magic' and 'superhuman cognition', current techniques are still at the experimental stage.[7] AI is now at the same stage as when the steam engine was invented, before the laws of thermodynamics necessary to explain and control its inner workings, had been discovered. Similarly, today, there are efficient neural networks for image recognition, but there is no *theory of learning* to explain why they work so well and how they fail so badly. Like any invention, the paradigm of machine learning consolidated slowly, in this case through the last half-century. A master algorithm has not appeared overnight. Rather, there has been a gradual construction of a method of computation that still has to find a common language. Manuals of machine learning for students, for instance, do not yet share a common terminology. How to sketch, then, a critical grammar of machine learning that may be concise and accessible, without playing into the paranoid game of defining General Intelligence?

As an instrument of knowledge, machine learning is composed of an object to be observed (*training dataset*), an instrument of observation *(learning algorithm*) and a final representation (*statistical model*). The assemblage of these three elements is proposed here as a spurious and baroque diagram of machine learning, extravagantly termed Nooscope.[8] Staying with the analogy of optical media, the information flow of machine learning is like a light beam that is projected by the training data, compressed by the algorithm and diffracted towards the world by the lens of the statistical model.

The Nooscope diagram aims to illustrate two sides of machine learning at the same time: *how it works and how it fails* – enumerating its main components, as well as the broad spectrum of errors, limitations, approximations, biases, faults, fallacies and vulnerabilities that are native to its paradigm.[9] This double operation stresses that AI is not a monolithic paradigm of rationality, but a spurious architecture made of adapting techniques and tricks. Besides, the limits of AI are not simply technical but are imbricated with human bias. In the Nooscope diagram, the essential components of machine learning are represented at the centre, *human biases* and interventions on the left, and *technical biases* and limitations on the right. Optical lenses symbolize biases and approximations representing the compression and dis-

6 For a concise history of AI see D. Cardon, J.P. Cointet and A. Mazières, Neurons spike back. The invention of inductive machines and the artificial intelligence controversy. *Réseaux* 211 (2018), pp. 173–220.

7 A. Campolo and K. Crawford, Enchanted determinism: power without control in artificial intelligence. *Engag Sci Technol Soc* 6 (2020), pp. 1–19.

8 The use of the visual analogy is also intended to record the fading distinction between image and logic, representation and inference, in the technical composition of AI. The statistical models of machine learning are operative representations (in the sense of Harun Farocki's operative images).

9 For a systematic study of the logical limitations of machine learning see M.M. Malik, A hierarchy of limitations in machine learning (2020). arxiv preprint; https://arxiv.org/abs/2002.05193, access: April 30, 2020.

tortion of the information flow. The total bias of machine learning is represented by the central lens of the statistical model through which the perception of the world is diffracted.

The limitations of AI are generally perceived today thanks to the discourse on bias – the amplification of gender, race, ability, and class discrimination by algorithms. In machine learning, it is necessary to distinguish between historical bias, dataset bias, and algorithm bias, all of which occur at different stages of the information flow.[10] *Historical bias* (or world bias) is already apparent in society before technological intervention. Nonetheless, the naturalisation of such bias, that is the silent integration of inequality into an apparently neutral technology is by itself harmful.[11] Paraphrasing Michelle Alexander, Ruha Benjamin has called it the New Jim Code, "the employment of new technologies that reflect and reproduce existing inequalities but that are promoted and perceived as more objective or progressive than the discriminatory systems of a previous era."[12] *Dataset bias* is introduced through the preparation of training data by human operators. The most delicate part of the process is data labelling, in which old and conservative taxonomies can cause a distorted view of the world, misrepresenting social diversities and exacerbating social hierarchies (see below the case of ImageNet).

Algorithmic bias (also known as machine bias, statistical bias or model bias, to which the Nooscope diagram gives particular attention) is the further amplification of historical bias and dataset bias by machine learning algorithms. The problem of bias has mostly originated from the fact that machine learning algorithms are among the most efficient for *information compression*, which engenders issues of information resolution, diffraction and loss.[13] Since ancient times, algorithms have been procedures of an economic nature, designed to achieve a result in the shortest number of steps consuming the least amount of resources: space, time, energy and labour.[14] The arms race of AI companies is, still today, concerned with finding the simplest and fastest algorithms with which to capitalise data. If information compression produces the maximum rate of profit in corporate AI, from the societal point of view, it produces discrimination and the loss of cultural diversity.

While the social consequences of AI are popularly understood under the issue of bias, the common understanding of technical limitations is known as the *black box* problem. The black box effect is an actual issue of deep neural net-

10 For a more detailed list of AI biases see: J. Guttag and H. Suresh, A framework for understanding unintended consequences of machine learning (2019). arxiv preprint; https://arxiv.org/abs/1901.10002, access: April 30, 2020 and A. Galstyan et al., A survey on bias and fairness in machine learning (2019). arxiv preprint; https://arxiv.org/abs/1908.09635, access: April 30, 2020.

11 V. Eubanks, Automating inequality (New York 2018); see also K. Crawford, The trouble with bias. Keynote lecture: conference on neural information processing systems (2017).

12 R. Benjamin, *Race after technology: abolitionist tools for the new jim code* (Cambridge 2019), p. 5.

13 Computer scientists argue that AI belongs to a subfield of signal processing, that is *data compression*.

14 M. Pasquinelli, *The eye of the master* (London, forthcoming).

works (which filter information so much that their chain of reasoning cannot be reversed) but has become a generic pretext for the opinion that AI systems are not just inscrutable and opaque, but even 'alien' and out of control.[15] The black box effect is part of the nature of any experimental machine at the early stage of development (it has already been noticed that the functioning of the steam engine remained a mystery for some time, even after having been successfully tested). The actual problem is the black box rhetoric, which is closely tied to conspiracy theory sentiments in which AI is an occult power that cannot be studied, known, or politically controlled.

The training dataset: the social origins of machine intelligence

Mass digitalisation, which expanded with the Internet in the 1990s and escalated with datacentres in the 2000s, has made available vast resources of data that, for the first time in history, are free and unregulated. A regime of *knowledge extractivism* (then known as Big Data) gradually employed efficient algorithms to extract 'intelligence' from these open sources of data, mainly for the purpose of predicting consumer behaviours and selling ads. The knowledge economy morphed into a novel form of capitalism, called *cognitive capitalism* and then *surveillance capitalism*, by different authors.[16] It was the Internet information overflow, vast datacentres, faster microprocessors and algorithms for data compression that laid the groundwork for the rise of AI monopolies in the twenty first century.

What kind of cultural and technical object is the dataset that constitutes the source of AI? The quality of *training data* is the most important factor affecting the so-called 'intelligence' that machine learning algorithms extract. There is an important perspective to take into account, to understand AI as a Nooscope. Data are the first source of value and intelligence. Algorithms are second; they are the machines that compute such value and intelligence into a model. However, training data are never raw, independent and unbiased (they are already themselves 'algorithmic').[17] The carving, formatting and editing of training datasets are a laborious and delicate

15 Projects such as Explainable Artificial Intelligence, Interpretable Deep Learning and Heatmapping among others have demonstrated that breaking into the 'black box' of machine learning is possible. Nevertheless, the full interpretability and explicability of machine learning statistical models remains a myth. See Z.C. Lipton, The mythos of model interpretability (2016). arXiv preprint; https://arxiv.org/abs/1606.03490, access: April 30, 2020.

16 A. Corsani et al., *Le Capitalisme cognitif comme sortie de la crise du capitalisme industriel. Un programme de recherché* (Paris 2004); S. Zuboff, *The age of surveillance capitalism: the fight for a human future at the new frontier of power* (London 2019).

17 L. Gitelman (ed.), *Raw data is an oxymoron* (Cambridge, MA 2013).

undertaking, which is probably more significant for the final results than the technical parameters that control the learning algorithm. The act of selecting one data source rather than another is the profound mark of human intervention into the domain of the 'artificial' minds.

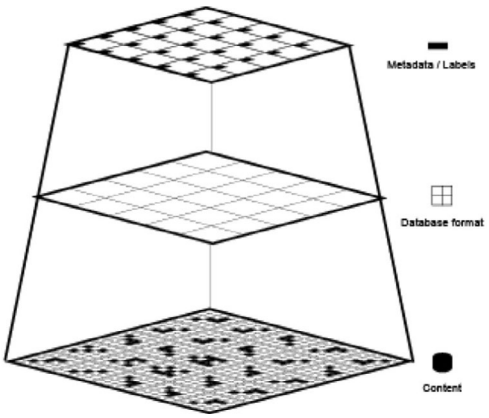


Fig. 2.

The training dataset is a *cultural construct*, not just a technical one. It usually comprises input data that are associated with ideal output data, such as pictures with their descriptions, also called labels or metadata.[18] The canonical example would be a museum collection and its archive, in which artworks are organised by metadata such as author, year, medium, etc. The semiotic process of assigning a name or a category to a picture is never impartial; this action leaves another deep human imprint on the final result of machine cognition. A training dataset for machine learning is usually composed through the following steps: (1) production: labour or phenomena that produce information; (2) capture: encoding of information into a data format by an instrument; (3) formatting: organisation of data into a dataset; (4) labelling: in supervised learning, the classification of data into categories (metadata).

Machine intelligence is trained on vast datasets that are accumulated in ways neither technically neutral nor socially impartial. Raw data do not exist, as it is dependent on human labour, personal data, and social behaviours that accrue over long periods, through extended networks and controversial taxonomies.[19] The main training datasets for machine learning (NMIST, ImageNet, Labelled Faces in the Wild, etc.) originated in corporations, universities, and military agencies of the Global North. But taking a more careful look, one discovers a profound division of labour that innervates into the Global South via crowdsourcing platforms that are used to edit and validate data.[20] The parable of the *ImageNet* dataset exemplifies the troubles of many AI datasets. ImageNet is a training dataset for Deep Learning that has become the de facto benchmark for image recognition algorithms: indeed, the Deep Learning revolution started in 2012 when Alex Krizhevsky, Ilya Sutskever and Geoffrey Hinton won the annual ImageNet chal-

18 In supervised learning. Also self-supervised learning maintains forms of human intervention.

19 On taxonomy as a form of knowledge and power see M. Foucault, *The order of things* (London 2005).

20 Such as Amazon Mechanical Turk, cynically termed 'artificial artificial intelligence' by Jeff Bezos. See J. Pontin, Artificial intelligence, with help from the humans. *The New York Times* (March 25, 2007).

lenge with the convolutional neural network AlexNet.[21] ImageNet was initiated by computer scientist Fei-Fei Li back in 2006.[22] Fei-Fei Li had three intuitions to build a reliable dataset for image recognition. First, to download millions of free images from web services such as Flickr and Google. Second, to adopt the computational taxonomy *WordNet* for image labels.[23]

Third, to outsource the work of labelling millions of images via the crowdsourcing platform Amazon Mechanical Turk. At the end of the day (and of the assembly line), anonymous workers from all over the planet were paid few cents per task to label hundreds of pictures per minute according to the WordNet taxonomy: their labour resulted in the engineering of a controversial cultural construct. AI scholars Kate Crawford and artist Trevor Paglen have investigated and disclosed the sedimentation of racist and sexist categories in ImageNet taxonomy: see the legitimation of the category 'failure, loser, nonstarter, unsuccessful person' for a hundred arbitrary pictures of people.[24]

The voracious data extractivism of AI has caused an unforeseeable backlash on digital culture: in the early 2000s, Lawrence Lessig could not predict that the large repository of online images credited by *Creative Commons* licenses would a decade later become an unregulated resource for face recognition surveillance technologies. In similar ways, personal data are continually incorporated without transparency into privatised datasets for machine learning. In 2019 artist and AI researcher, Adam Harvey for the first time disclosed the non-consensual use of personal photos in training datasets for face recognition. Harvey's disclosure caused Stanford University, Duke University and Microsoft to withdraw their datasets amidst a major *privacy infringement scandal*.[25] Online training datasets trigger issues of data sovereignty and civil rights that traditional institutions are slow to counteract (see the European General Data Protection Regulation).[26] If 2012 was the year in which the Deep Learning revolution began, 2019 was the year in which its sources were discovered to be vulnerable and corrupted.

21 Although the convolutional architecture dates back to Yann LeCun's work in the late 1980s, Deep Learning starts with this paper: A. Krizhevsky, I. Sutskever and G.E. Hinton, Imagenet classification with deep convolutional neural networks. *Commun ACM* 60/6 (2017), pp. 84–90.

22 For an accessible (yet not very critical) account of the ImageNet development see M. Mitchell, *Artificial intelligence: a guide for thinking humans* (London 2019).

23 WordNet is 'a lexical database of semantic relations between words' which was initiated by George Armitage at Princeton University in 1985. It provides a strict tree-like structure of definitions.

24 K. Crawford and T. Paglen, Excavating AI: the politics of training sets for machine learning (2019); https://excavating.ai, access: April 30, 2020.

25 A. Harvey, Megapixel project (2019); https://megapixels.cc/about/; access: April 30, 2020; M. Murgia, Who's using your face? The ugly truth about facial recognition. *Financial Times* (April 19, 2019).

26 The GDPR data privacy regulation that was passed by the European Parliament in May 2018 is, however, an improvement compared to the regulation that is missing in the United States.

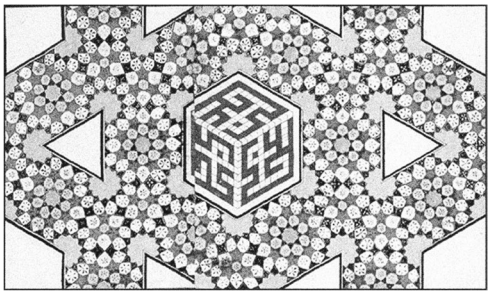


Fig. 3: Combinatorial patterns and Kufic scripts, Topkapi scroll, ca. 1500, Iran.

The history of AI as the automation of perception

The need to demystify AI (at least from the technical point of view) is understood in the corporate world too. Head of Facebook AI and godfather of convolutional neural networks Yann LeCun reiterates that current AI systems are not sophisticated versions of cognition, but rather, of perception. Similarly, the Nooscope diagram exposes the skeleton of the AI black box and shows that AI is not a thinking automaton but an algorithm that performs *pattern recognition*. The notion of pattern recognition contains issues that must be elaborated upon. What is a pattern, by the way? Is a pattern uniquely a visual entity? What does it mean to read social behaviours as patterns? Is pattern recognition an exhaustive definition of intelligence? Most likely not. To clarify these issues, it would be good to undertake a brief archaeology of AI.

The archetype machine for pattern recognition is Frank Rosenblatt's *Perceptron*. Invented in 1957 at Cornell Aeronautical Laboratory in Buffalo, New York, its name is a shorthand for 'Perceiving and Recognizing Automaton'.[27] Given a visual matrix of 20 × 20 photoreceptors, the Perceptron can learn how to recognise simple letters. A visual pattern is recorded as an impression on a network of artificial neurons that are firing up in concert with the repetition of similar images and activating one single output neuron. The output neuron fires 1 = true, if a given image is recognised, or 0 = false, if a given image is not recognised.

The automation of perception, as a visual montage of pixels along a computational assembly line, was originally implicit McCulloch and Pitt's concept of artificial neural networks.[28] Once the algorithm for visual pattern recognition survived the 'winter of AI' and proved efficient in the late 2000s, it was applied also to non-visual datasets, properly inaugurating the age of Deep Learning (the application of pattern recognition techniques to all kinds of data, not just visual). Today, in the case of self-driving cars, the patterns that need to be recognised are objects in road scenarios. In the case of automatic translation, the patterns that need to be recognised are the most common sequences of words across bilingual

27 F. Rosenblatt, The perceptron: a perceiving and recognizing automaton. Cornell Aeronautical Laboratory Report 85-460-1 (1957).

28 W. McCulloch and W. Pitts, How we know universals: the perception of auditory and visual forms. *Bull Math Biophys* 9/3 (1947), pp. 127–147.

texts. Regardless of their complexity, from the numerical perspective of machine learning, notions such as image, movement, form, style, and ethical decision can all be described as statistical distributions of pattern. In this sense, pattern recognition has truly become a new *cultural technique* that is used in various fields. For explanatory purposes, the Nooscope is described as a machine that operates on three modalities: *training*, *classification*, and *prediction*. In more intuitive terms, these modalities can be called: pattern extraction, pattern recognition, and pattern generation.

Rosenblatt's Perceptron was the first algorithm that paved the way to machine learning in the contemporary sense. At a time when 'computer science' had not yet been adopted as definition, the field was called 'computational geometry' and specifically 'connectionism' by Rosenblatt himself. The business of these neural networks, however, was to calculate a statistical inference. What a neural network computes is not an exact pattern but the *statistical distribution of a pattern*. Just scraping the surface of the anthropomorphic marketing of AI, one finds another technical and cultural object that needs examination: the *statistical model*. What is the statistical model in machine learning? How is it calculated? What is the relationship between a statistical model and human cognition? These are crucial issues to clarify. In terms of the work of demystification that needs to be done (also to evaporate some naïve questions), it would be good to reformulate the trite question 'Can a machine think?' into the theoretically sounder questions 'Can a statistical model think?', 'Can a statistical model develop consciousness?', et cetera.

The learning algorithm: compressing the world into a statistical model

The algorithms of AI are often evoked as alchemic formulas, capable of distilling 'alien' forms of intelligence. But what do the algorithms of machine learning really do? Few people, including the followers of artificial general intelligence (AGI), bother to ask this question. Algorithm is the name of a process, whereby a machine performs a calculation. The product of such machine processes is a statistical model (more accurately termed an 'algorithmic statistical model'). In the developer community, the term 'algorithm' is increasingly replaced with 'model.' This terminological confusion arises from the fact that the statistical model does not exist separately from the algorithm: somehow, the statistical model exists inside the algorithm under the form of distributed memory across its parameters. For the same reason, it is essentially impossible to visualise an algorithmic statistical model, as is done with simple mathematical functions. Still, the

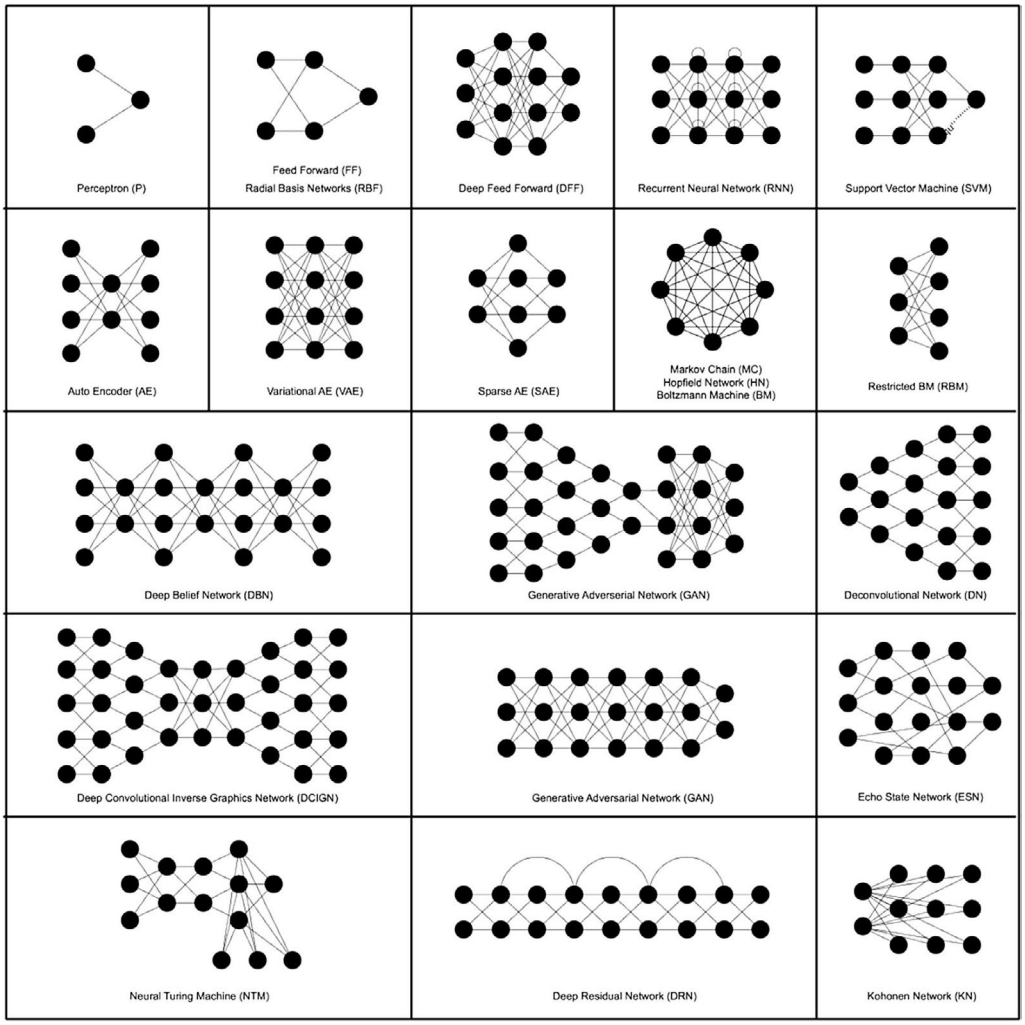


Fig. 4: Source: https://www.asimovinstitute.org/neural-network-zoo.

challenge is worthwhile.

In machine learning, there are many *algorithm architectures:* simple Perceptron, deep neural network, Support Vector Machine, Bayesian network, Markov chain, autoencoder, Boltzmann machine, etc. Each of these architectures has a different history (often rooted in military agencies and corporations of the Global North). Artificial neural networks started as simple computing structures that evolved into complex ones which are now controlled by a few *hyperparameters* that express millions of *parameters*.[29] For instance, convolutional neural networks are described by a limited set of hyperparameters (number of layers, number of neurons per layer, type of con-

29 The parameters of a model that are learnt from data are called 'parameters', while parameters that are not learnt from data and are fixed manually are called 'hyperparameters' (these determine number and properties of the parameters.).

nection, behaviour of neurons, etc.) that project a complex topology of thousands of artificial neurons with millions of parameters in total. The algorithm starts as a blank slate and, during the process called training, or 'learning from data', adjusts its parameters until it reaches a good representation of the input data. In image recognition, as already seen, the computation of millions of parameters has to resolve into a simple binary output: 1 = true, a given image is recognised; or 0 = false, a given image is not recognised.[30]

Attempting an accessible explanation of the relationship between algorithm and model, let us have a look at the complex Inception v3 algorithm, a deep convolutional neural network for image recognition designed at Google and trained on the ImageNet dataset. Inception v3 is said to have a 78% accuracy in identifying the label of a picture, but the performance of 'machine intelligence' in this case can be measured also by the proportion between the size of training data and the trained algorithm (or model). ImageNet contains 14 million images with associated labels that occupy approximately 150 gigabytes of memory. On the other hand, Inception v3, which is meant to represent the information contained in ImageNet, is only 92 megabytes. The ratio of compression between training data and model partially describes also the rate of information diffraction. A table from the Keras documentation compares these values (numbers of parameters, layer depth, file dimension and accuracy) for the main models of image recognition.[31] This is a brutalist but effective way to show the relation between model and data, to show how the 'intelligence' of algorithms is measured and assessed in the developer community.

Statistical models have always influenced culture and politics. They did not just emerge with machine learning: machine learning is just a new way to automate the technique of statistical modelling. When Greta Thunberg warns 'Listen to science', what she really means, being a good student of mathematics, is 'Listen to the statistical models of climate science'. No statistical models, no climate science: no climate science, no climate activism. Climate science is indeed a good example to start with, in order to understand statistical models. Global warming has been calculated by first collecting a vast dataset of temperatures from Earth's surface each day of the year, and second, by applying a mathematical model that plots the curve of temperature variations in the past and projects the same pattern into the future.[32] Climate models are historical artefacts that are tested and debated within the *scientific community*, and today, also beyond.[33] Machine learning models, on the

30 This value can be also a percentage value between 1 and 0.

31 https://keras.io/applications (documentation for individual models.)

32 P. Edwards, *A vast machine: computer models, climate data, and the politics of global warming* (Cambridge, MA 2010).

33 See the Community Earth System Model (CESM) that has been developed by the National Center for Atmospheric Research in Bolder, Colorado, since 1996. "The Community Earth System Model is a fully coupled numerical simulation of the Earth system

contrary, are opaque and inaccessible to community debate. Given the degree of myth-making and social bias around its mathematical constructs, AI has indeed inaugurated the age of *statistical science fiction*. Nooscope is the projector of this large statistical cinema.

All models are wrong, but some are useful

"All models are wrong, but some are useful" – the canonical dictum of the British statistician George Box has long encapsulated the logical limitations of statistics and machine learning.[34] This maxim, however, is often used to legitimise the bias of corporate and state AI. Computer scientists argue that human cognition reflects the capacity to abstract and approximate patterns. Therefore, what's the problem with machines being approximate, and doing the same? Within this argument, it is rhetorically repeated that 'the map is not the territory'. This sounds reasonable. But what should be contested is that AI is a heavily compressed and distorted map of the territory and that this map, like many forms of automation, is not open to community negotiation. AI is a map of the territory without community access and community consent.[35]

How does machine learning plot a statistical map of the world? Let's face the specific case of image recognition (the basic form of the *labour of perception*, which has been codified and automated as pattern recognition).[36] Given an image to be classified, the algorithm detects the edges of an object as the statistical distribution of dark pixels surrounded by light ones (a typical visual pattern). The algorithm does not know what an image is, does not perceive an image as human cognition does, it only computes pixels, numerical values of brightness and proximity. The algorithm is programmed to record only the dark edge of a profile (that is to *fit* that desired pattern) and not all the pixels across the image (that would result in *overfitting* and repeating the whole visual field). A statistical model is said to be trained successfully when it can elegantly *fit* only the important patterns of the training data and apply those patterns also to new data 'in the wild'. If a model learns the training data too well, it recognises only exact matches of the original patterns and will overlook those with close similarities, 'in the wild'. In this case, the model is *over-fitting*, because it has meticulously learnt

consisting of atmospheric, ocean, ice, land surface, carbon cycle, and other components. CESM includes a climate model providing state-of-the-art simulations of the Earth's past, present, and future." (https://www.cesm.ucar.edu).

34 G. Box, Robustness in the strategy of scientific model building. Mathematics Research Center, Technical report 1954, University of Wisconsin-Madison (1979).

35 Post-colonial and post-structuralist schools of anthropology and ethnology have stressed that there is never territory per se, but always an act of territorialisation.

36 Pattern recognition is one among many other economies of attention. "To look is to labor," as Jonathan Beller reminds us; see J. Beller, *The cinematic mode of production: attention economy and the society of the spectacle* (Lebanon, NH 2006), p. 2.

Documentation for individual models

Model	Size	Top-1 Accuracy	Top-5 Accuracy	Parameters	Depth
Xception	88 MB	0.790	0.945	22,910,480	126
VGG16	528 MB	0.713	0.901	138,357,544	23
VGG19	549 MB	0.713	0.900	143,667,240	26
ResNet50	98 MB	0.749	0.921	25,636,712	-
ResNet101	171 MB	0.764	0.928	44,707,176	-
ResNet152	232 MB	0.766	0.931	60,419,944	-
ResNet50V2	98 MB	0.760	0.930	25,613,800	-
ResNet101V2	171 MB	0.772	0.938	44,675,560	-
ResNet152V2	232 MB	0.780	0.942	60,380,648	-
InceptionV3	92 MB	0.779	0.937	23,851,784	159
InceptionResNetV2	215 MB	0.803	0.953	55,873,736	572
MobileNet	16 MB	0.704	0.895	4,253,864	88
MobileNetV2	14 MB	0.713	0.901	3,538,984	88
DenseNet121	33 MB	0.750	0.923	8,062,504	121
DenseNet169	57 MB	0.762	0.932	14,307,880	169
DenseNet201	80 MB	0.773	0.936	20,242,984	201
NASNetMobile	23 MB	0.744	0.919	5,326,716	-
NASNetLarge	343 MB	0.825	0.960	88,949,818	-

The top-1 and top-5 accuracy refers to the model's performance on the ImageNet validation dataset.

Depth refers to the topological depth of the network. This includes activation layers, batch normalization layers etc.

Fig. 5: Source: keras.io/applications.

everything (including noise) and is not able to distinguish a pattern from its background. On the other hand, the model is *underfitting* when it is not able to detect meaningful patterns from the training data. The notions of data overfitting, fitting and underfitting can be visualised on a Cartesian plane.

The challenge of guarding the accuracy of machine learning lays in calibrating the equilibrium between data underfitting and overfitting, which is difficult to do because of different machine biases. Machine learning is a term that, as much as 'AI', anthropomorphizes a piece of technology: machine learning *learns nothing* in the proper sense of the word, as a human does; machine learning simply maps a statistical distribution of numerical values and draws a mathematical function that hopefully approximates human comprehension. That being said, machine learning can, for this reason, cast new light on the ways in which humans comprehend.

The statistical model of machine learning algorithms is also an approximation in the sense that it guesses the missing

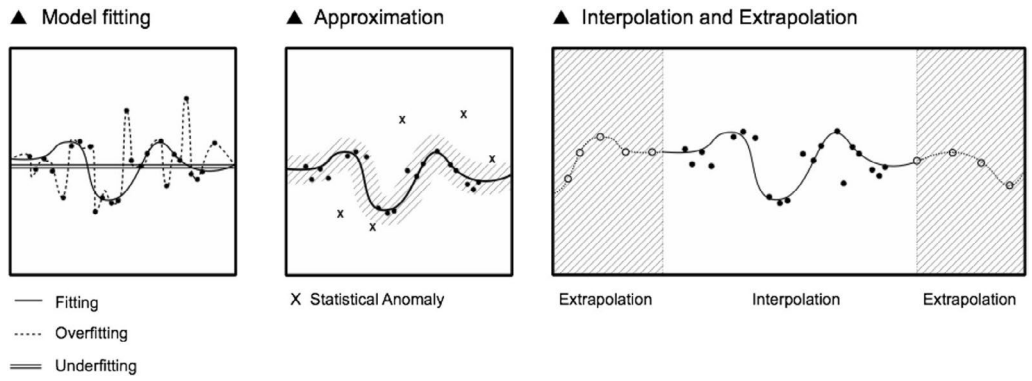


Fig. 6.

parts of the data graph: either through *interpolation*, which is the prediction of an output *y* within the known interval of the input *x* in the training dataset, or through *extrapolation*, which is the prediction of output *y* beyond the limits of *x*, often with high risks of inaccuracy. This is what 'intelligence' means today within machine intelligence: to extrapolate a non-linear function beyond known data boundaries. As Dan McQuillian aptly puts it: "There is no intelligence in artificial intelligence, nor does it learn, even though its technical name is machine learning, it is simply mathematical minimization."[37]

It is important to recall that the 'intelligence' of machine learning is not driven by exact formulas of mathematical analysis, but by algorithms of *brute force approximation*. The shape of the correlation function between input *x* and output *y* is calculated algorithmically, step by step, through tiresome mechanical processes of gradual adjustment (like gradient descent, for instance) that are equivalent to the differential calculus of Leibniz and Newton. Neural networks are said to be among the most efficient algorithms, because these differential methods can *approximate* the shape of any function given enough layers of neurons and abundant computing resources.[38] Brute-force gradual approximation of a function is the core feature of today's AI, and only from this perspective can one understand its potentialities and limitations – particularly, its escalating carbon footprint (the training of deep neural networks requires exorbitant amounts of energy because of gradient descent and similar training algorithms that operate on the basis of continuous infinitesimal adjustments).[39]

37 D. McQuillan, Manifesto on algorithmic humanitarianism. Presented at the symposium reimagining digital humanitarianism, Goldsmiths, University of London (February 1, 2018); D. McQuillan, People's councils for ethical machine learning. *Soc Media Soc* 4/2 (2018), p. 3.

38 As proven by the Universal Approximation Theorem.

39 A. Ganesh, A. McCallum and E. Strubell, Energy and policy considerations for deep learning in NLP (2019). arXiv preprint; arXiv:1906.02243.

World to vector

The notions of data fitting, overfitting, underfitting, interpolation and extrapolation can be easily visualised in two dimensions, but statistical models usually operate along multidimensional spaces of data. Before being analysed, data are encoded into a *multi-dimensional vector space* that is far from intuitive. What is a vector space and why is it multi-dimensional?

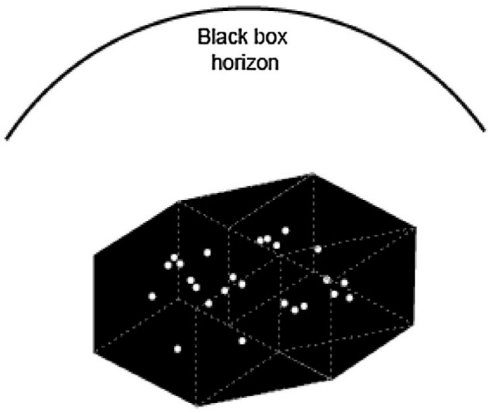


Fig 7: Multidimensional vector space.

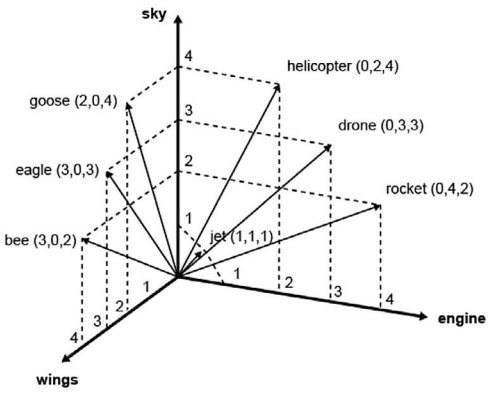


Fig 8: Vector space of seven words in three contexts. Source: https://corpling.hypotheses.org/495.

Cardon, Cointet and Mazière describe the vectorialisation of data in this way: A neural network requires the inputs of the calculator to take on the form of a vector. Therefore, the world must be coded in advance in the form of a purely digital vectorial representation. While certain objects such as images are naturally broken down into vectors, other objects need to be 'embedded' within a vectorial space before it is possible to calculate or classify them with neural networks. This is the case of text, which is the prototypical example. To input a word into a neural network, the *Word2vec* technique 'embeds' it into a vectorial space that measures its distance from the other words in the corpus. Words thus inherit a position within a space with several hundreds of dimensions. The advantage of such a representation resides in the numerous operations offered by such a transformation. Two terms whose inferred positions are near one another in this space are equally similar semantically; these representations are said to be distributed: the vector of the concept 'apartment' [– 0.2, 0.3, – 4.2, 5.1...] will be similar to that of 'house' [– 0.2, 0.3, – 4.0, 5.1...].[...] While natural language processing was pioneering for 'embedding' words in a vectorial space, today we are witnessing a generalization of the embedding process which is progressively extending to all applications fields: networks are becoming sim- ple points in a vectorial space with *graph2vec*, texts with *paragraph2vec*, films with *movie2vec*, meanings of words with *sens2vec*, molecular structures with *mol2vec*, etc. According

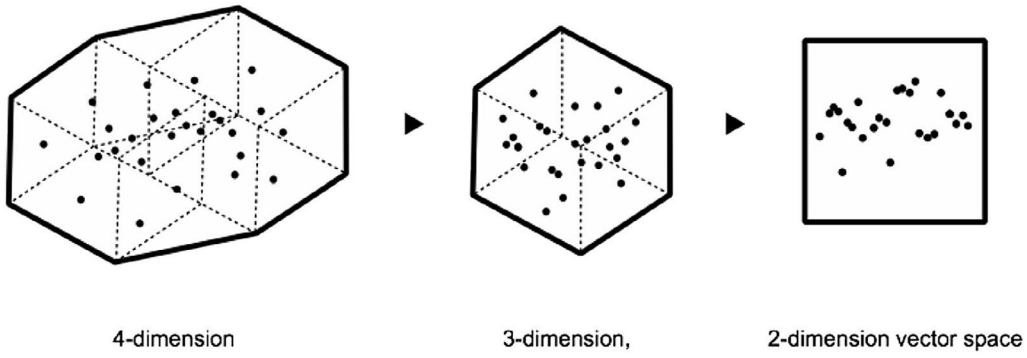


Fig. 9.

to Yann LeCun, the goal of the designers of connectionist machines is to put the world in a vector (*world2vec*).[40]

Multi-dimensional vector space is another reason why the logic of machine learning is difficult to grasp. Vector space is another new cultural technique, worth becoming familiar with. The field of Digital Humanities, in particular, has been covering the technique of vectorialisation through which our collective knowledge is invisibly rendered and processed. William Gibson's original definition of cyberspace prophesized, most likely, the coming of a vector space rather than virtual reality: "A graphic representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding."[41]

It must be stressed, however, that machine learning still resembles more craftsmanship than exact mathematics. AI is still a history of hacks and tricks rather than mystical intuitions. For example, one trick of information compression is *dimensionality reduction*, which is used to avoid the Curse of Dimensionality, that is the exponential growth of the variety of features in the vector space. The dimensions of the categories that show low variance in the vector space (i.e. whose values fluctuate only a little) are aggregated to reduce calculation costs. Dimensionality reduction can be used to cluster word meanings (such as in the model word2vec) but can also lead to *category reduction*, which can have an impact on the representation of social diversity. Dimensionality reduction can shrink taxonomies and introduce bias, further normalising world diversity and obliterating unique identities.[42]

40 D. Cardon, J.P. Cointet and A. Mazières, Neurons spike back: the invention of inductive machines and the artificial intelligence controversy. *Réseaux* 5 (2018), p. 211.

41 W. Gibson, *Neuromancer* (New York 1984), p. 69.

42 S. Samadi et al., The price of fair pca: one extra dimension, in: *Advances in neural information processing systems* (2018), pp. 10976–10987.

The society of classification and prediction bots

Most of the contemporary applications of machine learning can be described according to the two modalities of classification and prediction, which outline the contours of a new society of control and statistical governance. Classification is known as *pattern recognition*, while prediction can be defined also as *pattern generation*. A new pattern is recognised or generated by interrogating the inner core of the statistical model.

Machine learning *classification* is usually employed to recognise a sign, an object, or a human face, and to assign a corresponding category (label) according to taxonomy or cultural convention. An input file (e.g. a headshot captured by a surveillance camera) is run through the model to determine whether it falls within its statistical distribution or not. If so, it is assigned the corresponding output label. Since the times of the Perceptron, classification has been the originary application of neural networks: with Deep Learning, this technique is found ubiquitously in face recognition classifiers that are deployed by police forces and smartphone manufacturers alike.

Machine learning *prediction* is used to project future trends and behaviours according to past ones, that is to complete a piece of information knowing only a portion of it. In the prediction modality, a small sample of input data (a primer) is used to predict the missing part of the information following once again the statistical distribution of the model (this could be the part of a numerical graph oriented toward the future or the missing part of an image or audio file). Incidentally, other modalities of machine learning exist: the statistical distribution of a model can be dynamically visualised through a technique called latent space exploration and, in some recent design applications, also *pattern exploration*.[43]

Machine learning classification and prediction are becoming ubiquitous techniques that constitute new forms of surveillance and governance. Some apparatuses, such as self-driving vehicles and industrial robots, can be an integration of both modalities. A self-driving vehicle is trained to recognise different objects on the road (people, cars, obstacles, signs) and predict future actions based on decisions that a human driver has taken in similar circumstances. Even if recognising an obstacle on a road seems to be a neutral gesture (it's not), identifying a human being according to categories of gender, race and class (and in the recent COVID-19 pandemic as sick or immune), as state institutions are increasingly doing, is the gesture of a new disciplinary regime. The hubris of automated classification has caused the revival of reaction-

43 See the idea of assisted and generative creation in R. Pieters and S. Winiger, Creative AI: on the democratisation and escalation of creativity. *Medium* (March 7, 2016); https://www.medium.com/@creativeai/creativeai-9d4b2346faf3, access: February 13, 2021.

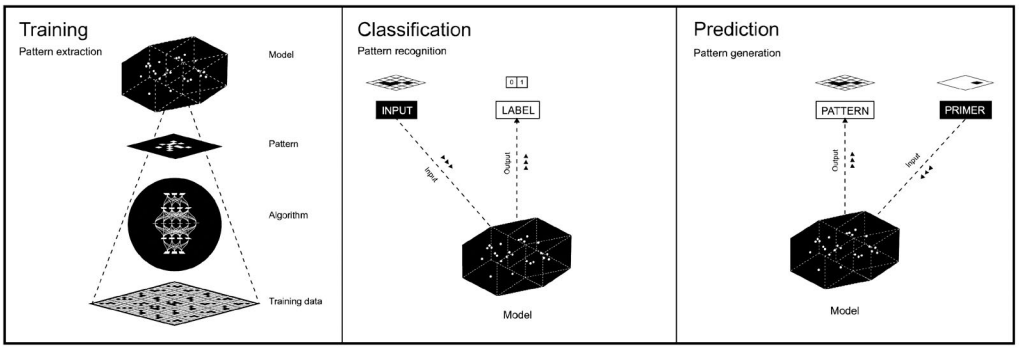


Fig 10.

ary Lombrosian techniques that were thought to have been consigned to history, techniques such as automatic gender recognition (AGR), "a subfield of facial recognition that aims to algorithmically identify the gender of individuals from photographs or videos."[44]

Recently, the generative modality of machine learning has had a cultural impact: its use in the production of visual artefacts has been received by mass media as the idea that artificial intelligence is 'creative' and can autonomously make art. An artwork that is said to be created by AI always hides a human operator, who has applied the generative modality of a neural network trained on a specific dataset. In this modality, the neural network is run *backwards* (moving from the smaller output layer toward the larger input layer) to generate new patterns after being trained at classifying them, a process that usually moves from the larger input layer to the smaller output layer. The generative modality, however, has some useful applications; it can be used as a sort of reality check to reveal what the model has learnt, i.e. to show how the model 'sees the world.' It can be applied to the model of a self-driving car, for instance, to check how the road scenario is projected.

A famous way to illustrate how a statistical model 'sees the world' is Google DeepDream. DeepDream is a convolutional neural network based on Inception (which is trained on the ImageNet dataset mentioned above) that was programmed by Alexander Mordvintsev to project hallucinatory patterns. Mordvintsev had the idea to 'turn the network upside down', that is to turn a classifier into a generator, using some random noise or generic landscape images as input. He discovered that "neural networks that were trained to discriminate between different kinds of images have quite a bit of the information needed to generate images too."[45] In DeepDream first experi-

44 O. Keyes, The misgendering machines: trans/HCI implications of automatic gender recognition, in: *Proceedings of the ACM on human-computer interaction*, vol. 2 (2018), n CSCW, article 88; https:// doi.org/10.1145/3274357.

45 A. Mordvintsev, C. Olah and M. Tyka, Inceptionism: going deeper into neural networks. *Google AI Blog* (2015); https://ai.googleblog.com/2015/06/incep tionism-going-deeper-into-neural.html, access: June 17, 2015.

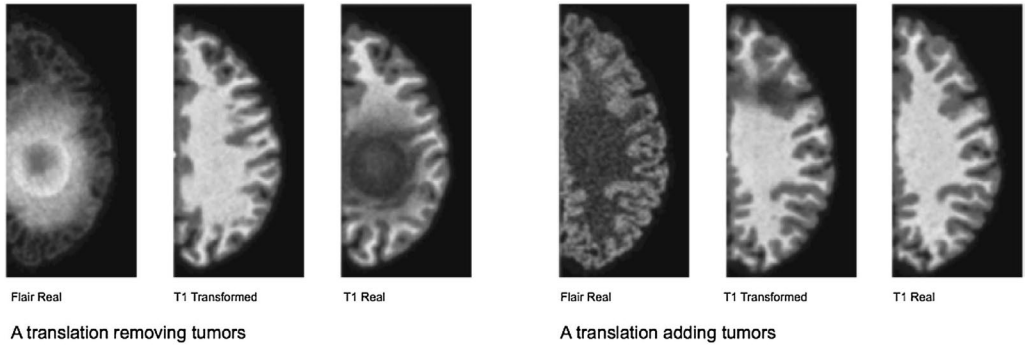


Fig. 11: Joseph Paul Cohen, Margaux Luck and Sina Honari, "Distribution Matching Losses Can Hallucinate Features in Medical Image Translation," 2018. Courtesy of the authors.

ments, bird feathers and dog eyes started to emerge everywhere as dog breeds and bird species are vastly overrepresented in ImageNet. It was also discovered that the category 'dumbbell' was learnt with a surreal human arm always attached to it. Proof that many other categories of ImageNet are misrepresented.

The two main modalities of classification and generation can be assembled in further architectures such as in the Generative Adversarial Networks. In the GAN architecture, a neural network with the role of *discriminator* (a traditional classifier) has to recognise an image produced by a neural network with the role of *generator*, in a reinforcement loop that trains the two statistical models simultaneously. For some converging properties of their respective statistical models, GANs have proved very good at generating highly realistic pictures. This ability has prompted their abuse in the fabrication of 'deep fakes'.[46] Concerning regimes of truth, a similar controversial application is the use of GANs to generate synthetic data in cancer research, in which neural networks trained on unbalanced datasets of cancer tissues have started to hallucinate cancer where there was none.[47] In this case "instead of discovering things, we are inventing things," Fabian Offert notices, "the space of discovery is identical to the space of knowledge that the GAN has already had.[...] While we think that we are seeing through GAN – looking at something with the help of a GAN – we are actually seeing *into* a GAN. GAN vision is not augmented reality, it is virtual reality. GANs do blur discovery and invention."[48] The GAN simulation of brain cancer is a tragic example of AI-driven scientific hallucination.

46 Deep fakes are synthetic media like videos in which a person's face is replaced with someone else's facial features, often for the purpose to forge fake news.

47 J.P. Cohen, S. Honari and L. Margaux, Distribution matching losses can hallucinate features in medical image translation, in: *International conference on medical image computing and computer-assisted intervention* (Berlin 2018); arXiv:1805.08841.

48 F. Offert, Neural network cultures panel, transmediale festival and KIM HfG Karlsruhe (2020); https://kim.hfg-karlsruhe.de/events/ neural-network-cultures, access: February 1, 2020.

Faults of a statistical instrument: the undetection of the new

The normative power of AI in the twenty first century has to be scrutinised in these epistemic terms: what does it mean to frame collective knowledge as patterns, and what does it mean to draw vector spaces and statistical distributions of social behaviours? According to Foucault, in early modern France, statistical power was already used to measure social norms, discriminating between normal and abnormal behaviour.[49] AI easily extends the 'power of normalisation' of modern institutions, among others bureaucracy, medicine and statistics (originally, the numerical knowledge possessed by the state about its population) that passes now into the hands of AI corporations. The institutional norm has become a computational one: the classification of the subject, of bodies and behaviours, seems no longer to be an affair for public registers, but instead for algorithms and datacentres.[50] "Data-centric rationality," Paula Duarte has concluded, "should be understood as an expression of the coloniality of power."[51]

A gap, a friction, a conflict, however, always persists between AI statistical models and the human subject that is supposed to be measured and controlled. This logical gap between AI statistical models and society is usually debated as *bias*. It has been extensively demonstrated how face recognition misrepresents social minorities and how black neighbourhoods, for instance, are bypassed by AI-driven logistics and delivery service.[52] If gender, race and class discriminations are amplified by AI algorithms, this is also part of a larger problem of discrimination and normalisation at the logical core of machine learning. The logical and political limitation of AI is the technology's difficulty in the *recognition and prediction of a new event*. How is machine learning dealing with a truly unique anomaly, an uncommon social behaviour, an innovative act of disruption? The two modalities of machine learning display a limitation that is not simply bias.

A logical limit of machine learning classification, or pattern recognition, is the inability to recognise a *unique anomaly* that appears for the first time, such as a new metaphor in poetry, a new joke in everyday conversation, or an unusual obstacle (a pedestrian? a plastic bag?)

49 M. Foucault, *Abnormal: Lectures at the Collège de France 1974–1975* (New York 2004), p. 26.

50 On computational norms see: M. Pasquinelli, Arcana mathematica imperii: the evolution of western computational norms, in: *Former west*, ed. M. Hlavajova et al. (Cambridge, MA 2017)

51 P. Ricaurte, Data epistemologies, the coloniality of power, and resistance. *Television & New Media* (March 7, 2019).

52 D. Ingold and S. Soper, Amazon doesn't consider the race of its customers. Should it? *Bloomberg* (April 21, 2016); https://www.bloomberg.com/graphics/2016-amazon-same-day, access: April 21, 2016.

on the road scenario. The *undetection of the new* (something that has never 'been seen' by a model and therefore never classified before in a known category) is a particularly hazardous problem for self-driving cars and one that has already caused fatalities. Machine learning prediction, or pattern generation, show similar faults in the guessing of future trends and behaviours. As a technique of information compression, machine learning automates the dictatorship of the past, of past taxonomies and behavioural patterns, over the present. This problem can be termed the *regeneration of the old* – the application of a homogenous space–time view that restrains the possibility of a new historical event.

Interestingly, in machine learning, the logical definition of a security issue also describes the logical limit of its creative potential. The problems characteristic of the *prediction of the new* are logically related to those that characterise the *generation of the new*, because the way a machine learning algorithm predicts a trend on a time chart is identical to the way it generates a new artwork from learnt patterns. The hackneyed question 'Can AI be creative?' should be reformulated in technical terms: is machine learning able to create works that are not imitations of the past? Is machine learning able to extrapolate beyond the stylistic boundaries of its training data? The 'creativity' of machine learning is limited to the detection of styles from the training data and then random improvisation within these styles. In other words, machine learning can explore and improvise only within the logical boundaries that are set by the training data. For all these issues, and its degree of information compression, it would be more accurate to term machine learning art as *statistical art*.

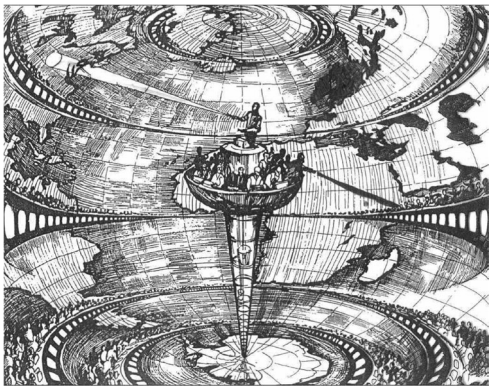


Fig 12: Lewis Fry Richardson, Weather Prediction by Numerical Process (London: Cambridge University Press, 1922).

Another unspoken bug of machine learning is that the statistical correlation between two phenomena is often adopted to explain causation from one to the other. In statistics, it is commonly understood that *correlation does not imply causation*, meaning that a statistical coincidence alone is not sufficient to demonstrate causation. A tragic example can be found in the work of statistician Frederick Hoffman, who in 1896 published a 330-page report for insurance companies to demonstrate a *racial correlation* between being a black American and having short life expectancy.[53] Superficially mining data, machine learning can construct any arbitrary correlation that is then per-

53 C. O'Neil, *Weapons of math destruction* (New York 2016).

ceived as real. In 2008, this logical fallacy was proudly embraced by Wired director Chris Anderson who declared the "end of theory," because "the data deluge makes the scientific method obsolete."[54] According to Anderson, himself no expert on scientific method and logical inference, statistical correlation is enough for Google to run its ads business, therefore, it must also be good enough to automatically discover scientific paradigms. Even Judea Pearl, a pioneer of Bayesian networks, believes that machine learning is obsessed with 'curve fitting', recording correlations without providing explanations.[55] Such a logical fallacy has already become a political one, if one considers that police forces worldwide have adopted predictive policing algorithms.[56] According to Dan McQuillan, when machine learning is applied to society in this way, it turns into a biopolitical apparatus of *preemption*, that produces subjectivities which can subsequently be criminalized.[57] Ultimately, machine learning obsessed with 'curve fitting' imposes a *statistical culture* and replaces the traditional episteme of causation (and political accountability) with one of correlations blindly driven by the automation of decision making.

Adversarial intelligence vs. artificial intelligence

So far, the statistical diffractions and hallucinations of machine learning have been followed step by step through the multiple lenses of the Nooscope. At this point, the orientation of the instrument has to be reversed: scientific theories as much as computational devices are inclined to consolidate an abstract perspective – the scientific 'view from nowhere', that is often just the point of view of power. The obsessive study of AI can suck the scholar into an abyss of computation and the illusion that the technical form illuminates the social one. As Paola Ricaurte remarks: "Data extractivism assumes that everything is a data source."[58] How to emancipate ourselves from a data-centric view of the world? It is time to realise that it is not the statistical model that constructs the subject, but rather the subject that structures the statistical mo-

54 C. Anderson, The end of theory: the data deluge makes the scientific method obsolete. Wired (June 23, 2008). For a critique see F. Mazzocchi, Could Big Data be the end of theory in science? A few remarks on the epistemology of data-driven science. *EMBO Rep* 16/10 (2015), pp. 1250–1255.

55 D. Mackenzie and P. Judea, *The book of why: the new science of cause and effect* (New York 2018).

56 Experiments by the New York Police Department since the late 1980s. See M. *Pasquinelli*, Arcana mathematica imperii: the evolution of western computational norms, in: *Former west*, ed. M. Hlavajova et al. (Cambridge, MA 2017).

57 D. McQuillan, Manifesto on algorithmic humanitarianism. Presented at the symposium reimagining digital humanitarianism, Goldsmiths, University of London (February 1, 2018); D. McQuillan, People's councils for ethical machine learning. *Soc Media Soc* 4/2 (2018), p. 3.

58 P. Ricaurte, Data epistemologies, the coloniality of power, and resistance. *Television & New Media* (March 7, 2019).

del. Internalist and externalist studies of AI have to blur: subjectivities make the mathematics of control from within, not from without. To second what Guattari once said of machines in general, machine intelligence too is constituted of "hyper-developed and hyper-concentrated forms of certain aspects of human subjectivity."[59]

Rather than studying only how technology works, critical inquiry studies also how it breaks, how subjects rebel against its normative control and workers sabotage its gears. In this sense, a way to sound the limits of AI is to look at hacking practices. Hacking is an important method of knowledge production, a crucial epistemic probe into the obscurity of AI.[60] Deep learning systems for face recognition have triggered, for instance, forms of counter-surveillance activism. Through techniques of face obfuscation, humans have decided to become unintelligible to artificial intelligence: that is to become, themselves, *black boxes*. The traditional techniques of *obfuscation* against surveillance immediately acquire a mathematical dimension in the age of machine learning. For example, AI artist and researcher Adam Harvey has invented a camouflage textile called HyperFace that fools computer vision algorithms to see multiple human faces where there is none.[61] Harvey's work provokes the question: what constitutes a face for a human eye, on the one hand, and a computer vision algorithm, on the other? The neural glitches of HyperFace exploit such a cognitive gap and reveal what a human face looks like to a machine. This gap between human and machine perception helps to introduce the growing field of adversarial attacks.

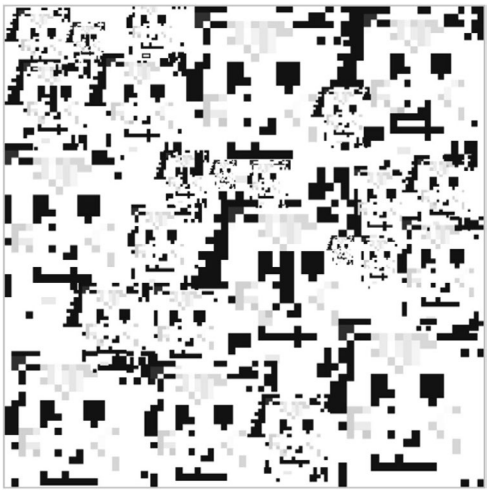


Fig. 13: Adam Harvey, HyperFace pattern, 2016.

Adversarial attacks exploit blind spots and weak regions in the statistical model of a neural network, usually to fool a classifier and make it perceive something that is not there. In object recognition, an adversarial example can be a doctored image of a turtle, which looks innocuous to a human eye but gets misclassified by a neural network as a rifle.[62] Adversarial

59 F. Guattari, *Schizoanalytic cartographies* (London 2013), p. 2.

60 The relationship between AI and hacking is not as antagonistic as it may appear: it often resolves in a loop of mutual learning, evaluation and reinforcement.

61 A. Harvey, HyperFace project (2016); https://ahprojects.com/hyperface, access: April 30, 2020.

62 A. Athalye et al., Synthesizing robust adversarial Examples (2017). arXiv preprint; https://arxiv.org/abs/1707.07397, access: April 30, 2020.

examples can be realised as 3D objects and even stickers for road signs that can misguide self-driving cars (which may read a speed limit of 120 km/h where it is actually 50 km/h).[63] Adversarial examples are designed knowing what a machine has never seen before. This effect is achieved also by reverse-engineering the statistical model or by polluting the training dataset. In this latter sense, the technique of *data poisoning* targets the training dataset and introduces doctored data. In doing so, it alters the accuracy of the statistical model and creates a backdoor that can be eventually exploited by an adversarial attack.[64]

Adversarial attack seems to point to a mathematical vulnerability that is common to all machine learning models: "An intriguing aspect of adversarial examples is that an example generated for one model is often misclassified by other models, even when they have different architectures or were trained on disjoint training sets.[65] Adversarial attacks remind us of the discrepancy between human and machine perception and that the logical limit of machine learning is also a political one. The logical and ontological boundary of machine learning is the unruly subject or anomalous event that escapes classification and control. The subject of algorithmic control fires back. Adversarial attacks are a way to sabotage the assembly line of machine learning by inventing a virtual obstacle that can set the control apparatus out of joint. An adversarial example is the *sabot* in the age of AI.

Labour in the age of AI

The natures of the 'input' and 'output' of machine learning have to be clarified. AI troubles are not only about information bias but also labour. AI is not just a control apparatus, but also a productive one. As just mentioned, an invisible workforce is involved in each step of its assembly line (dataset composition, algorithm supervision, model evaluation, etc.). Pipelines of endless tasks innervate from the Global North into the Global South; crowdsourced platforms of workers from Venezuela, Brazil and Italy, for instance, are crucial to teach German self-driving cars 'how to see'.[66] Against the idea of alien intelligence at work, it must be stressed that in the whole computing process of AI the human worker has never left the loop, or put more accurately, has never left the assembly line. Mary Gray and Siddharth Suri coined the term 'ghost work' for the invisible labour that makes AI appear artificially autonomous.

Beyond some basic decisions, today's

63 N. Morgulis et al., Fooling a real car with adversarial traffic signs (2019). arXiv preprint; https://arxiv.org/abs/1907.00374, access: April 30, 2020.

64 Data poisoning can also be employed to protect privacy by entering anonymised or random information into the dataset.

65 I. Goodfellow, J. Shlens and C. Szegedy, Explaining and harnessing adversarial examples (2014). arXiv preprint; https://arxiv.org/abs/1412.6572, access: April 30, 2020.

66 F.A., Schmidt, *Crowdsourced production of AI training data: how human workers teach self-driving cars to see* (Düsselsdorf 2019).

artificial intelligence can't function without humans in the loop. Whether it's delivering a relevant newsfeed or carrying out a complicated texted-in pizza order, when the artificial intelligence (AI) trips up or can't finish the job, thousands of businesses call on people to quietly complete the project. This new digital assembly line aggregates the collective input of distributed workers, ships pieces of projects rather than products, and operates across a host of economic sectors at all times of the day and night.

Automation is a myth, because machines, including AI, constantly call for human help, some authors have suggested replacing 'automation' with the more accurate term *heteromation*.[67] Heteromation means that the familiar narrative of AI as *perpetuum mobile* is possible only thanks to a reserve army of workers.

Yet, there is a more profound way in which labour constitutes AI. The information source of machine learning (whatever its name: input data, training data or just data) is always a representation of human skills, activities and behaviours, social production at large. All training datasets are, implicitly, a diagram of the division of human labour that AI has to analyse and automate. Datasets for image recognition, for instance, record the visual labour that drivers, guards, and supervisors usually perform during their tasks. Even scientific datasets rely on scientific labour, experiment planning, laboratory organisation, and analytical observation. The information flow of AI has to be understood as an apparatus designed to extract 'analytical intelligence' from the most diverse forms of labour and to transfer such intelligence into a machine (obviously including, within the definition of labour, extended forms of social, cultural and scientific production).[68] In short, the origin of machine intelligence is the *division of labour* and its main purpose is the *automation of labour*.

Historians of computation have already stressed the early steps of machine intelligence in the nineteenth century project of mechanizing the division of mental labour, specifically the task of hand calculation.[69] The enterprise of computation has since then been a combination of surveillance and disciplining of labour, of optimal calculation of surplus-value, and planning of collective behaviours.[70] Computation was established by and still enforces a regime of visibility and intelligibility, not just of logical reasoning. The genealogy of AI as an apparatus of power is confirmed today by its widespread employment in technologies of identification and prediction, yet the

67 H. Ekbia and B. Nardi, *Heteromation, and other stories of computing and capitalism* (Cambridge, MA 2017).

68 For the idea of analytical intelligence see: L. Daston, Calculation and the division of labour 1750–1950. *Bull Ger Hist Inst* 62 (2018), pp. 9–30.

69 S. Schaffer, Babbage's intelligence: calculating engines and the factory system. *Critical Inquiry* 21/1, pp. 203–227; L. Daston, Enlightenment calculations. *Critical Inquiry* 21 (1994), pp. 182–202; M.L. Jones, *Reckoning with matter: calculating machines, innovation, and thinking about thinking from Pascal to Babbage* (Chicago 2016).

70 M. Pasquinelli, On the origins of Marx's general intellect. *Radical Philosophy* 2/6 (2019), pp. 43–56.

core anomaly which always remains to be computed is the *disorganisation of labour*.

As a technology of automation, AI will have a tremendous impact on the job market. If Deep Learning has a 1% error rate in image recognition, for example, it means that roughly 99% of routine work based on visual tasks (e.g. airport security) can be potentially replaced (legal restrictions and trade union opposition permitting). The impact of AI on labour is well described (from the perspective of workers, finally) within a paper from the European Trade Union Institute, which highlights

seven essential dimensions that future regulation should address to protect workers: (1) safe- guarding worker privacy and data protection; (2) addressing surveillance, tracking and monitoring; (3) making the pur- pose of AI algorithms transparent; (4) ensuring the exercise of the 'right to explanation' regarding decisions made by algorithms or machine learning models; (5) preserving the security and safety of workers in human–machine interac- tions; (6) boosting workers' autonomy in human–machine interactions; (7) enabling workers to become AI literate.[71]

Ultimately, the Nooscope manifests in response to the need for a novel Machinery Question in the age of AI. The Machinery Question was a debate that sparked in England during the industrial revolution, when the response to the employment of machines and workers' unemployment was a social campaign for more education about machines, that took the form of the Mechanics' Institute Movement.[72] Today, an Intelligent Machinery Question is needed to develop more collective intelligence about machine intelligence, more public education instead of 'learning machines' and their regime of knowledge extractivism, which crosses once again old colonial routes (if one looks at the network map of crowdsourcing). Also in the Global North, the colonial relationship between corporate AI and the production of knowledge as a common good has to be brought to the forefront. The Nooscope's purpose is to break into the hidden room of the corporate Mechanical Turk, and to illuminate the invisible labour of knowledge that makes machine intelligence appear ideologically alive.

Acknowledgements

Thanks to Jon Beller, Claire Glanois, Adam Harvey, Leonardo Impett, Arif Kornweitz, Wietske Maas, Dan McQuillan, Fabian Offert, Godofredo Pereira, Mitch Speed and the extended community around KIM HfG Karlsruhe for their inputs and comments. Open Access funding enabled and organized by Projekt DEAL.

71 A. Ponce, Labour in the age of AI: why regulation is needed to protect workers. ETUI Research Paper – Foresight Brief #08 (2020). https ://doi.org/10.2139/ssrn.3541002.

72 M. Berg, *The machinery question and the making of political economy* (Cambridge 1980). In fact, even the Economist has recently warned about "the return of the machinery question" in the age of AI. See T. Standage, The return of the machinery question. *The Economist* (June 23, 2016).

References

Anderson, C., The end of theory: the data deluge makes the scientific method obsolete. *Wired* (June 23, 2008).

Athalye, A. et al., Synthesizing robust adversarial Examples (2017). arXiv preprint; https://arxiv.org/abs/1707.07397, access: April 30, 2020.

Beller, J., *The cinematic mode of production: attention economy and the society of the spectacle* (Lebanon, NH: Dartmouth University Press, 2006).

Benjamin, R., *Race after technology: abolitionist tools for the new jim code* (Cambridge: Polity, 2019).

Berg, M., *The machinery question and the making of political economy* (Cambridge: Cambridge University Press, 1980).

Box, G., Robustness in the strategy of scientific model building. Mathematics Research Center, Technical report 1954, University of Wisconsin-Madison (1979).

Campolo, A., and K. Crawford, Enchanted determinism: power without control in artificial intelligence. *Engag Sci Technol Soc* 6 (2020), pp. 1–19.

Cardon, D., J.P. Cointet and A. Mazières, Neurons spike back: the invention of inductive machines and the artificial intelligence controversy. *Réseaux* 5 (2018), p. 211.

Cardon, D., J.P. Cointet and A. Mazières, Neurons spike back. The invention of inductive machines and the artificial intelligence controversy. *Réseaux* 211 (2018), pp. 173–220.

Cohen, J.P., S. Honari and L. Margaux, Distribution matching losses can hallucinate features in medical image translation, in: *International conference on medical image computing and computer-assisted intervention* (Berlin: Springer, 2018); arXiv:1805.08841.

Corsani, A., B. Paulré, C. Vercellone, J.M. Monnier, M. Lazzarato, P. Dieuaide, Y. Moulier-Boutang, *Le Capitalisme cognitif comme sortie de la crise du capitalisme industriel. Un programme de recherche*' (Paris: Laboratoire Isys Matisse, Maison des Sciences Economiques, 2004).

Crawford, K., The trouble with bias. Keynote lecture: conference on neural information processing systems (2017).

Crawford, K. and T. Paglen, Excavating AI: the politics of training sets for machine learning (2019); https://excavating.ai, access: April 30, 2020.

Daston, L., Enlightenment calculations. *Critical Inquiry* 21 (1994), pp. 182–202.

Daston, L., Calculation and the division of labour 1750–1950. *Bull Ger Hist Inst* 62 (2018), pp. 9–30.

Edwards, P., *A vast machine: computer models, climate data, and the politics of global warming* (Cambridge, MA: MIT Press, 2010).

Ekbia, H. and B. Nardi, *Heteromation, and other stories of computing and capitalism* (Cambridge, MA: MIT Press, 2017).

E**ubanks, V.,** *Automating inequality* (New York: St. Martin's Press, 2018).

F**oucault, M.,** *Abnormal: Lectures at the Collège de France* 1974–1975 (New York: Picador, 2004).

Foucault, M., *The order of things* (London: Routledge, 2005).

Galstyan, A., K. Lerman, N. Mehrabi, F. Morstatter, N. Saxena, A survey on bias and fairness in machine learning

(2019). arxiv preprint; https://arxiv.org/abs/1908.09635, access: April 30, 2020.

Ganesh, A., A. McCallum and E. Strubell, Energy and policy considerations for deep learning in NLP (2019). arXiv preprint; arXiv:1906.02243.

Gibson, W., *Neuromancer* (New York: Ace Books, 1984).

Gitelman, L. (ed.), *Raw data is an oxymoron* (Cambridge, MA: MIT Press, 2013).

Goodfellow, I., J. Shlens and C. Szegedy, Explaining and harnessing adversarial examples (2014). arXiv preprint; https://arxiv.org/abs/1412.6572, access: April 30, 2020.

Guattari, F., *Schizoanalytic cartographies* (London: Coninuum, 2013).

Guttag, J. and H. Suresh, A framework for understanding unintended consequences of machine learning (2019). arxiv preprint; https://arxiv.org/abs/1901.10002, access: April 30, 2020.

Harvey, A., HyperFace project (2016); https://ahprojects.com/hyperface, access: April 30, 2020.

Harvey, A., Megapixel project (2019); https://megapixels.cc/about/; access: April 30, 2020.

Ingold, D. and S. Soper, Amazon doesn't consider the race of its customers. Should it? *Bloomberg* (April 21, 2016); https://www.bloomberg.com/graphics/2016-amazon-same-day, access: April 21, 2016.

Jones, M.L., *Reckoning with matter: calculating machines, innovation, and thinking about thinking from Pascal to Babbage* (Chicago: University of Chicago Press, 2016).

Keyes, O., The misgendering machines: trans/HCI implications of automatic gender recognition, in: *Proceedings of the ACM on human-computer interaction,* vol. 2 (2018), n CSCW, article 88; https://doi.org/10.1145/3274357.

Krizhevsky, A., I. Sutskever and G.E. Hinton, Imagenet classification with deep convolutional neural networks. *Commun ACM* 60/6 (2017), pp. 84–90.

Leibniz, G.W., Preface to the general science [1677], in: G.W. Leibniz, *Selections*, ed. P. Wiener (New York: Scribner, 1951).

Lipton, Z.C., The mythos of model interpretability (2016). arXiv preprint; https://arxiv.org/abs/1606.03490, access: April 30, 2020.

Mackenzie, D. and P. Judea, *The book of why: the new science of cause and effect* (New York: Basic Books, 2018).

Malik, M.M., A hierarchy of limitations in machine learning (2020). arxiv preprint; https://arxiv.org/abs/2002.05193, access: April 30, 2020.

Mazzocchi, F., Could Big Data be the end of theory in science? A few remarks on the epistemology of data-driven science. *EMBO Rep* 16/10 (2015), pp. 1250–1255.

McCulloch, W. and W. Pitts, How we know universals: the perception of auditory and visual forms. *Bull Math Biophys* 9/3 (1947), pp. 127–147.

McQuillan, D., Manifesto on algorithmic humanitarianism. Presented at the symposium reimagining digital humanitarianism, Goldsmiths, University of London (February 1, 2018).

McQuillan, D., People's councils for ethical machine learning. *Soc Media Soc* 4/2 (2018), p. 3.

Mezzadra S. and B. Neilson, *The politics of operations: excavating contempora-*

ry capitalism (Durham: Duke University Press, 2019).

Mitchell, M., *Artificial intelligence: a guide for thinking humans* (London: Penguin, 2019).

Mordvintsev, A., C. Olah and M. Tyka, Inceptionism: going deeper into neural networks. *Google AI Blog* (2015); https://ai.googleblog.com/2015/06/inceptionism-going-deeper-into-neural.html, access: June 17, 2015.

Moretti, F., *Distant reading* (London: Verso, 2013).

Morgulis, N. et al., Fooling a real car with adversarial traffic signs (2019). arXiv preprint; https://arxiv.org/abs/1907.00374, access: April 30, 2020.

Murgia, M., Who's using your face? The ugly truth about facial recognition. *Financial Times* (April 19, 2019).

O'Neil, C., *Weapons of math destruction* (New York: Broadway Books, 2016).

Offert, F., Neural network cultures panel, transmediale festival and KIM HfG Karlsruhe (2020); https://kim.hfg-karlsruhe.de/events/ neural-network-cultures, access: February 1, 2020.

Pasquinelli, M., Arcana mathematica imperii: the evolution of western computational norms, in: *Former west*, ed. M. Hlavajova et al. (Cambridge, MA: MIT Press, 2017).

Pasquinelli, M., *On the origins of Marx's general intellect*. Radical Philosophy 2/6 (2019), pp. 43–56.

Pasquinelli, M., Three thousand years of algorithmic rituals. *e-flux* 101 (2019).

Pasquinelli, M., *The eye of the master* (London: Verso, forthcoming).

Pieters, R. and S. Winiger, Creative AI: on the democratisation and escalation of creativity. *Medium* (March 7, 2016); https://www.medium.com/@creativeai/creativeai-9d4b2346faf3, access: February 13, 2021.

Ponce, A., Labour in the age of AI: why regulation is needed to protect workers. ETUI Research Paper – Foresight Brief #08 (2020). https ://doi.org/10.2139/ssrn.3541002.

Pontin, J., Artificial intelligence, with help from the humans. *The New York Times* (March 25, 2007).

Ricaurte, P., Data epistemologies, the coloniality of power, and resistance. *Television & New Media* (March 7, 2019).

Rosenblatt, F., The perceptron: a perceiving and recognizing automaton. Cornell Aeronautical Laboratory Report 85-460-1 (1957).

Samadi, S., U. Tantipongpipat, J.H. Morgenstern, M. Singh and S. Vempala, The price of fair pca: one extra dimension, in: *Advances in neural information processing systems* (2018), pp. 10976–10987.

Schaffer, S., Babbage's intelligence: calculating engines and the factory system. *Critical Inquiry* 21/1 (1994), pp. 203–227.

Schmidt, F.A., *Crowdsourced production of AI training data: how human workers teach self-driving cars to see* (Düsseldorf: Hans-Böckler-Stiftung, 2019).

Standage, T., The return of the machinery question. *The Economist* (June 23, 2016).

Winner, L., *Autonomous technology: technics-out-of-control as a theme in political* thought (Cambridge, MA: MIT Press, 2001).

Zuboff, S., *The age of surveillance capitalism: the fight for a human future at the new frontier of power* (London: Profile Books, 2019).

TALK WITH MACHINES, REDUX

By Lucy Suchman

"The designer's project in this sense is to imbue the machine with grounds for behaving in ways that are accountably rational; that is, reasonable or intelligible to others including, in the case of interaction, ways that are responsive to the others' actions."

Suggested citation:
Lucy Suchman, Talk with Machines, Redux. *Interface Critique* 3 (2021), pp. 69–80.
DOI: https://doi.org/10.11588/ic.2021.3.81328.

Preface

With Claude Shannon's translation of numerical analysis into "The Mathematical Theory of Communication" in 1949[1], the foundations were secured for an imaginary of the computational sensorium. Framed through the trope of communication, moreover, these foundations were posited as the model not only for signal processing but also for human cognition and social relations. In the ensuing decades the intelligent, interactive machine has become an established figure in discussions of information technology, from scientific and professional discourse to popular media representations. At the same time, scholarship in feminist science and technology studies, post/decolonial theory, media studies, and related fields has taught us to question the figure, to trace its genealogies and identify its legacies. Figuration, we now understand, is consequential not only for what is posited to be known but also for what comes to matter, as well as what is ignored and what differences that matter are erased.[2]

Since the 1980s I have been following the figure of the intelligent, interactive machine with the aim of slowing down its facile claims, not only for kinship with (more than) human being but for pride of place among sensing media. In the beginning my impetus to resist was based in an immersion in ethnomethodology and conversation analysis, through the work of a community of researchers profoundly attentive to the exquisite, mundane improvisations through which human interlocutors reflexively co-construct their mutual intelligibility.[3] In light of the loving care with which these scholars traced the emerging, contingent arc of socially organised, materially embodied human action and communication, demonstrating the astonishing range and depth of competencies involved in even the most ordinary encounter, the trope of signal processing seemed to offer a weak analogy. But it was only gradually that I came to appreciate the strength of its rhetorical grasp.

The work revived in this contribution began its life over three decades ago, in the context of a PhD dissertation submitted to the Department of Anthropology at the University of California at Berkeley in 1984. It was an unusual dissertation for the discipline of anthropology at the time, addressing developments in computing and the emerging fields of cognitive science, artificial intelligence (AI), and human-computer interaction (HCI). Based at Xerox's Palo Alto Research Center, my 'fieldwork' involved a critical

1 Claude Shannon, *The Mathematical Theory of Communication* (Champagne-Urbana 1949).

2 See Donna Haraway, *Modest _Witness @Second_Millenium.FemaleMan_Meets_OncoMouse™: Feminism and Technoscience* (New York 1997); Sara Ahmed, *Differences that Matter: Feminist Theory and Postmodernism* (Cambridge 1998); Anne Balsamo, Reading Cyborgs Writing Feminism, in: *The Gendered Cyborg*, ed. Gill Kirkup (New York 2000), pp. 148 – 158; Londa Schiebinger, Taxonomy for Human Beings, in: *The Gendered Cyborg*, ed. Gil Kirkup (New York 2000), pp. 11 – 37; Claudia Castañeda, *Figurations: Child, Bodies, Worlds* (Durham 2002)

3 For a recent and exemplary text see Charles Goodwin, *Co-Operative Action* (Cambridge, MA 2017).

but also constructive engagement with some emerging projects in the creation of humanlike, interactive machines. What follows is an unpublished paper titled 'Talk with Machines,' presented at the conference *Talk and Social Structure*, a gathering of ethnomethodologists and conversation analysts (a community hereafter referred to as ethno/CA) at the University of California at Santa Barbara in March 1986.[4] This was one of the first conference papers I had ever presented, and definitely my first to an audience of ethno/CA scholars. To say that I was nervous would be an understatement; a condition not lessened when Gail Jefferson, one of the founding and most famous members of the field, commented to me before convening the panel on which I spoke that she had absolutely no idea who I was and so found the job of introducing me a (clearly somewhat annoying) challenge. To my great relief things improved from there, as the paper was well received by an audience delighted by the (novel at the time) idea of bringing conversation analysis to the interface of people and machines.

I rediscovered this paper as a hardcopy document in my basement file cabinet, which I then ran through a scanner and OCR software. This left me with a text that was amusing in the ways that it manifested the argument that it made, including errors of 'recognition' that no human reader would make. The text below has been edited for correctness but is otherwise as it was presented in 1986. I follow it with a brief afterword, reflecting on the book(s) in which versions of the talk were subsequently published, and what I think this all has to say to us now, amidst the massive transformations in the human/machine sensorium in the decades since.

Talk with Machines (as presented in 1986)

From questions that I've received over the last several days of the conference, it seems worthwhile to begin by saying something about where in the world it is that I do my work. Xerox began its Palo Alto Research Center in 1970, with the mandate to do research on computing machinery. PARC now comprises roughly 200 or so computer scientists, with a smaller complement of cognitive psychologists, linguists, and two anthropologists, grouped into several laboratories. The lab of which I'm a member includes researchers engaged in the project of building intelligent, conversationally competent machines. It's a preposterous enterprise on the face of it. And yet in the ways that it proceeds, its achievements and its troubles, it offers a unique setting in which to look in detail at what the practical activities of intelligence and conversation actually involve.

4 For the publication based in this conference, not including my own paper, see Deirdre Boden and Don H. Zimmerman, *Talk and Social Structure* (Berkeley 1991).

When I say that the project of the lab is to build machines that display intelligence and are capable of engaging in conversation, I use the terms intelligence and conversation advisedly. That is, I want neither to appropriate them in a facile way to the description of machines, nor simply to put scare quotes around them and argue that they are *a priori* unique to persons. I want rather to point out that they have now come to be applied to machines, and to suggest that the grounds for that application, how it gets done, represents a new embodiment of practical sociology and a new laboratory for social studies.

It was quite a few years ago that I first read Harvey Sacks' paper "On Sociological Description"[5]. Sacks' primary business in that paper was to consider what are the essential requirements for a science of the social world. Somewhat incidentally, as illustration, he sets up the following scene. Imagine that you are at a trade show where there is a machine that, as it is operating, provides a running account of its own operations. At the show as well are several typified observers, each of whom has a particular stance toward this self-explicating machine. Sacks develops his paper around the differences among the observers. But their differences are of less importance, for present purposes, than their common problem: for each of them the relevant issue in making sense of the machine is the relation between what the machine says, and what it can be seen to be doing.

Metaphorically, the observers at the trade show and the machine observed are members of the society, their common problem that of constructing the coherence of talk and actions. Through the metaphor Sacks is pointing, among other things, to something that seems uniquely identifying of the social world. That is the fact that we human beings have the ability both to produce intelligible actions and to find sense in the actions of others. We are self-explicating, in short, and treat others as such, and that is a fundamental premise for the mutual intelligibility of our interaction.

As life imitates art, recent directions in the development of technology turn Sacks' metaphor into a more nearly literal description of an occasion that any of us may in fact encounter. Specifically, researchers in the field of artificial intelligence are hard at work using the powers of computation to try to build machines that we no longer simply use, but that will interact with us. Over the past seven years I have become deeply interested in this notion of interactive artifacts; its use within the community of computer researchers and designers, its propagation out into the popular press and, most crucially, its basis in what actually goes on when people use computational machines.

The project of designing interactive machines is motivated in part by a practical concern with their usability. The designer of any artifact that is a tool must communicate the artifact's intended use and, in some cases, the rationale for its behavior to the user. This concern is dou-

5 Harvey Sacks, On Sociological Description. *Berkeley Journal of Sociology* 8 (1963), pp. 1–16.

bly relevant insofar as increasingly complex technology is to be usable by people with decreasing amounts of training. The preferred solution is that machines should somehow be self-explanatory; really, that users should be able to discover the machine's intended use solely from information found in and on the machine itself. In physical design, the designer anticipates certain questions such that, in the event, an answer is there ready at hand. So, for example, the user's question 'Where do I grab?' is answered by a handle fitted to the act of grabbing. In the traditional instruction manual, some further classes of inquiry are anticipated, and answers provided. The stepwise instruction set addresses the question "What do I do next?" and the diagram "Where?". In every case, the questions anticipated and answered must be those that any user of the machine might ask, and the occasion for both questions and answers is found by the user.

For the novice engaged in doing some procedural task with a machine, the guiding inquiry is some form of the question "What next?"[6]. Lynch, Livingston and Garfinkel, in their paper "Temporal order in laboratory work"[7] characterise the general task in following instructions as bringing standard descriptions of objects and actions to bear on the specific objects and embodied actions that the instructions describe, right here and right now, this time through. Social studies of the production and use of instructions have identified what Garfinkel calls the "irremediable incompleteness" of instructions and the nature of the work required to carry them out.[8]

The idea of a self-explicating artifact accords well with the notion that using a machine could be like interaction. The interactive machine, in this sense, represents the latest solution to the longstanding problem of providing the user of a tool with instruction in its use. There is also, however, a sense of machine interactivity that is more recent, and is uniquely tied to the advent of computing. The new idea is that the intelligibility of artifacts could be not just a matter of the availability to the user of the designer's intentions for the artifact's use, but of the intentions of the artifact itself. The designer's project in this sense is to imbue the machine with grounds for behaving in ways that are accountably rational; that is, reasonable or intelligible to others including, in the case of interaction, ways that are responsive to the others' actions.

In 1950, the mathematician A.M. Turing proposed a now-famous test for ma-

6 I would now note that the interface as imagined here is the site for inter/action in a rather different sense than that of our interfacing activities at the screen today, which are more ways of inhabiting a place of engagement (with texts, images, others). At the same time, the issues of un/familiarity that I highlight remain at least as salient.

7 Michael Lynch, Eric Livingston and Harold Garfinkel, Temporal Order in Laboratory Work, in: *Science Observed: Perspectives on the Social Study of Science*, eds. Karin D. Knorr-Cetina and Michael Mulkay (London 1983), pp. 205–238.

8 Briefly the argument is that instructions are indexical; that is, they assume the work of finding their relevance for the immediate task at hand, in this particular setting and circumstances, and that work cannot be fully specified given the contingencies of any actual time/place. For an extensive and quintessentially Garfinkelian discussion see Harold Garfinkel, *Ethnomethodology's program: working out Durkheim's aphorism* (Lanham 2002), Chapter 6.

chine intelligence, based on a view of intelligence as rational accountability. Turing argued that if a machine could be made to respond to questions in such a way that a person asking the questions could not distinguish between the machine and another human being, the machine would have to be described as intelligent.[9] Turing expressly dismissed the possible objection that although the machine might succeed in the game, it could succeed by means that bore no plausible resemblance to human thought. The Turing test became the canonical form of the argument that if two information processors, subject to the same input, produce indistinguishable output, then regardless of the differences in their internal operations one is essentially equivalent to the other.

The lines of controversy raised by the Turing test were drawn over a family of programs developed by Joseph Weizenbaum at MIT in the 1960s under the name ELIZA, and designed to support, in Weizenbaum's words, "natural language conversation" with a computer. Anecdotal reports of occasions on which people approached the teletype to one of the ELIZA programs and, believing it to be connected to a colleague, engaged in some amount of interaction without detecting the true nature of the respondent led many to believe that Weizenbaum's program had passed a simple form of the Turing test. Weizenbaum himself, however, denied the intelligence of the program – not on the basis of its interactional success, but on the basis of the underlying mechanism – in a paper that discussed the program's reliance on what Weizenbaum called 'a mere collection of procedures'[10]. In explicating the ELIZA programs, Weizenbaum was concerned with the inclination of human users to find sense in the computer's output, and to ascribe to it an understanding unwarranted by the actual mechanism. This was a process that Harold Garfinkel[11] was at the time identifying as the documentary method of interpretation; a method he discovered, among other places, in his study of students producing the sense of advice provided to them by a counselor. The method is, he argues, the basis for our commonsense knowledge of what are, in the terms of sociology, social structures.

As I said earlier, in looking at the case of ELIZA Weizenbaum was concerned not only with the behavior of his programs, but with the underlying mechanisms that he took to generate that behavior. His concerns elucidate the prevailing view of social structures held by those engaged in engineering machine intelligence. Roughly, the view is that action, and by extension interaction, are epiphenomenal. The structure of observ-

9 While this is the standard characterization of the test, it misses the crucial dimension of gender. For reflections on this lacuna see the preface to Katherine N. Hayles, *How we became posthuman: virtual bodies in cybernetics, literature, and informatics* (Chicago 1999); see also Jennifer Rhee, *The Robotic Imaginary: The human and the price of dehumanized labor* (Minneapolis 2018), pp. 13–14; and Lucy Suchman, Demystifying the Intelligent Machine, in: *Cyborg Futures: Social and Cultural Studies of Robots and AI*, ed. Teresa Heffernan (Basingstoke 2019), pp. 35–61.

10 Joseph Weizenbaum, ELIZA – a computer program for the study of natural language communication between man and machine. *Communications of the ACM* 9 (1966), pp. 36–45.

11 Harold Garfinkel, *Studies in ethnomethology* (Englewood Cliffs 1967).

able behavior is the reflection of underlying cognitive mechanisms that control behavior and give it its sense. On this view, the skillful use of the documentary method by observers or users is seen as a foil that belies the true – read underlying – nature of the artifact.

Commensurate with this view, Weizenbaum's critique of the ELIZA programs was little concerned with the question of conversation. While unmasking the apparent intelligence of his program, he continued to describe it as 'a program which makes natural language conversation with a computer possible.' Nevertheless, as part of his disclaimer regarding its intelligence, Weizenbaum does point to a crucial limit on ELIZA's behavior with respect to talk:

> *ELIZA in its use so far has had as one of its principal objectives the* concealment *of its lack of understanding. But to encourage its conversational partner to offer inputs from which it can select remedial information, it must* reveal *its misunderstanding. A switch of objectives from the concealment to the revelation of misunderstanding is seen as a precondition to making an ELIZA-like program the basis for an effective natural language man-machine communication system.*[12]

Twenty plus years later, conversation continues to elude the capabilities of interactive machines. In the time left to me, I'll tum to some preliminary data, and try to suggest why this might be the case.

The transcripts that you have on your handouts[13] are drawn from a corpus of videotapes of first-time users of a machine designed to be intelligent and interactive. The system is something of a hybrid of old and new technologies; a large photocopier, controlled by a computer-based system intended to act as an artificially intelligent 'expert' in the machine's use. The machine presents to the user a series of video displays on a computer screen attached to the photocopier, composed of text and drawings. Each display either describes the machine's behavior or provides the user with some next instructions. In the latter case, the final instruction of each display prescribes an action whose effect is detectable by the system – buttons pushed, paper taken in and out of trays – thereby triggering a change to the next display.

The objective of the system is that rather than providing a compendium of instructions and leaving decisions of their relevance to the user, instruction should be occasioned by and fitted to the user's actions. To meet this design objective, the system must in some sense be able to find that action's significance. To handle the problem of action interpretation, the designer of this machine adopts the view, common to the cognitive sciences, that the source of the order of situated actions is a cognitive structure – in this case a plan – that stands behind the action and gives it its sense. Action interpretation, on this view, is effectively plan recognition. From the user's response to an initial set of questions

12 Weizenbaum, ELIZA, p. 43.

13 The transcripts can be found in Chapter 9 of Lucy Suchman, *Human-Machine Reconfigurations: Plans and Situated Actions (Learning in Doing: Social, Cognitive and Computational Perspectives)* (Cambridge 2007).

her purposes in using the machine are identified with a goal, the goal invokes an associated plan, and the enactment of the plan is prescribed as a stepwise procedure. The prescribed procedure then provides the system with a ready-made template against which certain of the user's actions can be located in the plan, and the location of the user's action in the plan determines what the system does in response.

The most general aim of my analysis of these recordings was to find the locus of mutual understanding between users and the machine. More particularly, I wanted to compare the user's and the machine's respective 'views' of what happened over the course of events. To document the user's views, I adopted the simple device of asking two people, neither of whom had ever used the machine before, to collaborate on the production of copies. An artifact of such a collaboration is a kind of naturally generated 'think aloud' protocol.

In working to organize the transcripts of the videotapes, I arrived at the simple framework into which your transcripts are arranged:

The User		The Machine	
Actions not available to the machine	Actions available to the machine	Effects available to the user	Design rationale

The framework revealed that the sense of the users' actions was largely unavailable to the machine, and something of why that was the case. Beginning with the observation that what the user was trying to do was, somehow, available to the analyst, one could ask how that was so. The richest source of information for me, as a full-fledged 'intelligent' observer, was the talk, recorded in Column I. In reading the instructions aloud, users located the problem that they were working on. Their questions about the instructions identified the problem more specifically, and further talk provided their understanding of the machine's behavior and clarified their actions in response.

A second, but equally crucial resource was visual access to the actions in which the talk was embedded. Of all of the actions, one could clearly see the very small subset, recorded in Column II, that were actually detected by the system (that is, those that actually changed its state). From the machine's 'point of view,' correspondingly, one could see how it was that those available traces of the user's actions – the user's actions seen, as it were, through a pin-hole – were mapped onto the plan, under the design assumption that, for example, button x pushed at this particular point in the procedure must mean that the user is doing y.

The framework proved invaluable for considering seriously the idea that user and machine were interacting. By treating the central columns as the human-machine 'interface,' one could compare and contrast them with the sense made by the users as displayed in column 1 and the design rationale on which the machine state changes were based in column 4. This comparison located precisely the points of confusion,

as well as the points of intersection or 'mutual intelligibility,' at least for practical purposes. I problematize 'mutual intelligibility' here insofar as it presupposes capacities for the detection and repair of troubles in conversation. This takes us back to the observation made by Weizenbaum with respect to the ELIZA program, that its intelligence was limited in the first instance by its inability to recognize misunderstanding on the part of its interlocutor or to reveal its own.

The idea that language ability is the mark of intelligence is found in the notion of competent member of the society, as used by Garfinkel and Sacks who explain that they "do not use the term [member] to refer to a person. It refers instead to mastery of natural language"[14]. At the same time, it would be misleading to take language as such as the problem for artificial intelligence research. The fact that the so-called natural language problem has proven to be such a difficult one suggests that language ability is not an isolable skill but is part and parcel of the more general competence that Garfinkel and Sacks identify as competent membership. It's instructive to view machines, in this way, as resource-limited participants in an interaction. In his recent book on ethnomethodology, John Heritage summarizes the findings of conversation analysis with respect to institutional interaction as (1) the selective reduction of the full range of conversational practices and (2) the specialization of particular procedures taken from ordinary talk.[15] The difference between this and human-machine communication is that institutional asymmetries, say between doctors and patients, are based in ordinary conversation. Mutual understanding continues to be founded in the latter, with further work being done through the addition of special institutionally established constraints. Comparing the interactional resources of user and machine, in contrast, reveals a fundamental asymmetry in the available means by which each produces and construes the features of their shared situation. Because of this asymmetry, human-machine interaction is less a matter of simulating human communication, than of engineering alternatives to talk's situated properties.

Afterword

The original book *Plans and Situated Actions: The problem of human-machine communication*[16] tried to make several, interconnected arguments, which might be helpfully summarized here. At the core (as the title suggests) was a reconceptualization of the relation of plans to the situated activities of their creation and use. Most importantly, I argued that while the plan-based AI dominant at the

14 Harold Garfinkel and Harvey Sacks, On formal structures of practical actions, in: *Theoretical Sociology: Perspectives and Development*, eds. John C. McKinney and Edward A. Tiryakian (New York 1970), p. 342.

15 John Heritage, *Garfinkel and ethnomethodology* (Cambridge 1984).

16 Lucy Suchman, *Plans and Situated Actions: The problem of human-machine communication* (Cambridge 1987).

time treated a plan as an algorithmic specification that determines action, plans are better conceptualized as a genre of artefact created as a resource for action and communication. Plans are made in anticipation of doing something, often referenced as the activity unfolds, and sometimes cited after the fact to account for how things went (or went differently). Plans may be only conceptual or discursive, or they may be materialized in a variety of media, as flow charts, lists, directions and the like.

One of the common mistranslations of this argument is that while sometimes our actions go as planned, often they don't; it's the latter case, on this reading, that calls for situated actions. But the argument is a much more fundamental one. The argument is that even in cases where everything does go 'according to plan,' the implementation of a plan is always, and necessarily, a situated activity not fully specified in the plan itself. In other words, given the contingencies of any actual occasion of action, every plan presupposes capacities of cognition and (inter)action that are not, and cannot ever be, fully specified. This isn't a problem for human actors, who rely on a range of ordinary (or extraordinary) competencies to bring plans into relation with the circumstances of action. But it is a profound, and unsolved, problem for computational machines.

The other central thesis of the original book addresses the implications of the argument just summarized for human-computer interface design. This begins with recognition that like action, human communication presupposes a range of taken-for-granted competencies. Central among those is the ability to engage in collaborative sense making. The latter is not just a matter of recognizing meanings that are pre-given, but of engaging in an open-ended way in the co-production of mutually accountable (inter)action. Taking this view of communication seriously as a basis for analyzing interactions at the interface reveals the significant and enduring limits to communicative abilities on the machine side and highlights just how difficult a problem the design of human-machine communication really is.

In *Human-Machine Reconfigurations*[17] I revisit these arguments through an annotated version of the original text, reframed by a series of new chapters considering relevant developments both in HCI and AI, and in social studies of science and technology. The annotations allow me to express changes in my ways of thinking about the issues discussed in the original text, while the new chapters provide an opportunity to update both theoretical resources and empirical examples. While it is unquestionably the case that the fields of HCI and Artificial Intelligence have advanced significantly over the decades since the original publication of *Plans and Situated Actions*, I believe that the argument put forward in that book still holds. The primary developments in both fields rely upon a combination of expanding networked infrastructures, massive data capture,

17 Suchman, *Human-Machine Reconfigurations*.

storage capacity and processing speed, and associated elaborations of technologies and techniques of data analysis. Yet as Chapters 12 through 14 of *Human-Machine Reconfigurations* suggest, there has been notably little progress towards the creation of systems capable of engaging in social interaction. The reasons for this lie in the situated qualities of both action and communication, specifically their reliance on capacities of generative co-production of a contingently unfolding and dynamic world. These persistent problems are indicative of enduring differences that matter between persons and machines; they call in turn for design practices that engage with those differences creatively, rather than aiming to obscure or even to erase them.

Most importantly, I hope that the trope of re/configuration can help to underscore the central question of how we conceptualize or *figure* humans and machines respectively; what that means for the ways in which we *con*figure human-machine relations both imaginatively and materially; and how we might *re*figure and *re*configure persons, machines and their relations as part of a wider project of displacing the autonomous Human subject and his (subservient) Others as a previously unexamined foundation for design. This involves continuing attention to differences that matter between humans and machines, as part of the larger project of enabling more just and sustainable futures.

References

Ahmed, Sara, *Differences that Matter: Feminist Theory and Postmodernism* (Cambridge: Cambridge University Press, 1998).

Balsamo, Anne, Reading Cyborgs Writing Feminism, in: *The Gendered Cyborg, ed. Gill Kirkup* (New York: Routledge, 2000), pp. 148–158.

Boden, Deirdre and Don H. Zimmerman, *Talk and Social Structure* (Berkeley: University of California Press, 1991).

Castañeda, Claudia, *Figurations: Child, Bodies, Worlds* (Durham: Duke, 2002)

Garfinkel, Harold, *Studies in ethnomethology* (Englewood Cliffs: Prentice-Hall, 1967).

Garfinkel, H., *Ethnomethodology's program: working out Durkheim`s aphorism* (Lanham: Rowman & Littlefield Publishers, 2002).

Garfinkel, H. and Harvey Sacks, On formal structures of practical actions, in: *Theoretical Sociology: Perspectives and Development*, eds. John C. McKinney and Edward A. Tiryakian (New York: Appleton-Century-Crofts, 1970).

Goodwin, Charles, *Co-Operative Action* (Cambridge, MA: Cambridge University Press, 2017).

Haraway, Donna, *Modest _Witness @Second_Millenium.FemaleMan_Meets_OncoMouse™: Feminism and Technoscience* (New York: Routledge, 1997).

Hayles, N. Katherine, *How we became posthuman: virtual bodies in cybernetics, literature, and informatics* (Chicago: University of Chicago Press, 1999).

Heritage, John, *Garfinkel and ethnomethodology* (Cambridge: Polity Press, 1984).

Rhee, Jennifer, *The Robotic Imaginary: The human and the price of dehumanized labor* (Minneapolis: Minnesota University Press, 2018).

Sacks, Harvey, On Sociological Description. *Berkeley Journal of Sociology* 8 (1963), pp. 1–16.

Schiebinger, Londa, Taxonomy for Human Beings, in: *The Gendered Cyborg*, ed. Gill Kirkup (New York: Routledge, 2000), pp. 11–37.

Shannon, Claude, *The Mathematical Theory of Communication* (Champagne-Urbana: University of Illinois Press, 1949).

Suchman, Lucy, Demystifying the Intelligent Machine, in: *Cyborg Futures: Social and Cultural Studies of Robots and AI*, ed. Teresa Heffernan (Basingstoke: Palgrave Macmillan, 2019), pp. 35–61.

Suchman, L., *Human-Machine Reconfigurations: Plans and Situated Actions (Learning in Doing: Social, Cognitive and Computational Perspectives)* (Cambridge 2007).

Suchman, L., *Plans and Situated Actions: The problem of human-machine communication* (Cambridge 1987).

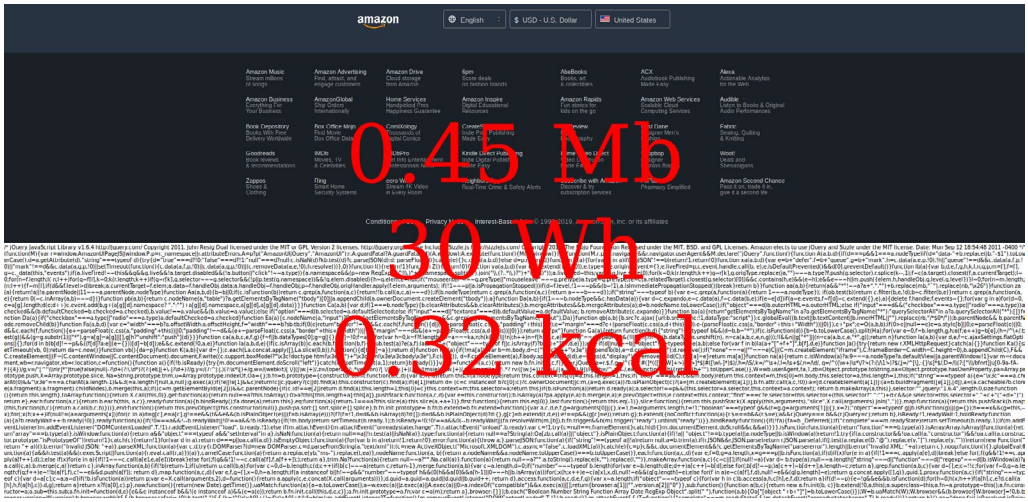
Weizenbaum, Joseph, ELIZA – a computer program for the study of natural language communication between man and machine. *Communications of the ACM* 9 (1966), pp. 36–45.

WORKING FOR SYSTEMS THAT DO NOT DO THE WORK. JOANA MOLL'S *THE HIDDEN LIFE OF AN AMAZON USER*

By Jussi Parikka

"If you double the number of experiments you do per year you're going to double your inventiveness."
– Jeff Bezos

Suggested citation:
Jussi Parikka, Working for Systems that Do Not Do the Work. Joana Moll's The Hidden Life of an Amazon User. *Interface Critique* 3 (2021), pp. 81–85.
DOI: https://doi.org/10.11588/ic.2021.3.81325.



Joana Moll, *The Hidden Life of an Amazon User* (Installation, 2019), projection still.

The pseudo-mathematical formula offered by Jeff Bezos taken from the opening chapter's epigraph of *The Life, Lessons & Rules for Success: The Journey, The Teachable Moments & 10 Rules for Success Cultivated from the Life & Wisdom of Jeff Bezos*[1] (s. previous page) is one of those pithy self-help manual statements situated somewhere between the corporate teachings and inspirational jargon that defines Silicon Valley's self-styled contemporary discourse. "Most of our freedoms are energy intensive",[2] as Dipesh Chakrabarty wrote, and most libertarian digital discourse is particularly so.

But such discourse does not come merely in the guise of self-help books. Joana Moll's *The Hidden Life of an Amazon User* takes as its starting point a far more significant quote from the non-discursive language of code that lurks behind the Bezos one-liners, tech-bro enthusiasm, interface effects, and screen views of contemporary logistics. Hence, a more fitting epigraph could instead be the opening code gambit that lurks behind the Amazon web interface:

> */* jQuery JavaScript Library v1.6.4 http://jquery.com/ Copyright 2011, John Resig Dual licensed under the MIT or GPL Version 2 licenses. http://jquery.org/license Includes Sizzle.js http://sizzlejs.com/ Copyright 2011, The Dojo Foundation Released under the MIT, BSD, and GPL Licenses. Amazon elects to use jQuery and Sizzle under the MIT license. Date: Mon Sep 12 18:54:48 2011 -0400 */ (function(M) {var r=window.AmazonUIPageJS||window.P,p=r._namespace||r.attributeErrors,A=p? p("AmazonUIjQuery","AmazonUI"):r;r.guardFatal?A.guardFatal(M) (A,window):A.execute(function(){M(A,window)})})) (function(M,r,p)*

1 Influential Individuals, *The Life, Lessons & Rules for Success: The Journey, The Teachable Moments & 10 Rules for Success Cultivated from the Life & Wisdom of Jeff Bezos* (Influential Individuals, 2018).

2 Dipesh Chakrabarty, The Climate of History: Four Theses. *Critical Inquiry* 35/2 (2009), pp. 197–222, here 208.

The Hidden Life of an Amazon User maps the purchase of one copy of *The Life, Lessons & Rules for Success* book on the Amazon website, and it does so in a gesture of algorithmic self-reflection, laying out the hundreds of pages of script and document requests required in the code to run what appears to end users as a seemingly simple purchase *click*. The 8724 pages of code translates to 87.33 MB of information which becomes the numbingly long interface experience of Moll's piece: the energy consumed to load the code and the (human) energy needed to scroll through it is measured as a transaction that speaks directly to the larger scale *economy-cum-ecology* of contemporary digital culture.

Moll's critical interface project can also be considered an experimental set up of the Standard Amazon User (SAU): a semi-automated algorithmic pattern of interface actions that are measured and guided by a mass of code and synchronised in relation to the planetary scale logistical operation that is the backbone of Amazon's infrastructural and data-intensive operations – the warehouse driven architecture of digital economy. Moll's piece is a laboratory situation of the logistical SAU whose energy consumption translates as putting the code *to* work. In this orchestrated set of labour and energy, environmental costs and user clicks are harnessed by code in an extension of the algorithmic logic that is already at the core of how Amazon works at its back end: in order to fully automate the logistics of the warehouse, the primary test case of the Standard Amazon Worker (SAW) is a step towards measuring how to automate the SAW into technological robotics.[3] In this shift from human servantry to the automated logistical landscape of machine servantry,[4] we see what was, in some ways, already the focus of Ivan Illich's critical notes of the 1970s in *Energy and Equity:* class relations are solidified in energy relations and infrastructures.[5] We are also presented with lessons in capitalism: energy costs are externalised both onto the user and the environment. We can call it *integral waste*,[6] and we can see it cited in Jessica Wood's article on the logistics and labour of Amazon's system: "[E]mergency services responded to 189 calls from 46 Amazon warehouses in 17 states between the years 2013 and 2018, all relating to suicidal employees."[7]

On the one hand, Moll's project is a performance piece of repetition and patience measured by the 14-minute period it takes to scroll down the code of thousands of pages, matched perhaps only by the obfuscating legal conditions of contemporary Terms and Conditions culture. Digital capitalism is embedded in infrastructures of service as well as the quietly executed code. On the other

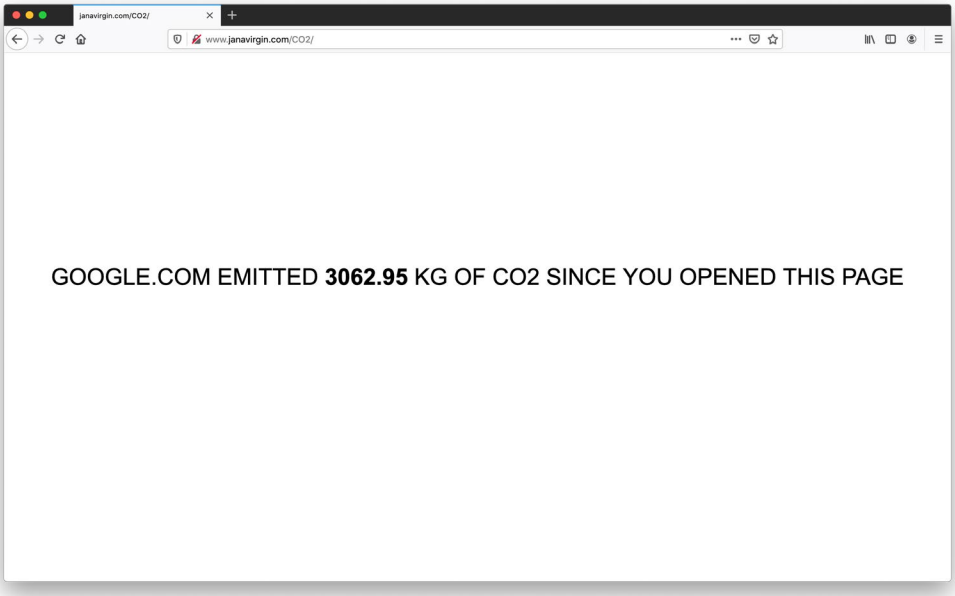
3 Jessica Wood, A Glimpse into a Dark Future. Amazon's Logistics of Extraction and the Illusion of Efficiency. *Strelka Magazine* (July 30, 2019); https://strelkamag.com/en/article/jessica-wood-amazon-logics-of-extraction, access: December 2, 2020.

4 Markus Krajewski, *The Server. A Media History from the Present to the Baroque*, trans. Ilinca Iurascu (New Haven 2018).

5 Ivan Illich, *Energy and Equity* (New York 1974).

6 Sean Cubitt, *Finite Media. Environmental Implications of Digital Technologies* (Durham 2016).

7 Wood, A Glimpse into a Dark Future.



Joana Moll, *GO2GLE* (website, http://www.janavirgin.com/CO2/, 2014), screenshot.

hand, this also implies that the piece is not only performance art but it is also art of logistics: any user action is synchronised and matched with large-scale logistics operations, whether that of physical transport, storage, or data transmission that ensure an ecology of relations of measure and tracking, capturing value and energy. If "logistics maps the form of contemporary imperialism,"[8] as Deborah Cowen argues, then it follows that critical interface art may also participate in this extended mapping of where the user sits in relation to the infrastructures of the digital appropriation of our energies, and how the distributed mass of users is synchronised in relation to centralised structures of data and power.

Any interface is thus a logistical operation, and any interface is already part of metainterfaces[9] that do not merely cater to the human user. Instead, they operate on – and express – the symbolic and material realities that are part of a complex ecology of relations. Moll's earlier project *CO2GLE* is an example of the work of an interface that registers its own existence as part of a larger ecology of energy: *CO2GLE* measures real time Google.com search CO2 emissions while reporting them in plain terms on the screen. *The Hidden Life of an Amazon User* is in many ways a continuation of these same themes and more: a contemporary software art response to the emergence of the field of energy humanities. In addition to being cultural and historical in-

8 Deborah Cowen, *The Deadly Life of Logistics. Mapping Violence in Global Trade* (Minneapolis 2014), p. 8.

9 Christian Ulrik Andersen and Søren Bro Pold, *The Metainterface. The Art of Platforms, Cities, and Clouds* (Cambridge, MA 2018).

vestigations, the art methods used also make the connections between value, labour, energy, and digital interfaces that stand at the core of Moll's work and are constantly performed – by you – in front of your screen, captured in code and in the energy costs of imagined freedoms and digital discourse. At a fundamental level, *The Hidden Life of an Amazon User* tells us, we work for systems that do not do the work.

Acknowledgements:
The work *The Hidden Life of an Amazon User* was realized within the framework of the European Media Art Platforms EMARE program at IMPAKT with the support of the Creative Europe Culture Programme of the European Union.
The research for this text has been supported by the Operational Images and Visual Culture project (2019–2023), funded by the Czech Science Foundation, 19-26865X.[10]

Copyeditor: Elise Hunchuck

References

Andersen, Christian Ulrik, and Søren Bro Pold, *The Metainterface. The Art of Platforms, Cities, and Clouds* (Cambridge, MA: The MIT Press, 2018).

Chakrabarty, Dipesh, The Climate of History: Four Theses. *Critical Inquiry* 35/2 (2009), pp. 197–222.

Cowen, Deborah, *The Deadly Life of Logistics. Mapping Violence in Global Trade* (Minneapolis: University of Minnesota Press, 2014).

Cubitt, Sean, *Finite Media. Environmental Implications of Digital Technologies* (Durham: Duke University Press, 2016). Illich, Ivan, Energy and Equity (New York: Harper & Row, 1974).

Krajewski, Markus, *The Server. A Media History from the Present to the Baroque*, trans. Ilinca Iurascu (New Haven: Yale University Press, 2018).

Wood, Jessica, A Glimpse into a Dark Future. Amazon's Logistics of Extraction and the Illusion of Efficiency. *Strelka Magazine* (July 30, 2019); https://strelkamag.com/en/article/jessica-wood-amazon-logics-of-extraction, access: December 2, 2020.

10 **Editorial note:** This essay was first published on Joana Moll's project website https://www.janavirgin.com/AMZ/;. It is here published with additional images and kind permissions by both the artist and author.

AMBITOPIA AND AFFECTIVE ATMOSPHERES. HOW WORLD-BUILDING AND CINEMA CAN HELP UNPACK IDEOLOGY INSIDE PERVASIVE SYSTEMS

By Emilia Tapprest and Victor Evink

"Who owns and controls the data infrastructure? What is the relationship between the owners and the average participant? What are the interests that drive the use of power gained from data ownership?"

Suggested citation:
Emilia Tapprest and Victor Evink, Ambitopia and affective atmospheres.How world-building and cinema can help unpack ideology inside pervasive systems. *Interface Critique* 3 (2021), pp. 87–101.
DOI: https://doi.org/10.11588/ic.2021.3.81329.

"Knife through the vast underwater realms of beauty and adventure. Use your sonar, dive deep, flip above the waves. Explore, solve puzzles, unlock the secrets of crystal glyphs. The fate of the world rests on your wits and fins."

With this enticing description, adapted from the back cover of the 1992 SEGA game Ecco the Dolphin, a vivid narrator in the audio fiction piece 'Liquid Dream' welcomes the listener to a district-wide urban neverland for full-time gamers called Dolphin Waves. The playful and carefree tone reflects the ludic atmosphere of life in this place. Dolphin Waves is one of the three speculative near-future worlds of Zhōuwéi Network, a critical worldbuilding research project focusing on the relationship between embodiment, datafication and power. Through imagining three types of datafied societies in 2041 and bringing them to life cinematically, the research explores how different ideological underpinnings produce affordances for distinct affective undertones.

The study of 'affective atmospheres' appears increasingly relevant – not only because of the recent 'affective turn' in academic discourse,[1] but also because the ability to apply this knowledge could bring immense political and economic power. Crucially, this power seems less and less bound to qualitative interpretation of human behaviour; recent technological developments promise to render our affective lives transparent through the use of sensors, real time data processing, pattern recognition and rapid feedback loops.[2] What makes broad public discourse challenging is the ubiquity and complexity of these data-driven systems, further amplified by intentional rhetorics which can be at the same time enchanting, opaque, contradicting, and even misleading. As an attempt to unpack different motivational mindsets giving rise to newly emerging societal paradigms, we propose to harness and subvert the power of affective atmospheres through the practices of worldbuilding and cinema.

In the fall of 2019, an internet meme emerged that fuses the two-dimensional political compass with eccentric accelerationist scenarios and a 'Choose Your Own Adventure' type interactive storytelling. A matrix with 4x4 speculative situations is presented, often with the instruction: "Choose Your Future." The two axes can differ freely per future compass but they typically revolve around themes such as high-tech versus

1 The notion of 'affect' has been attracting a growing interest across many disciplines, including cultural studies and neuroscience, erasing the historical separation between mind and body, subject and environment as well as between human beings, animals and machines. See for example: Marie-Luise Angerer, *Desire After Affect* (London: Rowman & Littlefield International, 2015). Bernd Bösel, Affective Synchronization, Rhythmanalysis and the Polyphonic Qualities of the Present Moment, in: *Timing of Affect*, ed. Marie-Luise Angerer, Bernd Bösel, and Michaela Ott (Zurich 2014), pp. 87–102. Melissa Gregg and Gregory J. Seigworth (eds.), *The affect theory reader* (Durham, NC 2010), pp. 5-9.

2 Bösel, Affective Synchronization. Hans Krause Hansen, Numerical operations. Transparency illusions and the datafication of governance. *European Journal of Social Theory* 18(2) (2015), pp. 203–220. Marjolein Lanzing, The transparent self. Ethics and Information Technology. *Ethics and Information Technology* 18(1) (2016), pp.9–16.

primitive, human-machine merger versus human-machine conflict, fate versus choice or order versus chaos. Most future compasses fall in the category of intellectual humour, playing with combinations of extravagant theoretical concepts. However, the meme's invitation to explore possibilities beyond contemporary capitalism can be embraced by fiction authors, artists and theorists to reclaim political agency in a crucial decade that requires, above all, creative adaptation.[3]

Following science-fiction writer and activist Redfern Jon Barrett, we embrace the idea of 'ambitopia': speculative imagination beyond the dystopia-utopia binary. On the one hand, as advocated by the solarpunk movement, the socio-political challenges of the present necessitate the will to imagine something better. On the other hand, naive utopianism has become suspicious in the 20th century.[4] The three worlds in focus in Zhōuwéi Network are imagined as part of a broader roadmap of different possibilities, further explored from the perspective of the lifeworlds implicated by them.

Dolphin Waves (New York City, 2041) explores what surveillance capitalism could evolve into after automation and climate change have ended the era of industry, consumption and paid work. Legal reforms around data ownership obliged big tech platforms to compensate users for harvesting their data. As data harvesting from XR play proved valuable to integrate human imagination, the final frontier, into hybrid AI, the resulting paradigm could be described as 'Ludified Surveillance Capitalism.' Fuelled by the AI arms race, sparcades (fully automated play and wellness campuses) became the new pinnacle of cultural aspiration. New York's ‚Dolphin Waves', the original model for this concept, popularised an early generation of fully immersive virtual reality, based on a combination of sensory isolation and a neural interface.[5]

Dragonfly (Netherlands, 2041) depicts a design-driven post-democratic government focused on safeguarding a sustainable, inclusive environment and collective happiness. In response to the radicalisation and outbursts of violence that had been building up for more than a decade, unconventional, post-democratic approaches became irresistible. 'Posthumanist Ecosystem Design,' developed by an international data science NGO called ‚Dragonfly' as a development tool for politically fragile states, applies ecological systems thinking and AI to

3 Ruben Jacobs, How Do We Get Home On This New Earth? *Neuhaus* (2019); https://neuhaus.hetnieuweinstituut.nl/en/how-do-we-get-home-new-earth, access: March 17, 2021, 9.30pm. Dan Hassler-Forest, *Science Fiction, Fantasy, and Politics. Transmedia World-building Beyond Capitalism* (London 2016). Kim Stanley Robinson, Dystopias Now. *Commune* 1 (2018); https://communemag.com/dystopias-now/, access: March 17, 2021, 9:30pm.

4 Eleanor Tremeer, Why We Need Utopian Fiction Now More Than Ever. *Gizmodo* (2018); https://io9.gizmodo.com/why-we-need-utopian-fiction-now-more-than-ever-1830260945, access: March 17, 2021, 9.30pm.

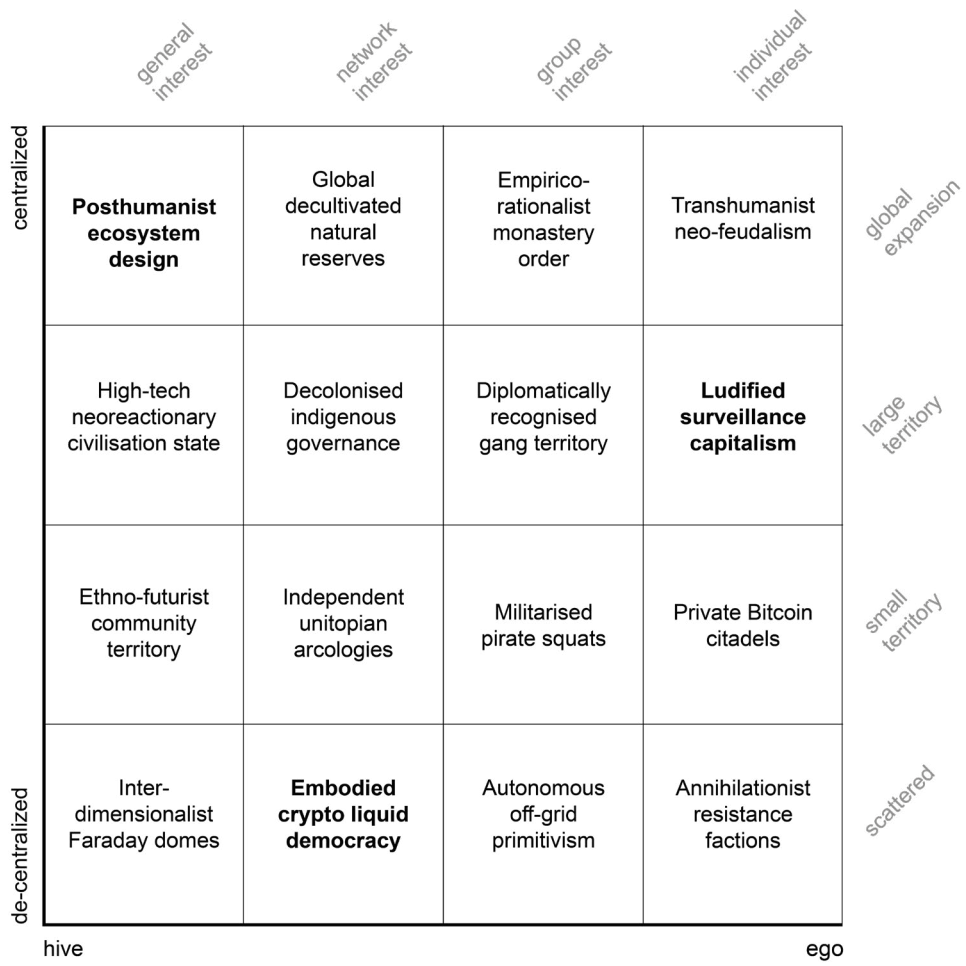
5 Philosopher of AI Rainer Mühlhoff (2019) describes different strategies to harness human cognitive abilities to perform subtasks inside a hybrid human-machine computing network in the age of contemporary Deep Learning. Rainer Mühlhoff, Human-aided artificial intelligence. Or, how to run large computations in human brains? Toward a media sociology of machine learning. *New Media & Society* 00(0) (2019), pp. 1–17, here pp. 9,10.

	Dolphin waves	Dragonfly	Project Gecko
Infrastructure	Multinational corporate platform infrastructure	International public platform infrastructure	Open hardware
Controlled by	US-based tech platform	Post-democratic state backed by international NGO	Decentralised democratic participant network
Motive	Maximising advantage in AI arms race	Minimising societal risk, stable endurance	Governing the commons, inner change
Legitimation	Relaxation, dissipation, self-actualisation	Social harmony, environmental protection	Fairly providing basic needs and liberties
Security	Platform specific, safe from unlicensed access	Purpose specific, protected against 3rd party interests	Personal, body-cryptographic
Economy	AI-guided play, virtual sub-economies	AI-guided societal participation	Collaborative resource sharing

complex socio-environmental issues as one interconnected whole. The approach managed to rewire memetic bubbles into a stable societal fabric, using a flexible combination of matchmaking, coaching and exercise, carried out by personal AI coaches.

With *Project Gecko* (different locations, 2041) we imagine something that emerges out of the turbulent experimentation phase of the 2020s and ‚30s, which saw an explosion of decentralised autonomous micro societies aimed at radically reinventing democracy for the 21st century. Project Gecko accentuates the importance of inner healing for participation by adopting conscious movement as the foundation for its distributed data sharing. The name ‚Project Gecko' refers to it's easily attachable sticky sensors, reflecting the principle that the presence of tech should be visible and optional. In response to the accumulation of heated conflicts in several locations, onboarding of new members has recently been limited to ‚invitation only.'

We position the three worlds on the two-dimensional grid of a future compass by elaborating on three main questions: Who owns and controls the data



infrastructure[6]? What is the relationship between the owners and the average participant? What are the interests that drive the use of power gained from data ownership?

In both *Dolphin Waves* and *Dragonfly*, the society's data infrastructure is centralised and the power derived from data ownership is in the hands of a small group of people, whereas the essence of *Project Gecko* is the decentralisation of the network. In both *Dragonfly* and *Project Gecko*, the driving motivations of the society are aimed at the benefit of the collective and the survival of the broader system as a whole. *Dolphin Waves* on the other hand, appeals entirely to the self-centred individual, in its rhetoric towards the gamers as well as on the higher level of privately accumulated power. From the average participants' perspective, *Dragonfly* is more thoroughly centralised and inescapable than *Dolphin Waves*, whereas the hive-like col-

6 Here understood as a "wider socio-technical infrastructures through which data is created, stored and analysed"; Jonathan Gray, Carolin Gerlitz and Liliana Bounegru. Data infrastructure literacy. *Big Data & Society* 5.2 (2018), pp. 1–13.

lectivism of *Dragonfly* leaves much less room for individual freedom than *Project Gecko*.

Whether present developments in datafication are driven by techno-religious aspirations, the concentration of power, a genuine belief in the objective benefits of technocratic governance, or something we can't quite grasp yet, we explore these possible futures through the following premise: A social system's higher-level goals and ideological underpinnings trickle down to the way it is designed, how behaviour is conditioned, and eventually, how it feels to live in those worlds. The subjective experience of taking part in a particular world is here approached through the notion of 'affective atmospheres'.

An affective experience can be understood as an embodied state which is more diffuse than emotions and feelings. It precedes conscious thoughts, and in this way forms a basis from which other states and actions emerge. Similarly, an *atmos-sphere* surrounds, or envelopes, yet can be hardly localised.[7] Atmospheres have been described as 'half-entities' because they are prompted (or given rise) by actual properties of the world, while also being determined by an experiencing subject.[8] This way, affective atmospheres provide an interesting link between the material layers of a given system and the circumstances and pre-dispositions of different subjects to experience them in certain ways.

In research carried out in 2020, we focused particularly on the way in which societal paradigms, manifested through technology, affect the *relationships people have with their bodies and with each other through their bodies*. A series of audio- and video fictions produced for each speculative society depict how different characters are led through mind-body exercises manifesting the world's characteristic rhetoric through a normalised human-computer interface.

In addition, each fiction piece expresses a particular affective atmosphere arising from its respective world paradigm. While atmospheres can't be captured nor exhausted with explanation, they can be shifted, interrupted and designed for. As pointed out by Böhme (1993), a wide range of professionals work explicitly with atmospheres.[9] For example, scenographers and retail shop architects produce realities which are physically entered, dealing with transitions through three-dimensional space with scale, tactility, scent, light and movement. UX designers can craft the target atmosphere of a digital environment through interaction flows, visual representation and aural feedback. In religious gatherings as well as secular events such as electronic music festivals, a ceremonial combination of sound, speech, visual in-

7 Ben Anderson, Affective atmospheres. *Emotion, Space and Society* 2(2) (2009), pp. 77–81.

8 Christoph Michels, Researching affective atmospheres. *Geographica Helvetica* 70(4) (2015), pp. 255-263. Hermann Schmitz, Rudolf Owen Müllan, and Jan Slaby, Emotions outside the box. The new phenomenology of feeling and corporeality. *Phenomenology and the cognitive sciences* 10(2) (2011), pp. 241–259.

9 Gernot Böhme, Atmosphere as the fundamental concept of a new aesthetics. *Thesis Eleven* 36(1) (1993), pp. 113–126.

	Dolphin waves	Dragonfly	Project Gecko
Inspiration	Meditation, astral projection, ecstatic trance dance	Yoga, proxemics, tantra, biodanza, tai chi	Conscious dance, 'Movemeant', light language
Contextualisation	Fully Immersive VR through flotation	AR-enhanced personal coaching	Built into wearable body-tracking interface as basis for participation
Carried out by	AI muse	AI coach	Human 'seer'
Purpose	Reading muscle signals for operating a non-human avatar, stimulating and harvesting 'cunning' intelligence	Teaching subjects a desired way to relate to self and others as part of a social engineering agenda	Passcodes and other digital interactions through motion capture and detachable sensors

put and the use of space guides the audience through a collective journey that can be experienced as transcendental or sublime. Cinema, as an immersive time-based medium, has its own particular affordances for constructing affective atmospheres. Scenes can be 'entered', places can be given a particular aura and intensities can be orchestrated through audiovisual storytelling. The German film theorist Siegfried Kracauer suggests that "the material elements that present themselves in films directly stimulate the material layers of the human being: his nerves, his senses, his entire physiological substance" (quoted in Hansen 1993).

Within the cinematic storytelling of Zhōuwéi Network, the understanding of '*interface*' extends beyond the technological realm in two directions. As the area of mediated contact, the interface represents the affective transition between subjective experience and prefabricated affordances of a designed world. In the absence of an unambiguous visual representation of the presence of technology in immersive storytelling, accessible through the medium of cinema, the works intentionally erase the boundaries between different spaces of reality and meaning, hereby referred to as the *world space*, the *subjective space* and the *symbolic space*.

World space is the spatiotemporal reality where the characters bodily exist and interact with their surroundings. It is the basis of a society's 'characteristic' affective atmosphere and encompasses the 'physical world', as well as other manifestations of technological mediation such as the indirect presence of

psycho-physiological sensing, gestural interfaces and intimate speech AI. Going beyond the 'material' design of the world, ideological premises of each society manifest holistically throughout different areas of life, including normalised social interaction, aesthetics and verbal communication.

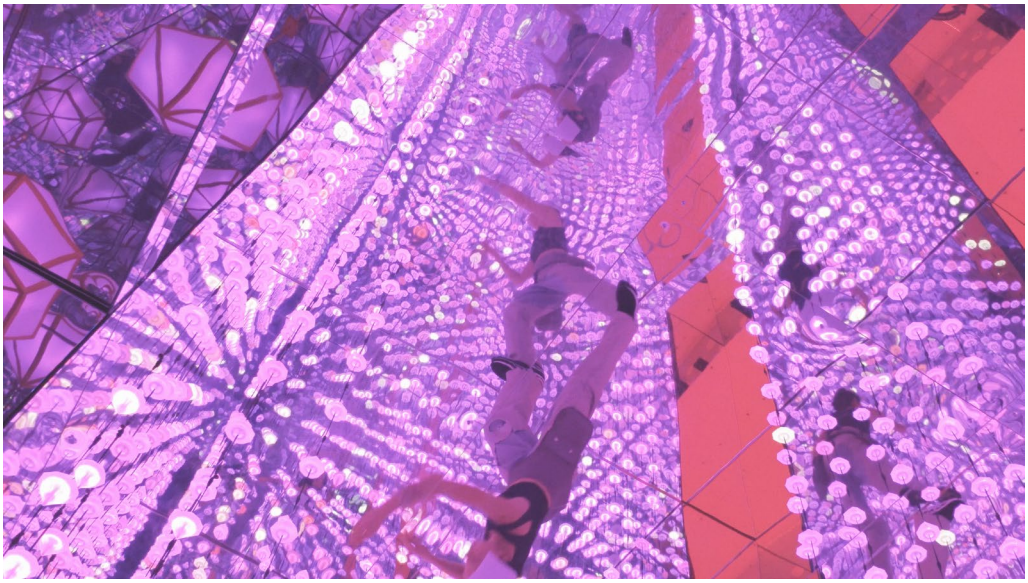
The *subjective space*, on the other hand, represents the layer of experience that is shaped by the *world space* in combination with the protagonists' personality, subjective views, social position, perceptions and actions. In other words, it shows how our sociotechnical environments are "brought to life in an affectively conditioned felt body," which flow into, but also alter and even overthrow a world's target atmosphere.[10]

In turn, these inner states can be situated in the *symbolic space*: a purely metaphorical representation that is not part of the storyworld in the literal sense. It differs from the narrative depiction of character development in that the *symbolic space* is not exclusively part of the individual character but belongs to a collective subconscious realm which does not need to be interpreted correctly by the viewer in order to understand the narrative and overall dynamics of the worldbuilding. Building on iconographic traditions such as the tarot, it can be used as a vivid narrative tool to reflect the characters' inner journey.

Then what is the role of narrative? In this research iteration, intentional focus is on prototyping the affective atmospheres of the three societies, rather than on the characters' storylines and psychological development. Their subjective perspectives and experiences function as segways into the worlds from the perspective of an 'average' member. Transiently contrasting this through glimpses of the perspectives of other characters who occupy a much less harmonious position in their society plants the seed for the narrative of the forthcoming fiction film.

The affective atmospheres of Zhōuwéi Network and further research artifacts aim to act as a liminal space not only between the fictional characters and their respective speculative environments but also between present-day audiences and different possible futures. They can be entered as a roadmap to explore the ideologies and rhetorics driving these futures as well as their corresponding metaphorical undertones in present-day developments. Hopefully, the work contributes to providing a critical compass that facilitates positioning ourselves onto this map today.

10 Michels, Researching affective atmospheres.



References

Angerer, Marie-Luise, *Desire After Affect* (London: Rowman & Littlefield International, 2015).

Anderson, Ben, Affective atmospheres. *Emotion, space and society* 2(2) (2009), pp. 77–81.

Böhme, Gernot, Atmosphere as the fundamental concept of a new aesthetics. *Thesis Eleven* 36(1) (1993), pp. 113–126.

Bösel, Bernd, Affective Synchronization, Rhythmanalysis and the Polyphonic Qualities of the Present Moment, in: *Timing of Affect*, ed. Marie-Luise Angerer, Bernd **Bösel**, and Michaela Ott (Zurich: Diaphanes, 2014), pp. 87–102.

Gregg, Melissa and Gregory J. Seigworth (eds.), *The affect theory reader* (Durham, NC: Duke University Press, 2010).

Gray, Jonathan, Carolin Gerlitz and Liliana Bounegru, Data infrastructure literacy. *Big Data & Society* 5.2 (2018), pp. 1–13.

Hansen, Hans Krause, Numerical operations. Transparency illusions and the datafication of governance. *European Journal of Social Theory* 18(2) (2015), pp. 203–220.

Hansen, Miriam, "With Skin and Hair." Kracauer's Theory of Film, Marseille 1940. *Critical Inquiry* 19(3) (1993), pp. 437–469.

Hassler-Forest, Dan, *Science Fiction, Fantasy, and Politics. Transmedia World-building Beyond Capitalism* (London: Rowman & Littlefield International, 2016).

Jacobs, Ruben, How Do We Get Home On This New Earth? *Neuhaus* (2019); https://neuhaus.hetnieuweinstituut.nl/en/how-do-we-get-home-new-earth, access: March 17, 2021, 9:30pm.

Lanzing, Marjolein, The transparent self. *Ethics and Information Technology* 18(1) (2016), pp. 9–16.

Michels, Christoph, Researching affective atmospheres. *Geographica Helvetica* 70(4) (2015), pp. 255–263.

Robinson, Kim Stanley, Dystopias Now. *Commune* 1 (2018); https://communemag.com/dystopias-now/, access: March 17, 2021, 9:30pm.

Mühlhoff, Rainer, Human-aided artificial intelligence. Or, how to run large computations in human brains? Toward a media sociology of machine learning. *New Media & Society* 00(0) (2019), pp. 1–17

Schmitz, Hermann, Rudolf Owen Müllan and Jan Slaby, Emotions outside the box. The new phenomenology of feeling and corporeality. *Phenomenology and the cognitive sciences* 10(2) (2011), pp. 241–259.

Tremeer, Eleanor, Why We Need Utopian Fiction Now More Than Ever. *Gizmodo* (2018); https://io9.gizmodo.com/why-we-need-utopian-fiction-now-more-than-ever-1830260945, access: March 17, 2021, 9:30pm.

Index of Images

1. Still from design fiction work 'Fluid motion' (2021) by Liminal Vision, set in Dolphin Waves.
2. Still from design fiction work 'Fluid motion' (2021) by Liminal Vision, set in Dolphin Waves.
3. Still from design fiction work 'Clouds of Smoke' (2021) by Liminal Vision, situated in Dolphin Waves.
4. Still from design fiction work 'Tent of Presence' (2021) by Liminal Vision, set in Dragonfly.
5. Still from design fiction work 'Tent of Presence' (2021) by Liminal Vision, set in Dragonfly.
6. Still from design fiction work 'Tent of Presence' (2021) by Liminal Vision, set in Dragonfly.
7. Still from design fiction work 'The Grid' (2021) by Liminal Vision, set in Project Gecko.
8. Still from design fiction work 'The Grid' (2021) by Liminal Vision, set in Project Gecko.
9. Still from design fiction work 'The Grid' (2021) by Liminal Vision, set in Project Gecko.
10. Still from design fiction work 'Ray of Light' (2021) by Liminal Vision, situated in a symbolic space between the worlds.

THE FLUSSER-HYPERTEXT: “ELECTRONIC BOOK PROTOTYPE 2”

By Daniel Irrgang

“I am but a pre-text for this work!”
– Vilém Flusser (1991)

Suggested citation:
Daniel Irrgang, The Flusser-Hypertext: “Electronic Book Prototype 2.” *Interface Critique* 3 (2021), pp. 103–114.
DOI: https://doi.org/10.11588/ic.2021.3.81322.

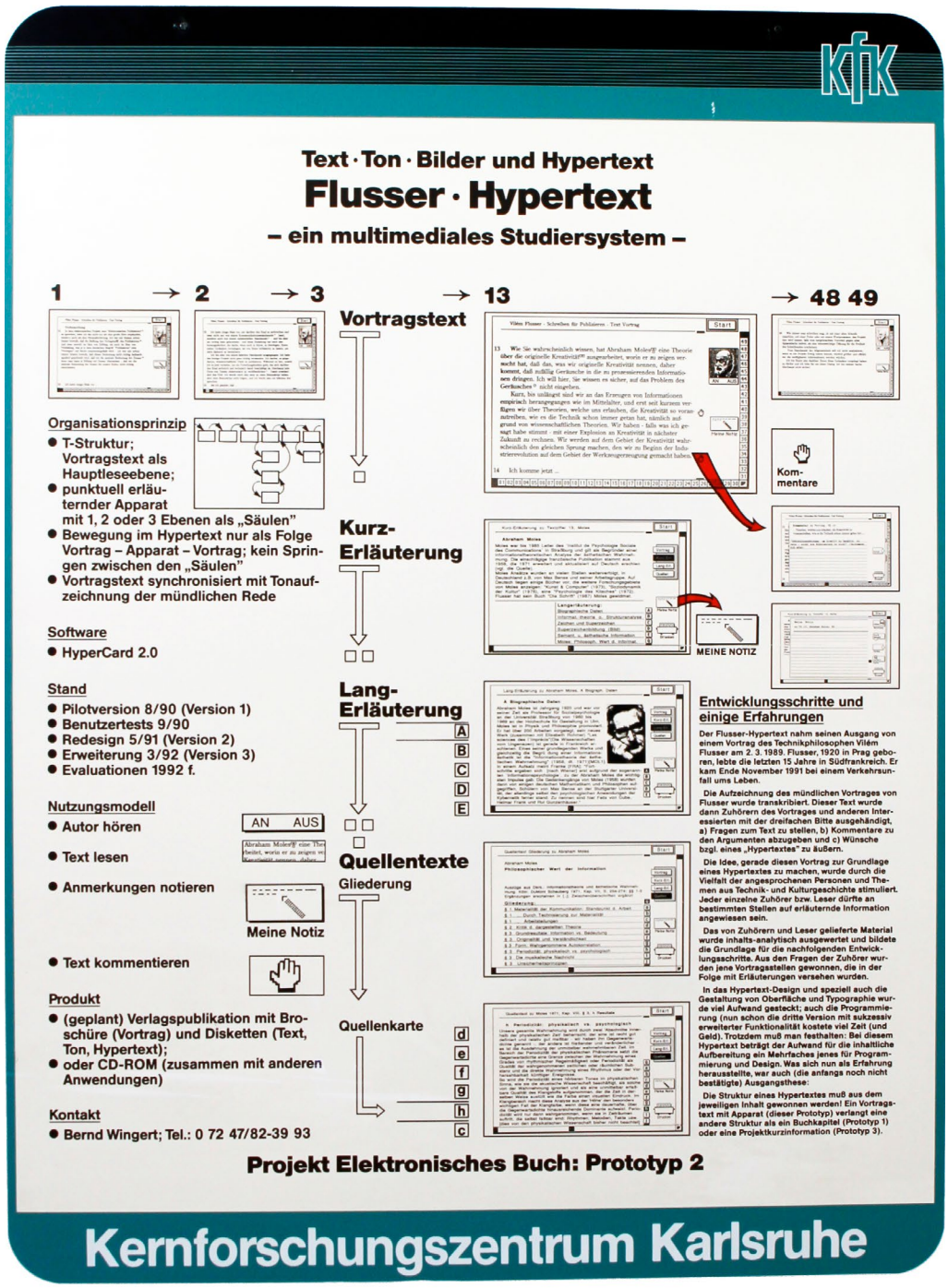


Fig. 1: "Text, audio, images and hypertext. Flusser-Hypertext – a multimedia study system. Project electronic book: Prototype 2," conference presentation poster, ITAS, Karlsruhe Nuclear Research Center (undated, ca. 1990). Source: Vilém Flusser Archive.

The 'Flusser-Hypertext' was developed as part of a research project on electronic publishing, initiated around 1988 at the Institute for Technology Assessment and Systems Analysis (ITAS) of the Karlsruhe Nuclear Research Center (today: Karlsruhe Institute of Technology), Germany. It embodies an experimental approach towards the new writing, reading and publishing possibilities of hypertext authoring tools available at the time. Besides its technological challenges the project raised significant cultural and hermeneutical questions: How do 'non-linear' strategies of reading and interaction (e.g. by using annotation tools) as well as multi-modal elements (text, image, audio) affect the practice of reading – a basic cultural technique – itself? With this perspective, the Flusser-Hypertext addressed media theoretical questions that would become increasingly popular during the 1990s.[2]

The hypertext system is based on the lecture "Schreiben für Publizieren" [writing for publishing] delivered by the Czech cultural philosopher and media theorist Vilém Flusser (1920–1991) at ITAS on March 2, 1989.[3] The lecture was recorded, transcribed[4] and supplemented with written annotations relating to topics or sources Flusser had mentioned or pointed to while he spoke (as usual in his case only loosely, if at all, consulting his prepared manuscript) – a process involving extensive research by the ITAS team as well as additional interviews with Flusser at his home in Robion, France.[5] The audio recording, text transcription, images, and supplementary material constitute the core content of the Flusser-Hypertext. A notepad or commentary section which could be used by the readers – or users – to add their own thoughts gives the application an additional dimension of interactivity.

The Flusser-Hypertext was developed as a case study within the research project "Elektronisches Buch" [electronic book] by the ITAS researchers Knud Böhle, Ulrich Riehm and Bernd Wingert, supported by a group of freelance programmers. Funded by the Department for Technology Assessment of the German Federal Ministry of Research and Technology, the project conducted basic research on, including the development of a prototype for "an innovative electronic presentation form for results of scientific projects."[6] The hypertext is the second of three prototypes developed as

Quote title page: Vilém Flusser to Bernd Wingert during an interview to complete the hypertext's supplementary material; May 15, 1991, Robion, France (quoted in Bernd Wingert, Der Flusser-Hypertext. Einige Erfahrungen aus Entwickler- und Nutzersicht, in: *Bodenlos – Vilém Flusser und die Künste*, ed. Siegfried Zielinski and Daniel Irrgang (Berlin 2015), pp. 78–79, here 78; transl. D.I.

2 Jakob Nielsen, *Multimedia, Hypertext und Internet. Grundlagen und Praxis des elektronischen Publizierens* (Braunschweig and Wiesbaden 1996).

3 Daniel Irrgang and Marcel R. Marburger, Vilém Flusser – A Biography, in: *Flusseriana. An Intellectual Toolbox*, ed. Siegfried Zielinski, Peter Weibel and Daniel Irrgang (Minneapolis 2015), pp. 452–519; see p. 510 for the hypertext project.

4 The transcription of Flusser's lecture, along with the transcription of the subsequent discussion between Flusser, Bernd Wingert, and the audience, is available at the Vilém Flusser Archive (doc. ref.: Conference 22, documents 4 and 5).

5 Wingert, Der Flusser-Hypertext.

6 Knud Böhle, *Ulrich Riehm and Bernd Wingert, Vom allmählichen Verfertigen elektronischer Bücher. Ein Erfahrungsbericht* (Frankfurt/M. and New York 1997), pp. xiii; transl. D.I.

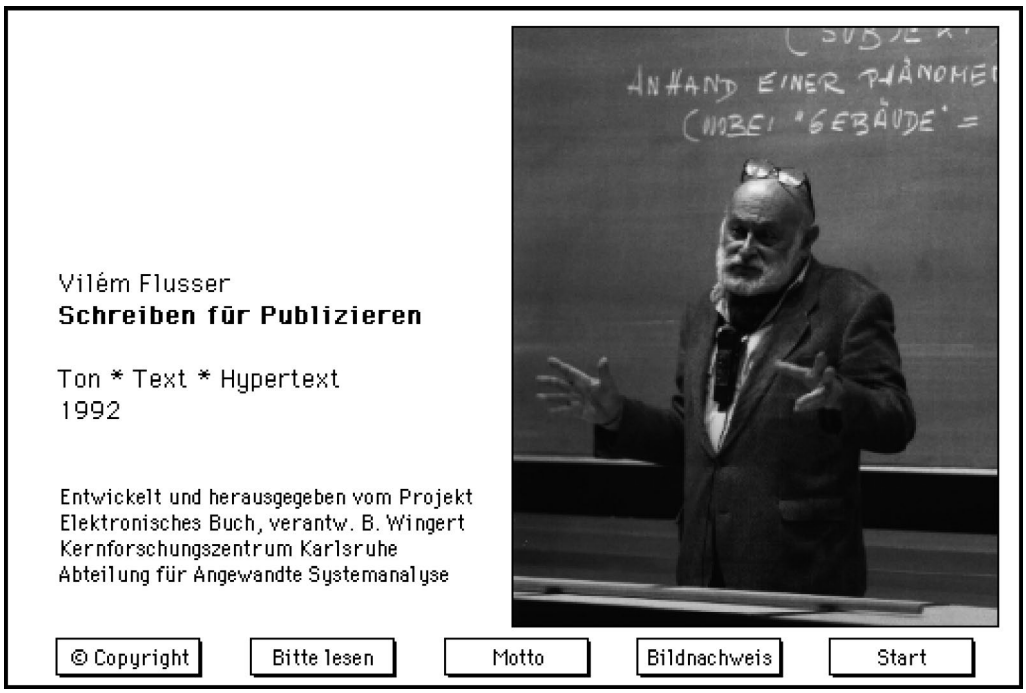


Fig. 2: Title window. Source: Vilém Flusser Archive.

case studies for the research project. One aspect of the project was to investigate new approaches to electronic publishing by exploring the possibilities of interactive reading that involved the at the time new possibilities of hypertext and multimedia. The prototypes are built with and run on the authoring system Apple HyperCard 2.0 which displays and organizes text and image content with a GUI resembling file cards, making use of the already established desktop/office metaphor. Thus, also the Flusser-Hypertext, in its attempt to overcome the limitations of printed media, draws on a metaphor which had the advantage to accessibly combine "the concrete with the abstract in a highly satisfying way."[7]

Such an attempt to transform Flusser's words into a multimedia hypertext means to take his theories and pleas for a future "telematic society"[8] seriously. Building on earlier studies in communication and information theory, Flusser developed his later media theory in the 1970s and mostly during the 1980s. Towards the end of this decade Flusser was widely known for his analyses of the upcoming information society, claiming (similar to Marshall McLuhan) the end of writing as the dominant discursive form of information storage and distribution. According to Flusser, written text and its

7 Alan Kay, User Interfwace. A Personal View, in: *multiMEDIA. From Wagner to virtual reality*, ed. Randall Packer and Ken Jordan (New York 2001), pp.121–131, here 130.

8 Vilém Flusser, *Ins Universum der technischen Bilder* (Göttingen 1985).

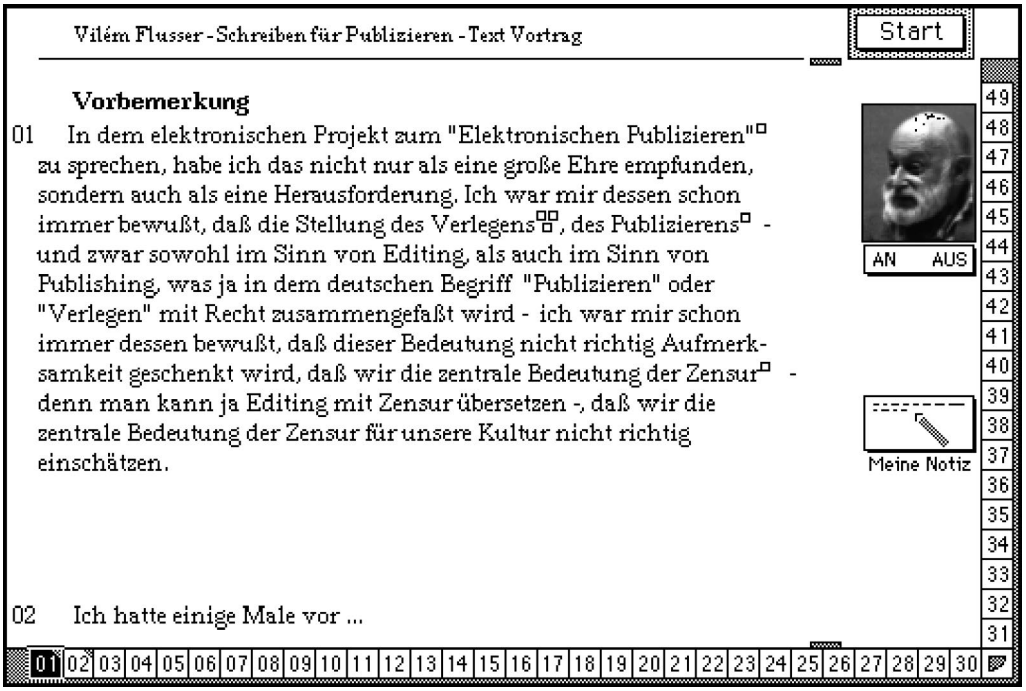


Fig. 3: First file card with first lines of the lecture transcript. Source: Vilém Flusser Archive..

'linear' structure – which has dictated structures of discourse, narratives and historiography since centuries – is slowly vanishing and will soon be replaced by what he called 'technical images' or 'synthetic images'. Those images of abstract concepts and models calculated by computers would replace written text, as there would be no need to take the 'detour' of transcoding information into letters.[9] Flusser described alternative representations of electronic text – such as hypertexts – as transitional phenomena on the way to overcome the yet dominant textual linearity,[10] while societies are, in Flusser's projection, continuously shifting towards a new "universe of technical images."[11] In one of Flusser's early structural or ontological distinctions between text and image, laid out in his widely received article "Line and surface,"[12] he describes the perception of the former as a strictly linear and analytical process and the latter as a process of "synthesis followed by analysis" in which "we may seize the totality of the picture

9 A, from today's perspective, rather problematic conclusion since informatization or digitalization appears to lead to a convergence of text and image rather than to the extinction of written text, while boosting text production and reception to levels never seen before.

10 Vilém Flusser, Hypertext. Über das Schicksal von Büchern. *NZZ Folio* 10 (October 1991), pp. 35–36.

11 Flusser, Ins Universum der technischen Bilder; Baruch Gottlieb, Hypertext, in: *Flusseriana*, ed. Zielinski, Weibel and Irrgang, pp. 212–214.

12 Vilém Flusser, Line and Surface. *Main Currents in Modern Thought* 29/3 (1973), pp. 100–106.

Fig. 4: Biographical reference on Abraham A. Moles, one of the pioneers of information aesthetics. Source: Vilém Flusser Archive.

at a glance, so to speak, and then proceed to analyze it."[13] It was Flusser's hope that future technical images may contain the same informational richness and efficiency as traditional images while gaining the analytical capacity similar or superior to written text.

There are certain parallels between Flusser's theory and the conceptual basis of the Flusser-Hypertext, since its "spatial arrangement of texts allows reading to partly free itself from the boundaries of the linear."[14] However, as Peter Wiechens points out it in his analysis of the Flusser-Hypertext,[15] the system does not put an end to the lecture's or text's linear structure but rather *adds* a dimension of simultaneity while its multimodal features (text, image, sound) and its GUI which make those features easily accessible.[16]

The Flusser-Hypertext is organized in a 'T-structure' which arranges the 'file card' windows of HyperCard: The horizontal level contains the transcribed lecture as well as its original recording as text and audio content (fig. 3). The 'ver-

13 Ibid., p. 101.

14 Bernd Wingert, Kann man Hypertexte lesen?, in: *Literatur im Informationszeitalter*, ed. Dirk Matejovski and Friedrich Kittler (Frankfurt/M. and New York 1996), pp. 184–218, here 200; transl. D.I.

15 Peter Wiechens, Hypertext und Künstlerbuch. Das Buch nach dem Ende des Buches, in: *Einführung in die Kulturwissenschaft*, ed. Thomas Düllo (Münster 1998), pp. 328–346.

16 For the notion of simultaneity in interface aesthetics see Florian Hadler and Daniel Irrgang, Instant Sensemaking, Immersion and Invisibility. Notes on the Genealogy of Interface Paradigms. *Punctum* 1 (2015), pp. 7–25.

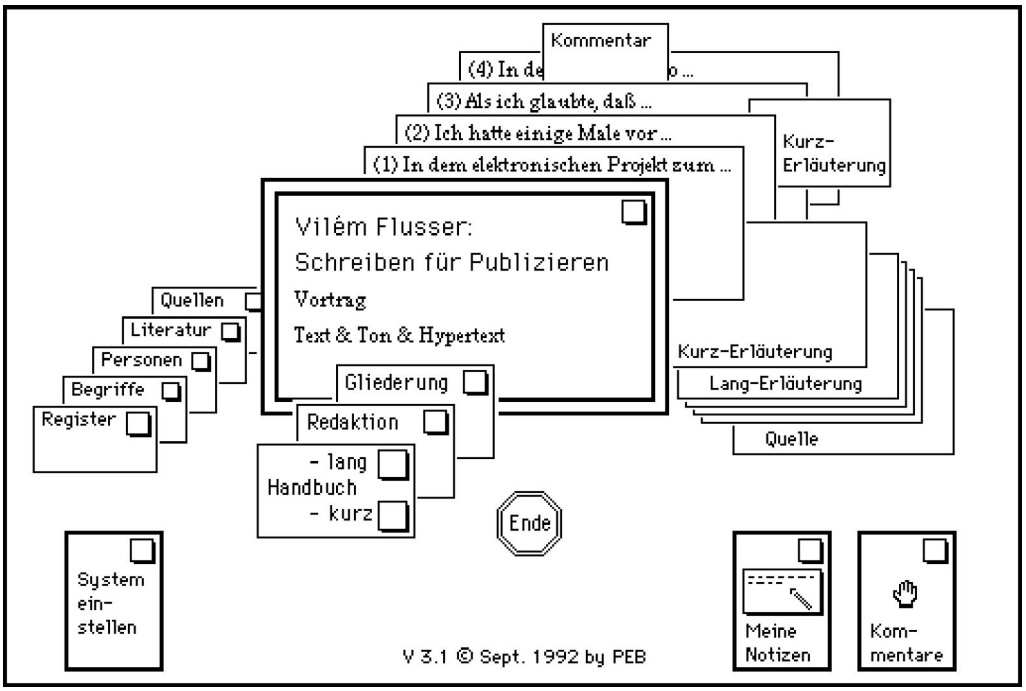


Fig. 5: Start window providing an overview of the different sections. Source: Vilém Flusser Archive.

tical' levels contain references to further information about names or philosophical concepts that Flusser mentioned, in passing, during his lecture (e.g. 'Abraham A. Moles', 'Maxwell's Demon') as well as additional bibliographical references (fig. 4). At any time, users can choose to add their own annotations or to jump to the start screen, a map-like overview signifying the various 'layers' of the hypertext (fig. 5). The hypertext's T-structure is unusual since the contemporary standard definition describes hypertext as "a network […] with poly-hierarchical structures that cannot be displayed in a linear fashion."[17] One might question if a hypertext really follows such "a principle of non-linearity"[18] or if its structure could rather be described as a multi-linear one which manifests itself while users find their own navigational paths. The developers of the Flusser-Hypertext, however, determined that the structure of a hypertext shall be derived from its content.[19] Thus, a T-structure seems to be the obvious choice to organize the *linear temporality* of a lecture, while a finite number of references explore aspects *in depth*.

Flusser participated in the case study as a consultant, supporting the researchers with further information and explanations of his references. He witnessed various development stages of the sys-

17 Rainer Kuhlen, Hypertext. *Ein nicht lineares Medium zwischen Buch und Wissensbank* (Berlin and Heidelberg 1991), p. 33; transl. D.I.

18 Ibid.

19 Böhle, Riehm and Wingert, *Vom allmählichen Verfertigen elektronischer Bücher*.

tem: Bernd Wingert demonstrated an early version on May 15, 1991 at Flusser's home in Robion[20] and also presented later versions on conferences where Flusser was present, first at "Literatur im Informationszeitalter" [literature in the information age] on December 12, 1990 in Düsseldorf[21] and, finally, on November 22 and 23, 1991 at the CulTech conference in Essen[22] – only four days before Flusser's untimely passing in a car accident. According to Bernd Wingert (in a conversation with the author of this paper and Philipp Tögel), Vilém Flusser was apparently honored to see his words being materialized by the same technological apparatuses he had, since many years, explored in his writings. However, the Flusser-Hypertext was never finalized (in the sense of a fully functional and sufficiently tested application). The version depicted in this paper shows the last state of the work, the result of the project's 'phase 3' which lasted from January 11, 1990 until November 22, 1991. Afterwards, the project was wrapped-up with an electronic documentation (1991–1993) and published as a research report in 1997.[23]

Fast forward ten years, in 2007, the Flusser-Hypertext, still running on the same Apple Macintosh Performa 630 computer on which it was developed, was given to the care of the Vilém Flusser Archive at the Berlin University of the Arts by Bernd Wingert.[24] Restored by Baruch Gottlieb and collaborators at the Vilém Flusser Archive, a copy of the hypertext running on a similar Macintosh Performa system was presented to the public during the transmediale festival 2011 in Berlin. The efforts to exhibit the hypertext, with its system requirements demanding hard- and software with specifications identical with or similar to the Macintosh Performa 630, where quite high, as old hardware had to be repaired and partly replaced.[25]

The hardware aspect turned out to be a significant instability factor, not only for the exhibition during transmediale but also for a permanent setup for research purpose. This is why, in 2012, the Flusser Archive, thanks to the initiative of Baruch Gottlieb, contacted the researchers of the 'bw-FLA'[26] project at the Institute for Computer Science, University of Freiburg. Lead by Klaus Rechert, Dirk von Suchodoletz and Dragan Espenschied, the project aimed at developing an "Emulation as a Service" strategy as well as a technological architecture that "simplifies access to preserved digital assets

20 Wingert, Der Flusser-Hypertext.

21 Bernd Wingert, Kann man Hypertexte lesen?

22 Bernd Wingert, Schreiben für Publizieren. Ein Hypertext-Experiment mit einem Flusser-Text. *Kunstforum* 117 (1992), p. 109.

23 Böhle, Riehm and Wingert, *Vom allmählichen Verfertigen elektronischer Bücher*.

24 Bernd Wingert, Flusser hören – lesen – studieren. Der "Flusser-Hypertext" – von der Nachgeschichte zur Vorgeschichte. *Flusser Studies* 24 (2017); https://www.flusserstudies.net/sites/www.flusserstudies.net/files/media/attachments/wingert-flusser-hypertext.pdf, access: February 15, 2021.

25 Transmediale, Flusser Hypertext Prototype 2 (2011); https://archive.transmediale.de/content/flusser-hypertext-prototype-2, access: February 15, 2021.

26 bwFLA – Emulation as a Service (project website); http://eaas.uni-freiburg.de, access: Febraury 15, 2021.

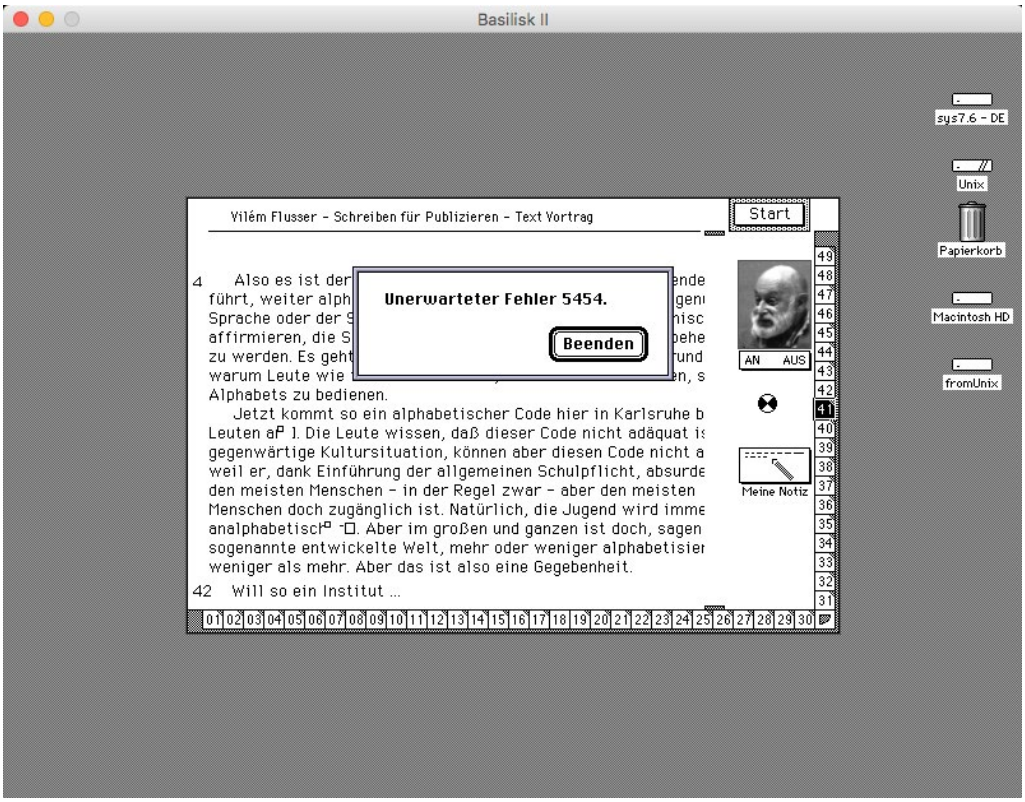


Fig. 6: Basilisk II emulation displaying an "unexpected error 5454" message, indicating corrupted HyperCard files. Screenshot: Philipp Tögel.

allowing end users to interact with the original environments running on different emulators."[27] After transferring the hypertext from the original Macintosh Performa, the researchers set up a first version of the Flusser-Hypertext emulation, which became one of the bw-FLA use cases. Although this version did not yet support the audio level of the hypertext, the emulation was now finally available on both the bw-FLA project website[28] and, embedding the emulation that ran on the bw-FLA servers, the Vilém Flusser Archive website.[29]

The next 'life cycle' of the Flusser Hypertext began with the preparation of the exhibition "Without Firm Ground – Vilem Flusser and the Arts" by Siegfried Zielinski, Baruch Gottlieb and the team of the Vilém Flusser Archive (lead by the author of this paper), which opened at the ZKM | Center for Art and Media, Karlsruhe in 2014 and which travelled in subsequent years to the Academy of Arts, Berlin, to WEST in The Hague and to The Gallery of the Academy of Performing Arts in Prague. Due to the media archaeological element in the curatorial

27 Ibid.

28 Now moved to the new domain http://eaas.uni-freiburg.de, access: Febraury 15, 2021.

29 http://flusser-archive.org, access: Febraury 15, 2021

concept, the hypertext emulation constituted a vital element of the exhibition, which made a solution of the defect audio function even more relevant. Philipp Tögel from the Berlin University of the Arts, in a thorough quasi-forensic investigation into the HyperCard stacks, finally solved the problem after identifying a corrupt HyperCard file holding audio data (fig. 6); he was also essential for setting up the emulation and its installation for the exhibition.[30] During the exhibition the Flusser-Hypertext emulation used a Basilisk II emulator on a modern mini PC running on Linux, while, applying some creative adapter wiring by Philipp Tögel, peripheral devices (screen, mouse, keyboard, speakers) from the time back when the hypertext was developed where used to provide an authentic interaction experience.

Only a few years after the bw-FLA research project had concluded in 2013,[31] the emulation ceased to run on the project website at the University of Freiburg, probably due to a lack of server-related updates. However, thanks to the continuous commitment of Baruch Gottlieb, the emulation is now up and running again via the website of the 'Flusser Club' initiative, as a result of the Flusser100 Winter School funded by the DAAD.[32] According to a Flusser Club newsletter (February 12, 2021), references and source material will be added within the next months to document the Flusser-Hypertext project history. A history of curiosity, research and tinkering that now spans over a period of more than 20 years and that demonstrates the importance, and difficulties, of preserving digital cultural artifacts.

Acknowledgements:
This work has been funded by the Federal Ministry of Education and Research of Germany (BMBF) under grant no. 16DII126 ("Deutsches Internet-Institut").

30 Frank Padberg, Philipp Tögel, Daniel Irrgang and Martin Häberle, A Case Study on Emulation-based Preservation in the Museum: Flusser Hypertext. *Proceedings of the 13th International Conference on Digital Preservation IPRES* (2016), pp. 149–158. See also Baruch Gottlieb and Philipp Tögel, Rehabilitating Vilém Flusser's "Schrift" and "Hypertext," presentation at iMAL, Brussels (2015); video documentation available online: https://www.youtube.com/watch?v=-wZgycDop9E, access: February 15, 2021.

31 Klaus Rechert et al., Take care of your belongings today – securing accessibility to complex electronic business processes. Electronic Markets 24/2 (2014), pp. 125–134.

32 Flusser Club, Flusser Hypertext, http://flusser.club/en/hypertext/, access: February 15, 2021.

References

Böhle, Knud, Ulrich Riehm and Bernd Wingert, *Vom allmählichen Verfertigen elektronischer Bücher. Ein Erfahrungsbericht* (Frankfurt/M. and New York: Campus, 1997).

bwFLA — Emulation as a Service (project website); http://eaas.uni-freiburg.de, access: Febraury 15, 2021.

Flusser Club, Flusser Hypertext, http://flusser.club/en/hypertext/, access: February 15, 2021.

Flusser, Vilém, Hypertext. Über das Schicksal von Büchern. *NZZ Folio* 10 (October 1991), pp. 35–36.

Flusser, V., *Ins Universum der technischen Bilder* (Göttingen: European Photography, 1985).

Flusser, V., Line and Surface. *Main Currents in Modern Thought* 29/3 (1973), pp. 100–106.

Flusser, V., *Schreiben für Publizieren. Kernforschungszentrum Karlsruhe 2/3/89* (1989). Lecture manuscript, Vilém Flusser Archive, doc. no.: 2639.

Gottlieb, Baruch, Hypertext, in: *Flusseriana. An Intellectual Toolbox*, ed. Siegfried Zielinski, Peter Weibel and Daniel Irrgang (Minneapolis: Univocal Publishing, 2015), pp. 212–214.

Hadler, Florian and Daniel Irrgang, Instant Sensemaking, Immersion and Invisibility. Notes on the Genealogy of Interface Paradigms. *Punctum* 1 (2015), pp. 7–25.

Irrgang, Daniel and Marcel R. Marburger, Vilém Flusser – A Biography, in: *Flusseriana. An Intellectual Toolbox*, ed. Siegfried Zielinski, Peter Weibel and Daniel Irrgang (Minneapolis: Univocal Publishing, 2015), pp. 452–519; see p. 510 for the hypertext project.

Kaiser, Gert, Dirk Matejovski and Jutta Fedrowitz, *Kultur und Technik im 21. Jahrhundert* (Frankfurt/M. and New York: Campus, 1993).

Kay, Alan, User Interface. A Personal View, in: *multiMEDIA. From Wagner to virtual reality*, ed. Randall Packer and Ken Jordan (New York: W.W. Norton, 2001), pp.121–131.

Kuhlen, Rainer, *Hypertext. Ein nicht lineares Medium zwischen Buch und Wissensbank* (Berlin and Heidelberg: Springer, 1991).

Nielsen, Jakob, *Multimedia, Hypertext und Internet. Grundlagen und Praxis des elektronischen Publizierens* (Braunschweig and Wiesbaden: Vieweg, 1996).

Padberg, Frank, Philipp Tögel, Daniel Irrgang and Martin Häberle, A Case Study on Emulation-based Preservation in the Museum: Flusser Hypertext. *Proceedings of the 13th International Conference on Digital Preservation IPRES* (2016), pp. 149–158.

Rechert, Klaus, Dirk von Suchodoletz, Isgandar Valizada, Johann Latocha, Tatiana Jimenez Cardenas, Alibek Kulzhabayev, Take care of your belongings today – securing accessibility to complex electronic business processes. *Electronic Markets* 24/2 (2014), pp. 125–134.

Transmediale, Flusser Hypertext Prototype 2 (2011); https://archive.transmediale.de/content/flusser-hypertext-prototype-2, access: February 15, 2021.

Wiechens, Peter, Hypertext und Künstlerbuch. Das Buch nach dem Ende des Bu-

ches, in: *Einführung in die Kulturwissenschaft*, ed. Thomas Düllo (Münster: LIT, 1998), pp. 328–346.

Wingert, Bernd, Der Flusser-Hypertext. Einige Erfahrungen aus Entwickler- und Nutzersicht, in: *Bodenlos – Vilém Flusser und die Künste*, ed. Siegfried Zielinski and Daniel Irrgang (Berlin: Akademie der Künste, 2015), pp. 78–79.

Wingert, B., Flusser hören – lesen – studieren. Der "Flusser-Hypertext" – von der Nachgeschichte zur Vorgeschichte. *Flusser Studies 24* (2017); https://www.flusserstudies.net/sites/www.flusserstudies.net/files/media/attachments/wingert-flusser-hypertext.pdf, access: February 15, 2021.

Wingert, B., Schreiben für Publizieren. Ein Hypertext-Experiment mit einem Flusser-Text. *Kunstforum* 117 (1992), p. 109.

Wingert, B., Kann man Hypertexte lesen?, in: *Literatur im Informationszeitalter*, ed. Dirk Matejovski and Friedrich Kittler (Frankfurt/M. and New York: Campus, 1996), pp. 184–218.

SKIN

By Vilém Flusser

"Here the skin surface will be considered a plane on which I happen to the world and the world happens to me."

Suggested citation:
Vilém Flusser, Skin. *Interface Critique* 3 (2021), pp. 115–126.
DOI: https://doi.org/10.11588/ic.2021.3.81319.

This essay by the cultural philosopher and media or communication theorist Vilém Flusser remained unpublished during his lifetime. This is surprising since it provides an exciting account of Flusser's special take on phenomenology while exploring the skin of the human body as an interface phenomenon, a threshold between subjective experience and the environment. Flusser's specific take on such a "dermatology,"[1] which he elaborated (although never fully developed) in this and a few other texts,[2] is not only relevant for studies or heuristics of interfaces. It is also a valuable contribution to the now widely debated – in cognitive science, philosophy of mind and beyond – possibility of an 'embodied' or 'extended mind'. One of the topics at stake in this debate is no less than the possibility of freeing cognition from the neurocentrism or Cartesian dualism of traditional cognitive science, by expanding cognition from the brain to the whole body and beyond to the artifacts and devices we use.

The text is undated, but considering other essays written by Flusser on this subject (see footnote 2), I estimate its year of origin around 1974. For this publication it has been transcribed from the typewriter manuscript (Vilém Flusser Archive, Berlin University of the Arts, doc. no. 2796) and carefully edited, eliminating only spelling and grammatical errors.

We are indebted to Siegfried Zielinski for suggesting this text as a candidate for Interface Critique and to Anita Jóri from the Vilém Flusser Archive for providing the manuscript.

Berlin, February 2021
Daniel Irrgang

1 Silvia Wagnermaier, preface to Vilém Flusser's essay "Von den Möglichkeiten einer Leibkarte," in: *Lab: Jahrbuch 2000 für Künste und Apparate*, ed. Kunsthochschule für Medien Köln/Verein der Freunde der KHM (Cologne 2000), pp. 113–114, here 113.

2 Vilém Flusser, Von den Möglichkeiten einer Leibkarte, in: *Lab*, pp. 115–124; Flusser, *Ist ein Modell meines Leibes möglich?*, manuscript Vilém Flusser Archive, doc. no. 2451 (undated, ca. 1974); Flusser, *On the Crisis of our Models. (Theoretial considerations and a practical pro-posal)*, manuscript Vilém Flusser Archive, doc. no. 2767 (undated, ca. 1974); Flusser also wrote a German version of "*Skin*": Flusser, *Haut*, manuscript Vilém Flusser Archive, doc. no. 3147 (undated).

Skin atlas? There are some (for instance Jacobi's). Dermatological texts. And dermatology is about skin diseases. This is not enough. We need a broader dermatology, a science of the skin as a limit between myself and the world. And an atlas that would show the regions through which that limit passes. We need a dermatology that is an anthropology, and an atlas that shows our being in the world. But in order to have such a science and such an atlas we must change our attitude. We must become superficial. It must be the surfaces and not the mysteries they are said to cover up, that must interest us. We must concentrate upon mere appearance ("*phainomenon*"). Only if we desist from all explanations and significations of appearances, the surface "skin" will become visible. Mystery is not hidden. It lies on the surface of the skin. "Not how the skin is mysterious, but that it is." The mystery is not that I am or that the world is. Such things may be explained. The mystery is that I am in the world. This cannot be explained because it is a concrete fact. Theoretically, the skin is the limit between myself and the world. But concretely, "I" and "the world" are limits of the skin, horizons. Let us be superficial and consider the concrete mystery "skin".

The view that it is a surface that covers my body is extreme. It is due to my curious capacity to step outside myself into theory and view myself extatically as a body covered by skin. Such an *extasis* is not a very good point of departure for a concrete skin consideration. If I look at the skin surface concretely I am under the impression that it is a plane on which everything happens. I was told, it is true, that some things happen outside the skin (the "purely objective" and the "purely subjective" ones), but whether what I was told is true is one of the questions a concrete consideration of the skin should be able to answer. Therefore, my impression that everything happens on the skin surface is the point of departure for this essay.

The happenings on the skin surface must be classified if we are to map them. Several categories offer themselves for such a classification. For instance, the category "agreeable – disagreeable". Thus, the happening would become experiences, and the skin an "erogenous" and "pathogenic" surface. A good method to start projecting skin maps. But it will not be applied here. Here the skin surface will be considered a plane on which I happen to the world and the world happens to me. Thus, the happenings become facts. It goes without saying that several categories will have to be combined in the future if our skin atlas is to have usefulness·

Considered thus (as a place for facts), the skin is a surface which protrudes into to third dimension of space and does so dynamically along the dimension of time. It is a space-time continuum without losing its two-dimensional characteristics. The curves of the skin are its "geographic" and its dynamics are its "historical" accidents. Some accidents are more or less permanent (like the abyss "mouth"), others are more ephemerous (like wounds and other

shallow valleys). Skin maps will have to show such features. But they will have first to draw the outlines of the continent "skin".

Those outlines are not sharp because the skin absorbs and secretes. What may be absorbed is a skin possibility, and it becomes real during absorption. The totality of absorbable influences forms the outer horizon of the skin and may be called "my future". Each single incoming possibility may be called "an adventure". During the absorption of an adventure a fact happens on the skin surface. The sum total of such facts may be called "the given world" or "my passive presence in the world". Each fact leaves a scar on the skin (even if this may not be visible to the naked eye). This may be called "a fact remembered". The totality of such scars may be called "my memory" or "my passive past".

What may be excreted is another skin possibility and it becomes real during secretion. The totality of excretable effluences forms the inner horizon of the skin and may be called "my freedom". Each single outgoing tendency may be called "a decision". During the secretion of a decision a fact happens on the skin surface. The sum total of such facts may be called "how I give myself to the world" or "my active presence in the world". Each fact leaves a scar on the skin, which may be called "an action remembered". The totality of such scars may be called "my works" or "my active past".

These observations permit the drawing of skin outlines. It lies between the horizons of "future" and "past", of "freedom" and "given world". These horizons overlap, but still one can distinguish between an "outer" and an "inner" skin side. This is so because there are limits to the skin possibilities: it has not unlimited absorption and secretion potentialities. There is an inner limit to skin possibilities and it may be called "I". I am the most extreme and nebulous limit of freedom. And there is an outer limit to skin possibilities, but curiously enough, it may not be called "the given world". Concrete observation shows that the given world is absorbable without limit. The outer limit of skin possibilities must be called "my death". It is the most extreme and nebulous limit of my future. Therefore, the classical dichotomy "I – world" must be abandoned during the drawing of skin outlines. The skin lies between the extreme limit "I" which limits the horizon of freedom and the extreme limit "my death" which limits the horizon of the given world. But we must resist our tendency toward symmetry (as we must resist all our prejudices). Although the skin is a continent bathed by the Mediterranean "I" and the ocean "my death", the two seas may not be compared easily. Both are unreal, in the sense of "merely possible", and they never and nowhere happen as a fact. But "I" am more like a bottomless abyss below the skin surface and "my death" is more like a sharp line behind every adventure. "I" and "my death" are different theoretical constructions.

Although the outlines of the skin are unprecise (like the outlines of America in the 16th century), one can still try to inscribe some accidents on it. Otherwise

the atlas here proposed would lose all technical interest. Four very common facts were chosen for that purpose (a) "I eat a ham sandwich", (b) "I read a book", (c) "I suffer liver pains" and (d) "I write a letter". These examples were chosen haphazard, but it must be confessed that facts of the type. "I meet a friend" were excluded. The happening of a different skin on my own is too complex a fact to be inscribed in the map at such an early stage. Although, of course, it is facts of that type which are the decisive ones for my being in the world.

(a) A happy coincidence: the decision "I want something to eat" and the adventure "an eatable sandwich" coincide on the skin surface. It is important to note that the two incidences condition each other. The adventure "sandwich" is eatable because of my decision to eat it, and my decision "to eat a sandwich" is so because of the sandwich adventure. One is the cause of the other. This is a coincidence, and not some "psycho-physical parallelism". Sandwich and appetite coincide, they do not run parallel. "Sandwich" and "appetite" are theoretical concepts (skin possibilities) and "psycho-physical parallelism". is the coincidence of two theories in one single concrete fact: "I eat a ham sandwich."

Now if explained theoretically, the fact is extremely complex. All theories (physical, physiological, sociological and so forth on one side, behaviorist, gestaltist, psychoanalytical and so forth on the other) fail to explain it fully. But if considered concretely and superficially (from the skin surface), it is obvious like every concrete fact. What happens is that the virtualities "sandwich" and "my decision to eat it" condense about some places of the skin surface and become real there. Especially on the skin protuberance "my hand" and the skin abyss "my mouth". On these places I become real as one who eats a sandwich and the sandwich becomes real as my eating of it. But this is not a satisfactory description. I become real as one who eats in various ways which vary according to the skin place. I eat differently on my hand and on my mouth. And the sandwich is different on my hand, my mouth and on other skin places. "I" and "sandwich" are theoretical hooks on which to hang these various aspects of the concrete fact. If I want to analyze myself and the sandwich, I must analyze the various skin places. And "I" and "sandwich" disappear from the surface of reality after my eating of the sandwich. What is left is a scar: the sandwich remembered by me.

This fact may be inscribed on the map as follows: my passive and active presence in the world coincide on various places of the skin surface to form the fact: I eat a sandwich. The fact has two futures: the adventure "sandwich" coming in from my future and the decision to eat it coming in from my freedom. And it has two pasts: the sandwich remembered and my deed of having eaten it. Thus, the inscription of the "geographic and historical" accidents of "I eat a sandwich" has succeeded, although nobody will deny that it is in need of further improvement.

(b) No happy coincidence in the case

of the fact "I read a book" and no psycho-physical parallelism. In it the skin seems to point from the world to myself in a one-way dynamic. But still: even if the usual theoretical difficulties are bracketed out, the superficial aspect of the fact is complex. The adventure "book" cannot be said to flow into the abyss "eye", to become real there as the fact "I read it" and to leave a scar "book remembered". Because the book can flow in only if it meets my decision to read it. Although it must be admitted that the book causes such a decision. And it does not leave just a scar but also continues to be readable in the future. This complication renders the inscription on the map difficult, and it is no doubt due to the mystery of the specific skin spot (the eye) where the fact happens.

There are excellent phenomenologies of the eye and of the glance, for instance Merleau-Ponty's, Bachelard' and Ortega's. Still, the mystery remains unviolated. The reason may be that the eye, unlike other spots of the skin, is immediately invisible. It may be seen only through the glance of somebody else's eye (for instance the mirror's). A glance (even if it be a phenomenological one) must glance at a glance in order to see it. This methodological complication undoubtedly reflects the fact that the eye is an abyss which reaches deep into freedom and through which myself reaches very near the skin surface. In the case under consideration the mystery of the eye manifests itself as its capacity for reading. The eye can glance at an adventure as if it were decipherable (as if it had some meaning). It glances at the sandwich in a way that is different from the glance at the book: the eye makes different decisions. But this is not the whole problem. The glance depends on what it sees, it is conditioned by it and reflects it. The book conditions the eye toward a reading decision. But the glance has a certain autonomy with regard to what it sees. It may try to read the sandwich and to look at the book as if it were something to eat. Theoretically, much may be said to explain this reading faculty of the eye, and theory of communication does so. But no theory can explain the mystery of the eye fully.

If one tries to inscribe the fact "I read a book" on the skin map despite of this, one would have to do this approximately as follows: a possible adventure, "book", comes in from the given world of my future, provokes the decision to read it on the skin spot "eye" and becomes real in the fact "I read it". Its future is double: the given adventure and my decision to read it. But the future "adventure" is anterior to the future "decision" and the given world is anterior to my freedom. After its realization the fact bifurcate into a past ("book remembered") and a future ("the possibility to read it again"). Nobody will consider such an attempt to describe the fact to have been very successful, but some may think that it is worth while trying.

(c) The fact that I suffer liver pain offers difficulties of inscription within the map which are of quite different order. In order to face them we must resist the temptation to fall back into the extreme point of view which we have abandoned

with such an effort. If we consider the skin to be the surface which covers the body, then, of course, the liver, being a part of the body, lies on its inner side and liver pains come in from the inner skin side. But if we consider the fact "I suffer liver pains" from the surface, "liver pains" are seen as one of my possible adventures which come in, like the sandwich and the book, from out of my given world, from the skin outside. Such a view shows the liver pains to be a theoretical concept before its realization on the skin, just like the sandwich and the book, and therefore to lie in my future as one of the skin possibilities. But of course there can be no liver pain without a liver. The liver is thus shown to be an adventure which lies behind the liver pain, therefore further away in the given world, in my future (more theoretical and less possible than the liver pains). Now this raises two questions as far as inscription into the skin map is concerned: how to inscribe the body and what scale to use.

Seen "objectively", the body is a synchronized organism. But seen concretely, it is a vague concept which tries to cover a field of very disparate parts. The eye is a part of the body where the future becomes real as the given world. The finger is a part of the body where I become real in the world. The liver is a part of the body which makes it possible that the fact "I suffer liver pain" happens. Ribonucleic acids are parts of the body which make it possible to theoretically explain certain facts that happen on the skin surface. Therefore, the body will have to appear on the skin map as sporadically scattered parts which lie in various distances from the skin surface within the given world, or are part of the surface.

The scale of the map will have to base itself on [Abraham A.] Moles' research on "proximity"[3] Moles projects a space-time the structure of which is the distance between myself and things ("*objets*") and the measure of which is the interest the things have for me. Thus the sandwich, if I want to eat it, is nearer than the liver and the liver nearer than the sandwich if I suffer pain. But Moles' space-time has "myself" as its center, whereas the skin map has the skin surface (the dialectics between myself and the thing) as its center. The "*théorie des objets*" must be adapted to the map structure before it is used as a scale for map inscriptions.

This will allow the following inscription of the fact "I suffer liver pain": out from the future (the given world) the adventure "liver pain" comes in and becomes real on the skin surface as the fact "I suffer them". Behind that future there is a more distant one (the liver) which is more objective in the sense of further away in the given world. The skin spot where the fact happens is part of my passive being in the world (a "suffering"). The fact leaves a scar, "liver pain remembered", and thus becomes part of the past. This seems to be a quite satisfactory way to inscribe the fact into the skin map.

(d) The fact "I write a letter" must not be considered as an opposite of the fact "I suffer liver pain" because of the one

3 Editorial note: Abraham A. Moles, *Théorie des objets* (Paris 1972).

being active and the other passive. We must resist our tendency toward symmetry because observation of concrete facts shows active ones to be far more complex than passive ones. In the fact to be described, a pressure from inside the skin dominates which comes from my freedom in the form of my decision to write a letter. It is, of course, an extremely complex process if it is considered theoretically. But even if we put all those theoretical complexities within brackets, the fact is still complex because of the counter-pressure which the decision to write a letter provokes on the skin outside.

The pressure expands the skin in an act "I stretch out my hands" through which the skin reaches out into the given world. There it strikes against one of the given possibilities of the world: a typewriter. That possibility becomes real on the hands as part of my presence in the world, but immediately turns around from the present into the future. It becomes a prolonged hand and my decision to write a letter propels it further into the future.

There it strikes against a further possibility of the world: a paper. The pressure of the typewriter against the paper changes the paper and results in the concrete fact "I write a letter".

The passive element in the active process of my decision is what makes the fact complex. My decision strikes against "objects" (counter-pressures) and realizes itself through them by turning them around, by "revolutions". The typewriter imperative "write with me!" and the paper imperative "write on me!" are turned around to become imperatives which I articulate in the direction of the future. Such revolutionable objects, such possibilities for the realization of other possibilities, may be called "instruments" and their sum total may be called "culture". Other objects in my future which cannot thus be revolutionized may be called "nature". Which means that I can write a letter because part of my future (the given world) is culture.

Now such a way to describe the fact and to try and inscribe it in the map has its advantage and its disadvantage. The advantage is that it makes the distinction between culture and nature one of degree, not of kind, and that it makes it dependent on the dialectics between the given world and my decision. The more a given adventure is revolutionable and the more I decide to turn it around, the more it is culture and the less it is nature. The typewriter is culture if I want to write, but less so if I want to eat a sandwich. And if I am a Brazilian Indigenous it is nature because it is then not given as a revolutionable possibility. This is an advantage in the description because it allows, for instance, the distinction, on the map, between a "rightist" and a "leftist" being in the world. He who is in the world on the right has a skin where the given world happens more in the form of nature, and he who is in the world on the left pressures his skin by decisions which make the future happen more a revolutionable culture.

Yet this way to describe the fact is also a disadvantage. If the difference between

culture and nature is one of degree, and if it depends in part on the decision toward revolution, then no adventure is definable as "culture" before I decide myself to it. It is no help to say that I decide to eat a sandwich and to write on a typewriter because these possibilities offer them selves for such decisions. Because they offer themselves thus only after my decision. Thus it becomes quite mysterious why any decision at all is ever taken. This is a big disadvantage of the description and very probably due to some mistake that occurred during the description. This must be confessed.

By the way: The same mistake must have occurred during the liver pain description. If one explains that fact objectively, one has explained it from the "right" as a fact caused by the body. This is vulgar (fascist) materialism. If one explains the fact from the skin surface, one has explained it from the "left" as a fact which results from the dialectics between the given world and my presence in it. But this is no explanation. Is liver pain nature because I cannot decide to suffer it? And if so, why can I not?

With this disadvantage in mind, one can proceed with the inscription of the fact within the map as follows: My freedom presses against the skin as a decision to write a letter and realizes itself in the world as the act of stretching out my hands, turning around a typewriter and changing a paper, which means the fact "I write a letter". This fact has two futures: my freedom and the revolutionable world of culture. And two pasts: the written letter remembered and my work "the written letter". This second past is the future of somebody else (his adventure), but this cannot be inscribed in the map at this stage of its projection. On the other hand, what can be inscribed is this: The fact "I write a letter" is an act, i.e.: a gesture of the skin surface. The map may contain a series of gestures. Now it is very doubtful that many will agree to this way of inscribing the fact, but some will agree that it is open to further improvement.

Let us reconsider these reflections before we try to reach a conclusion. The thesis was that concrete facts happen on a dynamic surface between myself and the world. That surface is the skin in a sense very near, but not quite identical with, the sense meant in dermatology. If one means the skin thus, it becomes visible from a specific point of view, called the "superficial" one in this paper. During the attempt to define the skin it became evident that it does not lie between myself and the world but between myself and my death. Once defined, some specific facts were taken as tests for the elaboration of a skin map. They were chosen from an ontological viewpoint but it was confessed that other viewpoints must complete the chosen one if the map is to be useful. The attempt at inscription met with varying success. The question now is: Is it worthwhile to make such a map?

Apparently this should have been asked at the beginning of this paper. But this was impossible because at that point the question would not reveal its meaning. One could have said then that every map is useful if it serves orientation in

a complex situation and that it does so by simplifying the situation. If the map here proposed does so, it is useful. And it does so: It simplifies complex problems like psycho-physical parallelism, freedom/condition, the problem of the body, culture/nature, "rightist"/"leftist" existence and so forth. But this is not a good answer to the question. It does not ask whether such a map would be useful but whether it is worthwhile, whether the costs involved compensate its usefulness (to speak with Moles).

At this point of the argument it has become obvious that the costs involved would be very considerable. Costs that may be compared to those involved in the elaboration of an atlas of the Earth during the period of discoveries. Possibly a skin atlas would not cost as many lives as the Earth atlas did, although its elaboration would not be less an adventure. On the other hand, its projection would be much more difficult and costlier than was the Mercator projection. To understand this, the following must be considered:

Traditional maps are flat projections of three-dimensional objects. A historical atlas is a good example for this problem: It is an instrument for orientation within a space-time. It projects space on individual plane maps and time as a sequence of maps. This will not do for a skin atlas. If it were structured thus, it would not function because it would fail to store the information coming in from superficial skin observation. The skin is a surface that has a space-time dynamic. Only an atlas of similar structure would be able to store the information coming in from it. Otherwise the information in the atlas would become crowded and it would be useless. Now we possess media of such a structure. Videotapes and hologram series are examples. The skin atlas here proposed must take recourse to such media if it is to function. And this is very costly. Not mainly because the materials are expensive, their manipulation is expensive and their utilization is expensive. But because these media require the collaboration of very expensive workers like scientists, philosophers, artists and media manipulators. And because such a collaboration requires the elaboration of difficult and costly methods. What the question means is whether such costs are worthwhile.

He who accepts Husserl's thesis of the necessity to reformulate the basis of science will answer the question in the affirmative. The crisis of science manifests itself as, among other things, a crisis of maps and other models. Almost all of them have been projected from a transcendent, objective viewpoint. They do not store information acquired through phenomenological observation. But this is not all: They do not even store objectively acquired information any longer. Their structural poverty prevents them from absorbing the enormous amount of daily incoming information. The information inflation from which we suffer is the other side of the map crisis. We need new types of maps if we want to be able to digest the information inflation. As long as we do not have them, more information means more confu-

sion. The incapacity of science to provide us with orientation in the world is an aspect of the crisis of science.

This become obvious when the skin is considered. We dispose of a great amount of objective information about it. But it cannot be stored in a skin atlas because it has been acquired through various methods of observation and one information is thus not relatable to another. And we also dispose of much information acquired through phenomenological observation. But this information is not only not storable in present skin maps, it is covered up by such maps and disappear from our vision. As a consequence, we are alienated from our skin (we are not in our own skin but in an alien one) which means that we are alienated from ourselves and our world. And the more we learn about the skin, the more we are alienated. The question is whether it is worthwhile to attempt an instrument for dis-alienation.

The reflections here offered do not provide any guarantee that such an attempt would be successful. The elaboration of such a skin atlas is a technical problem. As such it lies outside the competence of this writer. Therefore, the purpose is this: (a) it wants to draw attention to the need of new types of maps, and to the existence of media suitable for such a purpose. (b) It wants to propose the elaboration of a specific map of the new type: a skin atlas. (c) It wants to ask scientists, artists and philosophers whether they believe such a proposal is of interest and media manipulators whether they think it is of interest and feasible.

In the last analysis, however, this paper wants to provoke a discussion of the following matter: The time for individual reflection is over. Even if it wants to be a dialogical reflection. The time for traditional philosophy is over. From now on each single step of reflection must be made in collaborations of various disciplines. For instance: The time for traditional philosophical anthropology is over. The interplay of various disciplines will "overcome" it. This paper wanted to show how this might happen – by proposing the elaboration of a skin map. It is, however, characteristic of our situation that the paper itself is still an individual traditional reflection. The fact that such a type of reflection is over may be regretted or hailed. No matter. What matters is that we must face the fact – and to face it together with others is the true motive and purpose of the present paper.

References

Flusser, Vilém, *Haut*, manuscript Vilém Flusser Archive, doc. no. 3147 (undated, ca. 1974).

Flusser, V., *Ist ein Modell meines Leibes möglich?*, manuscript Vilém Flusser Archive, doc. no. 2451 (undated, ca. 1974).

Flusser, V., *On the Crisis of our Models. (Theoretial considerations and a practical pro-posal)*, manuscript Vilém Flusser Archive, doc. no. 2767 (undated, ca. 1974).

Flusser, V., Von den Möglichkeiten einer Leibkarte, in: *Lab: Jahrbuch 2000 für Künste und Apparate*, ed. Kunsthochschule für Medien Köln/Verein der Freunde der KHM (Cologne 2000), pp. 115–124.

Moles, Abraham A., *Théorie des objets* (Paris: Éditions universitaires, 1972).

Wagnermaier, Silvia, preface to Vilém Flusser's essay "Von den Möglichkeiten einer Leibkarte," in: *Lab: Jahrbuch 2000 für Künste und Apparate*, ed. Kunsthochschule für Medien Köln/Verein der Freunde der KHM (Cologne 2000), pp. 113–114, here 113.

WELLNESS CAPITALISM AND THE DESIGN OF THE PERFECT USER

By Cherie Lacey, Alex Beattie and Catherine Caudwell

"Today, technological humanism replaces the Vitruvian Man with the Perfect User, who sits atop the hierarchy of all users. Mindful, intentional, healthy, disciplined, minimalist, designed: these features have become the 'measure of all things' for today's aspirational user-subject."

Suggested citation:
Cherie Lacey, Alex Beattie and Catherine Caudwell, Wellness Capitalism and the Design of the Perfect User. *Interface Critique* 3 (2021), pp. 127–150.
DOI: https://doi.org/10.11588/ic.2021.3.81323.

Discovering the Humanities[1]

On June 9 2019, former Google designer-turned-critic Tristan Harris tweeted, "we need a new field of 'Society & Technology Interaction' (or STX)" (@tristanharris, 9 June, 2019). This 'new field', he claimed, would research ways to realign technology so that it worked in the best interest of humanity. Harris is the figurehead of a loosely associated group of former technology insiders who have publicly raised ethical concerns about the persuasiveness of their designs and algorithms ('persuasive technology'), and the degree to which persuasive technology is integrated into the Facebook and Google platforms, among others.[2] Once labelled by the media as "the only person in the Silicon Valley with a conscience",[3] Harris leads the Center for Humane Technology (CHT), an influential organization that aims to reform the technology industry and design practice.

Harris' tweet was part of a wider thread in which humane technology practitioners and advocates discussed the need for a socio-political, critical turn in User Experience (UX) Design; the response by academics and social scientists was swift—and often fierce. Underscoring their general disdain was a perception that Harris was ignorant of science and technology studies (STS), internet and platform studies, and other various subfields within the social sciences and humanities that have been critiquing persuasive technology for some time.[4] Some replies accused Harris of "columbusing", a colloquial term to denote the claim of 'discovery' when nothing new has been discovered. More sympathetic academics called on their colleagues to reflect on their own institutional barriers in trying to undertake interdisciplinary research and establish new fields.

At a broader level, the emergence of the Center for Humane Technology and the call for the new field of STX signals a cultural-hegemonic shift in Silicon Valley towards what Tarnoff and Weigel call "technological humanism".[5] Technological humanism draws upon a classical Humanist moral framework to argue that persuasive technology leads to a

1 Our argument structure follows the key stages of the Double Diamond framework synonymous with design thinking: Discover, Define, Develop, Deliver. We use this framework to demonstrate the expansion of design as a paradigm in Big Tech's user- and customer-centred strategies. By following the four steps of the Double Diamond we mirror the strategic UX Design phases that work to design and produce the user-subject.

2 Paul Lewis, "Our minds can be hijacked": the tech insiders who fear a smartphone dystopia. *The Guardian* (October 6, 2017), https://www.theguardian.com/technology/2017/oct/05/smartphone-addiction-silicon-valley-dystopia, access: April 7, 2021, 8:00 pm.

3 Bianca Bosker, The Binge Breaker: Tristan Harris believes Silicon Valley is addicting us to our phones. He's determined to make it stop. *The Atlantic* (November 2016), https://www.theatlantic.com/magazine/archive/2016/11/the-binge-breaker/501122/, access: April 7, 2021, 8:00pm.

4 See Virgina Eubanks, *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poo*r (New York 2018); Safina Noble, *Algorithms of oppression: how search engines reinforce racism* (New York 2018); Nick Seaver, Captivating algorithms: Recommender systems as traps. *Journal of Material Culture* (2018).

5 Ben Tarnoff and Moira Weigel, Why Silicon Valley can't fix itself. *The Guardian* (May 3, 2018), https://www.theguardian.com/news/2018/may/03/why-silicon-valley-cant-fix-itself-tech-humanism, access: April 7, 2021, 11:00pm.

"downgrade"[6] of humanity—evidenced by digital addiction, superficiality, and an overall degradation of mental health. For the CHT and other tech humanists, humane technology and design practices can and should enhance the human condition. As part of this determinist approach to technology, a number of wellness groups, practices, and applications have emerged from, and are converging around, the CHT. On the CHT website, for example, readers are offered tips to make their phone use less habitual, with links to recommended mindfulness or time-management apps, such as *Calm* or *Moment*. Under a header of "Take Control", these tips reinforce an approach to technology that is founded in digital wellbeing or "digital healthism".[7] Indeed, humane technology can be seen as the latest incubators of the deep-seated Silicon Valley cultural belief that technology has the potential to solve social issues and maximize human potential,[8] and underscores a Humanist belief in the ability of the individual to act in concert with their own intentions.

Technological humanism reinforces many of Humanism's central tenets. Concepts such as the sovereign, rational human agent, who "remains separated from his world by maintaining his mastery over it",[9] have not only survived in the new technological age but have found new purpose in practices like Human Centered Design. Notably, Humanism's "unshakable certainty [in] the almost boundless capacity of humans to pursue their individual and collective perfectibility"[10] is being reinvigorated with the aegis of Californian wellness culture,[11] which attempts to align intentional technology use with self-mastery.

The backlash Harris received in response to his STX tweet may be read as a flashpoint in the emerging discourse of technological humanism, which appears to ignore many hard-won gains in theories of anti-human and post-human subjectivity, for which, as Halberstam and Livingston put it in *Posthuman Bodies*, we "have *never* been human"[12]—at least not in the way that Humanism recognized. As Braidotti wrote in the opening pages of *The Posthuman*:

> *Not all of us can say, with any degree of certainty, that we have always been human, or that we are only that. Some of us are not even considered fully human now, let alone at previous mo-*

6 Tristan Harris, Humane: A New Agenda for Tech. *The Center for Human Technology* (2019), https://humanetech.com/newagenda/, access: April 7, 2021, 11:00pm.

7 Adam Fish, Technology Retreats and the Politics of Social Media. *triple C* 15 (2017), pp. 355–369. Adam Fish defines 'digital healthism' as the positioning of the individual as responsible for their digital consumption.

8 Dorien Zandbergen, Fulfilling the Sacred Potential of Technology: New Edge Technophilia, Consumerism and Spirituality in Silicon Valley, in: *Things: Material Religion and the Topography of Divine Space*, eds. Birgit Meyer and Dick Houtman (New York 2012), pp. 356–379.

9 Benjamin Bratton, *The Stack: On Software and Sovereignty* (Cambridge, MA 2015), p. 251.

10 Rosi Braidotti, *The Posthuman* (Cambridge 2013), p. 13.

11 Daniela Blei, The False Promise of Wellness Culture. Jstor Daily (January 4, 2017), https://daily.jstor.org/the-false-promises-of-wellness-culture/, access: April 7, 2021, 9:00am; Barbara Ehrenreich, *Natural Causes: Life, Death and the Illusion of Control* (London 2018).

12 Jack Halberstam and Ira Livingston, *Posthuman Bodies* (Michigan 1995), p. 8; emphasis added.

> *ments of Western social, political, and scientific history. Not if by 'human' we mean that creature familiar to us from the Enlightenment and its legacy: the Cartesian subject of the cogito … the subject as citizen, rights-holder, property-owner, and so on.*[13]

The notion of humane technology both requires and assumes a human subject; yet, those who are most vocal in advocating for humane technology appear to rely on an outdated concept of human subjectivity, and the exclusionary politics on which it has historically relied. As Jasanoff argues, "it is our understanding of what being human means that has changed along with our technological achievements"[14], and yet, for many in the technology sector, the category of 'human' remains curiously fixed. What is urgently needed, then, is an awareness of precisely how discourses and applications of humane technology may be working to re-position Silicon Valley entrepreneurs, designers, and programmers as the ideal reformers of humanity.[15] The response Harris received to his STX tweet might therefore be read as part of ongoing debates regarding who gets to define the category of the human, as well as who gets to be considered most 'fully human' in our current techno-social predicament.

In this article, we draw connections between technological humanism and the emergence of the user as the privileged subject position of our time.[16] Specifically, we argue that the array of wellness apps that are emerging from the humane technology movement are extending the Humanist drive for individual perfectibility—actively producing what we call the 'Perfect User'. We consider the Perfect User to be a thoroughly designed, homogeneous subject position into which any individual user may momentarily step.[17] Impossible to sustain yet requiring constant labor, the Perfect User is the ideal instrument for wellness capitalism. Here, we interrogate the specific UX Design processes by which Silicon Valley wellness culture is actively involved in configuring this new taxon of user, and the ideological function of this user-subject in contemporary techno-politics.

13 Braidotti, *The Posthuman*, p. 1.

14 Sheila Jasanoff, Perfecting the Human: Posthuman Imaginaries and Technologies of Reason, in: *Perfecting Human Futures, Technikzukünfte, Wissenschaft und Gesellschaft / Futures of Technology, Science and Society* (Wiesbaden 2016), p. 74.

15 Maya Ganesh, The Center for Humane Technology Doesn't Want Your Attention. *The Society Pages* (2018), https://thesocietypages.org/cyborgology/2018/02/09/the-center-for-humane-technology-doesnt-want-your-attention/, access: April 7, 2021, 6:00pm; Lilly Irani & Rumman Chowohury, To Really "Disrupt," Tech Needs to Listen to Actual Researchers. *Wired* (2019), https://www.wired.com/story/tech-needs-to-listen-to-actual-researchers/, access: April 7, 2021, 5:00pm; Luddbrarian, Be Wary of Silicon Valley's Guilty Conscience: on The Center for Humane Technology. *Librarian Shipwreck* (2018), https://librarianshipwreck.wordpress.com/2018/02/13/be-wary-of-silicon-valleys-guilty-conscience-on-the-center-for-humane-technology/, access: April 7, 2021, 6:00pm; Tarnoff and Weigel, Why Silicon Valley can't fix itself.

16 Bratton, *On Software and Sovereignty*; Wendy Hui Kyong Chun, *Programmed Visions: Software and Memory* (Cambridge, MA 2011); Patricia Clough, *The User Unconscious* (Minneapolis 2018); Tung-Hui Hu, *A Prehistory of the Cloud* (Cambridge, MA 2015)

17 See Clough, *The User Unconscious*, p. 5, in which she paraphrases the work of both Wendy Chun and Benjamin Bratton: "The subject actually is a subject- or user-position into which anyone or anything human or other-than-human can enter and does enter, mostly temporarily, operating in relation to programs and platforms at any one or any number of the layers of planetary computing".

A number of STS scholars have recently considered the user-subject as an evolution of the Humanist subject. These scholars note, in particular, the way computers appear to extend the volition of the human subject via command-and-control applications and devices. Chun, for example, argues that computers "embody a certain logic of governing or steering us through the increasingly complex world around us",[18] thereby providing nourishment to the Enlightenment model of subjectivity:

> *The dream is: the resurgence of the seemingly sovereign individual, the subject driven to know, driven to map, to zoom in and out, to manipulate, and to act. The dream is: the more that an individual knows, the better decisions he or she can make.*[19]

Bratton, in *The Stack*, marks the connection between the Humanist subject and the user-subject within the space of a single sentence:

> *[A]s this figure [the individual of Humanism] came to organize systems in its own image, its synthetic replication through microeconomics and social psychology* set the state for its cohesion into what is called, by design, the User.[20]

Orit Halpern[21] and Tung-Hui Hu[22] make similar connections in their work. The purpose of our article is to add to emerging literature on user-subjectivity by examining the specific UX Design methods through which the user-subject is designed, 'perfected', according to Californian wellness ideology and technological humanism. To do this, we use the walk-through method[23] on one wellbeing app, *Siempo*, and draw from interview material that one of the authors undertook for his PhD, to demonstrate that UX Design functions in this instance by hailing the human subject as a particular kind of user—specifically, a Perfect User. Put differently, we argue that *Siempo* is actively involved in *producing the kind of subject with which it claims to interact*.[24] Ultimately, our purpose is to scrutinize UX Design practice and tech humanism for its ontological and ideological implications, asking: how is technological humanism reconfiguring the drive-to-perfection for the user-subject? Further, what ideological structures are arising alongside the Perfect User to ensure its functioning?

18 Chun, *Programmed Visions*, p. 9.

19 Ibid., p. 8.

20 Bratton, *On Software and Sovereignty*; emphasis added.

21 Orit Halpern, *Beautiful Data: A History of Vision and Reason since 1945* (Durham 2014).

22 Hu, *A Prehistory of the Cloud*.

23 Ben Light, Jeans Burgess and Stefanie Duguay, The walkthrough method: An approach to the study of apps. *New Media & Society* 20 (2018), pp. 881–900.

24 This idea is adapted from Benjamin Bratton, who writes: "technology has begun to build us in its own image, producing the very subjects it claims to be interacting with" (2015, 18); See also Judy Wajcman, How Silicon Valley Sets Time. *New Media & Society* 21 [6] (2019), on how Silicon Valley enacts the user through the design of calendar apps. In the context of interface critique see Florian Hadler and Joachim Haupt (eds.), *Interface Critique* (Berlin 2016), which views the interface as a "dynamic cultural phenomenon"; scholars such as Hadler and Haupt seek to understand how culture is imbricated in the design of the interface and the user. See also Florian Hadler, Beyond UX. Interface Critique Journal 1 (2018).

Defining the Ideal User

Design has long been an active participant in the configuration of the user as a privileged and practical subject position.[25] From the mid-1950s, design shifted from a techno-centric to a human-centric approach, which both reinforced and reproduced an understanding of the user as a discrete, sovereign, individual agent.[26] According to human-centric design (HCD) doctrine, it was towards this putative human user that design should orient itself. As part of the HCD research process, designers posited 'ideal users' for intended products, messages, or services, which came to be known as 'personas'. In one of the best-known examples of design personas, Dreyfuss created 'Joe and Josephine', whom Bratton dubs the "Adam and Eve of use-case personas".[27] In Dreyfuss' 1955 book *Designing for People*, he describes in detail the characteristics and everyday habits of Joe and Josephine, who came to represent the most average of all American couples. These "two extraordinarily typical people"[28] became the use-case personas against which normative, ergonomic standards of industrial design were measured in America for decades to come, introducing the notion that design should be 'frictionless'. As Dreyfuss articulated,

> *when the point of contact between the product and the people becomes a point of friction, then the [designer] has failed. On the other hand, if people are made safer, more comfortable, more eager to purchase, more efficient—or just plain happier—by contact with the product, then the designer has succeeded.*[29]

Building on the HCD approach, UX Design foregrounds a deep understanding of user behaviour and, increasingly, incorporates elements of human psychology into the design process. For Don Norman, good design should function as an intuitive, unconscious mediator between user and the product.[30] In *The User Experience Team of One*, Buley writes that "a user experience is the overall effect created by the interactions and perceptions that someone has when using a product or service".[31] Buley situates UX as simultaneously a reaction against the machine-age dehumanization of labour, and a descendant of Taylorist concepts regarding efficiency between workers and tools. For example, Buley cites Toyota's factory system as an example of good UX, since it included workers in trouble-shooting systems and processes, and harnesses their human knowledge and input to streamline production.[32] Parallel to these system-design approaches was

25 Bratton, *On Software and Sovereignty.*

26 Laura Forlano, Posthumanism and Design. *She Ji: The Journal of Design, Economics and Innovation* 3 (2017).

27 Bratton, *On Software and Sovereignty*, p. 251.

28 ibid.

29 Henry Dreyfuss, *Designing for People* (New York 1955), p. 25.

30 Don Norman, *The Design of Everyday Things*. Revised and expanded edition (Cambridge, MA. 2013).

31 Leah Buley, *The User Experience Team of One: A Research and Design Survival Guide* (New York 2013), p. 5.

32 Ibid., p. 10.

the rise of cognitive and behavioural science, which influenced the design industry's understanding of the user.[33] The psychological influence in UX has become known by a range of monikers, including 'persuasive technology'[34] and 'designing with intent',[35] and has the goal of influencing the user through manipulation of behavior, emotion, and cognition.

In recent years, the trajectory of design—from techno-centric, to user-centric, to UX and Interaction Design—has become the object of critical analysis in STS.[36] This work has revealed a structural shift in design approaches, from designing *for* the user to a *design of the user-position itself*.[37] Stark has described it thus: "a user-subject [was] first identified as an entity to be designed for, and then thrown back to the human person as a model with which to conform or suffer".[38] Bratton labels this shift the 'death of the user', by which he means

> *the expiration of a specific kind of user […] and the displacement of the soft humanism from the conceptual center of design for the user-subject position and* towards a design of the user-subject position.[39]

Although this paradigmatic shift in design may be applied to many contexts, it is arguably in the tech sector where this shift is most keenly felt, and its effects on subjectivity most pervasive; as Bratton writes, technology has begun to build us in its own image, producing the very subjects it claims to be interacting with.[40]

The notion that the user-subject is a thoroughly *designed* subject position bears some relationship to the Ontological Design approach—although there are also important differences. Ontological Design postulates that "design is something far more pervasive and profound than is generally recognized by designers, cultural theorists, philosophers or lay persons".[41] Anna Willis describes this as a "double movement" of design, by which "we design our world, while our world acts back on us and designs us".[42] In this model, intentionality does not originate or manifest in any one location; rather, intentionality "could be seen as inhabiting three continuous inter-connected regions … That is, no distinction is being made about the nature or relative significance of determinations; neither object, process nor agent is granted primacy".[43] However, Ontological Design does not appear to adequately account for the unequal power relations that structure

33 Ibid.; Rex Hartson and Pardha Pyla, *The UX Book: Process and Guidelines for Ensuring a Quality User Experience* (Boston 2012)

34 B.J. Fogg, *Persuasive Technology: Using Computers to Change What We Think and Do (interactive Technologies)* (San Francisco 2002).

35 Dan Lockton, *Design with Intent: Insights, Methods, and Patterns for Behavioral Design* (Cambridge 2017).

36 Bratton, On Software and Sovereignty; Hu, *A Prehistory of the Cloud; Tara McPherson, Feminist in a Software Lab: Design and Difference* (Cambridge, MA 2018).

37 Bratton, *On Software and Sovereignty*.

38 Luke Stark, Algorithmic Psychometrics and the Scalable Subject. *Social Studies of Science* 48 (2018), pp. 204–231.

39 Bratton, *On Software and Sovereignty*, p. 260; italics added.

40 Ibid., p. 18.

41 Anne-Marie Willis, Ontological Designing – Laying the Ground. *Design Philosophy Papers* 13 (2006), pp. 69–74.

42 Ibid.

43 Ibid.

many or most interactive technologies. As Zuboff argues, these technologies operate through unprecedented asymmetries in knowledge and the power that accrues to knowledge. Technology works by "knowing everything about us, yet their operations are designed to be unknowable to us. They accumulate vast domains of new knowledge *from us*, but not *for us*".[44] As such, although it is useful to consider the close relationship between design and being—the idea that 'design designs'—this approach does not go far enough in considering the specific design methods by which this occurs, nor its socio-political or ideological implications. In our analysis of *Siempo*, we have therefore looked closely at the ways in which the representation of the ideal user in the app's UX Design becomes conflated with the user-subject position itself, producing a Perfect User against which users can either 'conform or suffer'.

Developing the Intentional User

In 1959, Halbert Dunn—the so-called father of the wellness movement—defined wellness as "a condition of change in which the individual moves forward, climbing toward a higher potential of functioning".[45] Today, wellness capitalism materializes in the form of juice bars, meditation retreats, detox diets, intentional eating, intentional living, mindfulness, and, of course, wellbeing apps.[46] Although not geographically restricted to the Silicon Valley region, or California more broadly, wellness capitalism in its current form remains ideologically tethered to that place and is unique history of counter-cultural movements and technological innovation. Hesmondhalgh, for example, directly links wellness culture to the Silicon Valley tech sector, and although he does not use the term 'wellness capitalism', he certainly goes some way in describing its operations:

> *The rise of the Internet and mobile communication emerged from a new and evolving type of capitalist activity, centred on Silicon Valley, which presented itself as benign, and was accepted as such by many commentators. The social media produced by Silicon Valley have further fuelled the continuing growth of promotional communication, including the rise of 'self-branding', an increasing insertion of competitive behaviour into people's efforts at self-realisation.*[47]

In Silicon Valley, the latest means to achieve a sense of 'higher potential of functioning' is to behave 'intentionally'. Intentionality generally refers to goal-orientated behavior[48] or conduct

44 Shoshanna Zuboff, *The Age of Surveillance Capitalism: The Fight for the Future at the New Frontier of Power* (London 2019), p. 9.

45 Dunn, qtd. in Blei, The False Promise of Wellness Culture.

46 Blei, The False Promise of Wellness Culture; see also Carol-Ann Farkas, "Tons of Useful Stuff": Defining Wellness in Popular Magazines. *Studies in Popular Culture* 33 (2010), pp. 113–132.

47 David Hesmondhalgh, Capitalism and the media: moral economy, well-being and capabilities. *Media, Culture & Society* 39 (2017), p. 203.

48 Fiery Cushman, Deconstructing intent to reconstruct morality. *Current Opinion in Psychology* 6 (2015), pp. 97–103.

entailing belief, desire, intention, awareness, or skill.[49] For his part, CHT leader Tristan Harris lives in an intentional community in San Francisco with other technologists.[50] An intentional community appears to draw upon the New Communalism, which Fred Turner[51] traces as a movement of Northern Californian dropouts who retreated from mainstream American society in the 1960s and 1970s to create communes in their own image. The notion that technology could be used to mitigate social problems grew out of the New Communalist movement,[52] and has become known as the Californian Ideology.[53]

Intentionality has become a marketing device to achieve an aspirational, healthy, or focused life,[54] and is thus a key driver in wellbeing capitalism's 'higher potential of functioning'. The latest iteration of intentionality comes in relation to smartphone usage. Popular authors such as Newport[55] call for a lifestyle of digital minimalism, which requires users to take stock of smartphone habits and intentionally choose what to interact with or pay attention to. Intentionality is also an integral part of tech humanist discourse, with unconscious or unintentional use of the smartphone framed as a consequence of potent persuasive technology design. In a US senate hearing in June 2019 on persuasive technology, Google's UX Director Maggie Stanphill claimed that Google "supports an intentional relationship with technology".[56] The appeal for Google in adopting the language of intentionality may be because it puts the onus of change onto the user, rather than addressing the structural problems of neoliberalism.[57] We are reminded of a goal that unites tech humanism and digital healthism: in order to maintain and protect user sovereignty, designers should align digital consumptive practices with the users' intentions.

As technological solutionism is in-

49 Bertram F. Malle and Joshua Knobe, The Folk Concept of Intentionality. *Journal of Experimental Social Psychology* 33 (1997), pp. 101–121.

50 Bosker, The Binge Breaker.

51 Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (London 2006).

52 Ibid.

53 Richard Barbrook and Andy Cameron, The Californian idealogy. *Science as Culture* 6 (1996), pp. 44 – 72.

54 Cindy H. deBruler, *Intentional Eating: An Easy, Mindful Approach to Dietary Wellness for Increased Vitality, Weight Control, Chronic Disease Management and Stress Reduction* (Bloomington 2017); Anne Houghton, *Intentional Teaching: Promoting Purposeful Practice in Early Childhood Settings* (Melbourne 2013).

55 Carl Newport, *Digital Minimalism: Choosing a Focused Life in a Noisy World* (London 2019).

56 US Senate Committee: Maggie Stanphill, Optimizing for Engagement: Understanding the Use of Persuasive Technology on Internet Platforms. *US Senate Committee on Commerce, Science, and Transportation* (June 25, 2019), https://www.commerce.senate.gov/2019/6/optimizing-for-engagement-understanding-the-use-of-persuasive-technology-on-internet-platforms, access: April 8, 2021, 7:00pm.

57 Ronald. E. Purser, McMindfulness. How Mindfulness became the New Capitalist Spirituality. *Sexuologie* 26 (2019), pp. 179-180. It also reveals a common discursive pattern for surveillance capitalists; Facebook has similarly appropriated the language of tech humanism, specifically the prior name of CHT, Time Well Spent. In a post on 11 January 2018, Mark Zuckerberg wrote: "By focusing on bringing people closer together — whether it's with family and friends, or around important moments in the world — we can help make sure that Facebook is time well spent."

tegral to Silicon Valley culture[58] it is perhaps unsurprising that there is an app designed for the specific purpose of encouraging intentional smartphone use. We now turn to an analysis of the wellness app called *Siempo* in order to demonstrate the UX processes by which it delivers a Perfect User. Our analysis follows the walkthrough method defined by Light, Burgess and Duguay, in which the researcher "mimics everyday use" of an app by observing and recording each screen and action, "slowing down the mundane actions and interactions that form part of normal app use in order to make them salient and therefore available for critical analysis".[59] The purpose of Light et al.'s approach is for the researcher to engage "directly with an app's interface to examine its technological mechanisms and embedded cultural references to understand how it guides users and shapes their experiences".[60]

Walkthroughs are also common in UX, but tend to be less concerned with the socio-cultural implications of the design than achieving optimal usability. In UX practice, design walkthroughs are performed by design 'experts', who set out to complete a specific task by attempting to navigate the product from the perspective of the user, but "with an expert's eye".[61] This expert-led approach diverges from the justifiably user-centric UX research methods such as usability testing, which The Interaction Design Foundation defines as the "practice of testing *how easy* a design is to use on a group of representative users".[62] These UX walkthrough methods reinforce the idea that the user is a persona to be predicted, anticipated, and ultimately brought under control. In contrast, the STS walkthrough method is proposed "not to test whether users respond to an interface in the ways its designers intended, but rather to *illuminate the material traces of those intentions*, and thereby to critically examine the workings of an app as a sociotechnical artefact".[63] The critical examination and execution of walkthroughs across design, social, and cultural studies is well-placed to render visible the particular operations of user-subjectivity, and is arguably the kind of practice that Harris was calling for when he proposed his new field of 'STX'.

The purpose of *Siempo* is to allow users to disengage from common features of the smartphone that are considered distracting, or which might encourage mindless phone usage. Siempo was launched in 2017 by Ava/Andrew Dunn with the explicit purpose of counteracting the "negative nature of today's technology".[64] In an interview with

58 Evgeny Morozov, *To Save Everything, Click Here: The Folly of Technological Solutionism* (New York 2013).

59 Light, Burgess and Duguay, The walkthrough method, p. 882.

60 ibid.

61 Hartson and Pyla, *The UX Book*, p. 469.

62 Interaction Design Foundation, Usability Testing. *Interaction Design Foundation* (2018), https://www.interaction-design.org/literature/topics/usability-testing, access: April 8, 2021, 8:00pm.

63 Light, Burgess and Duguay, The walkthrough method, p. 886.

64 Sarah Perez, Siempo's new app will break your smartphone addiction. *Techcrunsh* (May 19, 2018), https://techcrunch.com/2018/05/19/siempos-new-app-will-break-your-smartphone-addiction/, access: April 8, 2021, 8:00pm.

Techcrunch, Dunn said:

> *The attention economy is making people more distracted, stressed, lonely and depressed… Big Tech is unlikely to take meaningful leadership in humane design, and individuals are at a loss for what to do because developing healthier digital habits is a long-term, manual, iterative process.*[65]

Siempo aims to address these problems with a set of features designed to appeal to any user concerned they have become "too addicted to their phone".[66] Features of the smartphone that are considered by *Siempo* to be potentially distracting are the interface and inventory of apps. *Siempo* deploys the ideal of intentionality to reorganize these features.

Feature 1: Intentional packaging of the interface

Siempo redraws the Android smartphone interface to encourage the user to be more intentional in how they use their device (Figure 1). The user is required to provide consent upon installation which allows *Siempo* to hide all third-party applications on a separate screen and change the Android home screen to grayscale.

The aim of the *Siempo* interface is to discourage unintentional usage. In *Siempo's* on-boarding process, the app asks 'What's your intention?' (Figure 1) with an open text field. The micro-copy of the text box reads 'type a few words' and has space for 40 characters. When the 'help' button below the text box is pressed, users can move through four 'hints'. The gray text reads: 'Your answer will appear on your home screen and you'll see it every time you unlock your phone. Your new mindful home screen will keep you focused on your intention"; "Your intention is the goal, aspiration, or idea that you want to prioritize right now. Think of your intention as the path you want to walk along rather a task to be checked off [sic]"; "Here are some example intentions: Spend more time with family. Eat healthy foods. Keep my phone locked"; and finally: "Type an intention that's short and positive, and try starting with an action verb. The next time you unlock your phone, you might enjoy pausing to focus on your stated intention."

Although there is no restriction on what can be entered as an 'intention', the 'help' prompts attempt to steer a user's stated intentions in length, phrasing, scope, and focus. There is an assumption that intentions entered by users will be morally 'good', and worth pursuing. Dotson writes that "the choices and abilities afforded by technologies are generally assumed to 'extend' human volition in a straightforward and unproblematic way";[67] however, *Siempo*—like other apps in the humane technology stable—opposes such a concept, instead assuming that much of the functional and aesthetic design of technology takes the user away

65 Ibid.

66 Dunn qtd. in Perez, Siempo's new app will break your smartphone addiction.

67 Taylor Dotson, Technology, Choice, and the Good Life: Questioning Technological Liberalism. *Technology in Society* 34 [4] (2012), p. 327.

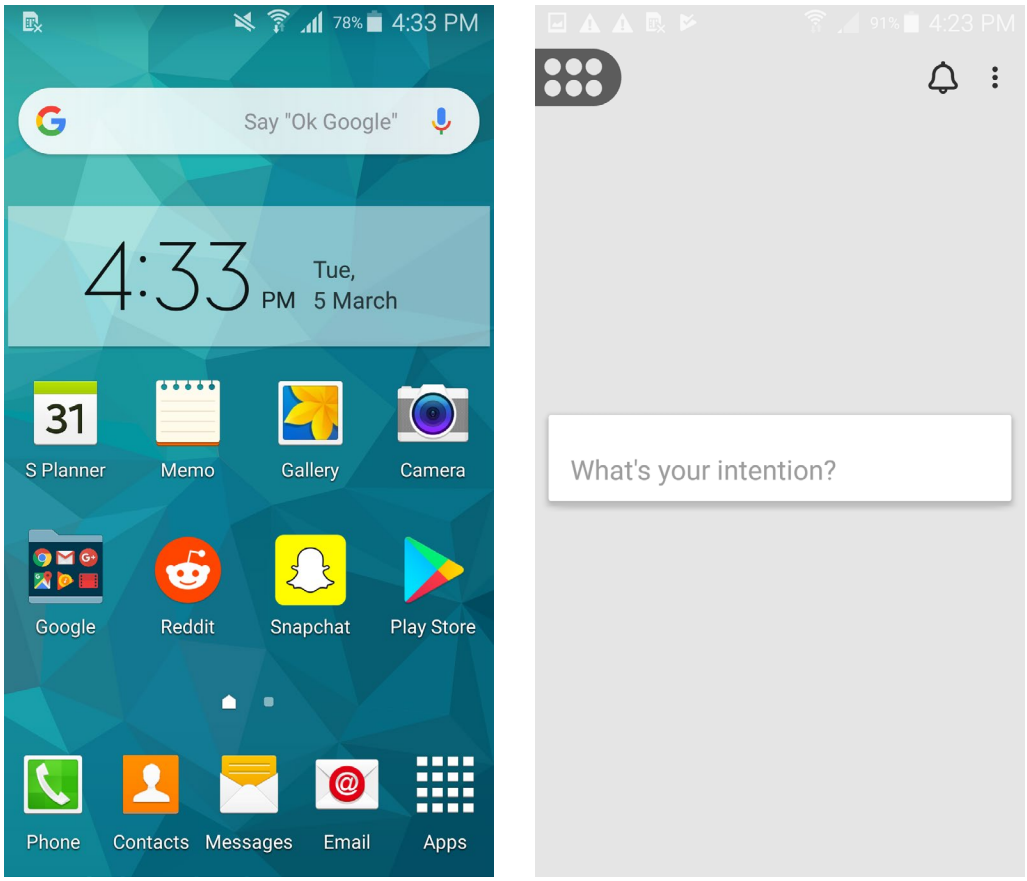


Figure 1: The home screen of a Samsung Galaxy 5 before and after installing *Siempo*.

from their goals and intentions. *Siempo* does not offer guidance on how often an intention should be modified, updated, or changed, and there is only space for one 40-character intention at a time. There is a presumption that users have, or could have, a dominant guiding aspirational intention.

The intention-setting feature aligns with the CHT's *Humane Design Guide*, a framework of 'human sensitivities'—described as "instincts that are often vulnerable to new technologies"—and strategies for ameliorating these potential deficiencies. In particular, *Siempo's* deliberate intention-stating function addresses the sensitivity of 'Decision-making: How we align our actions with our intentions', which is supported when we are "enabled to gain agency, purpose, and mobilization of intent".[68]

Once users have set their intention, this text stands out on the screen (Figure 2). Users are still able to customize background images as there are no re-

68 Center for Humane Technology, *Design Guide* (2019), https://humanetech.com/designguide/, access: April 8, 2021, 9:00pm.

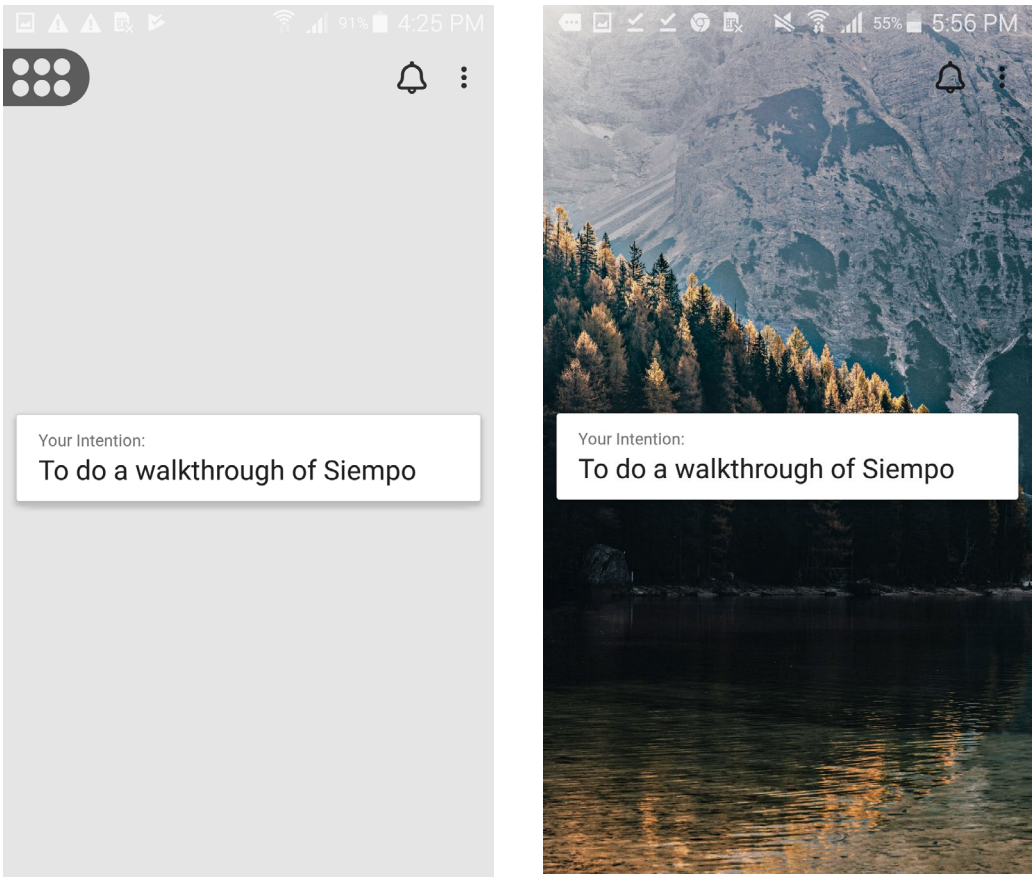


Figure 2: An example of the intentional interface and customizable background.

strictions on what images can be chosen. This implies that *Siempo* considers it more important that the user sets an intention rather than experiences a plain interface. The benefits of setting an intention for digital interactions are not based on empirical evidence[69] but are, rather, derived from Silicon Valley dropout culture, and Californian wellness culture more broadly. Ava Dunn, the Chief Executive Officer of *Siempo*, explains that the purpose of the intention prompt

69 The field of health psychology justifies manipulating people to partake in intentional behavior in situations to address gambling or obesity (Sue Churchill, Donna Jessop and Paul Sparks, Impulsive and/or planned behaviour: Can impulsivity contribute to the predictive utility of the theory of planned behaviour? *Social Psychology* 47 [4] [2008], pp. 631–646; Shoji Ohtomo, Effects of habit on intentional and reactive motivations for unhealthy eating. *Appetite* 68 [2013], pp. 69–75). In contrast, the debate about whether social media or digital screens are harmful is highly contentious. A number of studies dispute any causality between screens, social media and mental ill health (Amy Orben, Tobias Dienerin and Andrew Przybylski, Social media's enduring effect on adolescent life satisfaction. *Proceedings of the National Academy of Sciences* 116 [2019]; Felix Reer, Wai Yen Tang and Thorsten Quandt, Psychosocial well-being and social media engagement: The mediating roles of social comparison orientation and fear of missing out. *New Media & Society* [2019]). Any claims by Siempo that their intentional interface will improve wellbeing is contentious.

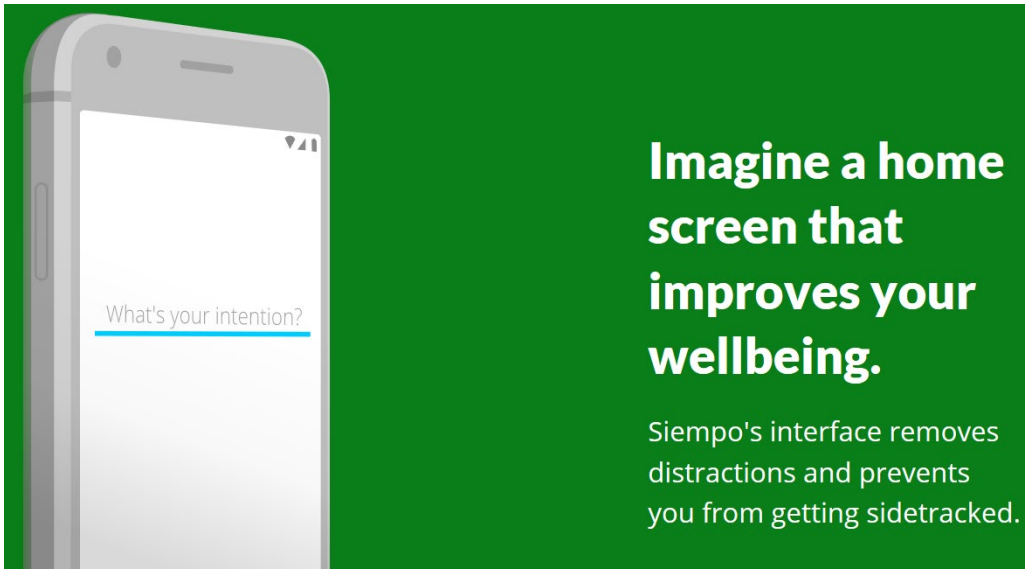


Figure 3: A screenshot from the *Siempo* website.

is to gently nudge the end user to reflect on their smartphone use:

> *I think that having an intention—whether it's going to a meeting or waking up in the morning for this time of the year—is a really [good] way to invite in what you're looking for in life, and to keep yourself on the track you want to go on. [Having an intention is about] what you want to focus on. There's…I dunno…it's kind of a loose subject, like there's no real science behind it right now so we're just playing with different ways of surfacing it.*[70]

As Ava's comments reveal, the benefits of setting an intention for digital interactions are not based on empirical evidence but are, rather, derived from Californian wellness ideology.

Siempo encodes the ethos of intentionality or ideals of goal-orientated behavior within the smartphone interface. Every time the user unlocks their phone or swipes to additional screens, they are reminded of their set intention (see Figure 5). The intentional interface of *Siempo* transforms the smartphone into a self-help assistant, where a focused and purposeful life can be realized. Users are encouraged to disengage from any distractions that could deter them from their set intention. However, it is possible that users may not wish to, and cannot always, act intentionally. Behavioral scientists argue that intentionality is only one factor that motivates behavior, alongside willingness and habit and that to act intentionally all the time is cognitively exhausting.[71] By presuming that the user

70 Alex Beattie, Move Slow and Contemplate Things: An App That Drops Users Out from Distracting Aspects of the Internet, in: *Making Time for Digital Lives: Beyond Chronotopia*, eds. Anne Kaun, Christian Pentzold and Christine Lohmeier (London 2020), p. 145.

71 Churchill, Jessop and Sparks, Impulsive and/or planned behaviour: C; Ohtomo, Effects of habit on intentional and reactive

can maintain a state of intentionality, *Siempo* anticipates the scope of possible purposes and usages of the smartphone, falling foul of what is otherwise known as the 'designer's fallacy'.[72] In turn, *Siempo* risks inhibiting spontaneous or unintentional usages of the smartphone. However, more than this, the *Siempo* app introduces a relation of power into the subject-object (user-smartphone) relation, in which the user is required to be intentional in order to be recognized precisely as a subject in the first place. As Foucault wrote in *Discipline and Punish*:

> *Over the whole surface of contact between the body and the object it handles, power is introduced, fastening them to one another. It constitutes a body-weapon, body-tool, body-machine complex. One is as far as possible from those forms of subjection that demanded of the body only signs or products, forms of expression or the result of labor.*[73]

With *Siempo* installed, the smartphone becomes a 'body-tool' through which the user-subject must transform themselves into an intentional subject in order to become a 'user' at all. However, as users cannot always act intentionally, what *Siempo* really demands is continuous aspirational behavior. There is less room for unintentional smartphone usage such as idle smartphone play or digital wayfaring; all user activities intermediated by *Siempo* are expected to be part of a wider intention. The actual effect of constantly reminding the user of their intention is to subtly nudge users to self-manage their digital consumption and aspire to healthier, productive or otherwise self-optimal modes of living. *Siempo* therefore draws similarities to smartphone monitoring apps that impose "endless micro-project management, transforming downtime into something structured, obedient, and explicitly purposeful".[74]

Feature 2: Tidying the app menu

The aspirations of *Siempo* are made even more apparent via subsequent features, such as the 'tidy app menu'. *Siempo* reorganizes the inventory of apps on a user's smartphone. When users swipe left from the home screen for the first time, they are welcomed to a "healthier app menu!" and prompted to arrange their most helpful apps on this screen (Figure 4). Apps that are considered 'tools'—maps, rideshare apps, or the camera—are foregrounded, occupying positions of convenience in the app inventory. If a tool (e.g. 'wellness') has not been assigned to an app, then the user is prompted to do so. For example, an app that the user could assign to 'wellness' could be the meditative app *Headspace*.

The foregrounding of utility and wellness apps is a reminder of the recent

motivations for unhealthy eating.

72 Don Idhe, The Disigner's Fallacy and Technological Imagination, in: *Philosophy and Design: From Engineering to Architecture*, eds. P.E. Vermaas, P. Kroes, S. Moore and A. Light (Dordrecht 2008), pp. 51–59.

73 Michel Foucault, *Discipline and Punish. The Birth of the Prison* (New York 1995), p. 152.

74 Alex Beattie, Out of Network: Controlling Workers by Controlling their Technology Use. *Real Life* (2018), https://reallifemag.com/out-of-network/, access: April 9, 2021, 9:00am.

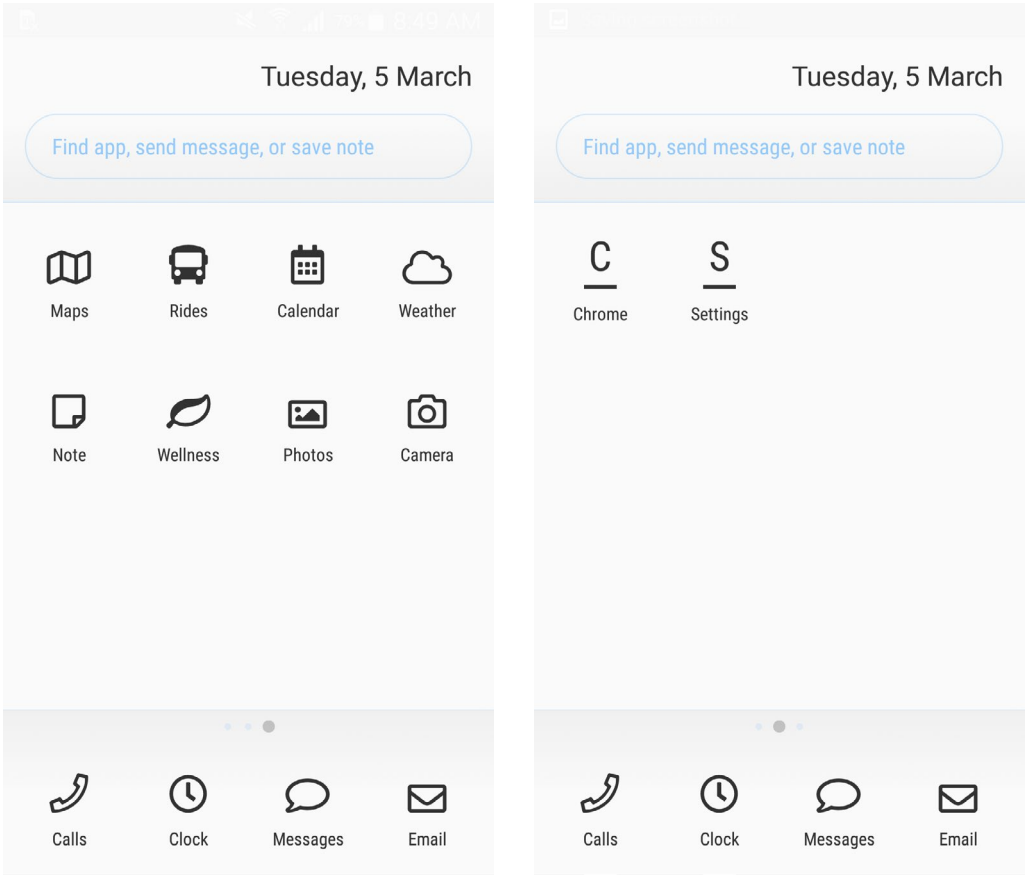


Figure 4: Tools and 'frequently used apps' of the *Siempo* interface.

minimalist lifestyle trend that encourages individuals to remove any items from their homes or workspaces that are neither functional nor which elicit delight.[75] The tidy app menu of Siempo requires users to enact a clean-out of their digital inventory, promoting an idealized form of lifestyle-minimalism.[76]

'Frequently used apps' that are deemed 'non-distracting' are pushed onto a second screen (Fig. 4), which includes the internet browser app Chrome. That Siempo is happy to support *Chrome* – a Google-owned app that tracks users to capture their data[77] – suggests that the tidy app menu is not designed to protect the user from surveillance activities or enhance privacy, but instead to reduce cognitive load. Researchers who examine the link between attention and

75 Marie Kondō, T*he Life-Changing Magic of Tidying Up: The Japanese Art of Decluttering and Organizing* (Berkeley 2014); Newport, *Digital Minimalism.*

76 Miriam Meissner, Against accumulation: lifestyle minimalism, de-growth and the present post-ecological condition. *Journal of Cultural Economy* 12 [3] (2019), pp. 185–200.

77 Zuboff, *The Age of Surveillance Capitalism.*

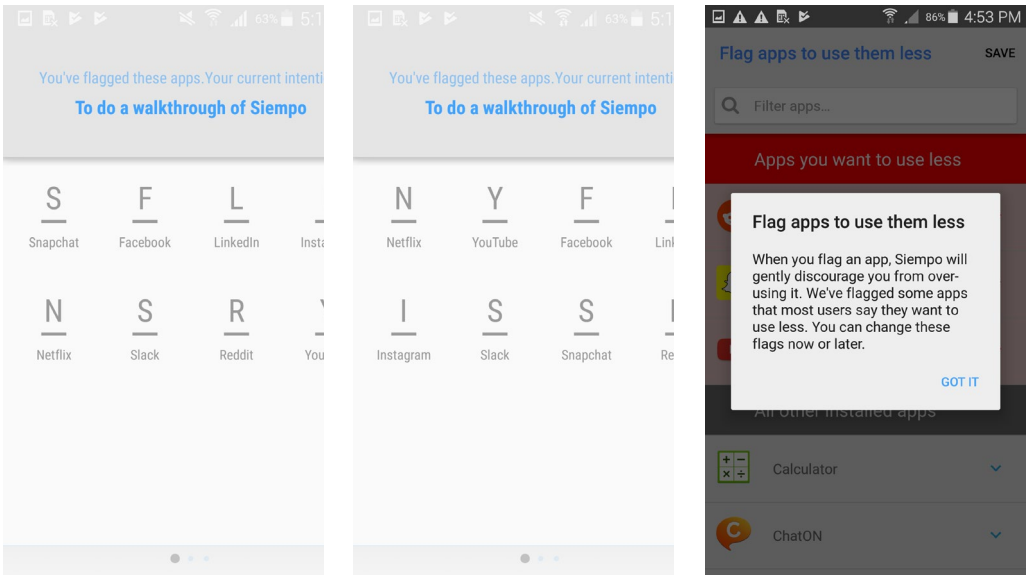


Figure 5: Flagged apps of *Siempo*.

wellbeing argue that a heavy cognitive load can contribute towards feelings of purposelessness and unhappiness,[78] and preclude deep cognitive thought practices that enable people to define their goals and values in the first place.[79]

In an interview with Dunn, they reflect on a pivotal moment in their life was when they were travelling overseas and were disconnected from the Internet:

> *So when I got to India, a month after I got there I travelled by myself for a week. That was my first time really travelling solo for more than a few hours, and the first night I got to this one city and I found this hostel and I put my shit down and after 12 hours of really draining travel at night, and I was just alone. Further away from anyone I had ever been—no electronics, no Wi-Fi. Which was unintentional; I had them with me, they were just dead, and there was no Wi-Fi at this hostel. I had a notebook with me and I had this three-dollar hostel room. It was the first time that I had this silence and pause and this space to really examine myself and I feel like I looked down at my hands and I was like who am I? what have I been doing in the last 10 years? It was this surreal experience where I suddenly felt clear and creative and free and present and alive. It was like I was learning about myself for the first time and I had snapped out of this hypnosis of tech, that I had been under for a decade. It was like holy shit! now what? what's important to me, what happened, what do I want?*[80]

Ava attributes the opportunity for deep revelation and self-reflection to being

78 Paul Dolan, *Happiness By Design: Change What You Do, Not How You Think* (New York 2014).

79 James Williams, *Stand Out Of Our Light: Freedom and Resistance in the Attention Economy* (Cambridge 2018).

80 Alex Beattie, *The Manufacture of Disconnection*, PhD thesis (Victoria University of Wellington 2020), http://hdl.handle.net/10063/9362, p. 140.

disconnected from the Internet. The tidy app menu attempts to offer the user the same experience by foregrounding wellness and note-taking apps to encourage them to partake in introspective activities on a regular basis, mimicking Dunn's experience in India. Apps that are considered to be the most distracting, and therefore injurious to self-discovery, are positioned the furthest away on a third screen (Figure 5).

On the 'flagged apps screen' app icons are muted, unbranded and colored a faint gray. Apps are stripped of their branding and replaced by the first letter of the app name; Snapchat become "S" and YouTube becomes "Y", and underneath the letter is the name of the application. The location of flagged apps is also scrambled, meaning the position of each app is randomized to prevent unconscious selection and usage. Every time the user returns to the screen that houses flagged apps, the position of each app changes. Users are also given an opportunity to flag any apps *Siempo* did not do for them. When flagging an app, users are given an option to either 'flag this app to use it less', 'get info or uninstall app'.

Delivering the Perfect User

As a socio-technical artefact, *Siempo* leaves behind ample material traces of its intentions—from what constitutes an intention, to what a good intention looks like, to the fundamental belief in the value of intentional behavior. Ontological Design theorists might see intentionality as evenly distributed across the three interconnected regions of the system (designer, interface, user), and argue that the user's intention finds its point of affinity in the application. However, we argue that another reading is necessary, one that takes into account the specific power relations that have been designed into *Siempo's* idealized user-subject. Despite the app's worthy cause, Siempo's user remains a docile subject to be brought under control and disciplined in accordance with Californian wellness ideology. In fact, *Siempo* requires the user to enter into a thoroughly designed user-position in order to be recognized, 'hailed', as a subject by the socio-technical apparatus. In this system, one cannot function as a user—whose very subjectivity is defined precisely by their use-value—without conforming to the modes of use that have been designed into the system. The result is the creation of a fixed and homogeneous subject-position, a Perfect User, for whom the fantasy-structure of intentionality masks *the ideological functioning of the app*, not to mention the broader structures of wellness capitalism itself.

We acknowledge that the user-subject is always-already a thoroughly constructed, or 'designed', subject position. Any recourse to a natural or unmediated form of subjectivity outside regimes of representation is, we believe, illusory. In this sense, the representation of the user by UX Design is always imbricated in the creation of the user-subject itself. However, more attention needs to be paid to the specific ideological structures that inform the design of the user position. As Bratton writes: "building a better armature for the user-subject may not seem like the most pressing design problem, but in many ways, that is exactly what it is".[81] This returns us once more to the question of intentionality, for it is important to also acknowledge that humane technologists like Dunn likely do have the best of intentions. For their part, Dunn acknowledges they are a "privileged white person", motivated to learn more about identity politics and social justice issues.[82] Humane technology advocates may in fact be attempting to do exactly what Bratton is suggesting: designing a better framework for the user-subject. There is much value in this, and encouragement can be drawn from the speed with which the humane technology movement has taken hold.

However, what also needs to be acknowledged is the ideological configuration of what is fast becoming the new, idealized subject: the Perfect User. The Perfect User is not an open framework for user-subjectivity; rather, it is a normative, homogenous, and fixed subject position which instrumentalizes the operations of wellness capitalism by providing a knowable identity around which wellness products and services can cohere. In this sense, then, the Perfect User is not only a fixed subject-position but also a point of leverage that inserts the user directly into Californian Ideology, whose continued functioning is ensured by wellness capitalism.

Further, the Perfect User – as idealized subject-position – represents the re-establishment of exclusionary structures of traditional Humanism. Humanism has been critiqued by anti- and post-humanists for its hierarchical organization of categories of 'human'. The classical ideal of 'Man', formulated by Protagoras as 'the measure of all things' and later materialized by Leonardo da Vinci as the Vitruvian Man, functioned as an "ideal of bodily perfection which doubles as a set of mental, discursive, and spiritual values".[83] The Humanist model of 'Man' sat atop of hierarchy of all beings and upheld a specific view of what is *most* human about humanity; other beings—women, people of color, animals—were all subordinate to this figure. Da Vinci's Vitruvian model of Man thus represented Humanism's belief in the possibility of individual perfectibility, to which all beings could aspire. Today, technological humanism replaces the Vitruvian Man with the Perfect User, who sits atop the hierarchy of all users. Mindful, intentional, healthy,

81 Bratton, *On Software and Sovereignty*, p. 348.

82 Interview data, collected by Alex Beattie (2018).

83 Braidotti, *The Posthuman*, p. 13.

disciplined, minimalist, *designed*: these features have become the 'measure of all things' for today's aspirational user-subject.

Although the purpose of this paper is not to provide practical solutions to better design the user-subject, a 'better armature' for the user-subject could well be sought in theories of posthumanism. In posthumanism, subjectivity is considered an open, relational framework rather than a fixed identity position. A posthuman user might be considered a 'becoming-user' – a variation on what Braidotti calls a 'becoming-machine'. For the 'becoming-user', a new subject-object relationship is possible. When this kind of user engages with their smartphone it would not be as a 'body-tool', and they would not be subjected to a systematic disciplining of behavior or usage. Rather, a posthuman approach to UX Design would design into the socio-technical apparatus an equitable and respectful relationship, in which neither agent in the dyad is reduced to the other; this kind of user may be less susceptible to instrumentalization under capitalism's economic imperatives. Finally, a posthuman approach to technology interaction design would address the need for greater diversity in the ways that users are recognized, 'hailed', by socio-technical systems – which may help to avoid a situation in which a relatively small group of Northern Californian technology entrepreneurs are fast becoming the new reformers of humanity.

References

Barbrook, Richard, and Andy Cameron, The Californian idealogy. *Science as Culture* 6 (1996), pp. 44–72.

Beattie, Alex, Move Slow and Contemplate Things: An App That Drops Users Out from Distracting Aspects of the Internet, in: *Making Time for Digital Lives: Beyond Chronotopia*, eds. Anne Kaun, Christian Pentzold and Christine Lohmeier (London 2020: Roman & Littlefield), pp. 137–154.

Beattie, A., Out of Network: Controlling Workers by Controlling their Technology Use. *Real Life* (2018), https://reallifemag.com/out-of-network/, access: April 9, 2021, 9:00am.

Beattie, A., *The Manufacture of Disconnection*, PhD thesis (Victoria University of Wellington 2020), http://hdl.handle.net/10063/9362.

Blei, Daniela, The False Promise of Wellness Culture. *Jstor Daily* (Janary 4, 2017), https://daily.jstor.org/the-false-promises-of-wellness-culture/, access: April 7, 2021, 9:00am.

Bosker, Bianca, The Binge Breaker: Tristan Harris believes Silicon Valley is addicting us to our phones. He's determined to make it stop. *The Atlantic* (November 2016), https://www.theatlantic.com/magazine/archive/2016/11/the-binge-breaker/501122/, access: April 7, 2021, 8:00pm.

Buley, Leah, *The User Experience Team of One: A Research and Design Survival Guide* (New York: Rosenfeld Media, 2013).

Braidotti, Rosi, *The Posthuman* (Cambridge: Polity Press, 2013)

Bratton, Benjamin, *The Stack: On Software and Sovereignty* (Cambridge, MA: MIT Press, 2015).

Center for Humane Technology, Design Guide (2019), https://humanetech.com/designguide/, access: April 8, 2021, 9:00pm.

Chun, Wendy Hui Kyong, *Programmed Visions: Software and Memory* (Cambridge, MA.: MIT Press 2011)

Churchill, Sue, Donna Jessop and Paul Sparks, Impulsive and/or planned behaviour: Can impulsivity contribute to the predictive utility of the theory of planned behaviour? *Social Psychology* 47 [4] (2008), pp. 631–646

Clough, Patricia, *The User Unconscious* (Minneapolis: University of Minnesota Press, 2018).

Cushman, Fiery, Deconstructing intent to reconstruct morality. *Current Opinion in Psychology* 6 (2015), pp. 97–103.

deBruler, Cindy H., *Intentional Eating: An Easy, Mindful Approach to Dietary Wellness for Increased Vitality, Weight Control, Chronic Disease Management and Stress Reduction* (Bloomington: Balboa Press, 2017)

Dolan, Paul, *Happiness By Design: Change What You Do, Not How You Think* (New York: Avery Books, 2014).

Dotson, Taylor, Technology, Choice, and the Good Life: Questioning Technological Liberalism. *Technology in Society* 34 [4] (2012), p. 327.

Dreyfuss, Henry, *Designing for People* (New York: Skyhorse, 1955)

Dunn, Halbert, What High-Level Wellness Means. *Canadian Journal of Public Health* 50 [11] (1959), pp. 447–457.

Ehrenreich, Barbara, *Natural Causes: Life, Death and the Illusion of Control* (London: Granta Books, 2018).

Eubanks, Virginia, *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor* (New York: St. Martin's Press, 2018).

Farkas, Carol-Ann, "Tons of Useful Stuff": Defining Wellness in Popular Magazines. *Studies in Popular Culture* 33 (2010), pp. 113–132

Ferrando, Francesca, *Philosophical Posthumanism* (London: Bloomsbury, 2019).

Fish, Adam, Technology Retreats and the Politics of Social Media. *triple C* 15 (2017), pp. 355–369.

Fogg, B.J., *Persuasive Technology: Using Computers to Change What We Think and Do (Interactive Technologies)* (San Francisco: Morgan Kaufmann, 2002).

Forlano, Laura, Posthumanism and Design. *She Ji: The Journal of Design, Economics and Innovation* 3 (2017).

Foucault, Michel, *Discipline and Punish. The Birth of the Prison* (New York 1995: Vintage Books).

Ganesh, Maya, The Center for Humane Technology Doesn't Want Your Attention. *The Society Pages* (2018), https://thesocietypages.org/cyborgology/2018/02/09/the-center-for-humane-technology-doesnt-want-your-attention/, access: April 7, 2021, 6:00pm.

Hadler, Florian and Joachim Haupt (eds.), *Interface Critique* (Berlin: Kultureverlag Kadmos, 2016).

Hadler, F., Beyond UX. *Interface Critique Journal* 1 (2018).

Halberstam, Jack, and Ira Livingston, *Posthuman Bodies* (Michigan: Indiana Uni-

versity Press, 1995).

Halpern, Orit, *Beautiful Data: A History of Vision and Reason since 1945* (Durham: Duke University Press 2014).

Hartson, Rex, and Pardha Pyla, *The UX Book: Process and Guidelines for Ensuring a Quality User Experience* (Boston: Elsevier, 2012).

Harris, Tristan (@tristanharris). 2019. We need a new field of "Society & Technology Interaction" (or STX) as @aza and I have said, since "Human-Computer Interaction" is limited to individual human + machine. Getting alignment right = "Humane Social Systems"." Twitter, 9 June, 2019. https://twitter.com/tristanharris/status/1138126884330278912

Harris, T., Humane: A New Agenda for Tech. *The Center for Human Technology* (2019), https://humanetech.com/new-agenda/, access: April 7, 2021, 11:00pm.

Hesmondhalgh, David, Capitalism and the media: moral economy, well-being and capabilities. *Media, Culture & Society* 39 (2017), pp. 202–218.

Houghton, Anne, *Intentional Teaching: Promoting Purposeful Practice in Early Childhood Settings* (Melbourne: Teaching Solutions, 2013).

Hu, Tung-Hui, *A Prehistory of the Cloud* (Cambridge, MA: MIT Press, 2015).

Idhe, Don, The Disigner's Fallacy and Technological Imagination, in: *Philosophy and Design: From Engineering to Architecture*, eds. P.E. Vermaas, P. Kroes, S. Moore and A. Light (Dordrecht 2008), pp. 51–59.

Interaction Design Foundation, Usability Testing. Interaction Design Foundation (2018), https://www.interaction-design.org/literature/topics/usability-testing, access: April 8, 2021, 8:00pm.

Irani, Lilly and Rumman Chowohury, To Really "Disrupt," Tech Needs to Listen to Actual Researchers. *Wired* (2019), https://www.wired.com/story/tech-needs-to-listen-to-actual-researchers/, access: April 7, 2021, 5:00pm

Jasanoff, Sheila, Perfecting the Human: Posthuman Imaginaries and Technologies of Reason, in: *Perfecting Human Futures, Technikzukünfte, Wissenschaft und Gesellschaft / Futures of Technology, Science and Society* (Wiesbaden: Springer 2016).

Kondō, Marie, *The Life-Changing Magic of Tidying Up: The Japanese Art of Decluttering and Organizing* (Berkeley: Ten Speed Press, 2014).

Lewis, Paul, "Our minds can be hijacked": the tech insiders who fear a smartphone dystopia. *The Guardian* (2017), https://www.theguardian.com/technology/2017/oct/05/smartphone-addiction-silicon-valley-dystopia, access: April 7, 2021, 8:00 pm.

Light, Ben, Jeans Burgess and Stefanie Duguay, The walkthrough method: An approach to the study of apps. *New Media & Society* 20 (2018), pp. 881–900.

Lockton, Don, *Design with Intent: Insights, Methods, and Patterns for Behavioral Design* (Cambridge: O'Reilly Media, 2017).

Luddbrarian, Be Wary of Silicon Valley's Guilty Conscience: on The Center for Humane Technology. *Librarian Shipwreck* (2018), https://librarianshipwreck.wordpress.com/2018/02/13/be-wary-of-silicon-valleys-guilty-conscience-on-the-center-for-humane-technology/, access: April 7, 2021, 6:00pm.

McPherson, Tara, *Feminist in a Software Lab: Design and Difference* (Cambridge, MA.: Harvard University Press, 2018)

Malle, Bertram F. and Joshua Knobe, The Folk Concept of Intentionality. *Journal of Experimental Social Psychology* 33 (1997), pp. 101–121.

Meissner, Miriam, Against accumulation: lifestyle minimalism, de-growth and the present post-ecological condition. *Journal of Cultural Economy* 12 [3] (2019), pp. 185–200.

Morozov, Evgeny, T*o Save Everything, Click Here: The Folly of Technological Solutionism* (New York: Public Affairs, 2013).

Newport, Carl, *Digital Minimalism: Choosing a Focused Life in a Noisy World* (London: Portfolio, 2019).

Norman, Don, *The Design of Everyday Things* (Revised and expanded edition) (Cambridge, MA: MIT Press, 2013).

Noble, Safiya, *Algorithms of oppression: how search engines reinforce racism* (New York: New York University Press, 2018).

Perez, Sarah, Siempo's new app will break your smartphone addiction. *Techcrunsh* (2018), https://techcrunch.com/2018/05/19/siempos-new-app-will-break-your-smartphone-addiction/, access: April 8, 2021, 8:00pm.

Purser, Ronald E., McMindfulness. How Mindfulness became the New Capitalist Spirituality. *Sexuologie* 26 (2019), pp. 179–180.

Reer, Felix, Wai Yen Tang and Thorsten Quandt, Psychosocial well-being and social media engagement: The mediating roles of social comparison orientation and fear of missing out. *New Media & Society* (2019).

Ohtomo, Shoji, Effects of habit on intentional and reactive motivations for unhealthy eating. *Appetite* 68 (2013), pp. 69–75.

Orben, Amy, Tobias Dienerin and Andrew Przybylski, Social media's enduring effect on adolescent life satisfaction. *Proceedings of the National Academy of Sciences* 116 (2019).

Seaver, Nick, Captivating algorithms: Recommender systems as traps. *Journal of Material Culture* (2018).

Stark, Luke, Algorithmic Psychometrics and the Scalable Subject. *Social Studies of Science* 48 (2018), pp. 204–231.

Stanphill, Maggie, Optimizing for Engagement: Understanding the Use of Persuasive Technology on Internet Platforms. *US Senate Committee on Commerce, Science, and Transportation* (June 25, 2019), https://www.commerce.senate.gov/2019/6/optimizing-for-engagement-understanding-the-use-of-persuasive-technology-on-internet-platforms, access: April 8, 2021, 7:00pm.

Tarnoff, Ben and Moira Weigel, Why Silicon Valley can't fix itself. *The Guardian* (2018), https://www.theguardian.com/news/2018/may/03/why-silicon-valley-cant-fix-itself-tech-humanism, access: April 7, 2021, 11:00pm.

Turner, Fred, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (London: The University of Chicago Press, 2006).

Wajcman, Judy, How Silicon Valley Sets Time. *New Media & Society* 21 [6] (2019).

Williams, James, *Stand Out Of Our Light: Freedom and Resistance in the Attention Economy* (Cambridge: Cambridge University Press, 2018).

Willis, Anne-Marie, Ontological Designing – Laying the Ground. *Design Philosophy Papers* 13 (2006), pp. 69–74.

Zandbergen, Dorien, Fulfilling the Sacred Potential of Technology: New Edge Technophilia, Consumerism and Spirituality in Silicon Valley, in: *Things: Material Religion and the Topography of Divine Space*, eds. Birgit Meyer and Dick Houtman (New York: Fordham University Press, 2012), pp. 356–379.

Zuboff, Shoshanna, *The Age of Surveillance Capitalism: The Fight for the Future at the New Frontier of Power* (London: Profile Books 2019).

HOW A TECHNICAL INNOVATION IN ANCIENT TEXTILE INDUSTRY PIONEERED A NEW WAY OF THINKING

By Ulrike Beck and Martin Jess

"As early as the 1st millennium BC, the innovative idea to cut into fabric laid the foundation for new, efficient production concepts, extensively restructured the craft and established a new distinguished discipline: the construction of patterns."

Suggested citation:
Ulrike Beck and Martin Jess, How a technical innovation in ancient textile industry pioneered a new way of thinking. *Interface Critique* 3 (2021), pp. 151–169.
DOI: https://doi.org/10.11588/ic.2021.3.81306.

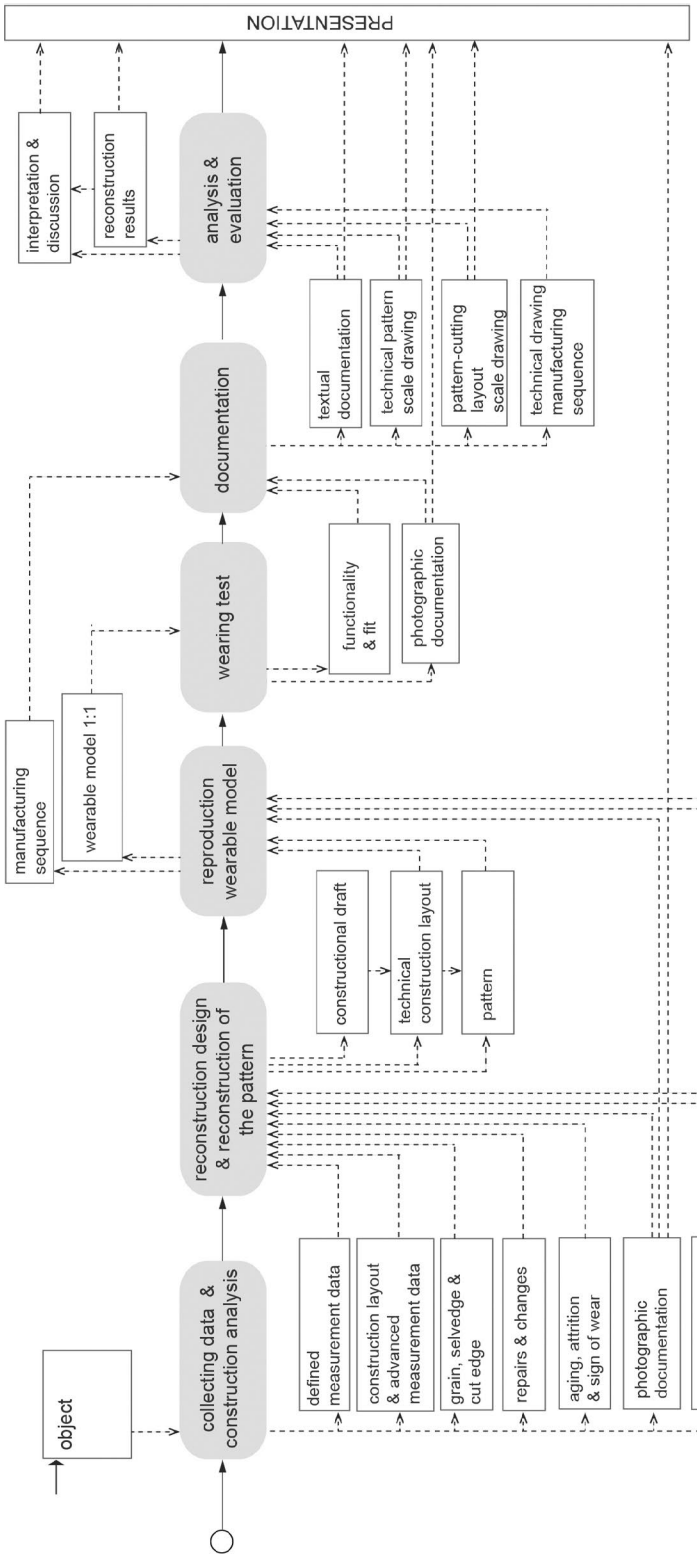


Fig. 1: Diagram of the reconstruction methodology: Overview of the different steps of the method: grey areas visualise the actions, that are executed within the methodology. The framed boxes represent the acquired knowledge and research results as well as practical achieved research findings in the form of con-struction layouts or wearing models; methodology and diagram: Ulrike Beck.

If examined in chronological order, comparable datasets of the excellently preserved textile finds from the 1st millennium BC in Xinjiang, Central Asia, tell an unusual story of the swift spread of an innovative technological idea within the clothing production in the region. It significantly changed the entire handcraft and is still essential today. It is the innovative idea to cut into fabric to manipulate its shape.[1] Even though this thought seems very natural to us at first glance – this idea is ground-breaking. Beyond laying the foundation for new, efficient production concepts and extensively restructuring the craft, its impact was felt through other parts of the culture. The concept to cut into a fabric to produce clothes is still the foundation of modern clothing production and the corresponding knowledge is mathematically implemented in today's construction systems.

Clothing fulfils practical, communicative and social functions.[2] As a cultural memory, it traces the changing eras and their social structures. Additionally, clothing plays an essential role in economic production and trading processes. It is a powerful driving force for commercial and social networking and the development of new technologies. The technology of cutting fabric to tailor clothes has prevailed over the millennia. It has adapted to industrialization, the development of chemical fibres and digitalization, and it is still absolutely essential for modern clothing production.

What principle makes this concept such an innovative and assertive strategy? Which core components enable it to integrate into modern digitalized society over millennia of fundamental social changes and restructuring?

In modern data processing, it is clearly defined: Solution strategies for complex problems must demonstrate good adaptation and allow for significant variance. In order to do this, they have to be dynamic, flexible and efficient. Could these core components represent a transferable pattern that has prevailed over the millennia? The concept of cutting fabric to tailor clothes seems to be precisely one of these phenomena. Although already developed in the 1st millennium BC, its basic principles are characterized by adaptability, flexibility and efficiency. As a new abstract thought pattern, it stands in contrast to an era of previous much more static concepts of clothing production. This ground-breaking innovation in ancient clothing production laid the technological and the intellectual foundations for today's industrialized and digitalized production processes for clothes.

---

1 Ulrike Beck, *Kleidung des 1. Jahrtausends v. Chr. In Xinjiang. Schnittentwicklung zwischen Funktionalität, Ästhetik und Kommunikation* (Regensburg 2018), pp. 154–222.

2 Susan North, *The Tudor Tailor* (London 2006), p. 5., Gabriele Mentges, *Kulturanthropologie des Textilen. Für eine Kulturanthropologie des Textilen* (Bamberg 2005), pp. 11–39.

Method and cast-off clothing as data archives

In order to highlight the core components of this excellent strategy, we have compared it with the model of modern solution strategies in data processing, as both clothing production and software development solve complex tasks, by converting creative ideas into a mathematical concept and applying it to a specific problem. Through this comparison, we can identify specific interdependencies and describe the different concepts and solution methods to solve complex problems. The development of different solution strategies in modern data processing is well documented. Due to the fast pace of digitalization, the concepts in data processing change and refine themselves over a short period of time.

The basis for the investigation of ancient production strategies are new insights into innovative approaches within the ancient textile industry in the 1st millennium BC in Xinjiang, China.[3] They reveal that the idea to cut into a fabric to tailor clothes was already invented at this time in Xinjiang. The consequent newly structured, faster and more dynamic manufacturing processes changed the aesthetics and the functionality of the clothes in a very short period of time. Furthermore, the new approach also significantly changed the structure of the entire craft.[4]

This ground-breaking change could be demonstrated by a new methodology which combines forensic techniques with those of reverse engineering. The method was applied to significant, and excellently preserved textile finds from the 1st millennium BC in Xinjiang, China (fig. 1).[5]

Textile finds are data archives: even after several thousand years, the ancient clothes still contain information about their design concepts and their production techniques. On top of uncovering information about the construction, aesthetics and functionality of the clothes, the unique strategies of the craftsmen at that time are still present in the stringent logic of the clothes' design and construction.

This article highlights an outstanding strategic concept and defines the core components of its longevity and exceptional adaptability.

3 Beck, *Kleidung des 1. Jahrtausends v. Chr. In Xinjiang*, pp. 62–222.

4 Ibid., pp. 154–222.

5 Ibid., pp. 26–60.

An ancient development achievement: The idea to cut into a fabric and its ground-breaking consequences

At the beginning of the First Millennium BC in Xinjiang, the pieces for a pair of woollen trousers are handcrafted directly on a loom: Therefore, right from the beginning, both trouser legs and the crotch piece are woven into the right shape and size and then sewn together.[6]

In that time in Xinjiang, garments were directly woven on the loom.[7] For this purpose, each separate construction part of a garment was already shaped during the weaving process.[8] This time-consuming approach required significant planning and foresight. While weaving the fabric, all desired details had to be included properly, to ensure that they would sit in the right place in the finished garment.[9] Therefore, the different phases of the production process – the weaving, the construction and the sewing – were completely interconnected disciplines and could not be processed independently.[10] The entire manufacturing process was very likely realised by one person, or in very close cooperation.

With this technique, the clothes could be decorated with complex ornaments or patterns that were directly woven into specific positions of the garment. However, the method had two major disadvantages: To weave clothes on a loom, the entire concept and planning of the garments had to be done right at the beginning of the manufacturing process. Only when the planning was completed, the actual production process could start. Therefore, possible construction mistakes in the working process were only visible and verifiable on the finished garment, weeks or even months later.[11]

For technological reasons, the form weaving offered only a few possibilities for the three-dimensional construction of the clothes because the loom as a tool is best suited to producing two-dimensional textile surfaces rather than to construct three-dimensional garments.[12] Thus, the

6 Ulrike Beck et.al, The invention of trousers and its likely affiliation with horseback riding and mobility. *Quaternary International* 348 (2014), pp. 224–235; Beck, *Kleidung des 1. Jahrtausends v. Chr. in Xinjiang*, pp. 62–75.

7 Beck et.al, The invention of trousers and its likely affiliation with horseback riding and mobility; Beck, *Kleidung des 1. Jahrtausends v. Chr. In Xinjiang*, pp. 62–75, 78–88, 154–222.

8 Beck et.al, The invention of trousers and its likely affiliation with horseback riding and mobility, pp. 224–235; Beck, *Kleidung des 1. Jahrtausends v. Chr. in Xinjiang*, pp. 62–75, 78–88, 154–222.

9 Ibid., pp. 154–263.

10 Beck et.al, The invention of trousers and its likely affiliation with horseback riding and mobility pp. 224–235; Beck, *Kleidung des 1. Jahrtausends v. Chr. in Xinjiang*, pp. 62–75, 78–88, 154–222.

11 Ibid., pp. 214–215.

12 Ibid., pp. 156–159.

Fig. 2: Reconstructed woolen garments from Yanghai: Reconstruction and wearing test of a pair of woollen trousers (2003SYIM21:19) and a woolen poncho (2003SYIM21:4/1) from Yanghai, manufactured around 1000 BC in Xin-jiang. Both garments consist of only a few basic geometric shapes, that were directly shaped on the loom. Left and middle: wearing test with the reconstructed models; right: construction layout of the garments; reconstruction and technical drawing: Ulrike Beck, photographs: Martin Jess, model: Juan Felipe.

clothes that were produced in this manner consisted of only a few basic geometric shapes (fig. 2).[13] The aesthetic of these garments was primarily created through exquisite patterns and ornaments.[14]

However, this demanding and time-consuming production technique was replaced smartly and unexpectedly: the exquisitely hand-crafted fabrics were cut.

A new idea

The idea to cut into a handcrafted fabric is exceptionally innovative. It intends to destroy an exquisite, handmade product in order to manufacture it into something new. This idea to manipulate the shape of a fabric by cutting it into a new pattern would revolutionize the craft.

To implement this idea, new techniques were needed to stabilize the cutting edges of the delicate fabrics and stop the threads from unravelling. These trimming tech-

13 Ibid., pp. 78–88, 156–159.

14 Ibid.

Fig. 3: A reconstructed woolen tunic from Wupu: Reconstruction and wearing test of a woolen tunic (86HWM-NN-1) from Wupu, manu-fac-tured around 500 BC in Xinjiang. The tunic was made of one single, six metres long fab-ric. To construct the garment, the fabric was cut only three times. Left and middle: wearing test with the reconstructed model; right: construction layout of the garment; reconstruction and technical drawing: Ulrike Beck, photographs: Martin Jess, model: Frederike Doffin.

niques were developed and propagated in Xinjiang in a short period of time. In the second half of the 1st Millennium BC, these trimming techniques were already implemented in a wide range of different variations depending on the quality of the textiles.[15] This concept probably evolved from earlier repairing techniques for small holes and tears in the fabrics.[16] However, this knowledge was now implemented to drive forth a new manufacturing concept.

Around 500 BC in Xinjiang, an ankle-length tunic is produced from fine dark brown wool and decorated with deep blue wool twines on its seams and hems. It is made of one single, six metres long fabric. For the construction of the tunic, the fabric is cut only three times. The pattern pieces were trimmed and sewed.[17] This method is a whole new way to manufacture clothes (fig. 3).

By that time, the separate pieces of a garment were already cut out of larg-

15 Ibid., pp. 163–167.

16 Ibid., pp. 165–167.

17 Ibid., pp. 166–167.

er fabrics. This new approach separates the weaving from the three-dimensional construction of the clothes. As a result, shape-neutral fabrics can be produced independently and later processed as needed.[18] Because of that, a piece of fabric is not just one defined part in a planned garment anymore. Instead, a fabric has potentially many different functions and can be processed as needed.

Division of labour, specialization and trade

The new strategy to separate the weaving of the fabrics from the three-dimensional construction of the garments lays the foundation for division of labour and specialization in the craft. Textile craftsmen were now able to focus on one of the two areas within the clothing production and to develop and refine their skills. Various specialists in the craft promote cooperation in the production process and open up space for differently oriented production sites. Thus, trading with intermediate products such as delicate fabrics and different-coloured yarns becomes beneficial.

It is improbable that the prior manufactured garment pieces, which were shaped on the loom, have already been traded, such as a single trouser leg of a specific size, shape and colour. Garment pieces that are directly shaped on the loom are so explicitly produced for their one single purpose, that it is preferable to manufacture and finish them on one production site.

In contrast, the trade with various exquisitely crafted fabrics and woollen yarns between different production sites seems very worthwhile with this new strategy. It increases the variety of the materials, patterns and shades of the garments. In addition, trade leads to an exchange of knowledge. One of the most important trade routes worldwide leads through Xinjiang, Eastern Central Asia: the Silk Road. It was an important economic hub for the exchange of materials, knowledge and technologies across Europe and Asia. Evidence for trade with intermediate products and a lively exchange of knowledge which took place in Xinjiang is clearly shown by the materials and techniques found in the textile finds from the second half of the 1st millennium BC.[19]

A new dynamic and fast strategy

In addition to the specialisation and the division of labour, the new strategy of

18 Ibid., pp. 167–170.

19 Ibid., pp. 169–170; Regula Schorta, A group of Central Asien wollen textiles in the Abegg-Stiftung collection in: *Riggisberger Berichte 10. Fabulous creatures from the desert sands*, eds. Dominik Keller and Regula Schorta (Riggisberg 2001), pp. 79–114; Wang Bo, Xiao Xiaoyong, A General Introduction to the Ancient Tombs at Shampula, Xinjiang, China, in: ibid., pp. 77-78; Emma C. Bunker, The Cementery at Shanpula Xinjiang. Simple Burials, Complex Textiles, in: ibid., pp. 15-46.

clothing production also has an entirely different advantage: It accelerates the design and construction process from the idea to the finished product in a ground-breaking way. Because the construction and the cutting of the garments are now realised on the already finished fabrics, the concepts and designs can be verified and adapted much faster as a consequence. Whereas weeks or months passed by weaving the fabrics into a specific form, now the same procedure takes only a fraction of the time by cutting a finished fabric. A design idea can be implemented within just one day, discrepancies can be verified during the process, and troubleshooting is much easier. If a pattern behaves differently than expected, it can also be adjusted afterwards or simply cut again.

As a consequence of the new strategy, the concept of a garment can now be implemented, tested and optimized more quickly. The design process is, therefore, significantly more dynamic and adaptable. A construction idea can now be further refined and improved while it is still being implemented.

Together, these new components in the production process pioneer a new distinguished discipline: the construction of patterns.

The construction of patterns – from decorator to architect

In the 1st Century AD in Xinjiang, an extraordinary ensemble of silk garments was constructed. It consists of a delicate blouse and a long silk wrap skirt.[20] *The construction of the blouse is a masterpiece. The narrow cuffs and the high standing collar are finely lined and artfully composed of a mosaic of narrow silk ribbons. The blouse shows an exquisite balance and fit when worn (fig. 4).*[21]

At that time, the garments already show an extraordinary degree of abstraction in their construction. The technology of cutting fabrics and constructing patterns has already developed enormously in only a short period of time.[22] The dynamic process and the verifiability of the new construction concepts enable a significantly better adaptation of the clothes to the human anatomy and motor function. As a consequence, the conceptual examination of the human anatomy is clearly reflected in the construction of the clothes. Thus, the functionality and the fit of the

20 Beck, *Kleidung des 1. Jahrtausends v. Chr. in Xinjiang*, pp. 184–188, 195–198.

21 Ibid., pp. 184–188.

22 Ibid., pp. 170–177.

Fig. 4: A reconstructed silk ensemble from Niya: Reconstruction and wearing test of a silk blouse (95MN1M5-23) and a silk wrap skirt (95MN1M5-18) from Niya, manufactured in the 1st Century AD in Xinjiang. Both garments were cut and constructed of different silk fabrics and illustrate an extraordinary degree of abstraction in their design. They are both produced on the basis of the ‚dynamic construction principles' that were implemented into the production process in Xinjiang at that time; above: wearing test with the reconstructed models; below: construction layout of the garments; reconstruction and technical drawing: Ulrike Beck, photographs: Martin Jess, model: Deva Schubert.

garments achieve a new quality.[23]

With form weaving the aesthetic of the clothes was achieved through colourful patterns and ornaments. Now the new construction concepts themselves emerge as a distinct form of expression.

The silk wrap skirt, which was worn with the blouse embodies such a new idea: The translucent silk fabric artfully cascades around the body. With every step, the skirt moves like a fine mist. The seams draw subtle lines into the fabric,

23 Ibid., pp. 177–188.

like delicate leaf veins in the overlapping silk pedals (fig. 4).[24]

The design of the skirt is outstanding: It is sculptural and created for motion.[25]

This is the last advanced step, that was needed: It is the idea to utilise the strictly logical construction of the garments as an independent, sculptural form of expression. It is the idea to design for motion and the interaction with the moving body.

This is the beginning of constructing clothes as an advanced art form, as we know and use it today in our modern clothing production.

"The soul of the dress is the body."[26]

A modern development achievement: Agile software development – the peak of a rapid evolution

Since the beginning of the computer program production, three concise process models have emerged. Their development can be traced from the 1950s.

At that time, the course of flight paths was still calculated manually in a NASA department, requiring many people and man-hours.[27] *Thus, new computer programs were developed for a more efficient and faster process and to minimize the error rate in the calculations.*

Over time, these programs became more and more complex, so that writing the source code can no longer be implemented without careful planning.

For this reason, the first two-phase model in programming was developed. Alan Turing put it aptly as: "Make a plan and break the problem down. Do the programming of the new subroutines and program the main routine."[28] This model is divided into the analysis phase and the subsequent programming. In the first phase, a concept is created and structured for the problem to be solved. In the following programming phase, the specific instructions in the form of arithmetic commands are implemented exactly according to the plan.

In this model, one person usually conducts the entire process, from planning to writing the specific arithmetic commands. The 2-phase software development model with the direct sequence of analysis and programming is functional for manageable and clearly defined problems.

24 Ibid., pp. 195–198.

25 Ibid., pp. 195–198.

26 Jean Cocteau, *Beauty and the Beast: Diary of a Film* (New York 1972).

27 Jim Hodges, She Was a Computer When Computers Wore Skirts, *NASA History*, August 26, 2008; https://www.nasa.gov/centers/langley/news/researchernews/rn_kjohnson.html, access: November 18, 2020.

28 Alan M. Turing, *Programmer's Handbook for Manchester Electronic Computer Mark II* (Cambridge, undated); http://www.alanturing.net/turing_archive/archive/m/ m01/M01-001.html, access: November 18, 2020.

Specialization in software development

From the 1970s onwards, digital data processing opened up to be used in a broader social context. Until then, the problems and applications for computer programs had been narrowly defined. With the rapidly increasing use of computers, the requirements for software development are changing. Programs are getting more extensive and the problems to be solved are more and more complex. It is no longer feasible to have the software implemented by just one person. The 2-phase model is now reaching its limits.

Therefore, new strategies are being developed that allow the distribution of tasks and specialization of software developers. In order to use the knowledge of various specialists in a structured manner, the software manufacturing process is divided into several phases. A subject area and a specialist are assigned to each phase. Each topic is processed in its corresponding phase and the results are passed on to the next specialist.

From the 1960s on, this model developed more and more phases.[29] In the 1970s, Thayer wrote an abstract description of this development method and labelled it as 'waterfall model'.[30] The advantage of this model is that different specialists work on corresponding steps of a computer program. Each phase is self-contained and can be planned separately. All specialists can focus on their phase and work on it independently.

In the 1980s, the invention of microprocessors paved the way for a new wave of technological innovations. However, these new developments also caused a software crisis that leads to the next evolutionary stage in software development.

At the beginning of the 1970s, computer inquiries were still centrally processed by mainframes in an organization's data centre. By the end of the 1970s, personal computers were already indispensable on desks in banks and offices. As early as the 1980s, computers found their way into the living room of private households and in the mid-2000s, they finally arrived in our pockets.

Due to the continuing fast advancement and distribution of hardware, the requirements for software are changing enormously. Scientific studies have identified the problem:[31] Every program has to manage an enormous number of different requirements so that it is impossible to calculate them from the start. Instead, they become apparent only during the process. The challenge for this software development stage is to manage this newly occurring problem strategically.

29 Winston W. Royce, Managing the Development of Large Software Systems. *Proceedings, IEEE WESCON* (August 1970), pp. 1–9.

30 Thomas E. Bell and T. A. Thayer, Software requirements: Are they really a problem? *Proceedings of the 2nd International Conference on Software Engineering* (San Francisco 1976), pp. 61–68.

31 Herbert Weber, Die Software-Krise und ihre Macher. (Springer-Verlag, 1992).

An interdisciplinary team is needed

From the mid-1990s onwards, a new strategy developed: It was based on the idea to place flexibility and speed at the centre of the cooperation between specialists. The agile software development method was born.[32]

The problem of the waterfall model is the one-way communication, similar to an assembly-line. A topic is processed in one phase and the results are transferred to the next specialist. If new insights and related changes arise during the work process, they can only be factored in during the current and all subsequent phases. However, all results of the phases that had already been completed are not changed. As a consequence, necessary changes during the process could not be transferred to the entire structure of the program but only to the current and upcoming phases. This could lead to enormous problems in programming.

In contrast, in agile programming each step is divided into smaller and manageable topics. Also, in this method, the phases from analysis to programming are structured sequentially, but only for the respective small topics.[33] When one cycle is completed, the next part of the software is processed in the same way in a new cycle. The enormous advantage of this method is that new insights and feedback from the first cycle can be integrated into the second cycle right from the start. This approach creates an excellent feedback loop: Each phase benefits from the feedback from all other phases and specialists. Software development is an interdisciplinary teamwork.

The priority of this approach is the quick feedback among the various specialists. Beyond that, the realization of intermediate products enables additional external feedback during the development process. The finished parts of the software can already be verified by the user and the feedback can be incorporated into further development.

Consequently, the agile software development method is a fast, adaptable, and dynamic strategy. The coordinated and interdisciplinary collaboration between the different specialists is a fundamental step forward in the fast-moving field of software development.

Pattern recognition – the strategies in comparison

Both clothing production and software development solve complex tasks by converting creative ideas into a mathe-

32 Tom Peters, *Thriving on Chaos. Handbook for a Management Revolution* (New York 1987).

33 Ken Schwaber, Scrum Development Process, in: *OOPSLA Business Object Design and Implementation Workshop*, eds. J. Sutherland et al. (London 1997).

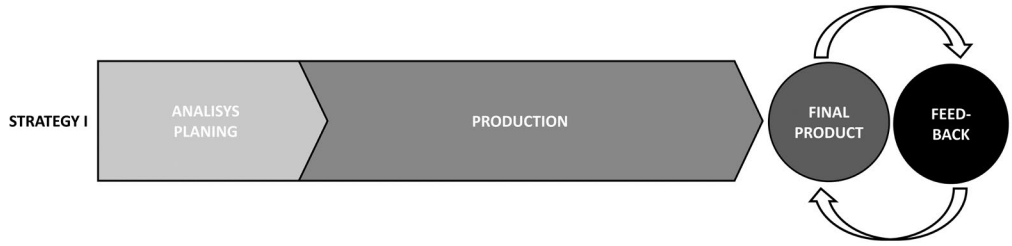


Fig. 5: Diagram of Strategy I: One 'all-rounder' proceeds linearly: One 'all-rounder' analyses, plans and develops the product and proceeds linearly in sub-steps. Analysis and planning are at the beginning of the production process and the defined concept is strictly implemented. Therefore, significant adjustments can only be im-plemented in a new product; diagram: Ulrike Beck and Martin Jess.

matical concept and applying it to a specific problem. Even though they belong to different historical contexts and use different technologies, they both show strikingly similar solution strategies which seem to relate to one transferable pattern. In order to define their core components, we demonstrate how their concepts evolved until they reached an adaptable and dynamic strategy.

"Homo sapiens is about pattern recognition […]."[34]

Strategy I: One 'all-rounder' proceeds linearly

- Concept: Both development cycles begin with the concept of one 'all-rounder' who at first analyses and plans his approach and then develops the final product. In the clothing production, this concept is implemented through the ancient strategy of form weaving, where the clothes are directly produced on the loom. The same structural procedure can be observed in the 2-phase model during the early data processing. In both cases, the production process relies on the linear 2-phase principle. Analysis and planning of the design are executed and completed at the beginning of the process. In the following production phase, the defined concept is strictly implemented (fig. 5).
- Core components – all-rounder, sub-steps, singular analysis: One all-rounder analyses, plans and develops the product. He proceeds linearly in sub-steps. Analysis and planning occur only at the beginning of the production process.
- Limitations: Due to the single analysis at the beginning of the process, it is hardly possible to react to new insights that occur in the practical implementation. Therefore, significant adjustments can only be implemented in a new product. As soon as the problems become extensive, the all-rounder strategy reaches its limits: It is very complicated for one person to analyse and plan the entire structure and all the details at the same time and in depth.
- This issue necessitates the devel-

34 William Gibson, *Pattern Recognition* (New York 2003).

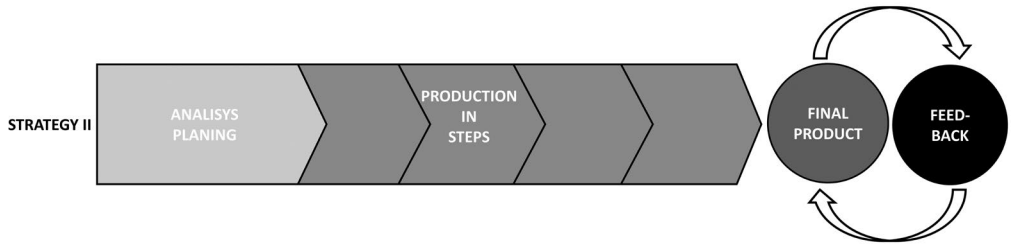


Fig. 6: Diagram of Strategy II: Specialists work on sub-steps: Specialists work on sub-steps, they proceed linearly through phases. Analysis and planning are at the beginning of the production process. Once completed, the developed concept is forwarded to the next phase. Thus, the specialists communicate only in one direction, which inhibits quick and dynamic reaction to new insights; diagram: Ulrike Beck and Martin Jess.

opment of a new strategy. In clothing production, a new technological idea causes the advancement: The idea to manipulate the shape of a fabric by cutting it into a new pattern. In data processing, the rapidly growing complexity of the requirements leads to a change.

Strategy II: Specialists work on sub-steps

- Concept: With this new strategy, the work is divided between different specialists. The division of labour is adapted to the sequence of sub-steps. Each specialist is assigned to one sub-step or phase in the entire development process. The sequence of all sub-steps results in the overall structure (fig. 6). Each specialist can focus on their corresponding phase. An example for this approach is the 'waterfall model'.
- Core components – specialization, sub-steps, singular analysis: Specialists work on sub-steps for the product. They proceed linearly through phases. Analysis and planning are still at the beginning of the production process.
- Limitations: The limitation of this strategy is due to its structure: Despite the division of labour and the specialization, it is still linear and static. Analysis and planning are performed at the beginning of the manufacturing process. Once completed, the developed concept is forwarded to the next phase. Thus, the specialists communicate only in one direction. Unfortunately, this type of communication inhibits quick and dynamic reaction to new insights. Thus, the approach is effective but not efficient. The waterfall model shows that specialization alone does not necessarily lead to the desired success. Instead, and more importantly, it is the manner how the work is divided and how the specialists are able to cooperate with each other.

Strategy III: Specialists solve sub-problems

- Concept: This strategy identifies sub-problems. These are executed and resolved by specialists. The solution of the sub-problems leads to the solution of the overall problem. The specialists

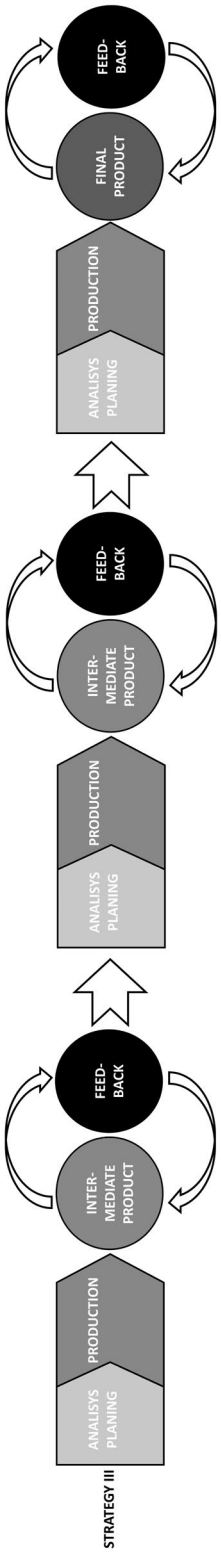


Fig. 7: Diagram of Strategy III: Specialists solve sub-problems: Specialists solve sub-problems for the final product. Analysis and planning for each sub-section provide the foundation for an efficient feedback mechanism. These core components are fundamental for a dynamic, flexible and efficient production process; diagram: Ulrike Beck and Martin Jess.

can develop strategies for their corresponding sub-steps and dynamically integrate the results into the overall concept (fig. 7). Both, the concept to cut into fabric to produce clothes and the agile software development follow this fundamental principle. Both processes are explicitly structured to produce verifiable intermediate products by solving sub-steps. These products efficiently allow an analysis and a dynamic adjustment already during the production process. In case of the clothing production, this would be the finished fabrics that can be processed further as required. These intermediate products enable an excellent feedback mechanism where new insights during the manufacturing process can be integrated dynamically. Analysis and planning stand no longer exclusively at the beginning of a production process. Instead, both steps can be performed in each sub-step during the entire process.

- Core components – specialization, sub-problems, feedback mechanism: Specialists solve sub-problems for the final product. Analysis and planning for each sub-section provide the foundation for an efficient feedback mechanism.
- Advantages: The interdependence of these core components is fundamental for a dynamic, flexible and efficient production process. It allows good adaptation and can cope with significant variance, which are the foundations of successful complex problem solving.

Both the concept to cut into fabric and the agile software development utilise the same core components and follow the same fundamental pattern. An excellent example of this innovative strategy developed several thousand years ago is illustrated by the 'dynamic construction principles'.[35] In the second half of the 1st millennium BC, those were already implemented in the clothing production in Xinjiang.[36] Based on the planned garment and its appearance, fit and size, its construction was dynamically adapted to the measurements and material properties of the available fabrics.[37] This extraordinary combination of analysis and adaptation during the manufacturing process enabled the craftsmen in Xinjiang to produce at the same time excellently constructed, functional and even opulent clothing with a remarkable material-saving approach (fig. 4).[38] This was an exceptional achievement combining high clothing standards with an absolutely resource-friendly production.

Conclusion

In modern data processing, the following premise is clearly defined: Strategies for complex problems must allow good adaptation and deal with significant variance. In order to do this, they have to be dynamic, flexible and efficient. A comparison of both strategies, to cut into fabric to tailor clothes and agile software development, demonstrates that the ancient clothing production concept in Xinjiang utilises the same core components and strategic pattern that is used in modern concepts today.

By integrating specialization, sub-problem solving, and excellent feedback mechanisms into the clothing production process, this innovative ancient concept transformed into a ground-breaking assertive strategy within the clothing production over several thousand years.

The core components of this strategy are crucial for a dynamic, flexible and efficient approach. They allow an excellent adaptation and integration of new insights into the production process as well as a broad variability to cover a wide range of requirements. Their interdependency is fundamental to solve complex problems efficiently.

As early as the 1st millennium BC, the innovative idea to cut into fabric laid the foundation for new, efficient production concepts, extensively restructured the craft and established a new distinguished discipline: the construction of patterns. Furthermore, its impact was felt through other parts of the culture. In the course of its further development, it pioneered the concept to duplicate construction patterns and established the crucial step from custom-made garments to serial production. Today, its corresponding knowledge is mathematically implemented in modern construction systems.

35 Beck, *Kleidung des 1. Jahrtausends v. Chr. In Xinjiang*, pp. 198–204.

36 Ibid., pp. 198-211.

37 Ibid., pp. 198-204.

38 Ibid., pp. 198-211.

The technology of cutting fabric to tailor clothes has prevailed over the millennia. It has adapted to industrialization, the development of chemical fibres and digitalization, and it is still absolutely essential for modern clothing production. It demonstrates an outstanding strategic pattern, which we consistently apply in different contexts to solve complex problems efficiently. The technology's ground-breaking resilience is our tool to meet new challenges creatively.

Acknowledgements:
This study is a contribution to the „InnoTexGes" research project. It would not have been possible without the exceptional support by the Federal Ministry of Education and Research (Grant 01UL1917X). We express our heartfelt gratitude to Gesche Joost, Professor of Design Research at the Berlin University of the Arts, for providing us with kind support and the necessary infrastructure for the research.

References

Beck, Ulrike, Mayke Wagner, Xiao Li, Desmond Durkin-Meisterernst and Pavel E. Tarasov, The invention of trousers and its likely affiliation with horseback riding and mobility: A case study of late 2nd millennium BC finds from Turfan in eastern Central Asia. *Quaternary International* 348 (2014), pp. 224–235.

Beck, U., *Kleidung des 1. Jahrtausends v. Chr. in Xinjiang. Schnittentwicklung zwischen Funktionalität, Ästhetik und Kommunikation* (Regensburg: Schnell & Steiner, 2018).

Bell, Thomas. E., and T. A. Thayer, Software requirements: Are they really a problem? *Proceedings of the 2nd International Conference on Software Engineering* (San Francisco 1976), pp. 61–68.

Bo, Wang, Xiao Xiaoyong, A General Introduction to the Ancient Tombs at Shampula, Xinjiang, China, in: *Riggisberger Berichte 10. Fabulous creatures from the desert sands. Central Asien Woolen Textiles from the Second Century BC to the Second Century AD*, eds. Dominik Keller and Regula Schorta (Riggisberg: Abegg-Stiftung, 2001).

Bunker, Emma C., The Cementery at Shanpula Xinjiang. Simple Burials, Complex Textiles, in: *Riggisberger Berichte 10. Fabulous creatures from the desert sands. Central Asien Woolen Textiles from the Second Century BC to the Second Century AD*, eds. Dominik Keller and Regula Schorta (Riggisberg: Abegg-Stiftung, 2001).

Cocteau, Jean, *Beauty and the Beast: Di-*

ary of a Film (New York: Dover Publications 1972).

Gibson, William, *Pattern Recognition* (New York: Berkley Books 2003).

Hodges Jim, She Was a Computer When Computers Wore Skirts, *NASA History*, August 26, 2008; https://www.nasa.gov/centers/langley/news/researchernews/rn_kjohnson.html; access: November 18, 2020.

Mentges, Gabriele, *Kulturanthropologie des Textilen. Für eine Kulturanthropologie des Textilen. Einige Überlegungen* (Bamberg: Ebersbach & Simon 2005).

North, Susan, *The Tudor Tailor. Reconstructing sixteenth-century dress* (London: Batsford 2006).

Peters, Tom, *Thriving on Chaos. Handbook for a Management Revolution* (New York: Alfred A. Knopf, 1987).

Royce, Winston W., Managing the Development of Large Software Systems. *Proceedings, IEEE WESCON* (August 1970), pp. 1–9.

Schorta, Regula, A group of Central Asien wollen textiles in the Abegg-Stiftung collection, in: *Riggisberger Berichte 10. Fabulous creatures from the desert sands. Central Asien Woolen Textiles from the Second Century BC to the Second Century AD*, eds. Dominik Keller and Regula Schorta (Riggisberg: Abegg-Stiftung, 2001).

Schwaber, Ken, Scrum Development Process, in: *OOPSLA Business Object Design and Implementation Workshop*, eds. J. Sutherland et al. (London: Springer, 1997).

Turing, Alan M., *Programmer's Handbook for Manchester Electronic Computer Mark II* (Cambridge, undated, ca. 1951); facsimile: http://www.alanturing.net/turing_archive/archive/m/ m01/M01-001.html; transcript: http://curation.cs.manchester.ac.uk/computer50/www.computer50.org/kgill/mark1/RobertTau/turing.html; access: November 18, 2020.

Weber, Herbert, *Die Software-Krise und ihre Macher* (Springer-Verlag, 1992).

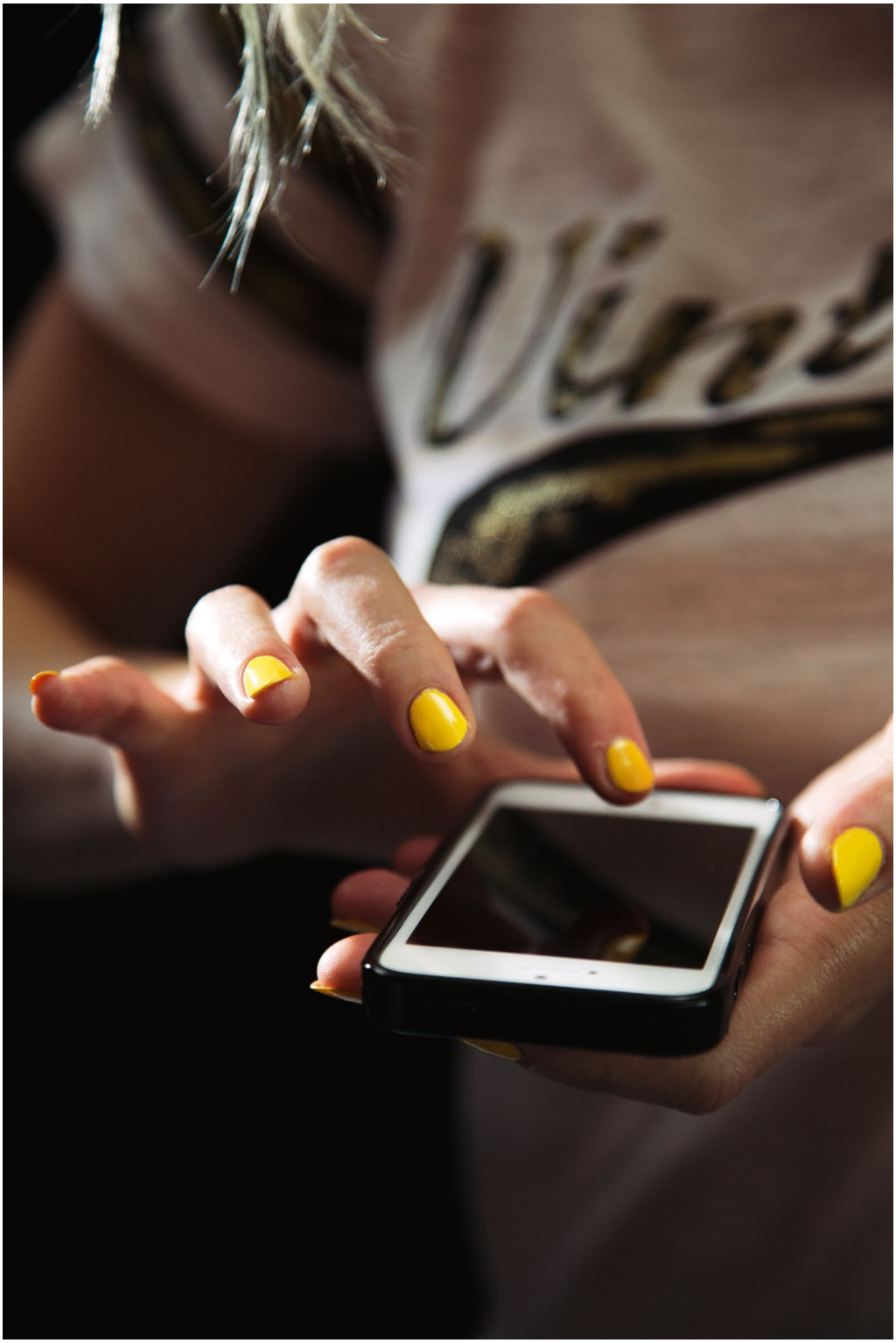
lapses in Thinking By the person i Am

By Josephine Pryde

Suggested citation:
Josephine Pryde, lapses in Thinking By the person i Am. *Interface Critique* 3 (2021), pp. 171–183.
DOI: https://doi.org/10.11588/ic.2021.3.81327.

The photographic works in this section have been selected from *lapses in Thinking By the person i Am* (Berlin: Sternberg Press, 2018). The catalogue comprises a body of work exhibited at the CCA Wattis Institute for Contemporary Arts, San Francisco, and the Institute of Contemporary Art at the University of Pennsylvania. With contributions by Anthony Elms, Josephine Pryde, and Jamie Stevens. Design: Clemens Jahn


Your Secure and Private Path to
Solution for your Busi




ICE


HUAWEI


:06:42 Sending PUSH_REQUEST to server...
19.1.6] [10.119.1.5]
06:42 LZO-ASYM init swap=0 asym=1
06:42 Comp-stub init swap=0
06:42 EVENT: ASSIGN_IP
06:42 Connected via tun
06:42 EVENT: CONNECTED p0623687@uk-southampton.privateinternetaccess.com:1194
/UDPv4 on tun/10.119.1.6/
06:42 SetStatus Connected
06:54 OS Event: SLEEP
06:54 TUN reassert
06:54 TUN reset routes
06:54 EVENT: PAUSE
1:38 OS Event: WAKEUP
1:41 RESUME TEST: Internet:ReachableViaWiFi
1:41 EVENT: RESUME
1:41 EVENT: RECONNECTING
1:41 LZO-ASYM init swap=0 asym=0

Index of Works

Your Secure and Private Path, 2015
(C-print, 60 x 44.5 cm)

For Myself 2, 2014
(C-print, 60 x 44.5 cm)

Here Do You Want To 2, 2014
(Giclée print, 60 x 40 cm)

Here Do You Want To, 2014
(Giclée print, 60 x 40 cm)

I For One, 2015
Prototype, not printed
Basis for the Artist Edition *Texte zur Kunst*,
issue no. 99, September 2015:
www.textezurkunst.de/artist-editions/i-one

Sorry, 2016
(C-print, 60 x 44.5 cm)

Kugelschreiber, 2016
(C-print, 60 x 44.5 cm)

Camera, 2016
(C-print, 60 x 44.5 cm)

Gift Für Mich,
Galerie Neu Christmas 2014 (2), 2015
(C-print, 60 x 44.5 cm)

Texto, 2014
(C-print, 60 x 44.5 cm)

For Myself 3, 2016
(C-print, 60 x 44.5 cm)

AESTHETICS OF HIGH-TECH INTIMIDATION. F-35 LIGHTNING II AND A DESIGN FOR HUMAN RECEPTION

By Jan-Henrik Walter

"They felt as secure as spectators at a bullfight; they risked their money perhaps on the result, but that was all. And such ideas of war as the common Americans possessed were derived from the limited, picturesque, adventurous war of the past. They saw war as they saw history, through an iridescent mist, deodorised, scented indeed, with all its essential cruelties tactfully hidden away."
– H.G. Wells, The War in The Air *(1908)*

Suggested citation:
Jan-Henrik Walter, Aesthetics of High-tech Intimidation. F-35 Lightning II and a Design for Human Reception. *Interface Critique* 3 (2021), pp. 185–206.
DOI: https://doi.org/10.11588/ic.2021.3.81331.

Form follows *what* function?

If the development of military fighter planes were only to follow the objective of creating the fastest and most efficient machines of their kind, while under the pressure of tight cost-benefit calculations, one must subsequently wonder about any aesthetic power inherent to the finished products. One can speculate about whether a visual impact is deliberately induced or merely a spandrel, the result of military and engineering necessities. In both cases, the visual design of modern warplanes emphasizes the fascination, that many people feel for them: The F-35 Lightning II is designed to be the world's most superior combat aircraft, created for ever more demanding attack and defence missions of the United States Air Force, Marine Corps and Navy.[1]

The *aesthetics* of the F-35 Lightning II are relevant not only because its design inevitably expresses *something* to both a maker of military decisions and to a threatened target on ground-level, but also because the F-35 as a mega-project is closely interwoven with international business, politics and the public sphere.[2] As carriers of action and spectacle, modern fighter planes regularly appear in mainstream blockbusters from *Top Gun* to *Transformers*, which is why the U.S. Air Force even runs its own office in Los Angeles, to arrange and subsidize corresponding Hollywood productions.[3] For film-makers and producers to tap into this potential of financial support and real effects, resulting audio-visual products of course have to serve the "best interest of public understanding of the U.S. Armed Forces", their recruiting programs, and U.S. policy.[4] Critical productions are excluded, steepening a potential slope in visual quality and reach between voices of the Pentagon and its opposition.

In real conflict scenarios moreover, the *aesthetics* of operated war equipment do have measurable impact on decision-making of both crew and pilots.[5] And even as a strategy, any aesthetic effects of the F-35 would not stand alone in the military realm: War paintings for intimidation are element of many cultures,[6] uniforms are used to create a shared sense of identity,[7] camouflages to cover up troops, artificial forces to fool

1 Lockheed Martin Corporation, The Multi-variant, Multirole 5th Generation Fighter (2019), https://www.f35.com/about, access: April 10, 2019, 13:05am.

2 The Economist, Dancing on the grave of the F-22. *The Economist* (July 22, 2009), https://www.economist.com/democracy-in-america/2009/07/22/dancing-on-the-grave-of-the-f-22, access: November 28, 2018, 03:45pm.

3 Air Force Entertainment Liaison Office, Breaking barriers since 1947 (2019), https://www.airforcehollywood.af.mil/, access: April 10, 2019, 01:20pm. An official Twitter-account to the F-35 Lightning II can be found via https://twitter.com/thef35.

4 Jim Gregory, *The development of Hollywood's relationship with the military: A guide for filmmakers and military entertainment liaison officers* (University of Southern California, 2008).

5 Erik Hedlund and Joseph Soeters, Reflections on Swedish Peacekeepers' Self-image and Dilemmas of Peacekeeping. *International Peacekeeping* 17/3 (2010), pp. 408–14.

6 Jimmy Nelson, *Before They Pass Away* (Kempen 2013).

7 Sean Real, Razzle Dazzle (2012), https://99percentinvisible.org/episode/episode-65-razzle-dazzle/, access: April 10, 2019, 01:30pm .

Fig 1: Lockheed Martin F-35 Lightning II in flight Falcon Photography, Lockheed Martin F-35, built 2017 (2019), https://flic.kr/p/2jbTcAX, access: March 17, 2021, 10:45pm.

opponents[8] and the sound design of a dive bomber's Jericho trumpet to terrify earthbound targets.[9] All these are military practices, whose modus of operation is primarily in the realm of aesthetics. An aggravation of this *aesthetic thinking* is infamously illustrated by the strategy of U.S. forces at the beginning of the 2003 invasion of Iraq, which was titled by officials as *Shock and Awe*, and was presented by domestic media, mostly as such.[10] In Qatar 2003, US General Tommy Franks has to say:

> *This will be a campaign unlike any other in history. A campaign characterized by shock, by surprise, by flexibility, by the employment of precise munitions on a scale never before seen, and by the application of overwhelming force.*[11]

Though the civilian casualties of the Iraq war expose, that said bombing campaign could neither hold the promise of precision nor deterrence, leaving military goals unclear.[12]

Meanwhile, the very idea of *spectacular* warfare for military use is nothing new: Already in World War I, Lieutenant Colonel (*Durch*-) Bruchmüller is known to have deployed artillery on the Western Front, in which a precise hit on the enemy was deemed less important to victo-

8 Katie Mingle, Show of Force (2015), https://99percentinvisible.org/episode/show-of-force/, access: April 10, 2019, 01:30pm.

9 Johann Althaus, Technikgeschichte: Stukas waren Hitlers mächtigste Waffe im Blitzkrieg. *Welt* (June 25, 2015), https://www.welt.de/geschichte/zweiter-weltkrieg/article143021882/Stukas-waren-Hitlers-maechtigste-Waffe-im-Blitzkrieg.html, access: April 10, 2019, 01:45pm; Laurenz Demps and Carl-Ludwig Paeschke, *Flughafen Tempelhof. Die Geschichte einer Legende, Laurenz Demps, Carl-Ludwig Paeschke* (Berlin1998).

10 Mitchell Hobbs, Reflections on the reality of the Iraq wars: the demise of Baudrillard's search for truth? *The Australian Sociological Association* (Newcastle 2007); Brian Whitaker, Flags in the Dust. *The Guardian* (March 24, 2003), http://www.theguardian.com/world/2003/mar/24/worlddispatch.iraq, access: March 15, 2021, 05:30pm.

11 *The Oxford Dictionary of Phrase and Fable*, 2nd ed. (Oxford 2005), http://www.oxfordreference.com/view/10.1093/oi/authority.20110803100502693, access: April 10, 01:30pm.

12 IBC and Oxford Research Group, IBC Press Release 12 (2005), https://www.iraqbodycount.org/analysis/reference/press-releases/12/, access: March 15, 2021, 5:50pm; Whitaker, Flags in the Dust.

ry, than a sheer intimidating number of shells.[13]

It is a similar intimidation, mixed with supposed superiority and technological progressiveness, that make the F-35 Lightning II an intriguing object for investigation: What role do design and aesthetics play in the perception of a state-of-the-art fighter jet and its usage on military missions? Does high-tech imply precision? Does slick imply just?

Currently the US-American stealth plane is being negotiated in public discourse between breakdown jet and wonder weapon.[14] For the high-tech aesthetics of the F-35 also communicate a well-founded mistrust as to whether functions under its glossy surface work as its design promises: launch problems, little space for armament and unclear production costs are causing customers to cancel orders.[15] Added to this, is the ongoing replacement by drones and even the replacement by old-fashioned propeller machines, which are deemed much more cost-effective to use against technologically inferior enemies:[16]

> *The country currently depends on an ever-decreasing number of extremely capable but eye-wateringly expensive multi-mission platforms which, if lost at the outset of a conflict, would be impossible to replace. A single F-35 aircraft can cost well over $100m, an attack submarine $2.7bn and a Ford-class carrier with all its aircraft approaching $20bn.*[17]

Nevertheless the cost and mixed opinions, these modern fighter planes fulfil a function: within the technological arms race of international parties, they serve as a product of security design (*Sicherheitsdesign*). That label goes back to Friedrich von Borries, who distinguishes between the extent, to which any manifestation of security design such as the F-35 is creating liberties (*entwerfen*) while constraining others (*unterwerfen*):

> *Not only everyday objects of daily use are the result of design processes, but also weapons and surveillance technology. They are also subjugating when they are used for an enabling goal.*[18]

A subjugating design "confirms existing relations of domination and power by manifesting them both functionally and aesthetically." [19]

The following text examines this aesthetic manifestation of the F-35 Lightning II in terms of industry design principles, depicting why modern fighter jets

13 Michael Sontheimer, Der Krieg im Reich: Wir hauen ein Loch hinein. *Der Spiegel* (1/2004), https://magazin.spiegel.de/EpubDelivery/spiegel/pdf/30300038, access: April 10, 2019, 01:30pm.

14 Valerie Insinna, Inside America's Dysfunctional Trillion-Dollar Fighter-Jet Program. *The New York Times* (August 21, 2019), https://www.nytimes.com/2019/08/21/magazine/f35-joint-strike-fighter-program.html, access: March 17, 2021, 07:30pm.

15 Gernot Kramper, F-35: Superjet oder teuerster Pannenvogel der Geschichte? *Stern* (July 14, 2016), https://www.stern.de/digital/technik/f-35--superjet-oder-teuerster-pannenvogel-der-geschichte--6949624.html#mg-0_1554633677398, access: April 10, 2019, 01:45pm.

16 The Economist, Air power on the cheap. *The Economist* (September 20, 2010), https://www.economist.com/technology-quarterly/2010/09/20/air-power-on-the-cheap, access: April 10, 2019, 01:45pm.

17 The Economist, Getting to grips with military robotics. *The Economist* (January 25, 2018), https://www.economist.com/special-report/2018/01/25/getting-to-grips-with-military-robotics, access: April 10, 2019, 01:45pm.

18 Friedrich von Borries, *Weltentwerfen: Eine politische Designtheorie*, 2nd ed. (Berlin 2017), p. 87.

19 Ibid., p. 21.

look the way they do. A special emphasis lies on the qualities of high-tech surfaces, as it is often ambiguous, what a high-tech product actually does, how it works, what it represents and most interestingly, what it excludes from its representative capabilities. Since it is not the first time, that fighter planes are subject to design and aesthetics, the italian *Aeropittura* (that is linked to Mussolini's fascist regime in World War II) will be visited for comparison. It is then concluded, how the U.S. Armed Forces may do benefit from any specific high-tech impressions, that the F-35 Lightning II might evoke.

From tech to product: Deconstructing the F-35's aesthetics

For economic reasons the F-35 exists in three very similar but slightly different versions, each optimized for their usage in the Marines, U.S. Air Force and Navy. The most common F-35A is used for *analysis* in here and serves as a proxy for the complete series.[20]

Where does form come from? First of all, jets must fly. In the case of warplanes, they must fly really fast: The F-35's prominent delta-wing shape leads to a special form of airflow, that is able to provide a high lift and stability, that is particularly suited to super-sonic aircraft, and leaves more room for fuel and armament.[21] In visual theory, the use of those delta forms has a long tradition as an expression of masculinity, threat or activity. Triangles are seen as warning, directional or even protective.[22] The F-35 models A and B form a very compact and therefore clear of these deltas with a relatively small wing-span of about 10m. This compactness is necessary because the F-35 Model B must fit into existing amphibious attack ships of the U.S. Navy.[23]

Many further form factors trace back to *design for stealth*: The invisibility in front of radar is achieved by the fact, that incoming rays from search devices are not reflected back to the sender, but are instead reflected away or absorbed by the surface.[24] To reduce radar cross section, the F-35 uses planar surfaces with sharp

20 Lockheed Martin Corporation, Three Variants, Common Capability (2019), https://www.f35.com/about/variants, access: April 10, 2019, 04:45pm.

21 E.g. Christian Breitsamter, Deltaflügel Aerodynamik. Technische Universität München, http://www.aer.mw.tum.de/fileadmin/tumwaer/www/pdf/lehre/Praktikum-aeroflugzeug/Versuch_05.pdf, access: April 10, 02:30pm; Greg Dimitriadis, Fighter Aircraft Design. LIÈGE université (2018), http://www.ltas-cm3.ulg.ac.be/AERO0023-1/ConceptionAeroFighter.pdf, access: March 17, 2021, 04:10pm.

22 E.g. Daniela Sternad, Gestaltungsgrundlagen (2019), http://www.grafixerin.com/bilder/Gestaltungsgesetze.pdf, access: April 10, 2019, 02:30pm.

23 Eric S. Ryberg, The Influence of Ship Configuration on the Design of the Joint Strike Fighter. Naval Surface Warfare Center Dahlgren Division (2002), https://apps.dtic.mil/dtic/tr/fulltext/u2/a399988.pdf, access: April 10, 2019, 02:30pm.

24 Markus Baecker, Passivradar raubt Stealth-Jets die Tarnkappe. *Der Spiegel* (September 14, 2012), http://www.spiegel.de/wissenschaft/technik/passivradar-nimmt-stealth-jets-die-tarnkappe-a-855711.html, access: April 10, 2019, 02:30pm.

Fig 2: Civil business airliner Hawker 850XP with rounded body and soft edges. Eugene Butler, Hawker Beechcraft 850XP (2011), https://en.wikipedia.org/wiki/File:Hawker_Beechcraft_850XP_Private_JP7325778.jpg, access: March 17, 2021: 09:15pm.

edges.[25] Roundings are mostly avoided, which marks a strong design differentiation to the civil aviation industry (Figure 2). Stealth requirements therefore create a sharp, polygonal look, while this does not necessarily mean, that aerodynamic features are lost. Possible directions of radar reflection are further minimized by wing and body edges following parallel lines and angles.[26] This high parallelism in the F-35 then ensures visual order and is usually considered a token of *good design*.

The resulting sharp and polygonal language can be assessed with Chandra,[27] who has investigated influence of form and shape on emotional affect for product development. In particular, affects of dynamism and intimidation can be attributed to a sharp-edged polygonal look with convex structural transitions, a design that is close to the F-35's shape:

> *[P]olygons are the clear choice both for large as well as sharp fillets, though sharp fillet has an edge [...] Sharp fillet polygons with flat convex surfaces generate a dynamic character supplemented by an element of intimidation.*

A particularly high intimidation effect

25 Brett S. Haisty, Affordable Stealth. Lockheed Martin Aeronautics (2000), http://www.f22fighter.com/AffordableStealth.pdf, access: April 10, 2019, 02:30pm .

26 Haisty, Affordable Stealth.

27 Sushil Chandra, *Aesthetics: Quantification and Deconstruction. A Case Study in Motorcycles* (Singapore 2018).

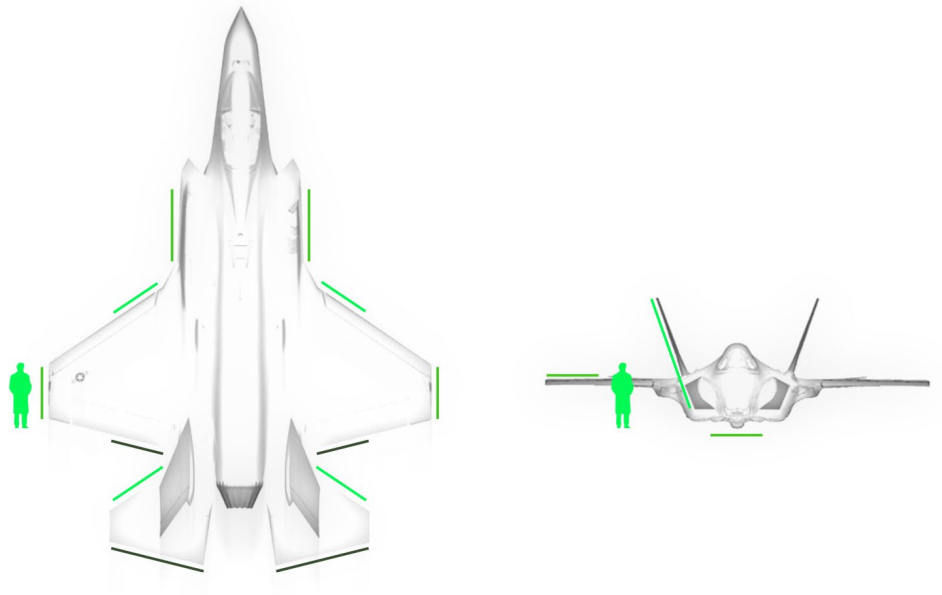


Fig. 3: Parallel lines in the F-35 for reasons of stealth, to minimize possible directions of reflection.

is achieved with high dynamics and a simple, uniform shape.[28] This uniformity is created by a clear silhouette, since the F-35's armament in the form of bombs or missiles must be stored in the interior of the plane, in order to keep the reflecting surfaces further as small as possible.[29] The simple form resulting here without any visually disruptive weapon systems, additionally facilitates the Gestalt distinction between a figure and ground; increasing said *pleasantness*, with which the F-35 is visually processed.[30]

Modern fighter jets are usually coated in grey, as this colour camouflages any aircraft particularly well against the sky in its various lighting moods. Surprisingly, a warm pink also makes for good camouflage. However legend has it, that this encountered the strong opposition of many male U.S. Air Force personnel.[31] Simple grey meanwhile is a valid design option, because visual identification through the eye of a pilot became unimportant in modern aerial warfare, while being crucial in conflicts of the past. Today, both colour and flag are no longer relevant for the distinction between friend and foe.[32] While visual identity

28 Ibid., p. 176.

29 John Hemmerdinger, Lockheed Martin's F-35A Joint Strike Fighter has conducted its first live-fire test. *Flight Global* (2013), https://www.flightglobal.com/news/articles/f-35b-launches-air-to-air-missile-in-test-392434/, access: April 10, 2019, 02:40pm.

30 Sternad, Gestaltungsgrundlagen.

31 Alan Radecki, Real Men Don't Fly Pink Airplanes (2012), http://vintageairphotos.blogspot.com/2012_01_01_archive.html, access: April 10, 2019, 05:00pm.

32 Kris Osborn, The Stealth F-35 Uses a "Threat Library" To Wage War. *The National Interest* (October 23, 2018), https://nationalinterest.org/blog/buzz/stealth-f-35-uses-threat-library-wage-war-heres-

Fig. 4: The asymmetric bomber Blohm & Voss BV 141 in 1942. Bundesarchiv, Blohm & Voss BV 14. (2020), https://de.wikipedia.org/wiki/Blohm_%26_Voss_BV_141#/media/Datei:Bundesarchiv_Bild_183-B21073,_Aufkl%C3%A4rungsflugzeug_Blohm_-_Vo%C3%9F_BV_141.jpg, access: March 20, 2021, 03:00pm.

fades, Chandra further concludes that the applied tones of grey are dynamizing in effect, while blacks are most likely to be threatening.[33]

It should also be mentioned that the F-35 is a symmetrical aircraft. This does not have to be the case, as the light bomber Blohm & Voss BV 141 of 1938 exemplarily shows (Figure 4). Symmetry is relevant in all forms of art and is of course considered one of the foundations of visual harmony. Human sensitivity to symmetry is well researched: Especially adults can process symmetrical stimuli more quickly, accurately and sustainably. So here, too, the plane's design has an effect on the simplicity of cognitive processing. In other words, its outer shape does not constitute to optical disturbance.[34]

If one continues to look at the F-35 Lightning II through the eyes of creative practice, composition particularly stands out: Composition describes the distribution of elements on a surface and the relationship of those elements to each other. Three tools used in practice are the golden ratio,[35] its simplification in the rule of thirds[36] and Tschichold's golden canon.[37]

The golden ratio describes the supposedly natural and beautiful ratio of 1:1.618. It served designers of antiquity, the renaissance and modern times as a grid to create especially *harmonious* compositions.[38]

The rule of thirds is applied in such a way, that focus points are located at the intersections of grid lines, that divide the image equally into nine areas.[39]

Lastly, Tschichold's golden canon describes a harmonic distribution derived from the golden ratio, which was developed for print.[40] Focus points are aimed to be located at intersecting lines and content should sit in the designated black frames.

Although no statement about a deliberate design process can be made, a specific aesthetic impression is underlined:

what-means-34132, access: April 10, 2019, 02:45pm.

33 Chandra, *Aesthetics: Quantification and Deconstruction*, p. 139.

34 Yi Huang et al, The aesthetic preference for symmetry dissociates from early-emerging attention to symmetry. *Scientific Reports* 8/1 (2018).

35 Gary B. Meisner and Rafael Aurajo, *The Golden Ratio: The Divine Beauty of Mathematics* (New York 2018).

36 E.g. Garry Reynolds, *Zen oder die Kunst der Präsentation: mit einfachen Ideen gestalten und präsentieren* (London 2008), p. 151.

37 E.g. Richard Hendel, *On Book Design* (New Haven 1998), p. 34.

38 Meisner and Rafael Aurajo, *The Golden Ratio: The Divine Beauty of Mathematics.*

39 Reynolds, *Zen oder die Kunst der Präsentation: mit einfachen Ideen gestalten und präsentieren.*

40 Hendel, *On Book Design.*

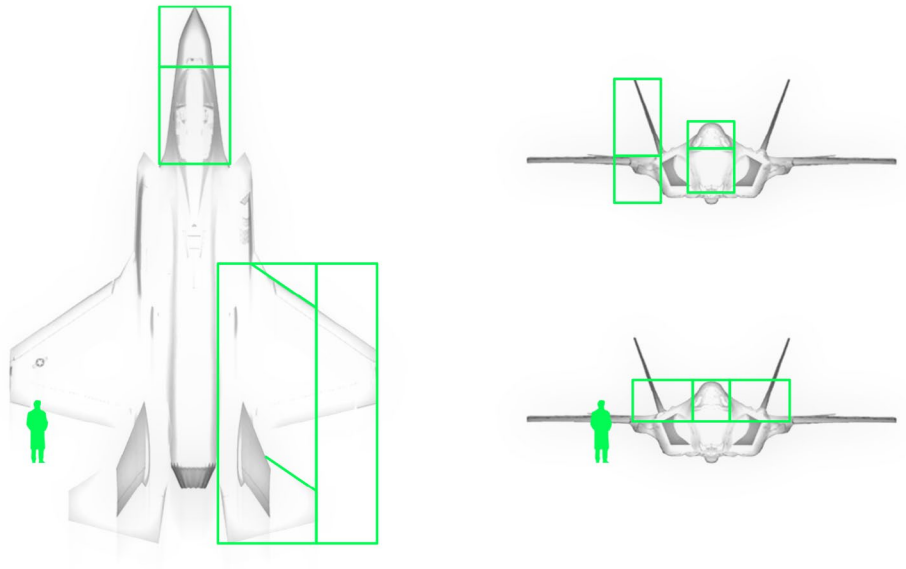


Fig. 5: The height of F-35's wings compared to the height of the aircraft, the dimensions of the cockpit compared to the fuselage and wingspan relative to jet engine fall within the grid of the *golden ratio*.

The F-35 is a harmoniously composed product with inherent visual balance. A clear silhouette, symmetry and monochrome camouflage favor processing of stimuli and simplify the resulting form. Straight lines and visual order indicate professionalism and make the F-35 appear clear; while the strong delta silhouette and sharp-edged polygony depict characteristics of dynamism, intimidation and also masculinity.[41]

Notice, that this very basic analysis does not yet include any notions of high-tech, which we will add in the following paragraphs.

Beyond the surfaces of high-tech

From the invention of the wheel, to bronze swords, steam engines, cell phones and autonomous automobiles, each era has its own form of high technology. With the introduction of electronics and microelectronics into machines, however, an aesthetic moment arises in which the functioning principle of a machine can *disappear* under its surface.[42] Form then no longer *necessarily* has to follow function. Surface language

41 Chandra, *Aesthetics: Quantification and Deconstruction*.

42 Barry Brummet, *Rhetoric of machine aesthetics* (Westport 1999).

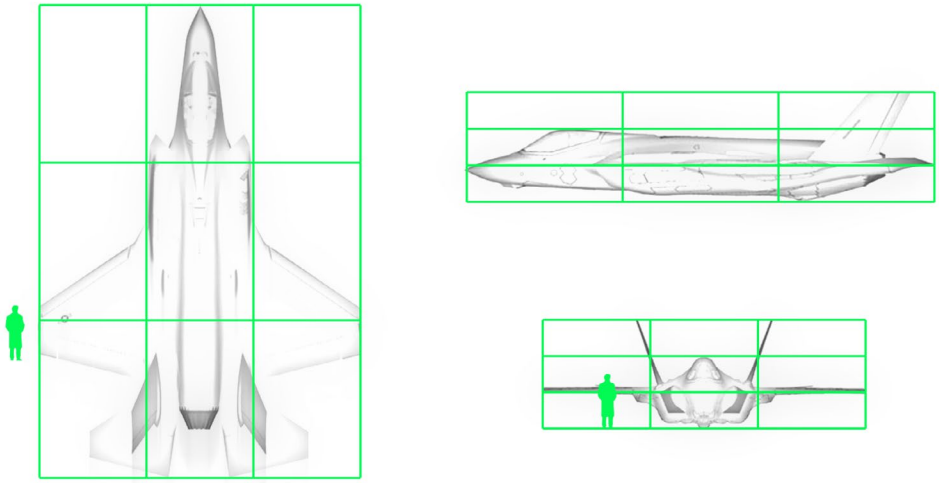


Fig. 6: The fuselage, which fills the middle third of the wingspan, fits neatly into the *grid of of thirds*. In the horizontal section, heights of wings as well as nose fulfil this compositional guideline.

of high-tech products is increasingly independent from mechanical constraints and designers are supposedly more free to choose, which information said surfaces should embody – with it however comes the task of expressing, what the high-tech product is actually *supposed to do*.

Machines of the mech-tech era convey both their underlying power and functional principle through perceptible processes of combustion, oscillation and also through sheer noise, which translate to the outside of their machine core; while the opposite tendency of high-tech is to create a world of more minimalistic, smaller and orderly shapes. High-tech and electro-tech enable devices to work in quiet and without vibration. The very principle of operation becomes less intrusive and the form of force development is rendered into the background.[43] Operations do not necessarily reveal themselves to human senses and a visualization via the tools of experts is needed. In the case of automobiles, the conflict between high-tech and mech-tech aesthetics is very sharp, because the latter has established itself on the automobile market for years: Authentic machine sound has become a strong emotional argument for sales and marketing.[44] Thus, high-tech cars with electric motors have to artificially create their soundscape, that is, they have to *fake mech-tech*, for both reasons of driving pleasure and road security. A selection of the accentuated high technology takes place, and with it a designed selection of affect.

43 Ibid., p. 57.

44 Werner Pluta, Klang erweckt Emotion. *Golem* (2018), https://www.golem.de/news/sounddesign-wie-vertont-man-ein-geraeuschloses-auto-1802-132809-3.html, access: April 10, 2019, 02:55pm.

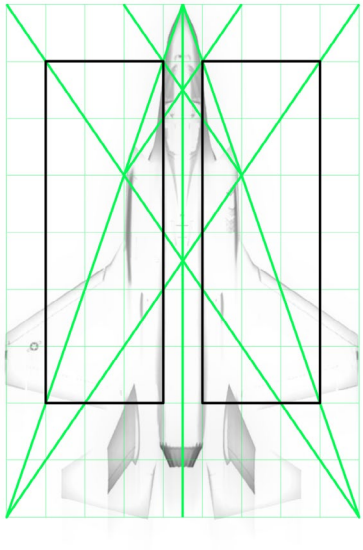


Fig. 7: A supposedly harmonious design of the F-35 Lightning II can also be seen in *Tschichold's golden canon*: Wing edges terminate perfectly with the floor of the content's frame (black). The cockpit terminates with the upper edge. The jet engine itself separates the aircraft neatly into „readable" halves with the spine in place, strongly highlighting the delta shape.

Since the surfaces of high-tech machines are less dependent on their actual function, they can be designed to be either concealing or permeable to their operating principle: The significant inner life of modern cars and airplanes is a software that can be updated or replaced even in crucial aspects, without these changes ever being visible on the outside. The software itself runs on boards that are undifferentiated to the layman. Remaining physical *interfaces*, such as air resistance or a bumpy road, are still noticeable as the rough aspects of mech-tech aesthetics, but they are dampened in perception by the use of quieting technology, electric motors and optimized aerodynamics. The modern car as the modern plane both hide parts of their uncomfortable physical environments from the user, while the comfort gained in this way creates possibilities for reception of new information in virtual interfaces.

If one wants to place the F-35 Lightning II in between these poles of high-tech and mech-tech aesthetics, different aspects can be found: Physical interfaces to the environment and thus remaining mech-tech aesthetics arise during the impressive take-off, in which by combustion the aircraft develops a propulsion and force, that easily exceeds the physical power of man. The interplay between thrust and movement is understood. It is mechanical. However, the fact that this movement ends in the very take-off of an object that weighs up to 30 tons,[45] is what begins to transcend any intuitive comprehensibility of mech-tech aesthetics – an effect that certainly constitutes to the fascination of flying.

Although the pilot is seated right above a noisy, heavy-duty jet engine, he perceives his surroundings mainly through a state-of-the-art augmented reality headset, that provides features from active noise reduction, to visual targeting, weapon cueing, night vision, general flight information and even a virtual view through the floor of the aircraft itself.[46] The mechanical relationships of

45 Royal Australian Air Force, F-35A specifications (2019), https://www.airforce.gov.au/technology/f-35a-specifications, access: April 10, 2019, 03:00pm.

46 Collins Aerospace, F-35 Gen III Helmet Mounted Display System (HMDS) (2019), https://www.rockwellcollins.com/Products-and-Services/Defense/Avionics/Displays-and-Controls/Helmet-Mounted-Displays/F-35-Gen-III-Helmet-Mounted-Display-

the environment, especially noise, are designed out of perception in favour of strategic information. Software and interface are what become elementary to function, but not to physical form. Armament disappears for reasons of stealth and is selected inside of the F-35's body. With this, the F-35 hits the very point of high-tech products identified by Brummet, which are covering both purpose and function behind layers of surfaces.

The hierarchization of surfaces in high-tech machines can have the tendency to *stop* a viewer's gaze at the outermost of the presented surfaces. For this reason, high-tech products can seem to be of easier use, but at the same time be less approachable in their operating principles, than mech-tech products are.[47] Dirk Baecker finds the words:

> *The term black box replaces the term substance and allows to bracket what can be presumed, but need not be understood.*[48]

Generally, products offer their users a purpose: A good design then uses affordances to make certain intended uses and receptions more likely than others. Donald Norman's considerations of human-centered product design imply: Where mech-tech becomes high-tech, where products are no longer explaining themselves, they need a design that does it for them – they evolve for the need of an interface. Human affect in high-tech product development therefore is a targeted and necessary process, to simplify cognition where appropriate. For this, information is selected onto or underneath said surfaces, designed for a simple goal of user perception: "[H]ere is potential danger, there is potential comfort. This is nice, that bad."[49]

High-tech aesthetics according to Brummet[50] would thus be able to stop cognitive processing of an object at the outermost of the presented layers, by giving affordances that do not correspond to neither principle nor purpose. An aesthetic distance to an object's function is established: What is therefore potentially hiding beneath layers of high-tech in the F-35 is the fact, that it is indeed a violent *machine* of war and a very real threat to human lives – all while its design tries to sell it as an *instrument*. A mechanical *plane of war* disguising as a high-tech *fighter jet*. The F-35's initially elaborated surface language suggest, in addition to dynamism and professionalism, a threatening nature whose direction of force is rendered unrecognizable: For the fleeting observer, who is not a potential target, the F-35 can thus only represent a powerful testimony to technology that seems to be directed against nobody and everyone else. This high non-directionality is further underlined by the minimal flagging, dispassionate colouring, the impartial grey, the lack of visible weapon systems and the visual uniformity of modern fighter planes on an international level.

System.aspx, access: April 10, 2019, 03:00pm.

47 Barry Brummet, *Rhetoric of machine aesthetics*, p. 57.

48 Dirk Baecker, *4.0 oder Die Lücke, die der Rechner lässt* (Leipzig 2018), p. 182.

49 Donald A. Norman, Emotion and design: Attractive things work better. *Interactions Magazine* ix (2002), https://jnd.org/emotion_design_attractive_things_work_better/, access: April 10, 2019, 03:05pm.

50 Barry Brummet, *Rhetoric of machine aesthetics.*

Fig. 8: Norway's first F-35 lightning II in October 2015. svarsdepartementet, Kaszynzki, Lockheed Martin, Testflyging av første norske F-35. (2015), https://www.flickr.com/photos/forsvarsdepartementet/22504078631/, access: March 17, 2021, 11:00pm.

Abstraction and a change of perspective

The disappearance of said function under surface can also be found in Italian Futurism around 1930 in the form of Aeropittura,[51] illustrated for example by the cinematic paintings of Tullio Crali. While mostly colourful and aesthetically impressive, both the artist and his work are however closely linked to the ideas behind and the promotion of Mussolini's fascist regime in Italy.[52]

In his paintings, Tullio Crali tries to convey the breath-taking heights, speed and excitement of military flight and (often) aerial dogfight, through the abstraction of speed and conflict, in a geometric visual language. In the notion of futurism, he proclaims progress through high mechanization, considering the airplane "the highest among the machines, that realizes the myth of Icarus, the eternal dream of man-

51 Estorick Collection, Futurist Skies: Italian Aeropainting. Estorick Collection of modern italian art (2015), https://www.estorickcollection.com/exhibitions/futurist-skies-italian-aeropainting, access: March 15, 2021, 06:30pm.

52 Laura Cumming, Tullio Crali: A Futurist Life Review – a Head-on Revelation. *The Guardian* (January 12, 2020), http://www.theguardian.com/artanddesign/2020/jan/12/tullio-crali-a-futurist-life-estorick-collection-review, access: March 15, 2021, 06:30pm.

Fig. 9: Incuneandosi nell'abitato (In tuffo sulla città), 1939, by Tullio Crali (Igalo, 1910 – Milano, 2000); oil on canvas, 130 x 155 cm. Mart, Museo di arte moderna e contemporanea di Trento e Rovereto.

kind".[53] His work *Incuneandosi nell'abitato* (Figure 9) conveys to the viewer this kind of ecstatic dynamism, taking the literal perspective of said *uber*-machine.

The painting could be described as *pleasant,* due to the artist's use of perspective, composition and colour – and in effect it is even called a *masterpiece of futurist art*.[54] Many however can and do not know, what the painting is actually presenting: The work from 1939 does not depict any random airplane, but takes the perspective of a dive bomber in attacking flight for a city. The pilot adopts said *steep perspective* for a vertical nosedive, in order to align his path of flight with the trajectory of his bomb, to hit his target with a high degree of certainty. It is the same moment when the Jericho trumpets of Stuka bombers would be heard. It is only the knowledge about the nosedive for bombing purposes, that can add to the visual surface of the work and

53 Bob Osborn, Tullio Crali – the ultimate Futurist Aeropainter (2012), https://web.archive.org/web/20120216062948/http://www.simultaneita.net/tulliocrali.html, access: April 10, 2019, 03:30pm.

54 Cumming, Tullio Crali.

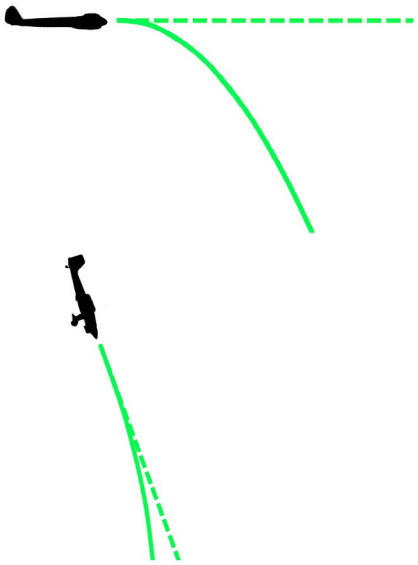


Fig. 10: A Stuka bomber is going to dive, in order to align the trajectory of his path of flight with his bomb. MLWatts, Vergleich des Bombenabwurfs im Horizontalflug und im Sturzflug (2011), https://de.wikipedia.org/w/index.php?title=Sturzkampfflugzeug&oldid=205219671, access: November 5, 2020, 02:05pm.

give back to it part of its dread, which then stays in stark contrasts to the purity of its geometric language – an aesthetic pattern that may also be found in the design of the F-35.

> *The changing perspectives of flight constitute an absolutely new reality, one that has nothing in common with the reality traditionally constituted by earthbound perspectives.*[55]

The constitution of non-earthly reality, a literally lifted perspective, the abstraction to machine, and the vibrant language in the writings and paintings of Aeropittura, were able to create aesthetic distances to the violent and messy realities of the conflict, that would arise as World War II. With its visual qualities it is therefore no coincidence, that the Aeropittura soon finds itself as an actual tool of propaganda for 1940s fascist regimes, promoting military aspirations through abstraction, while glorifying aerial warfare: Machines are depicted, humans are not.[56]

The futurists created these aesthetics facing high technologies of their time, as a response to an industrializing world becoming ever faster and increasingly incomprehensible;[57] conditions that are still prevalent today. As described in the Manifesto dell'aeropittua, modern fighter jets make use of non-earthbound perspectives, and with distinctive design patterns try to cast state-of-the-art images of technological superiority into clear-cut form, in response to accelerationist environments.

The strong silhouettes in both the geometric language of Aeorpittura and the F-35 Lightning II are representative to studies by Woodward, Winter and Jenkings, on the visual depiction of British soldiers in domestic print media, which emphasize:

> *[T]hese silhouettes render this particular conflict timeless; all references to the specifics of time and place are removed. [...] In the case of these photographs of conflict, the war in Afghanistan in these images becomes bloodless.*[58]

55 Estorick Collection, Futurist Skies: Italian Aeropainting.

56 Jonathan Jones, Birds of prey. *The Guardian* (January 5, 2005), https://www.theguardian.com/culture/2005/jan/05/1, access: April 10, 2019, 03:40pm.

57 Jan Drees, Das akzelerationistische Manifest. *Deutschlandfunk* (April 26, 2015), https://www.deutschlandfunk.de/philosophie-das-akzelerationistische-manifest.1184.de.html?dram:article_id=314626, access: April 10, 2019, 03:40pm.

58 Rachel Woodward, Trish Winter, and K. Neil Jenkings, Heroic anxieties: the figure of the British soldier in contemporary print media. *Journal of War & Culture Studies* 2/2 (2009), p. 211–23.

Military use of aesthetics

If any aesthetic affect in the military realm is to be called a strategy, goals and purposes need to be clarified. In particular, a document of the RAND Corporation can be cited, which in 1996 produces recommendations for the future of U.S. air operations on psychological grounds.[59]

The RAND Corporation itself is a U.S. think-tank that was founded in 1948 out of the Douglas Aircraft Company for issues of security policy.[60] As a FFRDC it provides the U.S. Air Force with strategic advice on policy, employment, combat readiness and development of its aerospace forces.[61]

After the U.S. air wars in World War II (1941–1945), Korea (1950–1953), Vietnam (1965–1972) and the Persian Gulf (1991), recommendations are made to the U.S. Air Force based on interviews with prisoners of war. These recommendations are aimed at psychological effects, driven by the idea, to keep conflicts short, or to prevent them in the first place, by ways of technological intimidation – also during times of peace.

For this reason, in addition to recommendations on rhythm and targeting of U.S. air strikes, the technological superiority of U.S. forces is given high emphasis:

> *[M]any Iraqi officers and enlisted personnel suffered from low morale even before the start of the Coalition air campaign. One reason for their low morale was the widespread awareness that U.S. aircraft, tanks, and other weapons were far more capable than their own obsolete military weapons. The Iraqis believed that the technological superiority of the U.S. weapons foreordained Iraq's defeat in any conflict. The Coalition air campaign subsequently strongly reinforced the Iraqi view that resistance was futile.*[62]
>
> *Begin psychological conditioning in peacetime. The Air Force and other U.S: military services have an interest in advertising their capabilities to would-be aggressors. For the Air Forces, much of this advertising will be a natural by-product of fire-power demonstrations, air shows, and peacetime training and deployment exercises. These and other opportunities should be used where appropriate to demonstrate the superior capabilities of technologically advanced U.S. aircraft and weapon systems.*[63]

From this point of view, the development of combat aircraft like the F-35 Lightning II makes considerable sense, as they can communicate technological superiority already by design, and are not limited to costly demonstrations, manoeuvres or even most costly, warfare itself.

The F-35 is thus creating a trust into its function by design: It will work superiorly when necessary and hide its promise of violence when in periphery. This trust in design must however be questioned, in so far as every high-tech design is scruti-

59 Stephen T. Hosmer, *Psychological Effects of U.S. Air Operations in Four Wars, 1941–1991: Lessons for U.S. Commanders* (Santa Monica, CA 1996).

60 Alex Abella, *Soldiers of Reason: The RAND Corporation and the Rise of the American Empire* (Boston 2009)

61 Hosmer, *Psychological Effects of U.S. Air Operations in Four Wars*, p. 3.

62 Ibid., p. 204.

63 Ibid., p. 205.

nized under the assumption of "only pretending to have a surface under which other, hidden surfaces serve completely different interests and functions."[64] It is this conflict between the promises of and mistrust in design, that drives the ongoing debate about the F-35 as a breakdown jet versus wonder weapon: The question of whether the F-35 can fulfil in function what is communicated by surface.

Accordingly, the fighter jet (better: *war* plane) is still seen at air shows to refute any possible suspicion of false design promises. In 2019, the F-35 A Heritage Flight Team under Captain Andrew Olson toured USA and Canada with 17 air shows. He explains:

> *This show is going to solidify the F-35 in its rightful place, just [as] the absolute, cutting-edge stealth fighter jet [that's] here and it's ready and so capable.*[65]

Deliberately or not, the advice of the RAND Corporation on how to communicate technological superiority is here implemented in the medium of air shows. Then lastly, the RAND Corporation advises for the development of explicitly *spectacular* weapons:

> *In preparing for future conflict, the Air Force should seek to develop and acquire sensors and weapons systems that will magnify the potential enemy's perception of American air prowess.*[66]

Closing

The strategies and products described in here attempt to affect their opponents by design. The F-35 Lightning II is a manifestation of this aesthetic military thinking, practicing a form of economical high-tech intimidation. Whether deliberately designed or not, the F-35 is a mega project, that favours existing U.S. policy not limited to but also by the use of aesthetics. Its affect can be examined in two directions:

In the face of an enemy, its design makes it seem an intelligent and precise threat; however with the double-edged question of how much functional fulfilment can actually lie beneath its high-tech surfaces. This ambiguity can either reinforce the feeling of awe to the fighter plane or invite to justified mistrust, to the suspicion of a *high-tech bluff*.

In the second direction, high-tech intimidation can be viewed in relation to those who are not directly involved and who do not have to fear an attack by a stealth aircraft on their person: The F-35 looks professional, clean and orderly. The aesthetic distance to both execution and threat of violence discussed in the Aeropittura comes into effect – for reasons of flight, the shift of perspective, the high degree of displayed power (*Shock*) and the concealing qualities of high-tech (*Awe*): Military bravado is clearly aimed to strike a balance, with civil insouciance.

The question of a goal-driven surface design of the F-35 Lightning II through the hands of any military strategist, can

64 Dirk Baecker, *4.0 oder Die Lücke, die der Rechner lässt*, p. 256.

65 Oriana Pawlyk, F-35 Demo Team Pilot to Debut All-New Moves for 2019 Show Season (2019), https://www.military.com/dodbuzz/2019/03/11/f-35-demo-team-pilot-debut-all-new-moves-2019-show-season.html, access: April 10, 2019, 04:10pm.

66 Hosmer, *Psychological Effects of U.S. Air Operations in Four Wars*, p. 199.

not be answered definitely. The results of this work, however, suggest a common interest of all the engineers, politicians and entrepreneurs involved, to mark the supposed superiority of their product with a fit design, that serves crucial and distinct functions to each of the public, political and military sphere. High-tech intimidation then, seems to be a threat only to those, who are in need to pay attention, while remaining yet another shiny surface to the rest; leading to a very possible answer to Baecker, as he states:

> *The question of the next society is, what threats are capable of ensuring that construction of power, without which politics in the sense of establishing order of whatever kind, is not possible.*[67]

67 Dirk Baecker, *4.0 oder Die Lücke, die der Rechner lässt*, p. 100.

References

Abella, Alex, *Soldiers of Reason: The RAND Corporation and the Rise of the American Empire* (Boston: Mariner Books, 2009).

Air Force Entertainment Liaison Office, Breaking barriers since 1947 (2019), https://www.airforcehollywood.af.mil/, access: April 10, 2019, 01:20pm.

Althaus, Johann, Technikgeschichte: Stukas waren Hitlers mächtigste Waffe im Blitzkrieg. *Welt* (June 25, 2015), https://www.welt.de/geschichte/zweiter-weltkrieg/article143021882/Stukas-waren-Hitlers-maechtigste-Waffe-im-Blitzkrieg.html, access: April 10, 2019, 01:45pm

Artnet, Battaglia sullaeroporto Mitragliere in azione (2020), http://www.artnet.de/künstler/tullio-crali/battaglia-sullaeroporto-mitragliere-in-azione-OwGKY2F1EQWdkeWLS2fDog2, access: November 5, 2020, 02:10pm.

Baecker, Dirk, *4.0 oder Die Lücke, die der Rechner lässt* (Leipzig: Merve, 2018).

Baecker, Markus, Passivradar raubt Stealth-Jets die Tarnkappe. *Der Spiegel* (September 14, 2012), http://www.spiegel.de/wissenschaft/technik/passivradar-nimmt-stealth-jets-die-tarnkappe-a-855711.html, access: April 10, 2019, 02:30pm.

von Borries, Friedrich, *Weltentwerfen: Eine politische Designtheorie*. 2nd ed. (Berlin: Suhrkamp, 2017).

Breitsamter, Christian, Deltaflügel Aerodynamik. Technische Univ. München, http://www.aer.mw.tum.de/fileadmin/tumwaer/www/pdf/lehre/Praktikum-aeroflugzeug/Versuch_05.pdf, access: April 10, 02:30pm.

Brummet, Barry, *Rhetoric of machine aesthetics* (Westport: Praeger, 1999).

Bundesarchiv, Blohm & Voss BV 14. (2020), https://de.wikipedia.org/wiki/Blohm_%26_Voss_BV_141#/media/Datei:Bundesarchiv_Bild_183-B21073,_Aufkl%C3%A4rungsflugzeug_Blohm_-_Vo%C3%9F_BV_141.jpg, access: March 20, 2021, 03:00pm.

Butler, Eugene, Hawker Beechcraft 850XP (2011), https://en.wikipedia.org/wiki/File:Hawker_Beechcraft_850XP,_Private_JP7325778.jpg, access: March 17, 2021: 09:15pm.

Chandra, Sushil, *Aesthetics: Quantification and Deconstruction. A Case Study in Motorcycles* (Singapore: Springer 2018).

Collins Aerospace, F-35 Gen III Helmet Mounted Display System (HMDS) (2019), https://www.rockwellcollins.com/Products-and-Services/Defense/Avionics/Displays-and-Controls/Helmet-Mounted-Displays/F-35-Gen-III-Helmet-Mounted-Display-System.aspx, access: April 10, 2019, 03:00pm.

Cumming, Laura, Tullio Crali: A Futurist Life Review – a Head-on Revelation. *The Guardian* (January 12, 2020), http://www.theguardian.com/artanddesign/2020/jan/12/tullio-crali-a-futurist-life-estorick-collection-review, access: March 15, 2021, 06:30pm.

Demps, Laurenz, and Carl-Ludwig Paeschke, *Flughafen Tempelhof. Die Geschichte einer Legende* (Berlin: Ullstein, 1998).

Dimitriadis, Greg, Fighter Aircraft Design. LIÈGE universitè (2018), http://www.ltas-cm3.ulg.ac.be/AERO0023-1/Conception-AeroFighter.pdf, access: March 17, 2021, 04:10pm.

Drees, Jan, Das akzelerationistische Manifest. *Deutschlandfunk* (2015), https://www.deutschlandfunk.de/philosophie-das-akzelerationistische-manifest.1184.de.html?dram:article_id=314626, access: April 10, 2019, 03:40pm.

Estorick Collection, Futurist Skies: Italian Aeropainting. Estorick Collection of modern italian art (2015), https://www.estorickcollection.com/exhibitions/futurist-skies-italian-aeropainting, access: March 15, 2021, 06:30pm.

Falcon Photography, F-35B Cockpit (2019), https://flic.kr/p/2jbQv5Y, access: March 17, 2020, 06:30pm.

Forsvarsdepartementet, Lockheed Martin, Testflyging av første norske F-35 (2015), https://www.flickr.com/photos/forsvarsdepartementet/22504078631/, access: March 17, 2021, 11:00pm.

Gregory, Jim, *The development of Hollywood's relationship with the military: A guide for filmmakers and military entertainment liaison officers* (University of Southern California, 2008).

Haisty, Brett S., Affordable Stealth. Lockheed Martin Aeronautics (2000), http://www.f22fighter.com/AffordableStealth.pdf, access: April 10, 2019, 02:30pm .

Hedlund, Erik, and Joseph Soeters, Reflections on Swedish Peacekeepers' Self-image and Dilemmas of Peacekeeping. *International Peacekeeping* 17/3 (2010), pp. 408–414.

Hemmerdinger, John, Lockheed Martin's F-35A Joint Strike Fighter has conducted its first live-fire test. *Flight Global* (2013), https://www.flightglobal.com/news/articles/f-35b-launches-air-to-air-missile-in-test-392434/, access: April 10, 2019, 02:40pm.

Hendel, Richard, *On Book Design* (New Haven: Yale University Press, 1998).

Hobbs, Mitchell, Reflections on the reality of the Iraq wars: the demise of Baudrillard's search for truth? *The Australian Sociological Association* (Newcastle 2007).

Hosmer, Stephen T., *Psychological Effects of U.S. Air Operations in Four Wars, 1941-1991: Lessons for U.S. Commanders* (Santa Monica, CA: RAND Corporation, 1996).

Huang, Yi, Xiaodi Xue, Elizabeth Spelke, Lijie Huang, Wenwen Zheng, and Kaiping Peng, The aesthetic preference for symmetry dissociates from early-emerging attention to symmetry. *Scientific Reports* 8/1 (2018), p. 6263.

IBC and Oxford Research Group, *IBC Press Release* 12 (2005), https://www.iraqbodycount.org/analysis/reference/press-releases/12/, access: March 15, 2021, 5:50pm.

Insinna, Valerie, Inside America's Dysfunctional Trillion-Dollar Fighter-Jet Program. *The New York Times* (August 21, 2019), https://www.nytimes.com/2019/08/21/magazine/f35-joint-strike-fighter-program.html, access: March 17, 2021, 07:30pm.

Jones, Jonathan, Birds of prey. *The Guardian* (January 5, 2005), https://www.theguardian.com/culture/2005/jan/05/1, access: April 10, 2019, 03:40pm.

Kramper, Gernot, F-35: Superjet oder teuerster Pannenvogel der Geschichte? *Stern* (July 14, 2016), https://www.stern.de/digital/technik/f-35--superjet-oder-teuerster-pannenvogel-der-geschichte--6949624.html#mg-0_1554633677398, access: April 10, 2019, 01:45pm.

Lockheed Martin Corporation, The Multi-variant, Multirole 5th Generation Fighter (2019), https://www.f35.com/about, access: April 10, 2019, 13:05am.

Meisner, Gary B., and Rafael Aurajo, *The Golden Ratio: The Divine Beauty of Mathematics* (New York: Race Point Publishing, 2018).

Mingle, Katie, Show of Force (2015), https://99percentinvisible.org/episode/show-of-force/, access: April 10, 2019, 01:30pm.

MLWatts, Vergleich des Bombenabwurfs im Horizontalflug und im Sturzflug (2011), https://de.wikipedia.org/w/index.php?title=Sturzkampfflugzeug&oldid=205219671, access: November 5, 2020, 02:05pm.

Museo d'arte moderna e contemporaneo, Rovereto, Tullio Crali 1939 (2020), https://www.centrepompidou-metz.fr/de/tullio-crali-incuneandosi-nellabita-to-tuffo-sulla-citt-1939, access: November 5, 2020, 02:00pm.

Nelson, Jimmy, *Before They Pass Away* (Kempen: teNeues, 2013).

Norman, Donald A., Emotion and design: Attractive things work better. *Interactions Magazine* ix (2002), https://jnd.org/emotion_design_attractive_things_work_better/, access: April 10, 2019, 03:05pm.

Osborn, Bob, Tullio Crali – the ultimate Futurist Aeropainter (2012), https://web.archive.org/web/20120216062948/http://www.simultaneita.net/tulliocrali.html, access: April 10, 2019, 03:30pm.

Osborn, Kris, The Stealth F-35 Uses a "Threat Library" To Wage War. *The National Interest* (October 23, 2018), https://nationalinterest.org/blog/buzz/stealth-f-

35-uses-threat-library-wage-war-heres-what-means-34132, access: April 10, 2019, 02:45pm.

Pawlyk, Oriana, F-35 Demo Team Pilot to Debut All-New Moves for 2019 Show Season (2019), https://www.military.com/dodbuzz/2019/03/11/f-35-demo-team-pilot-debut-all-new-moves-2019-show-season.html, access: April 10, 2019, 04:10pm.

Pluta, Werner, Klang erweckt Emotion. *Golem* (2018), https://www.golem.de/news/sounddesign-wie-vertont-man-ein-geraeuschloses-auto-1802-132809-3.html, access: April 10, 2019, 02:55pm.

Radecki, Alan, Real Men Don't Fly Pink Airplanes (2012), http://vintageairphotos.blogspot.com/2012_01_01_archive.html, access: April 10, 2019, 05:00pm.

Real, Sean, Razzle Dazzle (2012), https://99percentinvisible.org/episode/episode-65-razzle-dazzle/, access: April 10, 2019, 01:30pm .

Reynolds, Garry, *Zen oder die Kunst der Präsentation: mit einfachen Ideen gestalten und präsentieren* (London: Pearson Education, 2008).

Royal Australian Air Force, F-35A specifications (2019), https://www.airforce.gov.au/technology/f-35a-specifications, access: April 10, 2019, 03:00pm.

Ryberg, Eric S., The Influence of Ship Configuration on the Design of the Joint Strike Fighter. Naval Surface Warfare Center Dahlgren Division (2002), https://apps.dtic.mil/dtic/tr/fulltext/u2/a399988.pdf, access: April 10, 2019, 02:30pm.

Santiago, Joely, First F-35 Headed for USAF Service (2011), https://en.wikipedia.org/wiki/File:First_F-35_headed_for_USAF_service.jpg, access: November 5, 2020, 02.15pm.

Sontheimer, Michael, Der Krieg im Reich: "Wir hauen ein Loch hinein." *Der Spiegel* (2004), https://magazin.spiegel.de/EpubDelivery/spiegel/pdf/30300038, access: April 10, 2019, 01:30pm.

Sternad, Daniela, Gestaltungsgrundlagen (2019), http://www.grafixerin.com/bilder/Gestaltungsgesetze.pdf, access: April 10, 2019, 02:30pm.

The Economist, Air power on the cheap. *The Economist* (September 20, 2010), https://www.economist.com/technology-quarterly/2010/09/20/air-power-on-the-cheap, access: April 10, 2019, 01:45pm.

The Economist, Dancing on the grave of the F-22. *The Economist* (July 29, 2009), https://www.economist.com/democracy-in-america/2009/07/22/dancing-on-the-grave-of-the-f-22, access: November 28, 2018, 03:45pm.

The Economist, Getting to grips with military robotics. *The Economist* (January 25, 2018), https://www.economist.com/special-report/2018/01/25/getting-to-grips-with-military-robotics, access: April 10, 2019, 01:45pm.

The Oxford Dictionary of Phrase and Fable, 2nd ed. (Oxford University Press, 2005), http://www.oxfordreference.com/view/10.1093/oi/authority.20110803100502693, access: April 10, 01:30pm.

Wells, H.G., *The War in the Air* (London: George Bell & Sons, 1908).

Whitaker, Brian, Flags in the Dust. *The Guardian* (March 24, 2003), http://www.theguardian.com/world/2003/mar/24/worlddispatch.iraq, access: March 15, 2021, 05:30pm.

Woodward, Rachel, Winter, Trish, and Jenkings, K.Neil, Heroic anxieties: the figure of the British soldier in contemporary print media, *Journal of War & Culture Studies* 2/2 (2009), p. 211–223.

The article "Plant Sonification. Its formations and media-ecological implications" by Katharina Groß was unpublished due to unmarked takeovers from the article "Botanical Rhythms: A Field Guide to Plant Music" by Carlo Patrao.

CONVERSATIONS ON CINEMA AND MEDIA ARCHAEOLOGY

By Thomas Elsaesser and Siegfried Zielinski

In memoriam Thomas Elsaesser (1943–2019)

Suggested citation:
Thomas Elsaesser and Siegfried Zielinski, Conversations on cinema and media archaeology. *Interface Critique* 3 (2021), pp. 227–271.
DOI: https://doi.org/10.11588/ic.2021.3.81311.

Obituary

Siegfried Zielinski,
November 10, 2020, Berlin

Thomas Elsaesser was born in 1943 in Charlottenburg, that part of Berlin from which I am now writing these sentences. It has been an infinite period of eleven COVID months since we last saw each other and were able to talk to each other. The famous Peking University had invited us and honoured us with their first symposium on "Archaeology of Media: Art, Media and Perception" (December 2–3, 2019). The first day of the event was dedicated to our contributions to the field. Each of us gave a lecture in which we were able to present our concept of media archaeological thinking in detail. Afterwards, we were invited to join the podium for dialogue. The hall, located right behind the assembly hall of the university, was packed with about 200 doctoral students and colleagues from various disciplines and was decorated entirely in red and gold. There is room for 5,000 heads.

After the mild and humid Shanghai, where on its West Bund nothing less than the future had been discussed a few days earlier, Beijing felt crispy cold. There was even some snow on the venerable university campus which has the dimensions of a small German town. There are still individual houses on the campus in the traditional Chinese architectural style. The sun was shining, the air was clear, the colours glowed. Thomas had flown through the night and arrived in the morning. A bit tired, with dark edges under his eyes, but as always smiling friendly, in good spirits, full of zest for action. On the plane he had been still working on his lectures, he said, which he wanted to give in Beijing and then in Shanghai. But he was doing well, he said.

Thomas Elsaesser was in China for the first time. Already at noon, between our lectures, he got to know the generous hospitality of our Chinese hosts. We were invited to an extremely sumptuous lunch and were able to meet Professor Hongfeng Tang, our main host from the School of Arts, some of her colleagues and some passionate cineastes and curators at the usual large round table. We were immediately concerned with the topics that were on our minds: film, cinema, the changes that have taken place in recent decades, the opening of cinematic thinking to a larger context of thinking the whole field of media and its interrelations. Thomas was visibly astonished at how intensively his work on the history of film and cinema was studied in China and how well acquainted one was with the paradigm shift towards archaeology of media in which he had played a major role. And he was very pleased that many of his texts were in the process of being translated or were about to be translated – including some translations he was now hearing about for the first time.

The wonderful meal was repeated in the evening in one of the faculty restaurants of Peking University with a slightly different group of people. Once again, we were able to experience and enjoy that dining together in China can be something like an anticipation of the utopia of a society in which individuals are connected with each other – at least for a few hours – in affection and open curiosity. This is the most beautiful side of the *unconditional we* that characterises China's collective subjectivity. Thomas was happy. He even drank one of the light Chinese beers for dinner. In conversation, we extended the afternoon of the symposium, praised the various dishes and their deliciousness and finally discussed the following day before advising the guest of honour to rest and go to sleep soon.

The next day was special for Thomas. In the evening he was supposed to present and discuss his film "Die Sonneninsel." This work had become very important for Thomas in the last years. In 2017 he had completed the documentary film in memory of his family, their origins and their far-reaching relationships, among others with the landscape architect Leberecht Migge, thus also creating a cinematic monument to his father. When we met for breakfast in the morning, he immediately told me about the Super 8 films his father had made during almost 20 years and which are now an essential part of the found-footage material from which he had assembled the film. He was obviously very much looking forward to the special evening of showing and discussing this work in the heart of academic Beijing.

Back at the symposium, Thomas and I were able to listen to the young colleagues from the most diverse disciplines at Peking University and neighbouring faculties, each of whom was seeking their own approach to media archaeology. The level of knowledge about the field was enormous and astounded us. Thomas was able to work well on several levels at the same time and immediately started his electronic mail to organize the next lectures. At the same time, he was wide awake, alert and responded actively to the contributions of our hosts in the discussion.

After a few hours I had to say goodbye to the airport to fly back from Beijing to Frankfurt in the afternoon. Thomas and I embraced each other, I wished him all the best for the next days in Beijing and Shanghai and said that he should take care of himself and not overdo it. He smiled as always with his so sovereign cordiality. When I opened my digital letterbox very early the next morning in Berlin, the shock was incredibly big. Hongfeng Tang asked me in an e-mail that was already a few hours old whether I had contact with Thomas' partner. He had been found collapsed in his room the morning after the screening. A short time later the news came that he could not be reanimated anymore; "Thomas has passed away". It is still incomprehensible.

I am extremely grateful to the editors of *Interface Critique* for printing the last public conversation I had with Thomas Elsaesser.[1] Six years before the meeting in Beijing, we had met for another public dialogue, back then at the Berlin University of the Arts. It was part of a series in which we tried to find out how the media thinking of some German-speaking protagonists from different domains and disciplines had developed.[2] My introduction to the dialogue briefly summarises the working biography of this passionate cineaste and media thinker. But above all, it pays tribute to a great teacher and friend.

1 **Editorial note:** The panel was moderated by Hongfeng Tang. The audience questions delivered in Chinese were simultaneously translated and are not included in this transcription. Thomas Elsaesser and Siegfried Zielinski presented images during their talks which are, however, not published here. We are indebted to Siegfried Zielinski for the wonderful idea to transcribe and publish in our journal this last talk of Thomas Elsaesser as well as for writing its very personal introduction, to Hongfeng Tang for her generous support providing the audio recording and to Mari Matsutoya for taking care of the transcription and editing of the audio recording.

2 The talk has been transcribed and published in *Zur Genealogie des MedienDenkens*, ed. Daniel Irrgang and Florian Hadler (Berlin 2017); for the excerpt translated and published here see pp. 169–171.

Introduction

Siegfried Zielinski introducing Thomas Elsaesser, November 21, 2012, Berlin

Thomas Elsaesseer is a particular figure in the field of humanities of the past half century. As a modern thinker, he is completely in time and appears, at the same time, to be out of time. Possibly, in view of a truly qualified and engaging contemporaneity, as called for by Nietzsche. It requires a sensitivity for luxury to be able to be in the world in an untimely manner. Beyond any doubt, Thomas Elsaesser is a cinema-mad, cosmopolitan, elegant intellectual, of whom there are few with such charisma. Walter Benjamin could well have described him in the *Passagenwerk* if he had been at the Bibliothèque Nationale at a time when he could have met him, yet thirty years lay between their stays at the archival centre of European modernity in Paris.

Thomas Elsaesser is as much at home in Amsterdam as he is in ice-cold Turku or Stockholm, where he holds the Ingmar Bergman Professorship; in New York, in Paris or in London, in short: wherever there is exciting cinema culture, good filmmakers and interesting approaches to an intellectual engagement with film and other medial attractions. Thomas Elsaesser – you may be surprised to hear this from me, but I dare say – is an extremely friendly person. I have never experienced him as disgruntled or even aggressive, although there are many occasions for it in the institutions that have surrounded him for such a long time, and which so often torment us. His work as a film scholar, writer and traveling salesman in matters of advanced film culture is, for him, obviously a source of great pleasure. One can sense that he deems it a privilege to be able to do precisely this work, and he responds to this privilege by doing his work particularly well. This attitude is passed on to his students and doctoral candidates. The greatest gift. When Silvia Wagnermaier, the former research supervisor of the Vilém Flusser Archive, studied with him in Amsterdam, she wrote me in excitement one day that Thomas Elsaesser occasionally served coffee and biscuits in his study centre in Amsterdam to give the master's and doctoral students food for thought and to boost their well-being. For many of you this may sound old-fashioned, but not for me: Thomas Elsaesser is kind in a direct sense of this great word. Many in the field of media thinkers owe him a lot, including myself.

Born in Berlin into the last two years of the war, he went to grammar school in Mannheim, started briefly to study literature in Heidelberg, and then crossed the Channel to England as early as 1963. In the early provincial post-war years this was a big leap, comparable perhaps to the decision of a young person today to study in Shanghai or Mexico City. At the University of Sussex, he studied literature in the roaring sixties, continued to go to the cinema obsessively and wrote his first texts on film.

As a cinephile and a great admirer of the Nouvelle Vague, especially of Godard's

films, he then moved to Paris, the secret capital of all cinema enthusiasts – at least in the 1960s and 1970s – for just under a year. It is only when you have shared the experience of watching, say, "India Song" by Marguerite Duras for a few hours, during an afternoon screening in a sunny July with two or three other crazy people in a cinema in Saint-Germain can you start to understand the special bodily thinking this place evokes in relation to cinema.

Back in England, Thomas Elsaesser founded the magazine *Brighton Film Review* in 1968, later sponsored by the British Film Institute, which then from 1971 appeared as *Monogram*[3] – also in homage to Godard. With this magazine, he essentially cemented his reputation as an excellent connoisseur and critic of classic Hollywood films. In the same year he received his doctorate in comparative literature at the University of Sussex with a thesis on the historians of the French Revolution Jules Michelet and Thomas Carlyle. In the 1970s, together with some cinephile friends, Thomas Elsaesser ensured that the most exciting art of the 20th century would finally be taken seriously in academic educational institutions. In 1976, together with Charles Barr at the University of East Anglia, he founded one of the first independent institutes for film studies in the United Kingdom – I would say in Europe, there were actually not so many of them at the time. With like-minded experimental filmmakers and theorists like Peter Wollen, Ben Brewster, Robin Wood or Edward Buscombe from the British Film Institute, the construction work of an academic culture around film theory that is taken seriously by the humanities began. In my view, the new British cinema of the 1980s can hardly be imagined without this intellectual culture – the cinema of Derek Jarman, for example, of Stephen Frears, of Peter Greenaway and others.

1991 was the year he leapt back across the Channel, but not into the "repellently reunited Germany"[4], as Flusser wrote from Holland, but to Amsterdam. What Elsaesser mastered there fits on the shoulders of several giants. Within a few years, he had turned the Department for Film and Television Studies into one of the most highly regarded institutes in the world. Above all, it was a place for research in film studies with porous borders to media studies which was now emerging elsewhere. Together with Mieke Bahl and others, he founded the Amsterdam School for Cultural Analysis, ASCA for short, which has become one of the most important research institutes in our field worldwide.

From 2000 to 2006 he was head of the doctoral programme "Cinema Europe" and ever since I met him, he has been travelling halfway around the world with fellowships, guest- and honorary professorships. Among other things, he is currently a research fellow at the Bauhaus University in Weimar, which, together with Halle, Leipzig and Jena, is more and more becoming

3 *Brighton Film Review*, magazine by the Film Society at the University of Sussex, later Monogram, 1968 to the end of the 1970's.

4 Vilém Flusser in a letter to his cousin David Flusser dated November 25, 1990. Correspondence in the Vilém Flusser Archive, Letter No. 56; printed in Siegfried Zielinski, *Entwerfen und Entbergen. Aspekte einer Genealogie der Projektion.* International Flusser Lectures (Cologne 2010), p. 4.

the academic elite of the Republic, as it once was. His books include studies on the positioning and self-affirmation of European cinema under the hegemony of Hollywood. With titles like *European Cinema. Face to Face with Hollywood* [5], on the passion for cinema: *Cinephilia. Movies, Love and Memory* [6], on the European avant-garde: *Moving Forward, Looking Back* [7] – as well as books on Fassbinder, Farocki, Fritz Lang or *Filmgeschichte und frühes Kino. Archäologie eines Medienwandels*.[8]

For a start, compare the two cover pages. They belong to books on Thomas Elsaesser. One from 2004 and the other five years later. We won't mention the occasions, but you can probably guess what they were. The cover images are very different. To the left: *Die Spur durch den Spiegel. Der Film in der Kultur der Moderne*.[9] On the right, the book *Mind the Screen*, published five years later with the seductive subtitle, *Media Concepts According to Thomas Elsaesser* [10] – "film" is no longer mentioned here.

Thank you again for coming, dear Thomas …

---

5 Thomas Elsaesser, *European Cinema. Face to Face with Hollywood* (Amsterdam 2005).

6 Marijke de Valck and Malte Hagener, *Cinephilia. Movies, Love and Memory* (Amsterdam 2005).

7 Malte Hagener, *Moving Forward, Looking Back. The European Avant-Garde and the invention of film culture 1919–1939* (Amsterdam 2007).

8 Thomas Elsaesser and Michael Wedel, *Filmgeschichte und frühes Kino. Archäologie eines Medienwandels* (Munich 2002).

9 Malte Hagener, Johann N. Schmidt and Michael Wedel, D*ie Spur durch den Spiegel. Der Film in der Kultur der Moderne* (Berlin 2004).

10 Jaap Kooijman, Patricia Pisters and Wanda Strauven, *Mind the Screen. Media Concepts According to Thomas Elsaesser* (Amsterdam 2008).

Conversation

Thomas Elsaesser and Siegfried Zielinski, December 2, 2019, Beijing

TE: The genealogies and prehistories that have made the invention of cinema possible have focused on four aspects. First, the ancient art of projection, especially the camera obscura. And as you know, this is the principle of a camera obscura, a little hole in the wall, and if the light falls in the right way, you will have an upside-down replication of an image. Second, the history of photography, the light sensitive substances such as here, the very first photograph ever taken by Niépce. And here I dug out a photograph of the boulevard in Temple from 1838. So very early on. Then we have as necessary conditions of cinema, the developments in optics, telescope, lenses, magnifying glasses. And finally, the peculiarities of human perception. When visualizing motion, what used to be called persistence of vision, in other words, if there is a sufficient acceleration to an image with a slit, this is a phénakisticope, then we imagine motion. So that's what is called the persistence of vision.

Historians of the cinematic apparatus – this is something that you're probably familiar with, the so-called apparatus theory from the 1970s – Jean-Louis Baudry and Christian Metz added another aspect as necessary for our understanding of cinema; namely, the monocular representation in perspective, which we inherited from Western art since the 15th and 16th century. And according to this particular theory – apparatus theory – cinema has adopted the famous open window of Leon Battista Alberti by constraining the projected image inside a framed reticle. This is the traditional way in which we've been thinking about cinema. Now it's obvious with the emergence of digitization and digital cinema, that such a reliance on photography, or indeed on projection as a founding genealogy of cinema, is not only problematic but basically impossible to reconstruct.

I became interested in an archaeology of cinema because I wanted to discover other narratives of the origins of the moving image that are not necessarily reliant on photography. Indeed, I got interested in it through a study of early cinema, which is another story. So, as Siegfried was saying earlier, this well predates digitization. Nonetheless, I was interested in other narratives of the origins of the moving image, not necessarily reliant on photography. So in my book, *Film History as Media Archaeology*[11] – which I assume is one of the reasons I'm here today – I tried to rethink the story of the origins of cinema, especially the idea that cinema as we know or imagine it, namely that it tends towards greater and greater realism, and that it is primarily a storytelling medium; that this story is usually thought to be inevitable, that it must tend towards narrative and

11 Thomas Elsaesser, *Film History as Media Archaeology: Tracking Digital Cinema* (Amsterdam 2016).

Photo: Kaiyuan LU

it tends towards realism. And my study of early cinema convinced me that this was a false teleology. That was not how the cinema came about.

So there is a narrative of inevitability – and in this narrative they're all *men* who have helped over the centuries to bring cinema about. Here I give you a brief list of them.

There's Joseph Plateau and his phénakisticope. There is Edward Muybridge with his chrono-photography. There is Étienne-Jules Marey with his *station physiologique*, with his studies of motion and flow. There is the *fusil photographique*, inspired by Jules Janssen. They are all Frenchmen or Belgians. And then of course, in America you have Thomas Edison with the Edison kinetoscope. But you also have a German, Ottomar Anschütz with the electric quick viewer, the *Schnellseher*. You also have Georges Demenÿ, who was a very interesting person because of motion studies. Or you have William K. L. Dickson, who basically did the work that Edison is credited for, until one finally comes to the Lumiere brothers and their cinematograph setup for projection. So this story would assume that all these people, whether they knew it or not, had wittingly or unwittingly been the messengers, the mediators or the tools meant to further this inescapable invention of cinema by the Lumiere brothers.

This cannot be the case, when one studies what these people actually thought they were doing, when you look at the diversity of their inventions and their different apparatusses. And also, when one studies the practical goals that they were pursuing, in other words, all these different histories, and intentionalities and technologies were kind of brought together as if they were simply relay stations on the way to the cinema.

So that was the problem that I felt a long time ago bedevilled the traditional histories of cinema. And you could argue that the main purpose of media of my notion of film history as media archaeology is primarily to do away with the notion of predecessors. And the notion of this inevitable linearity of the history of cinema with another couple of other false teleologies. Usually we say, from chrono-photography to cinematography, or we say, from silent to sound; but if you think of Edison, it was actually the other way around. Edison invented or perfected the phonograph before the kinematograph. And here you see him listening to the phonograph. Now, he looks like somebody who had earphones on his mobile phone. A little bit bigger but there you go. Another false teleology is that we think that the cinema developed from black and white to colour, but we now have ample evidence that early cinema was actually in colour. So that too was a wrong teleology. Or that first you had 2D and then you had 3D, but that means completely forgetting that the 19th century had a very developed stereoscopic technology and also 3D cameras.

Now, the term media archaeology, as you probably already heard this morning, denotes very different things to different practitioners.

Here, for instance, these are three books that remotely but indirectly relate to these changes. I'm promoting a little bit, not so much my own book, but my own series of books that I edited for Amsterdam University Press, and I'm very honoured and proud that Siegfried Zielinski is also one of my authors. So what are these different definitions or explanations for media archaeology.

For instance, Erkki Huhtamo and Jussi Parikka, in their book, *Media Archaeology: Approaches, Applications and Implications*[12] say that media archaeology comes from a discontent with canonized narratives of media culture and media history. And they say that discontent is the clearest common driving tool.

Our friend Siegfried Zielinski in his original book, *Audiovisions*,[13] now thirty years ago, who is indeed one of the first to define media archaeology as an activity, *eine Tätigkeit*, which, and I quote, "probes into the strata of stories that make up the history of the media, and a pragmatic perspective that seeks to dig out secret paths in history, which might help us to find our way into the future." One goes back to the past in order to find a new path to the future.

There is another book by Wolfgang Ernst, who doesn't use the word media archaeology here, but clearly is also very much involved in this recovery activity.

There's Geert Lovink, a Dutch scholar who says that media archaeology is a hermeneutic reading of the new against the grain of the past, rather than the telling of the histories of technologies from past to present. Again, we're all against linearity and against teleologies. For

12 Erkki Huhtamo and Jussi Parikka (eds.), *Media Archaeology: Approaches, Applications and Implications* (Berkeley et al. 2011).

13 Siegfried Zielinski, *Audiovisions: Cinema and Television as Entr'actes in History* (Amsterdam 1999); German edition: *Audiovisionen. Kino und Fernsehen als Zwischenspiele in der Geschichte* (Reinbek/Hamburg 1989).

Laurie Emerson who comes from digital media, media archaeology provides a sobering conceptual friction to the current culture of the new that dominates contemporary thinking.

Well, you see, Parikka argues that, I quote, "media archaeology sees media cultures as sedimented and layered" – that is where the archaeological metaphor comes from a sedimentary layer of fold of time – "and materiality, where the past might be suddenly discovered anew." So we have these different definitions, this notion of layered-ness and sedimentation, but we also have this sense of going back in the past, to discover something that might be useful for the future.

Now, as for myself, I'm less concerned with answering what media archaeology is, and I'm more interested in what I call the symptomatic nature. That's why I call it the media archaeology of symptom, in the sense that I asked "why media archaeology now?", why are we now interested in media archaeology. So I'm inclined to treat media archaeology as a symptom rather than a method, as a placeholder rather than as a research program, as a response to various kinds of crises, rather than a breakthrough innovative discipline. And finally, I worry whether media archaeology is itself an ideology, that is, an ideology of the digital, rather than a way of generating or securing new kinds of knowledge. I suppose this would be the most controversial that I see. There is a particular question that we have to ask ourselves: Why media archaeology now?

But before I go into some of my doubts about it, let me just enumerate or show some of the positive features we have gained by having media archaeology now as an integral part of film history. Media archaeology can highlight a number of tensions and contradictions that are embedded in the cinema as we know it. A shift in attention can resituate or even resolve some of these tensions now within an enlarged context, adding an extended timeframe, and we owe the extended timeframe very much to Siegfried Zielinski's research. One such inherent tension, for instance, is the very setup of the cinematic apparatus in the movie theatre.

Imagine the movie theatre: It stems from the fact that the light emanating from the movie projector extends and scatters over a wide area. It's scattered over a wide area and it fills a given space in varying degrees of density and intensity. However, in order to achieve an image, this scattered light has to be reabsorbed by a black surround and a rectangular frame. So there you go, you have the scattering, and then you have the bringing it back together again. That's one of the tensions that I think are very significant. And of course, it's something that we are much more aware of now that we have images in very different spaces, but I'll come back to that.

Because with screens today often so large that the image actually or potentially exceeds the human field of vision, this constraint inherent in the traditional cinema screen loses its normative status and becomes much more noticeable as a historical convention, intended precise-

ly to hide this contradiction between the scattering and the constraining within a rectangle. Furthermore, such unbounded or unframed images, projected thanks to the technology first developed by anti-aircraft search lights, opens up the possibility of retro-actively returning to a long standing and long forgotten practice amongst the art of projection that appears to have become obsolete with the arrival of cinema. Namely, the practice of phantasmagoria. This was first introduced in the late 18th century after the French Revolution and persisted throughout the 19th century with such masters as Paul Philidor and Etienne-*Gaspard Robertson.* You saw these projections not on a rectangular screen, but scattering and filling the space.

This practice, more complicatedly called "Pepper's Ghost", of bringing ghosts onto the theatrical stage, was once prevalent and popular also amongst writers such as Horace Walpole. In other words, an image like this one here, in *The Castle of Otranto* (1764), is unthinkable without phantasmagoria as a practice that everybody was familiar with, or the German writer Friedrich Schiller, when he wrote *Der Geisterseher*.[14] So, you see, we can actually reconstruct the presence of phantasmagoria through the romantic literature of the 1820s and 1830s. But even more interesting perhaps is that phantasmagoria was very significant for the philosopher Georg Wilhelm Friedrich Hegel: "This is the night, the inner of nature that exists here – pure self. In phantasmagorical presentations it is night on all sides; here a bloody head suddenly surges forward, there another white form abruptly appears before vanishing again. One catches sight of this night when looking into the eye of man – into a night that turns dreadful, it is the night of the world that presents itself here."[15] So Hegel was speculating on the part that is not accessible to rationality and human beings by explicitly referencing phantasmagoria. Or we have here, the early photography that loved to use the stereoscopic slide and superposition, so we can reconstruct the presence of phantasmagoria through other media that reflect that presence indirectly.

We have known all this, but somehow we had assumed that it had become obsolete with the emergence of cinema. However, if we think of it now, we can look at what's happening to images. Especially in the area of fine arts and installations, we see the return of phantasmagoric spectacles, for instance. This is a return to images that fill a space rather than being constrained by a frame. Krzysztof Wodiczko, here in Venice: You probably recognize it, *Pozna? Projection* (2008), a projection onto the clock tower.

Or you have Doug Aitken (*sleepwalkers*, 2007), here projecting in New York on the walls of the Museum of Modern Art, or you have a very famous installation by Anthony McCall, *Line Describing a Cone* (1973).

14 Friedrich Schiller, *Der Geisterseher. Aus den Memoiren des Grafen von O*** (Leipzig 1789).

15 German source: G.W.F. Hegel, Jenaer Realphilosophie, in: *Frühe politische Systeme*, ed. Gerhard Göhler (Frankfurt/Main 1974), pp. 201–289, here 204; source of the translation quoted by Elsaesser unknown.

So in all these cases, the phantasmagoric notion of the image comes back. This is a clear example of how a current practice refers back to a past and where the study of the past gives us some clue to why seeing this return. This is why it's so interesting to speculate about why we are now talking about media archaeology so much. But I also want to bring up another aspect, another tension that is not unknown but often ignored. And this is, how cinema describes itself in the long history of making images mobile and portable, which takes us back to the Renaissance and the secularization of image making, and the establishment of a market for pictures in the way that other goods were manufactured on demand and then marketed as commodities. So the move is from fresco walls – here you have the Scrovegni Chapel in Padua frescos by Giotto di Bondone – to oil painting, and I don't want to make it too simplistic because it had far reaching consequences. But amongst other things, it proves that transitions and transformations are neither linear nor gradual. One simple point to make is that a mobile picture can indeed become a commodity, it can be bought and sold, it can be traded and transported, it can be owned and displayed in ways and in places quite different from a mural commissioned by a monastery, painted on or applied to a church. This process of mobility and portability affected both sides and subject matter. But it also determined the mode of representation and gave a very special meaning to indeed a monocular perspective, because it reinforced the spectator's single point of view, it is anchoring the image.

So here we have the easel, the invention of the easel painting and we also have, on the right-hand side, miniatures. So it anchors, you see. You have to imagine that if you have a great mobility and variability in physical space, it helps to have within the image, a focal point, the singular point of view of monocular perspective. So just as there is a relationship between scattering and framing, I am arguing that there's a relationship between mobility and portability, and monocular perspective as the dominant mode of Western representation since the Renaissance.

Now, it's quite clear that for most of the 20th century it wasn't painting but photography that was the medium that most decisively intensified what you might call economic aspects of image making, and image trading. And it accelerated this mobility of images as well as the exchange between mechanical images and mass-produced objects and commodities. My favourite postcards are of a very famous scene from Jean-Luc Godard's *Les Carabiniers* (1963), where the two main characters go to war. And then their women say, what have you brought us back, and they bring back these postcards and say, "Look at all the buildings we now own." So it actually makes the point that I'm making now very explicitly in *Les Carabiniers*. And here, the image is André Malraux with his *Musée Imaginaire*,[16] his imaginary museum where

16 Cf. particularly Malraux's first edition of the publication *Le Musée Imaginaire*, published in 1947 as first part of his *Psychologie*

all the art of the world was actually put on photographs. It also illustrates this notion of the exchange between objects and images.

So, I do have another question: Why did the moving image rely so heavily on photography, when electronic image making or an image transfer was already so close technologically, and so speculatively fantasized. And again, my inspiration here is Siegfried Zielinski, who has expressed some substantial doubts about a history of media that pays too much attention to cinema, and not enough attention to the prehistory of television, for instance.

The cinema as a photographic medium, but also as a projection medium was able to inherit and to exploit two traditions: that of wall paintings and murals because of the size, and that of miniatures and oil paintings. Here you have one of those miniatures with a close up. We have the intention to have the size, the scale if you like. But you also have the attention to detail of the close up that comes from miniature. And later the photograph.

So the cinema, my argument is, was not solely an extension of the novel, i.e. a narrative medium. But it was also the solution to what you might call a socio-economic problem when we think of it in terms of mobility, tradability and exchangeability. This would already be a parallel history of the cinema, or a genealogy of the cinema that has nothing to do with narrative. But it has to do with inherent contradictions of image making, portability, transportability, scale, and so on.

Yet while getting the best of all possible image worlds, cinema also embedded another tension in its *dispositif*, so that the different parameters are fixed spectator and mobile image of the focus gaze, and the wondering eye had to be renegotiated and played off against each other. For instance, a video installation artist, like Bill Viola can, as it were, rediscover the religious drama of the triptych, or the altarpiece of a gothic cathedral, or indeed reinvent the Scrovegni Chapel in his *Going Forth by Day* (2002) for his films and installations. This is how it looked at the Guggenheim Museum in New York when I visited it.

By a paradox that perhaps only the media archaeologists can fully appreciate, contemporary art in galleries and museums is rediscovering the unique value of location and site specificity. In other words, it reduces mobility and portability, both in terms of scale but also by using the museum as its site-specific location. In the Renaissance artists sacrificed that particular located-ness and site-specificity in order to create a market for their images. And what we have is on the one hand, patrons, churches or museums – because the museums act as patrons – and site specificity versus, on the other hand, market and mobility. These are not, as it were, linear developments, but constituent transhistorical variables. You can have either mobility and markets or you can have patrons and site specificity. So the function of images can now be seen as varying between these different parameters.

de l'Art (Gent 1947) and, revised, as first part of the three volume publication *Les Voix du Silence* (Paris 1951).

Now, I take this idea of the increased mobility and circulation argument from another Frenchman, Guy Debord and his *Society of the Spectacle*[17] where he argues this point, but there's also somebody else who might value this very much and who has done a similar job in relativizing and historicizing Renaissance perspective and that is John Berger in his book, *Ways of Seeing*.[18]

What this means for a genealogy of cinema is that the circulation and mobility of images in the form of framed pictures turns them into physical objects, while the material objects depicted become immaterial representations. A move, which in art history is often connected with Dutch still life painting.

These pictures here, of the 1660s to the 1690s, where food and precious objects are arranged and displayed in the way that shop windows were to exhibit luxury goods in the grand department stores on the boulevard of Paris or in New York's Park Avenue: There is now a connection between Dutch still life from the 17th century and 20th century shop window display. And indeed, there are many historians of American cinema who have shown a close connection between shop window display and the cinema and fashion. These are some of the cross-disciplinary threads that media archaeology can highlight. Across a 200year gap, cinema around 1900 took up this Dutch art of what we might call trends substantiation, remediating it from painting, photography and the shop window to film, tableau and moving image.

Indeed, as I was saying, cinema is therefore not only a storytelling medium, but functions as a mediator that prepares and reshapes the physical world as image and picture, as image and spectacle, in a process that is only intensified and accelerated throughout the 20th century. And it led a political filmmaker, Harun Farocki, to concede that even his kind of critical documentary cinema was in fact contributing to what he called "making the world superfluous."[19]

Think of that. As images absorbed and consumed the real in the very act of pretending to represent the real… This is one of the things where the more the documentaries discover parts of the world, the more they devalue that which they represent. Again, another paradox that has to do with what moving images, what the cinema does to the world and in the world.

Now, in this narrative that I've just sketched, from fresco wall and mural to oil painting, from easel painting to the studio to the impressionists, the two things that you need to learn about impressionist painting is the mobile easel and paint in an aluminium tube. Only then could you take the easel outside and actually paint a fresco. And in that sense, you have to connect that particular mobility to indeed, the cinematograph, which is a mobile camera as opposed to

17 Guy Debord, *La société du Spectacle* (Paris 1967).

18 John Berger, *Ways of Seeing* (London 1972).

19 Cf. Thomas Elsaesser, Making The World Superfluous: An Interview With Harun Farocki, in: *Harun Farocki. Working the Sightlines*, ed. Thomas Elsaesser (Amsterdam 2004), pp. 177–190.

Edison's Black Maria, which was stationary. So, again, mobility is an important factor. And indeed, as we now know, the impressionists very often used photographs as the basis of their drawings and paintings. So, again, we have this intermingling of histories and technologies. Art history is kept separate, but also cinema history is kept separate, so we really need to bring these into communication with each other.

However, insofar as we persist in associating cinema with this Renaissance model of perception and argue that the single point of view reinforces both bourgeois individualism and a strict object-subject division, we have little choice but to declare the cinema to be based on an unresolved contradiction, which was predestined to make it obsolete with the digital. Now the reason often given for this obsolescence is that our contemporary media landscape – multiple screens both big and small, indoors and out in the open – and our contemporary media use – watching movies on our smartphones, using YouTube or Vimeo or Netflix – encourages us, indeed obliges us to adopt multiple points of view, multi-tasking, being flexible both in our object relations and in our subjectivities. However, the benefit of this is that we can now see how this double geometry of linear narrative and monocular perspective can now clearly be seen as an arbitrary constraint, rather than as a necessity and inevitability. This is because other modes of interacting with moving images have become so readily available and have found so little resistance in becoming commonplace and habitual.

Now, if we are looking at alternative genealogies of audio-visual media, we must ask ourselves: What did the 19th century actually fantasize? And how did it imagine the technologies of the 20th century? And this is where I draw very much on Siegfried's work. Television, telegraphy, telephony, two-way sound and image communication and mobile devices – not cinema.

The fundamental fact is that the mid to late 19th century was not waiting for cinema. We actually have to explain why cinema was really hinted at before. You have people talking about the telegraph as the Victorian internet. You may say that is a kind of anachronism, but it actually points out this particular conjunction of a 19th century technology and its reinvention as it were, in our own time. Or we have, and this [picture] I actually take from Siegfried's book, the way that tele-transmission was imagined. And interestingly enough, the image that is being transmitted through wires is the Mona Lisa, in other words, *the* canonical art historical image.

But if you look at fantasies of the of the late 19th century, how it saw the 20th century would develop, you always have in the domestic sphere, a combination of the telephone and image projection.

In the year 2000, and here [an image], again, talking to somebody far away. And here, again, an image from Siegfried's book. The portability of – at that time it was the Walkman – the mobile phone hadn't yet been, or at least the iPhone had not been invented.

And this is the picture that we all love, which is from the 1870s and it looks exactly like Skype.

So that is what the 1870s were actually dreaming of, or imagining they had a very good idea of it. And all of this skips the cinema altogether. It goes straight from these telephone and telegraph based technologies to what we would now call the Internet, Skype and mobile communication.

But I want to open up another – avenue – if you like, where I refer myself more specifically to an alternative genealogy right within film studies as we know it, at least as I know it. And this is where I come back to André Bazin. For instance, in what might seem to be a counterintuitive and even counter-factual move, one can enlist André Bazin who is the father of film studies for many of us, and who is usually thought of as the champion of the ontology of the photographic image. His most famous article, "The Ontology of the Photographic Image"[20], is also the basis of the cinema.

I think we can enlist Bazin also as an eminent media archaeologist of cinema, for whom photography was only one possible physical and ontological support. As recent scholarship on Bazin has shown there are many more Bazins and one of them has always proposed a plausible argument for cinema as part of a very long history of human preoccupation with death and mortality under the dual heading of preservation and afterlife. Cinema for Bazin belongs to the same spiritual urge, fed by the same anxiety and dread out of which humans have wanted to preserve the dead by mummifying them. Or indeed by the Turin Shroud. He reminds his readers of the Turin Shroud and insists on the cinema's role as being a trace and an index in the way that plaster cast and death masks preceded photography, and at the same time, were continued by photography. So he viewed photography, not as a representational medium, but as a preservational medium, which opens up the whole issue of memory and the peculiarity of the half dead and half alive status of photography. And indeed you might say that the cast uses the same positive and negative reversal in order to preserve the uncanny likeness of human beings after death, fixing their faces and expressions as if they were alive.

Defined in this way, cinema is both very ancient and very modern. And so as long as human beings fear death and wish for an afterlife that is both immanent and tangible, cinema or a form of cinema may well persist and survive.

If we consider Bazin's film history as media archaeology, as indeed I do, it makes room for a genealogy that embeds the cinema in a history of opacity rather than transparency of material objects, like an envelope or a cast, rather than identifying it solely with a view to be contemplated, or indeed, the window on the world, which is how we usually see Bazin, the realist and phenomenologist.

For Bazin, these alternatives do not preclude each other but exist side by

20 André Bazin, The Ontology of the Photographic Image. *Film Quarterly* 13/4 (1960), pp. 4–9; translation by Hugh Gray of the first chapter of vol. 1 of Bazin's selected writings, *Qu'est-ce que le cinéma ? 1. Ontologie et Langage* (Paris 1958).

side. Similarly, I believe it should be possible to develop a media archaeological account from which analogue cinema and digital cinema can be seen as equally valid, but different ways of understanding both the material basis of cinema and its different manifestations over time. So these apparent returns that we see today, the return of what I call site-specificity, or the return of 3D in Hollywood films like *Avatar* (2009) and *Life of Pi* (2012), or the return of phantasmagoria as gallery installations, need not be plotted on a chronological timeline, and therefore need not be seen as returns at all. Instead, they are merely ever-present resources that filmmakers and artists are able to deploy as options and possibilities. Or indeed, they can be seen as solutions, solutions to problems which we may not yet even have properly formulated. I always liked this idea of thinking about developments as possible solutions to problems, as I said earlier.

Now I want to offer a particular way of getting into this. But I'm also aware that time is short so I'll try and make this as quick as I can. Because what I want to suggest is that there are two types of optics.

Another way of plotting an alternative genealogy is to start with the nature of light itself. It's propagation through space, it's absorption by physical bodies and its perception by an essential subject, i.e. a human being. And this other media archaeological trajectory would actually take us to a Dutchman, Christiaan Huygens, who lives from 1629 to 1695 and who was indeed the first one to sketch a magic lantern. But he was also the one who had not only the particle theory of light, but also the wave theory of light in mind, at a time when Isaac Newton was defending the particle theory of light and geometrical optics. The Newtonian way would be the geometrical optics that we inherited with monocular perspectives and so on, but Huygens now stands for me for physiological optics.

So this would be the alternative. And I want to show very briefly why I think this physiological optics is important because it was taken up by somebody that some of you may know, namely by Jonathan Crary in *Techniques of the Observer*.[21] Crary gives us a media archaeological account of the 19th century. He is an art historian relying quite heavily on Michel Foucault as indeed I do as well, and what he has done is to document the diversity and heterogeneity of visual culture in the 19th century.

Crary not only compares scientists' accounts of perception with artist experiments with different ways of seeing. He also rediscovers pre-cinematic devices such as the phénakisticope or the handheld stereoscope. As popular pastimes were once found in almost every bourgeois home in France, Britain and Germany, for him it were these domestic toys that held the key to this alternative way of thinking about optics as non-geometrical.

So Crary's rehabilitation of physiological optics as having existed throughout

21 Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, MA 1990).

the 19th century alongside geometrical optics constitute a first step also in understanding how and why in contemporary cinema, and indeed in contemporary studies, there is now a strong tendency to think of spectatorship once more in terms of embodied perception – that is, immersivity, interactivity, tactility and other ways of signalling haptic qualities of the image.

However, while most film theorists proposing such a turn towards embodiment and affect support their case either with a return to phenomenology – Merleau-Ponty – or by applying theories developing the cognitive sciences – for instance, Antonio Damasio is often quoted – my media archaeological argument would derive such a notion of embodiment both from the contrasting, complimentary and still debated theories of optics, which first divided the minds in the 17th century – Newton versus Huygens – precisely when the Magic Lantern became a popular source of entertainment. And indeed, from the evidence introduced by Crary, that embodied perception in the form of physiological optics was the dominant mode for much of the visual culture of the 19th century. So we come to the same point, the interest in embodiment today, but deriving it quite differently in one place by relying or reinventing or reworking philosophy. But obviously, I'm interested in a media archaeological perspective coming to a similar point.

Once monocular perspective is no longer the default value of our ways of seeing or modes of representation, we discover evidence which suggests that in the history of visual media there have been vision machines, optical toys, and para-cinematic devices that are either explicitly based or implicitly acknowledged as physiological optics as opposed to geometrical optics. Now, one of the people that Crary brings into the debate is Hermann von Helmholtz, who does indeed emerge as a key figure. Helmholtz is the author of foundational *Treatise on Physiological Optics*, he calls it the *Handbuch der Physiologischen Optik*, from 1867,[22] as well as a physiological study of music, *Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik* from 1863.[23] Helmholtz was also a crucial figure, along with James Clerk Maxwell, Michael Faraday and Heinrich Hertz, in analysing electromagnetism, and thus in laying not only some of the groundwork that harnessed electricity for the generation of energy as both labour and light but that also harnessed electricity for electronics. That is a completely different way of using electricity in the form of circuits, switches and relays and as the basis of signal processing and information processing as well as radio and telecommunication. So, in other words, Helmholtz is also one of those key figures that lead us both into electricity as generating light and energy and electricity as circuit breaks and even, computing.

22 Hermann von Helmholtz, *Handbuch der Physiologischen Optik* (Leipzig 1867).

23 Hermann von Helmholtz, *Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik* (Braunschweig 1863).

This is an extremely interesting way of talking about analogue and digital now, though using different terms of geometrical optics and physiological optics, but again, through two ways of understanding electromagnetic fields. Indeed, if we go back to German cinema in the 1920s, we have the beginnings of thinking about the cinema again not in terms of realism, but in terms of light modulation. So here you have Walter Ruttmann's optical wave.[24] I could have brought Moholy-Nagy and his *Lichtspiel* (1930), but even films of German Expressionism, let's say *Der Golem* (1920), you can see how this image, if you think of it in terms of intensities of frequencies of energy, becomes much more interesting than when you simply see it. If you read it optically, you read it as distortion and Cubism, but if you think of it in terms of physiological optics, you can actually reinterpret German Expressionism through physiological optics and then have that connection with Helmholtz and his other history.

But if we go to present day cinema, if you think of the blockbuster films that Hollywood turns out, you also find that these films increasingly depart from the frame view, and give the viewer neither a fixed horizon, nor images on a human scale. Think of films like *Gravity* (2013), or *Avatar*, or *Life of Pi*, or *The Revenant* (2015).

Deep space, the Earth's oceans or other planets are merely the narrative pretext for altering our spatial coordinates in order to recalibrate perception and disorient vision. As it happens, on the flight from Amsterdam to Beijing this morning, I watched *Ad Astra* (2019). It's a terrible story, but it does actually disorient you all the time in terms of where are you in relation to the image. It's a classic father and son story, totally Oedipal, which is simply the architecture to hang these extraordinary images on. Even on the smallest screen in an airplane, you can see the disorienting effect. Never mind if you see it on a big screen like IMAX or in 3D. Disorienting our vision is one of the ways that Hollywood functions.

At the micro level, a similar tendency operates inversely. The image comes too close both visually and viscerally for the viewer to gauge scale or to keep a distance. GoPro cameras as used in certain documentaries, for instance. There was this film called *Leviathan* (2012) about deep sea fishing, where you were so very close to the fish that you, I would say, never want to eat a fish again. They reinforce and exploit these possibilities of putting us in spaces where we do not know how to calibrate our own perception. The digital image allows for these possibilities, conveying tactile sensations and emphasizing haptic qualities and thereby making the image appeal to the sensorial register of touch and the sensitivity of skin. But my main point is, this has not in itself anything specific about the digital because it's been with us since the 19th century and even before. So that's the lesson of media archaeology.

With my brief examples of geomet-

24 Cf. Elsaesser, *Film History as Media Archaeology* – chapter 4: The Optical Wave. Walter Ruttmann in 1929: Tracking Digital Cinema.

rical optics and physiological optics as being two sides of the phenomena of light where both optics feed into what is known as cinema, I wanted to show how a binary divide between analogue and digital might be overcome by enlarging the context, by extending the horizon, and especially extending the timeframe. However, it does not dissipate the fundamental ambivalence that I feel hovers over media archaeology, of either fetishizing obsolescence or opening the door to a more utopian future. But it gives this ambivalence a sort of placeholder. That's why I call media archaeology a placeholder, a placeholder in the space of the human.

As a discourse, I think that media archaeology is the ideology of the digital. Without the digital, we wouldn't be talking about media archaeology and yet, if we think about media archaeology, it can do without the digital. It's one of those paradoxes that I'm trying to highlight.

But I would also say, media archaeology resists the digital by saying, we mustn't always think of the new and forget what's been before. So it is both a function of the digital and it resists the digital. That's why we have to be careful that media archaeology doesn't turn out to be the disease to that which it hopes to be the cure, deconstructing and reconstructing the human after the digital and through the technological. I think media archaeology is fundamentally humanist, but in an environment that is primarily or is now posthuman.

We seem to have come full circle, digital cinema revives and reinstates 19th century physiological optics harking back to these phantasmagorias, but it also brings us back to panoramas – this is from Edward Muybridge, his *Panorama of San Francisco [from California Street Hill]* (1878) – or to dioramas; IMAX screens are really just ways of technologizing dioramas, creating perceptions that augment or add reality to the world rather than represent or reflect the realities of the world.

Emulated by the cinematograph, the optics of the camera obscura led to cinema with the exception of a very brief period of early cinema. You see, in early cinema, you have something like *The Big Swallow* by James Williamson from 1902, which swallowed up not just a cameraman, but the entire epistemology of geometrical optics. That was already the emblem of haptic optics from the cinema, but the cinema diverged in another direction.

If the cinema's digital reincarnation seeks to undo all this by once more giving the spectator both body and sight and the image both volume and site – site-specificity – it is helpful to remind oneself that we are dealing not with antagonistic or incompatible systems, but with dual manifestations of light itself complemented by the genealogies of imprint and trace of indexing signals.

On the other hand, the cinema's purported obsolescence initially debated around the nature of indexicality of photographic and post-photographic media, but now put in the wider context of instantaneity, interactivity and simultaneity by a media archaeology focus on

television and the electronic media also means that the cinema has attained a new kind of freedom. The freedom from primarily ideological tasks. I call it in the book its indifferences, its inoperativeness, its uselessness. The obsolescence brings with it the uselessness. Now to this uselessness or this obsolescence can be assigned a different value. This value dovetails with the moving image's increasing importance for museums and galleries. Given that one of the traditional conditions of an object of practice for entering the art space is indeed its disinterestedness, its uselessness, its autonomy. Its freedom from practical uses, and its independence from instrumentalization. So the post-photographic obsolescence of a certain idea of cinema thus converges with a newly acquired status of art. At least within the definitions of the conventionally formulated. This is a sign outside of my home in Amsterdam, "everything is fucking art." So this shows that there's a new way of thinking, but here is the catch: The extension of our spatially configured visual and aural environment, such as we experience it in the data rich augmented realities, is also symptomatic of the rise of the surveillance paradigm, which is emblematic with Facebook acquiring Oculus Rift and Zuckerberg striding past people with goggles on their heads. This surveillance paradigm taking its widest sense is materially affecting our understanding and engagement with images and visual information, both offline and online. In either case, to see is now to be seen, and to act is now to be tracked.

Contemporary cinema, insofar as it participates in this hybridity of visualization, of virtualization and action, plays a duplicitous role when it cognitively and bodily seems to empower the user and spectator, hence this interesting embodiment. It also increasingly releases us from responsibility in the consequences for our actions, which is an ethical challenge we're only beginning to become aware of.

And I would say that images are now no longer considered by our culture as views i.e., as something to be looked at or contemplated, but act more like cues – instructions for action, not to be looked at, but to be clicked on. This is where operational images come from and Vilém Flusser's ideas about images.

However, we should remember what the gain and the loss are in this particular example, because they reverse something that Renaissance perspective accomplished. Namely, it banished the magic powers of images to act and be acted upon, which the Christian religion made ample use of in murals, and frescoes. When the magic of the painted saints, the magic to heal, to console, to intercede and to protect, was a function of that fixture to an actual site, as indeed murals and frescoes and monasteries and churches were. But what is now being instrumentalized is a different kind of agency in images, perhaps known as magical in their effects of viral proliferation of shock and horror. So I'm arguing that we now have a new kind of agency given to images, when we no longer contemplate them, but use them as instructions for action. – Thank you very much.

Question: I think this question may be applicable for Professor Elsaesser, because we know that media archaeology and new film history match together fruitfully. There are many books that have been published in this field and you did a lot of studies on the very early stage of films, and on the other end, recent studies up to the very present. So my question is, what will media archaeology do? And what can media archaeology bring to the middle part of film history? The middle part being the classical history of film. Professors like you or like Tom Gunning, who was in Beijing just a few days ago, talk about the very early period, or the very present.

What do you think of addressing the middle part of the classical history?

TE: Yes, that's a very interesting point. It's true that I came to media archaeology through the study of early cinema. And indeed, the book that I published in the 90s called *Early Cinema: Space, Frame Narrative*[25] was the book in which Tom Gunning's article on "The Cinema of Attraction" was first brought to a wider public. So I was very much involved in the rediscovery of early cinema and I also wrote in the same year as Tom Gunning wrote "The Cinema of Attraction" an article called "The New Film History"[26], where I was actually arguing that we need to expand what counts as historical factors in the history of cinema. At that point, in fact, in that book on early cinema, that's the first time I used the word media archaeology, in 1990, which I took from Siegfried. Now the interesting thing is that I've always looked to Siegfried's work as the counterpart and may even have exaggerated its difference. You know, his first book was on the video recorder, and television, he was very instrumental in the history of television. So he functions for me as somebody who reminds me precisely of this point, that the 19th century was not waiting for the cinema and that we have to explain the very existence of cinema.

And that is already, if you like, a media historical move, to say: Why did something not happen? Or why did something happen when it did happen? You see, this is getting us close to what some people might say is counterfactual history. As it happens, I'm very interested in counterfactual history. That is the things that could have happened and didn't happen, or what would be an alternative to it. Now, as far as classical Hollywood is concerned, you're quite right. There, it's much more difficult to think about how to deconstruct that because not only is it such a consistent practice over such a long time, but you have such powerful defenders of classical cinema as David Bordwell and Kristin Thompson. But if I were to do that, I would go to what I was suggesting, namely, the relationship between classical Hollywood or the Hollywood studio system, and the fashion industry, or department stores, or gramophone music. Whereas for somebody

25 Thomas Elsaesser (ed.), *Early Cinema: Space, Frame, Narrative* (London 1990).

26 Thomas Elsaesser, The New Film History. *Sight and Sound* 35/4, pp. 246–252.

like Bordwell, perhaps the western or the thriller are the important genres. If you were to do a media archaeological rewriting of classical Hollywood, it would be the musical for instance; if you look at Busby Berkeley musicals, they have come from a different world. If you look at Fred Astaire, at Ginger Rogers dance, you come to something else. People are now rewriting classical Hollywood in relation to its representation of racial minorities, or different sexual preferences. So those would be ways of deconstructing that normativity of classical Hollywood. I myself was very much involved in a slight deviation of this, with my interest in *film noir* and the importance of *émigrés* from Germany in bringing German Expressionism into American cinema, or in the melodrama, when I first wrote my piece on melodrama in the 70s, that was as a deviant genre and not as a mainstream genre. So you see that I've always been trying to look at the margins of a particular practice rather than at its normative centre.

SZ: I would like to discuss with Thomas something which is not so easy to express at the beginning. I think that we share a deep passion. That's the first thing. We share a passion for something which some people simply call cinema or other people call film. But the passion we have in this obscure object of desire is, in my opinion, much wider than just the lifespan of 100 years of cinema, for example, or just the lifespan of a specific genre of cinema, or a specific sort, *Gattung*, or even a specific fashion within the history of cinema. The passion is broader.

I can formulate it for myself, and I've tried to explain it a little bit this morning, but I would like to ask Thomas also to formulate it. For me, it's very much this interrelation between art, science and technology, what interests me. Tthis is what I grew up with at the Technical University of Berlin. And after decades of doing history and archaeology of media, it became clear for me, this is the tension I'm really interested in, and of course, this triangle, this tension has a deep-time history. This led me to a lot of questions regarding deep-time. And as far as I know, in Thomas' work and his books, and in his thinking, this murmur of something which is much bigger than the cinema, much bigger than film is also very present. I would like to ask you, as a start, if you would like to say something about this passion which motivated you to work so madly for decades and write so many books and so many essays and teach so many students. That is a strong energy.

TE: Yes, it's slightly different from what you were saying. And I suppose the technical side, the scientific side is less pronounced in my case, although my father was an electrical engineer, so a lot of that part of it, the apparatic side, the *bricoleur* and so on, was very prominent. And if you come to [the screening of] my film tomorrow evening, you will see that history. I don't want to pre-empt that part of my own biography. But in actual fact, my coming to the cinema is rather different insofar as I come from literature. My doctorate is in 19th century literature and

historiography. So I've always been very interested in history. But it had for many, many years a literary bias. The day before yesterday, I was giving a talk in Frankfurt in Germany, about how I participated in the May '68 events in France, and how strongly I was attached to the theories of *Cahiers du Cinéma* in the 1950s.

And that was very strongly based on *auteurs* of Hollywood. I was born in the last years of the war and I was brought up in the American zone of Germany, so I grew up with Americans right next to me. And so, the passion, but also the ambivalence has to do with America. What America represents for Germany, after '45, what America represents in the 20th century, what Hollywood represents. So through all these years, I keep coming back to Hollywood. It doesn't let me go, even though politically I was very militant in '68. I was a member of the French Communist Party for a year. So that kind of sort of what you call the passion for me is a vital contradiction. It was the contradiction of my political views, and my love-hate relationship with America and Hollywood, that was a driving force and still is a very strong driving force. Now, as far as my cinephile predilections are concerned, they almost go by decades. In the 1960s it was Jean Luc Godard. Every film of Godard was a new discovery, was a new way of thinking about cinema and was a way of fighting with…

SZ: Godard also has this ambivalent relation…

TE: Exactly! But in the 1970s, it was Rainer Werner Fassbinder that I followed religiously and I actually wrote a book about his work. He was deviant. He was also fascinated by Hollywood, but he was deviant in relation to Hollywood, he was deviant in relation to heterosexuality and heteronormativity, was deviant in relation to images of Germany, and so on and so forth. So he was a rebel as well, but again conflicted in much the same ways that I felt conflicted.

And in the 1980s, it was Harun Farocki. Now, you cannot imagine two more opposing figures as Fassbinder and Farocki, and yet that whole sense of media archaeology, my work on early cinema, was accompanied by Farocki's films. He was the filmmaker of media archaeology, before I had even fully articulated, theorized and verbalized it.

And in the 1990s, it's actually Lars von Trier who, for me, was the key figure of cinema. So I've had somebody almost every decade, a figure, a filmmaker, a thinker, a controversial figure that guided me in some way. I think that's where I would locate the persistence. I mean, I have published a book called *The Persistence of Hollywood*,[27] which really means the persistence of this contradiction. And I think that is symptomatic of the 20th century, at least for my generation. So for me, media archaeology is also ridden with contradictions, tensions which I've tried to explain a little bit in my talk today.

27 Thomas Elsaesser, *The Persistence of Hollywood* (New York 2012).

SZ: If I may continue with that a little bit. I think that something is driving your ideas, which leads us, perhaps, into a potential space beyond cinema into a future where all these things which have been so attractive for you might continue but also may not continue. They might be there in a different way. And your interest in the archaeological approach might correspond with that. You talked about the counterfactual, the anarchistic value of cinema – it's so difficult to really grasp it, it will always slip away when you are trying to define it, and so on. And this is also relevant for that which we can imagine for the future, but at the same time, of course, we don't want to lose it. We don't want to give it up only because the technological circumstances are changing, or the cultural circumstances are changing. Because people now prefer to be on their own with their little machinery, and don't like to be together with others anymore in a public situation.

TE: I think I do both. In a peculiar way, cinema has not disappeared as a social space. In fact, cinema for most people has always been going to the movies. It wasn't, "I'm going to see a John Ford film tonight", it was going to the movies, it was always an experience. And so what we're recovering and maybe, here, we academics, we people coming from literature, made a bit of a mistake. We thought of films as texts that needed to be deciphered. Moviegoers have always thought of films as events and experiences. And we're now recovering that event and experience dimension as opposed to the text and reading. And at the same time, there is also this question, and this is the one that I've been talking about in my mobility argument, whether Hollywood was in the business of product or of service. I think much of Hollywood was actually a service industry, providing comfortable seats, warm spaces, big feelings, these are all services and not products. Until the videotape and then the DVD, you couldn't physically own a copy of a film. I'm old enough to remember that I had to travel sometimes twenty, thirty, fifty miles to see a film that was only shown one evening, somewhere in a London flea pit cinema out in the outskirts. Now, you can click on YouTube and you have the same film five times in different versions. So cinephilia – that is what Siegfried calls the passion for cinema – had a lot to do with the effort you had to put in to actually see the film you wanted to see. The more effort you put in, the more valuable it became. So I used to say to my friend, when they said, "Well, you know, this Nicholas Ray film, it really wasn't that good." and I said, "Look, I travelled fifty miles to see this film. It had better be a masterpiece. And if it isn't, I'm going to make it one."

SZ: Good idea. I remember our discussions very well when we started all this archaeological terminology and an idea and the concept was very strong, the French apparatus theory, or with Michel Foucault, the *dispositive* cinema, the very specific *dispositif* of the cinema, "l'appa-

reil de *base*"[28], as Jean-Louis Baudry put it. How important for your work, for your passionate work is this notion of *dispositif*? How much does it pre-occupy your concept of the cinema?

TE: Well, this is what I was talking about when I now identified geometrical optics. This is very much the *dispositif* of Plato's cave locked into a space and having a geometry of vision, which means that you sit here, you have the screen in front of you, the projector is behind you, you think the image is there, but the power of the image comes from the projector. That's the power of the apparatus that Baudry taught us to understand. That was the ideological function, the ideology of the basic apparatus. Now, what's interesting about this for a media archaeologist, is that Baudry formulated this theory at exactly the point in history when going to the cinema and having no other space for viewing films was disappearing. In actual fact, it was formulated at the same time that one had television with a remote control and the first video recorders.

SZ: It was after Roland Barthes' famous essay "Upon Leaving the Movie Theater"[29].

TE: Yes, now that's something else. So what I came to think about is that very often, theory, and film theory in particular, is the funeral service of a practice. So that there's always delay. Although this is a little bit polemical in calling it the funeral service of a practice, it is what I was doing today as well, by saying that only when some other technology emerges one can see a previous practice as being historically determined, and to some extent arbitrarily, rather than necessary and inevitable. In other words, you can only see a certain practice once it has become obsolete or been displaced by something else. So it's not as if some practice disappears. No medium makes another one completely redundant, but you have a different view on it. For me, the digital gives me a different view on the analogue, on media history, on film studies. And that's what I'm grateful for, even though I don't think the digital, as I said, is a determining factor of many of the practices we are now seeing as contemporary.

SZ: If it's okay for the audience, I would also like to address some of your critical and some of your methodological thoughts you have presented. I was very curious when you suddenly started to use – that was around Bazin – the term genealogy. Genealogy is a term which I myself sometimes use analogous to what I call *an-archaeology*. I think of course of Nietzsche and his great writings on genealogy and history. And of course of Michel Foucault…

TE: …who changed from archaeology to genealogy.

28 Jean-Louis Baudry, Effets idéologiques produits par l'appareil de base. *Cinethique* 7/8 (1970), pp. 1–8.

29 Roland Barthes, En sortant du cinema. Communications 23 (1975), pp. 104–107.

SZ: Exactly. I would like to ask you about your specific concept of genealogy. One very important point as far as I understand Nietzsche and Foucault in this context is, that it's a long goodbye to what we can call the search for the origins. "The origin is a trap" – as far as Foucault is concerned. Genealogy has a much more open movement through labyrinth-like connections, and derivations instead of origins, is that right?

TE: Yes, I would say that as well. One sense of genealogy is precisely that it opens up these different venues… that branches, and trees on one side and rhizomatic graphs on the other, to use Deleuze's and Guatttari's distinction. So it is a way that something disperses itself, it's a network and… six degrees of separation, if you know about the way that connectivities and contingencies and accidents feed into a constellation that recognizes and in some way, determines it. That would be one way of thinking about it. Because archaeology does at some point suggest too much of this model of depth. It's a horizontal model we want, when in fact, archaeology is too vertical a model. But now of course, you would say you're a verticalist, whereas I might be more of a horizontalist. However, there is also a downside to genealogy, which is why I still prefer archaeology in the end. And I will be giving a talk here, called "Trapped in Amber", where I will go a little more into what I see as the value of the archaeological model. The downside to genealogy is that very often in family stories, a genealogy of a family starts from the present and goes back to the past. Now, in one sense, that's good, because in all our questions we must ask ourselves, why are we doing this now? From which position are we speaking, are we reinvesting and re-interrogating? I know this famous joke from the Soviet Union, where somebody goes and asks the commissar, the politburo, "Comrade Ivan, I'm very worried about the future." And comrade Ivan says, "Don't worry about the future. It's all set out in the five-year plan. It's the past I'm worried about. I have to rewrite it every year." And I think we are in the rewriting every year of the past situation. So that's where genealogy also is a slightly problematic terminology.

SZ: We talked about that in the morning a bit, I used the term "potential space" from Winnicott, and I used it with regard to the past and to the future, the openness of the possible futures that might come and in a specific sense, the openness of the past, which we currently have to run and reconstruct.

TE: Well, in this relationship between past and future I prefer to refer to Walter Benjamin. Because Benjamin has made a very interesting observation in his essays on Surrealism. I mean, he has a very interesting theory of art anyway because he says, an object of art used to be an object of a cult or an object of use, and only when it has become useless, can it become art. But there is a further dimension to that, this is why I'm so keen on obsolescence, a term that is both positive and negative in my thinking: We now have a

tendency to collect objects that have become useless. And we discover aesthetic qualities, we discover other uses, we discover possibilities. So, the condition of something having a future from the past is that its primary uses, or its economic potential has been exhausted. And then it's therefore ready to be discovered in its uselessness as having utopian potential. That was Benjamin's way of arguing that utopian potential is the condition of something in the past having become obsolete in relation to its primary functions and uses. What's important is that somehow there has to be a rupture, there has to be a break, there has to be something that differentiates. Something that breaks the continuity, and then it allows us a new assessment, a new valorisation, a new perspective, a new view on this object, on this practice, and there we can discover something that we can take into the future.

SZ: This is also very Althusserian. Althusser liked to work with the notion of *clinamen* [Epicurus/Lucretius]. He described it as a moment of irritation, which creates a change. Like Lucretius he uses the rain as a metaphor; the rain is falling down, drops are falling parallel to each other and then suddenly there is something like a window opening. And the change of the direction causes a lot of changes like the wing of the butterfly – the change is always an irritation, or the cause of change is always an irritation. It's not continuity. With continuity, the world would be very, very boring.

I would like to come to an issue, a methodological question and also a theoretical question which you addressed but did not really discuss explicitly. I was very interested in what you said especially when you were discussing media archaeology in a critical way. And with a critical gesture, I think this is extremely important. I completely agree that it has a lot to do with the arrival of digital media and so on, that's absolutely clear. It has also to do with the arrival of media archaeology, and especially the popularization of media archaeology. It has to do with an important, let's say, historical element regarding our own field. We grew up in the 1960s and in the 1970s with, I would say, a strong focus on the studies of political economy, studies on historical dialectical materialism. So this was always part of our study and of our research. We grew up with critical theory with Adorno and Horkheimer. And, of course, Benjamin, and many others. The new generation of media archaeologists, especially those who started around the turn of the millennium, Parikka and others you mentioned, they have hardly any connections with this kind of materialism. Put simply, for many popular media archaeologists, media archaeology is media history without the historical dialectical materialism. What do you think about this thesis?

TE: Well, it's a strong thesis. Clearly, it's true that the whole philosophical debate has shifted. I mean, our generation was quoting Adorno, today it's Heidegger. In our time, Heidegger was a complete reactionary, I mean, not only was he a

Nazi, he was philosophically totally unacceptable. However, we have learned to reread Heidegger in a completely different spirit. And of course, nowadays, Heidegger is read as a materialist. And, you know, everybody quotes the world picture, and what is technology, and so on. So, one has to ask oneself, where does this come from? Obviously, it's a Heidegger that's not a German Heidegger. It's a French Heidegger. It's Derrida, Nancy and Lacoue-Labarthe, and so on. So what we really have to talk about is, why do the French have such power over discourses? I find that extremely interesting because coming from literature, I realized that the 19th century novelists we think about, it's Dickens, it's Balzac, it's Dostoyevsky and Tolstoy. It's George Eliot, if one is an English specialist. However, the socio-economic study of the novel in the 19th century shows that all the valorisation of what we now call the bourgeois novel had to go via Paris. For instance, Charles Dickens was not transported from Britain to America directly across the Atlantic, but went through the valorisation of France; the same thing with Manzoni in Italy, Dostoyevsky, and so on. It was the French novel and the French discourses about the novel that actually made so many adopt some of the strategies of the novel in their own national literature; Stendhal would be another name. So throughout the 19th century, France, Paris, had the power to determine taste in the form of the novel. And what happens in the 20th century, France determines everything we think we know about the cinema. So the medium has changed by the power of determining what is valuable, and the ones who give the criteria are French. And likewise, we're now using the philosophers that have been adopted. Either they're French like Deleuze or Derrida, or they are philosophers who were reappropriated. Even Hegel, when he was read, he was read through Kojève in France. All the German philosophers actually had to go to France to come back in order to become internationally valuable. So my question is, why does this small country, this relatively minor nation has such an extraordinary power? I don't know whether you can give me some help. I don't have an answer.

SZ: I think one possible answer is that French philosophy generally speaking, is a very poetical form of thinking. The texts are extremely accessible and attractive in a poetical way. The French philosophy, at least in the last, let's say fifty, sixty years, developed this style of poetic philosophical thinking much more than German philosophy; I mean Adorno is hard, dry stuff, very analytical, very sharp. So is, of course, analytical philosophy, the traditional analytical philosophy in the United States and England. But the French have a soft way of formulating philosophical ideas, very seductive. Like literature on love and passion, very poetical.

TE: Yes, but there's also that the French are good at philosophy, they're good at cinema. They're good at cheese and good at wine, and at missiles. So they've actu-

ally spread it across a fairly wide spectrum of desirable objects. Maybe that has something to do with the language, also what you say about the feel for beauty and for a particular kind of elegance. But nonetheless, I think it's worth reflecting just the persistence of the power of determining how we think and what we think about. That really, I have to say, as much as I sometimes get totally irritated with the Parisians because they're so parochial and so inward looking, and nonetheless, in that sense, I think there's a parallel between Hollywood and Paris. Hollywood is completely self-absorbed, and yet has this power to spread its word or its images across the world. Also Paris has this power. Maybe one has to be totally self-absorbed in order to generate that kind of energy, maybe that's exactly the ways China has to learn.

SZ: Like smoking Gitanes or Gauloises cigarettes after one has been to the movies and watch Godard films. I think it's also a matter of having a specific idea of existence. The French, not only in the narrow sense of *Existenzphilosophie*, existential philosophy, but in a broad sense, they have this ability to develop their ideas as kind of an offer for a specific intellectual existence. And this is highly attractive for many people, for a specific group of people. An existence which is not as administered. Most of the French thinkers did not even have regular professorships or if they had them, they had them very late. You know, Derrida was never accepted in academia. He was an anarchist, so to speak, within academia.

TE: However, there is something else. It's very important: Famous French philosophers commit suicide. Gilles Deleuze committed suicide, Guy Debord committed suicide, Christian Metz committed suicide and Roland Barthes committed suicide.[30] We're talking about *joie de vivre* and we have to factor in that the great names, and there are a few others as well actually that I'm not recalling… that there's a long tradition of, when your work is done, you act out the final gesture. Maybe that's part of it. The final gesture is to take life into your own hands in this way. So here's another nugget to ponder.

[Question in Chinese]

SZ: You mentioned something very important for my own work, when you touched on the Weimar Republic and the 1920s. This is also extremely relevant for Thomas Elsaesser's work. Everything I learned about cinema in the Weimar Republic, more or less, I learned from him. But we have heroes from that time, intellectual and artistic heroes who had been extremely important for what I nowadays call "media anarchaeology." I will just mention two or three, who have not been mentioned so far.

Of course, Walter Benjamin is important but writers and thinkers and dramatists like Bertolt Brecht, for example, were extremely important. I grew up with

30 Editorial Note: Roland Barthes actually died from injuries after being hit, as a pedestrian, by a van in the streets of Paris. It never became really clear if he crossed the street intentionally at this dangerous moment.

Brecht at the institute in Berlin, because his work was performed very frequently in theatres in East Berlin. It was possible to go to the other side of the wall and to watch and to listen to the theatre pieces. Brecht had already formulated in the 1920s – this is all forgotten somehow – a theory of radio which already implicated everything that became valuable in technology-based communications later. The idea of networks and interactivity and all of this was formulated in 1928.

Or take somebody like Siegfried Kracauer, for example, who was very influential for my thinking and for my writing. In fact, the book which Thomas Elsaesser mentioned, on the history of the video recorder, starts with Kracauer. He was a thinker with a wonderful form of writing, who was able to locate aesthetical questions as aesthetical issues in the broad context of the social history of political economy questions, and of course, of historical questions.

So the connection of the period between the 1960s and the 1970s in Germany with the Weimar Republic was very strong. In a specific sense, the Weimar Republic was like the first Russian avant-garde, and it was a kind of utopian imagination for us. And I use this term "utopian" very consciously because for me, this archaeological gesture was always connected with utopia, with the impossible place. And it's extremely important for classical archaeologists, when they are diving into the deep-time, that they are always looking for constellations which are much richer, and to put it simply, much better than the present. And this may answer a little bit your question about prospective archaeology and the potentiality for the future. I'm a post-romantic person, a post-Novalis person and I believe deeply in this notion of utopia. Otherwise, I would not be doing the work I'm doing. I find in the past, in the deep-time of the past constellations, things which I might take as an energy into the future.

I'll give you one example. I studied cryptology of the 16th and early 17th century. Cryptology is now a cultural technique, which we have to relearn. In the context of internet communication we know that everybody is controlled everywhere. We have to relearn, how to keep secrets. Cryptology was highly developed in the 16th or 17th century for various reasons. What is very important is that cryptology was not a standardized technology. Rather it was full of variants, many different variants. And I want to take this variance, this multitude into the present and into a possible future. This is what I mean with prospective archaeology. But without the idea of utopia, a better world, it would not work at all. It would be blood-less, it would be ice cold and I would not be interested in it.

Hongfeng Tang: What's the true difference between linear time and genealogical time? What's the true difference between media technology and media history? You still use the word time…

SZ: I would like to address this because I noticed that we both address a lot media archaeology and history and the relation

between it. Regarding linear history, the established concept of history – not all the historians write linear histories. Histories can also be very dynamic and very confusing. It would be completely wrong to name all established history as conventional or linear. That's much too easy. But the dominant concept of writing history is the notion of progress, is the notion of civilization, which you can imagine in the form of a cone with a primitive beginning and then a bright development into the future. Technologies improve permanently, life quality improves permanently and so on. I deeply doubt this notion of historical progress. In my time machine, I sometimes visit constellations in the past, which are much richer and much more interesting than the present. And perhaps even some futures which I can foresee in the form of models. This is very important. And it has to do with – and this is a methodological question – the criterion I use for, let's say, excellence and for life quality, or however you want to call it. From the palaeontologist's view, such as Stephen Jay Gould's, I learned that the development of our civilization was staunchly geared towards standardization to reduce variety and multifariousness. And this is exactly what I do not accept. By going through deep-time, I want to take the varieties I find in the past into the present, and through the present into the future. This is a different concept compared to the traditional writing of history, because it's beyond the idea of what we call historical progress.

And when we look at the state of the planet at the moment, of course, this comes up again and again. We know that every minute, a few species in the world of plants and animals are dying, that every day we are losing a lot of these variations which have existed in the history of the planet. And I don't believe this is a necessity. This is why I need a different kind of concept, and of course this is also relevant for media and for media technology. No standardized future with five companies ruling the world. Even two or three companies ruling the world of mediated communication. This would be the end of any kind of multifariousness. We need the opposite. We need heterogeneity and multiplicity.

[Several Questions in Chinese]

TE: Well, thank you very much. This was extraordinarily interesting and diverse, but also quite coherent in the way that very different aspects came to the fore. I'll try and respond to perhaps all of them in one short passage, or two.

I want to start with the notion of history versus archaeology. What you were saying, that history tries to have a coherent narrative whereas archaeology seems to be primarily concerned with a fragment, that's correct. But that's not the only way of thinking about it. Clearly, what we have emphasized is a particular notion of history which is primarily concerned with linear progress.

But the 70s are so full of different versions and different concepts of history that we really need to be more specific. Obviously, the one that Siegfried was referring to is also the one Lyotard pos-

its: the end of grand narratives. In other words, that is one of the breaks. Also the Marxist notion that history is the driving force, and it's the contradiction between the classes and the modes of production and the means of production… The whole Hegelian notion of history had come to an end in the 70s.

But if you look at practicing historians, you see an enormous diversity of approaches. You have, for instance, Hayden White, who actually challenges the notion of a coherent narrative as being somehow related to reality rather than to rhetorical figures and tropes. You have Paul Ricœur talking about different forms of history. You have a German historian called Reinhart Koselleck, who actually uses a little word game that you can do in German between "Geschichte" and "Schichten" – "Schichten" means layers and sedimentation, and therefore relates already to an archaeological notion. He was not an archaeologist, but his notion of history was already one of layers and sedimentation, which is different from the pun you can make in English, where history and story are very close together. In other words, where history is already narrativized. Now, Frederick Jameson is another important figure who had another notion of history yet again in the 70s. So if we're really talking about history, we have to be much more differentiated. However, I also think that there is more to be said about archaeology in this respect.

You say archaeology is basically a fragment. But at a philosophical level, what has become very important around the notion of archaeology is also the question of causality and contingency, and much of the work that has been done, both in terms of narrative analysis and in terms of history, has to do with the status of causality. Now, that's obviously a very big topic. The phrase that I always use is that contingency is our new causality. But that is also technologically determined, because it is through the use of computers, through the use of big data, through the use of pattern recognition that we have changed our notion of causality. Causality is not something fixed. Causality is a historically determined relationship between tools and tasks. This opens up a whole new field, which I think has to do with archaeology.

However, even if we look just at archaeology, there are two kinds. Classical archaeology goes to a site and wants to look for the masterpieces, wants to put together the vase or the temple or the statue. Contemporary, or if you like, "archaeology mark two" doesn't go to the marble fragments. It goes to [questions such as]: Where did that civilization cook its food? Do we still have its faeces? Can we find out what they ate? Can we find out what they cooked? Can we find out what they wore? Think of the most extraordinary find in archaeology of the late 20th century. The Iceman, Ötzi. This has completely changed the notion of archaeology because you needed DNA, you needed forensics, you needed biology, you needed chemistry, you needed textiles. This one body found in the glacier in the Alps radically changed the way we think about archaeology. In other words,

completely different sciences are now drawn upon to reconstruct not the masterpiece, but the way our civilizations lived. You have the forensics of it. It turns out that he [Ötzi] was actually shot by an arrow that they found.

And if we transfer that to media, we see the difference between a film history that went for the great masters and the great masterpieces; a notion that it started with Griffith and then Eisenstein, and then came Fritz Lang, and then came Hitchcock, and then came Orson Wells, from one master to the other. That's the archaeology of mark one. The archaeology of mark two is the media archaeology that we are now doing. We're looking at all the aspects of it and we're not particularly interested in the masterpieces or the unique masters. So I think the notion of archaeology as simply about fragments cuts this one short, as indeed the notion of history as a coherent narrative, which is also in need of a slight revision.

I want to take up another point which was made about toys. I think that's very interesting because yes indeed, around the time of the cinema as I pointed out in the 19th century, you had the phénakisticope and the stereoscope as toys, but Plateau was a scientist; Holmes was a scientist for the stereoscope. And indeed, most of the people we now see as part of the genealogy of cinema, Marey, Muybridge, Janssen etc. – they were scientists. Even the Lumiere brothers' work got more interest in scientific aspects of colour theory.

Something that very few people know is that the Lumières made some major developments in fitting artificial limbs to the victims of the First World War who lost limbs. In other words, they were thinking stereoscopically, about the human body. And by that time, they had completely lost interest in cinema. So that scientific impulse is very deeply embedded, but so is the ludic one.

And indeed, if you go back to German philosophy, for Friedrich Schiller, game, play is a very important aspect of the imagination, and imagination is again very important for any kind of scientific discovery. As we know, science and the scientists very often have to rely on their imagination. So there is a very close link there. Indeed, you can say that scientific discoveries or inventions were hijacked by an entertainment world that was already fully established. I mean, the cinema didn't naturally enter the entertainment world, the entertainment was musical theatre, Vaudeville, circus, magicians' tricks, lightning sketches, and so on and so forth. The 19th century had a fully established public entertainment world into which the cinema entered, and then it was taken over in some respect.

But if we're now going to media archaeology, what we find is that we are rediscovering the toy side of it, but we're discovering it as a philosophical toy. In other words, they give us a reflection of so many other things. That's why philosophy is such an important element of media archaeology because, again, the toy is not a utility object. The toy is useless in the practical instrumentalized term. So all the things that I was saying

about obsolescence and what we're saying about utopia, has a very close relationship to toys, but now within a much broader context, which I would call philosophical. So you're absolutely right, there's the science-toy relationship, but there's also the philosophy-toy relationship. And if you like, entertainment really comes from outside.

You were talking about media archaeology in the museum, right? You're absolutely right. You mentioned Erika Balsom's book that I published in my series.[31] Also the course that I've been giving for years at Columbia University on moving image in the museum. And indeed, media archaeology has had a major boost through artists in museums, in galleries, or documentaries or biennials, rediscovering certain aspects of the cinema. But that has also to do with the so-called "death of cinema" that everybody was talking about, right around 1995. In fact, the centenary of the cinema's birth was also its death. And so, the art world and art spaces have now selectively appropriated aspects of cinema. The museum is a completely different space compared to the cinema – you walk around, you have your own temporality and so on. What happened to the cinema is, it became spatialised. And so, if we think of the cinema as a time-based art, if we think of cinema as narrative, it gets retranslated into something else in the museum. It gets remediated through the different *parcours* or the different trajectory that the visitor takes in a museum, as opposed to the cinema where you're locked to your seat. Also, the very notion of installation as a multimedia combination changes the nature of cinema.

So you're absolutely right. One of the major aspects of media archaeology is that it found a new home and a new energy and drive through commissions that museums were giving to artists. Indeed, the filmmaker that I mentioned, Harun Farocki, is the classic example of an avant-garde political filmmaker becoming world famous as an installation artist. You have Chantal Akerman, Ulrike Ottinger, Abbas Kiarostami, all filmmakers who find their work in the museum, partly because so many of the avant-garde cinemas disappeared, so there was no way of showing it. And partly because the museums were much richer and had more money to commission filmmakers to make new work than anybody else. So, a complicated but very well perceived relationship between media archaeology and the museum.

Then we had something about resistance. Now, I think maybe media archaeology is a resistance to the new as new. It's a resistance to thinking not only of the new as new, but also that the new is better. We come back to media archaeology being a resistance to teleology even more than to linearity. It's a resistance to origins, but also recently to teleology. Especially a teleology that celebrates or promotes the new for the sake of the new and for the sake of the better. Just think of the tyranny of the updates, the upgrade of the operating system of your

31 Erika Balsom, *Exhibiting Cinema in Contemporary Art* (Amsterdam 2013).

software. That is the planned obsolescence of software and hardware firms, which have a vested interest in the new as better and something you absolutely need. And I think media archaeology resists that for precisely the reasons that we've been talking about.

Obsolescence, a very important part. I said that 3D archaeology, for me, is a placeholder. It's a placeholder for how to define the human because I think, one of the anxieties, certainly in the part of the world where I come from, and Siegfried hinted at it, is the obsolescence of us as the human species; artificial intelligence and robots and cyborgs, etc. So valorising a new obsolescence of technologies is almost by substitute a recognition of our own vulnerability in relation to radical new changes in intelligence technology. And this is where Kittler is such an important person, because Kittler is a technological determinist. He actually said, "human beings at any stage in their history have always been the technologies that they use for communication."

Film studies, as indeed many other concerns of interest, comes from the humanities. And the humanities have traditionally been technophobe rather than technophile. You mentioned Hugo von Hofmannsthal and language and literature. I mean, there was a huge crisis of literature in the 20s, where people thought, "Oh, with a cinema, we will lose our jobs." And anybody who was writing for film was actually classified as a betrayer. So Hofmannsthal brought this to a very high level of philosophical reflection. It has to do with a problem of a new language that's coming in, which was somehow invalidating or challenging the literary language.

It also has to do with that sense of technology. What is the function of technology within the humanities? As I said, I come from literature and the humanities and Siegfried comes from a technical university and technology, but that is the area of negotiation. Can we define the human through the technologies that we're now so dependent on and actually are constituted by, or do we need to have a form, an understanding of the human that actually separates us? Anyone who goes to Freud will say, "Well, what makes us human is that we are fallible. Not only that we are mortal, but also that we're fallible." Technologies are always trying to perfect themselves. So media archaeology is very interested in the things that don't quite work. Media archaeology likes failure, it likes the glitches, it likes the things that are a little bit dirty, or incomplete. This is where the fragment comes in. The incomplete is actually that which shows that it's still human, it's still able to function in an organic way, rather than totally technological. This is a very important aspect of media archaeology, renegotiating what is human within a broadly and if not totally technological environment.

I've been working on something called, "The Cinema: In-Between the Animated and the Automated."[32] And by animated,

32 Cf. "The Cinema: In-Between the Animated and the Automated," lecture by Thomas Elsaesser at Whitney Humanities Center, Yale University, September 25, 2018; https://filmstudies.yale.edu/event/thomas-elsaesser-cinema-between-animated-and-automated, access: December 23, 2020.

I mean the *anima* of the soul and the automated – we're talking about algorithms. Algorithms are now capable of modelling human behaviour in real time almost better than we are ourselves. Think of Amazon and Facebook predictions etc., where we see the way that our inner most human beings are being modelled by mathematics, basically. And this is part of what I call the placeholder. Media archaeology as a placeholder in a position where we don't quite know what the definition of the human is for the 21st century.

And finally, to pick up your point about symbolic form, and then about gendering. Symbolic form in my article comes from Erwin Panofsky and his article, "Perspective as Symbolic Form."[33] And what I'm pointing out is that only at the point where that, in this case, perspective is no longer the norm, one can see that it's a symbolic form. Because the symbolic form in Panofsky's sense, is the blind spot from which you see everything but which you cannot see itself. In other words, as long as you think – as we saw it, because you in China never did – that perspective is natural and somehow inevitable, we couldn't criticise it. Only at the point when it's no longer dominant, one can see that it has these consequences and it is actually historically contingent. This is the point where we have to say, "We don't know what our symbolic form is." Maybe it's surveillance, but that doesn't quite hit it. It's because we're right inside that we cannot name it. And so it's the requirement of having that, I call it rupture, the French call it *decalage*, the slight difference, the shift that then allows us to see what we already knew in a different light.

And you're quite about the gendering. In my article on Freud, I do talk about it because psychoanalysis is basically the result of men analysing or observing hysterical women – women who are more sensitive to, more exposed to, more vulnerable to particular social structures, whether it's patriarchy, technology or new labour regimes. Whatever it is, they [psychoanalysts] are the media avant-garde within particular social structures. Charcot, Breuer and Freud were all using women to find out what's going on in the soul. So in that sense, they were the media that allowed that kind of insight. In a more practical way, women have been used as media – media in the spiritual sense – for many, many decades, if not centuries. And yet when industrialization fully took over, when the technologists came in, it was women who became the typists and the telephonists. That's the other important feminization. So there is actually a history of women being mediatized and at the same time of media being feminized.

SZ: I will address all of your questions with just a few points as an expansion to what Thomas said. What you discussed or what you started to discuss about game, this is a research project in itself – the *homo ludens*. It has all these

33 Erwin Panofsky, Die Perspektive als "symbolische Form", in: *Vorträge der Bibliothek Warburg 1924/25*, ed. Fritz Saxl (Leipzig 1927), pp. 258–330.

aspects that Thomas mentioned. But following, for example, the ideas of philosophers like Vilém Flusser, you come to a much broader point, which again, is strongly connected with media archaeology. For Flusser, the *homo ludens*, the playing human being, is the identity of the future. And now the research project begins. If you have such a thesis, which has to do with new technologies and the way labour is changing, you can go into the deep layers of history and find these identities of different concepts of *homo ludens* and try to find out where the souls of these concepts are. And this is extremely fruitful for developing something for the future.

I started to make something very clear which none of you mentioned. I started this archaeological work rigorously for a very important reason. And please try to follow me a little bit. I worked in the 1970s and through the 1980s in the field of so-called new media and technology. I was the first who wrote a history of the video recorder, when most of my professors didn't know what a video recorder was. With this competence I became responsible for the future. I built up an art academy for art and media since the early 1990s. Nearly every conference, every symposium where new media were discussed, I was invited. "Please tell us how the future will be." I was really frightened, and I said, "I cannot answer this question how the future will be." I had to invent a tactic with which I could partly respond to this question, but in my way. And this is where this whole notion of deep-time became extremely interesting for me. I started to make extensive dives into the deep-time layers of the past to find constellations, which might be fruitful for – not solving the problems of – the future, because we don't know what the future will be, but at least addressing some of the issues or themes which might be relevant for the future. And again, the notion of multitude, of multifariousness, of variations is extremely important to oppose standardization and universalization, which I fear very strongly for the future.

Related to this, and something which I think is important to address very clearly at least from my point of view: I do not think, and I do not suppose that media archaeology is a new master discipline. This would be a completely wrong perception. Media archaeology is just the opposite. It's beyond disciplines. It is discipline-less, so to speak. Of course, it needs a lot of disciplines because it's basically an activity connecting different disciplines, but it does not want to become a master discipline.

This is essential. So there should be no fear. I remember a similar discussion when semiotics was invented out of linguistics in the 1960s with Umberto Eco, Pier Paolo Pasolini and others. There was an attempt to create a new master discipline. Semiology should be the new master discipline. Everything became science, science, science. But media archaeology is a nervous activity, an activity transverse to the existing disciplines. And it's best located in between and not at a solid place which you can identify within a university structure. So in a specific

sense, it's also an anarchistic activity.

"Beyond disciplines" is an important gesture. Our references in philosophy are not so much the academic philosophers. These are people like Vilém Flusser or, in France, Gaston Bachelard or Roger Caillois and others who were also not disciplined in a specific sense, shifting between different disciplines. This helped us a lot to think what we were trying to think; linearity and non-linearity. I even make the mistake sometimes by using the term non-linearity. I should not do it, because I think non-linearity does not exist. I talk about multi-linearity instead, because what we also have in statical perspectives is a multi-linearity when it comes to so-called new media, not a non-linearity. It is impossible to write history or to make history through other media without any kind of linearities. But what counts is the complexity of linearities and how you put the different linearities together. To a consistent construction, definitely not.

Of course, what we write, what we do, what we make should be coherent, but it should be coherent newly every moment, and with every research project in a different way. So, coherence is not something that you can define in a dogmatic way, but that you must permanently generate anew. I learnt this from a famous chaos theoretician and physicist. You will not know him [Otto E. Rössler], he comes from Germany. He made that very clear for me. He said, "Of course, as a quantum physicist and as a chaos theoretician, I know that we need coherence, but knowing as a physicist of time that time is permanently changing, we need coherences which are permanently thought anew and permanently reinvented in a new way." This also regards the interrelation of media making and media thinking. I deeply believe that there are no strict boundaries in between. There are porous skins in between the two activities, and the one is fruitful for the other. I deeply believe that every one of us know that the moment we write, hopefully an interesting text, we are changing the world we are writing about. These are the kind of interdependencies that are oscillating between making and thinking. This becomes even more relevant when it comes to films and to complex audio-visual constructions.

The time issue has been addressed a lot before. Perhaps what I tried to make clear in my presentation this morning, when I talked about prospective archaeology, was not entirely understood. I think this is also important for China and for the Chinese civilization. The deeper you go through the layers of time, you come to a construction of time and time-space relations, which is not only highly complex in the sense of layers, but which only works when you think them cross-culturally.

I could give a lecture now, which I definitely will not do, for example (after all our discussions on optics) on Ibn al-Haytham, an Arabian physicist and astronomer in the 10th and early 11th century. He was the guy who invented perspective. He already invented instruments, machines like the camera obscura, with which he could work with perspecti-

val constructions long before European modernity. Why? Because he was very interested in constructing an optical theory and optical practices, which was beyond the theological constructions with which he was confronted. He wanted an interplay between the outside material world and his inner world of thinking, of conceptualizing. And this is how he invented not only perspective, but also the idea of a neurological construction of the image. Ibn al-Haytham, one of the greatest thinkers and scientists in the world. His books on Optics were only written in Arabian language. To this day, 1000 years later, they are not yet translated completely. Imagine that, only four of his seven books on optics are translated so far into English, the rest is completely unknown in the world outside of the Arabian language. But he is one of the most brilliant thinkers of optics, of mathematics, he was already dealing with the structure of snowflakes, he was dealing with a mathematical calculation of the structure of crystals, of winds and of the most complex and dynamic issues. Of course, the people in the Renaissance, sitting in Venice, sitting in Padua, and in other places in Italy, they knew of these guys because they had access to their manuscripts in Venice, in Padua, and so on. But they never mentioned them. And so, it looks like this is an invention of European modernity. But in a deep-time perspective it is not. There are many different constellations of modernity in the layers of history and not one modernity, one origin. I don't like this notion of origin. Derivation – this is much better. This is a much more complex construction. The origin, as we said already a little bit earlier, is a trap.

As soon as you try to find an origin and define it, you are constructing a deterministic system. I agree full-heartedly with what Thomas said. A media history or media archaeology that is constructed deterministically is a dead-end road and it doesn't bring us anywhere. And it only serves the big industry, some capitalists and some politicians, but definitely not artists and those who are interested in the lively aesthetics of media. This is, for me, an important point – no determination. Things develop in interdependencies, in complex connectivities. Thomas knows this much better than me because he was living already in England at that time. This is what we learned not only from the apparatus theoreticians of the French cinema tradition such as Baudry, Comolli, Pleynet, etc., but also from the very early cultural studies, they were very important for us. Raymond Williams, Richard Hoggart before Williams, Stephen Heath and all these people around the Birmingham School of cultural studies, partly influenced by the critical theory, the Frankfurt School, they were all thinking interdependently. One of the most important books in this tradition is by Raymond Williams, the main title was *Television* and then the subtitle, *Technology and Cultural Form*.[34] Of course, this implicates a rhetorical question because Raymond Williams made

34 Raymond Williams, *Television: Technology and Cultural Form* (London 1974).

absolutely clear, it's always both, cultural form and technology and none of the two was there before. So a non-deterministic interdependence or a change of cause and effect. And this is, I think, a very useful model.

The gender issue is a highly complex matter too. Because of time reasons, I cannot really go into it, but I think in flat time, not in deep-time history, you can also make a lot of wonderful investigations and projects about the interrelation of machinery, media machinery and female activities regarding experimental art. For example, video art as an experiment. Think about the work of VALIE EXPORT, the work of Ulrike Rosenbach in Germany, and many, many others. In Britain a book was just published on female video art[35] and there you can see how important this new technology was to generate a new, freer form of art within the feminist movement. This is the period of time around 1970. Of course, this research has not really been done yet when you go deeper in time. You can find a lot of interrelations for example between clock working in Switzerland and the construction of fine mechanical laces, which was mainly done by women. And there you have a beautiful interdependency with highly sophisticated forms of labour, which of course for our form of media archaeology is extremely relevant.

Question: Thanks for your splendid talk, and this is just one simple question for both Professor Zielinski and Professor Elsaesser. I'm curious what you think about the connection between media archaeology and posthumanism propositions, because that is what I am focusing on for my recent research program which relates to contemporary performing art, including films, videos and installation art, and also the materiality of artistic materials. What is different is that the theories I refer to, like Karin Barad, are focusing on the same question, but some of the posthumanism positions deny the simple linear relations to establish an intra-action. So, I think we are pointing to the same question just from a different perspective. What I'm wondering is: What do you think of the idea to combine media archaeology with post-humanist propositions? Will there be any more potential research questions?

SZ: Very quickly, because it opens up a lot. I think most important is, again, in order to develop your project and your research, you really have to deal with concepts which work with an open concept of time. Such as Freeman Dyson, the great physicist, in his text *Time Without End*.[36] If you start as a physicist with this notion of time without limits, you can't land in a deterministic area. For me determinism and the radical anthropocentrism are very strongly interconnected.

35 Laura Leuzzi, Elaine Shemilt and Stephen Partridge (eds.), *EWVA European Women's Video Art in the 70s and 80s* (New Barnet 2019); Siegfried Zielinski wrote a foreword for the book.

36 Freeman J. Dyson, Time without end: Physics and biology in an open universe. *Reviews of Modern Physics* 51/3 (1979), pp. 447–460.

So you need concepts which are open. It's good that you're starting this kind of research now, because it's still very unclear where it can go. This whole notion of posthumanism was only invented a few years ago. And of course, it should also include pre-humanity, and then you get a wide spectrum of possibilities through which you can go. The only advice I can give is, work with open concepts, with dynamic open concepts, and then you will develop your research in a wonderful way, I'm sure.

TE: I think you have to really distinguish between different forms of posthumanism, there are at least three that I can think of right away. One notion of posthumanism, it's the Kittlerian version, that says that the human and the technology have always gone hand in hand, there is absolutely no issue whatsoever, there'll be a smooth transition from one to the other, we'll become more and more like machines. But it'll be just another phase in our humanity.

The second one says, human beings are an accident, they should never have been. Evolution made a mistake. And if the dinosaurs hadn't disappeared, then small mammals wouldn't have crawled out of their holes and human beings wouldn't exist. So we should really have that perspective in our minds, that we are an accident of evolution. And therefore, you should think of our special way of being an accident, which is both one way of saying that we're very valuable because contingency and coincidence created us. But on the other hand, we should be also humble in relation to the rest of creation, that we shouldn't think that we are the very top and therefore, if we're now being absorbed into something else, that it is part of being, that particular accident of creation.

And the third one is in relation to the Anthropocene, which has the peculiar way of saying, yes, we are now responsible for nature and creation, because we have such a massive influence on the planet. But the other thing is that, as far as the planet is concerned, what we do, even global warming, is completely irrelevant to the planet. If you take that other perspective: There have been ice ages, there have been meteorites. In other words, we are again, through the Anthropocene, placing ourselves in the centre by saying that we are responsible. But at the same time, we're also acknowledging that in the Earth perspective, the planet's perspective, whatever we do is irrelevant. The universe is indifferent to our activities. So you have to decide what kind of posthumanism you want to refer yourself to when you're looking at specific performances, films, artifacts, or practices.

Hongfeng Tang: I deeply appreciate what you two brought to us today.

References

Balsom, Erika, *Exhibiting Cinema in Contemporary Art* (Amsterdam: Amsterdam University Press, 2013).

Barthes, Roland, En sortant du cinema. *Communications* 23 (1975), pp. 104–107.

Baudry, Jean-Louis, Effets idéologiques produits par l'appareil de base. *Cinethique* 7/8 (1970), pp. 1–8.

Bazin, André, *Qu'est-ce que le cinéma ? 1. Ontologie et Langage* (Paris: Éditions du Cerf, 1958).

Bazin, A., The Ontology of the Photographic Image. *Film Quarterly* 13/4 (1960), pp. 4–9.

Berger, John, *Ways of Seeing* (London: Penguin, 1972).

Brighton Film Review, journal by the Film Society at the University of Sussex, later titled *Monogram*.

Crary, Jonathan, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, MA: The MIT Press, 1990).

Debord, Guy, *La société du Spectacle* (Paris: Buchet-Chastel, 1967).

Dyson, Freeman J., Time without end: Physics and biology in an open universe. *Reviews of Modern Physics* 51/3 (1979), pp. 447–460.

Elsaesser, Thomas (ed.), *Early Cinema: Space, Frame, Narrative* (London: BFI Publishing, 1990).

Elsaesser, T., *European Cinema. Face to Face with Hollywood* (Amsterdam: Amsterdam University Press, 2005).

Elsaesser, T., *Filmgeschichte und frühes Kino. Archäologie eines Medienwandels* (Munich: Edition Text + Kritik, 2002).

Elsaesser, T., *Film History as Media Archaeology: Tracking Digital Cinema* (Amsterdam: Amsterdam University Press, 2016).

Elsaesser, T., Making the World Superfluous: An Interview With Harun Farocki, in: *Harun Farocki. Working the Sightlines*, ed. Thomas Elsaesser (Amsterdam: Amsterdam University Press, 2004), pp. 177–190.

Elsaesser, T., "The Cinema: In-Between the Animated and the Automated," lecture at Whitney Humanities Center, Yale University, September 25, 2018; https://filmstudies.yale.edu/event/thomas-elsaesser-cinema-between-animated-and-automated, access: December 23, 2020.

Elsaesser, T., The New Film History. *Sight and Sound* 35/4, pp. 246–252.

Elsaesser, T., *The Persistence of Hollywood* (New York: Routledge, 2012).

Flusser, Vilém, letter to David Flusser (November 25, 1990), facsimile print in Siegfried Zielinski, *Entwerfen und Entbergen. Aspekte einer Genealogie der Projektion.* International Flusser Lectures (Cologne: Walther König 2010), p. 4.

Hagener Malte, *Moving Forward, Looking Back. The European Avant-Garde and the invention of film culture 1919–1939* (Amsterdam: Amsterdam University Press, 2007).

Hagener, M., Johann N. Schmidt and Michael Wedel, *Die Spur durch den Spiegel. Der Film in der Kultur der Moderne* (Berlin: Bertz und Fischer, 2004).

Hegel, G.W.F., Jenaer Realphilosophie, in: *Frühe politische Systeme*, ed. Gerhard Göhler (Frankfurt/Main: Ullstein, 1974), pp. 201–289.

von Helmholtz, Hermann, *Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik* (Braunschweig: Vieweg, 1863).

von Helmholtz, H., *Handbuch der Physiologischen Optik* (Leipzig: Voss, 1867).

Huhtamo, Erkki, and Jussi Parikka (eds.), *Media Archaeology: Approaches, Applications and Implications* (Berkeley et al.: University of California Press, 2011).

Irrgang, Daniel, and Florian Hadler (eds.), *Zur Genealogie des MedienDenkens* (Berlin: Kulturverlag Kadmos, 2017).

Kooijman, Jaap, Patricia Pisters and Wanda Strauven, *Mind the Screen. Media Concepts According to Thomas Elsaesser* (Amsterdam: Amsterdam University Press, 2008).

Leuzzi, Laura, Elaine Shemilt and Stephen Partridge (eds.), *EWVA European Women's Video Art in the 70s and 80s* (New Barnet: John Libbey Publishing, 2019).

Malraux, André, *Les Voix du Silence* (Paris: Gallimard, 1951).

Malraux, A., *Psychologie de l'Art* (Gent: Albert Skira, 1947).

Panofsky, Erwin, Die Perspektive als "symbolische Form", in: *Vorträge der Bibliothek Warburg 192/25*, ed. Fritz Saxl (Leipzig: Teubner, 1927), pp. 258–330.

Schiller, Friedrich, *Der Geisterseher. Aus den Memoiren des Grafen von O*** (Leipzig: Göschen, 1789).

de Valck, Marijke, and Malte Hagener, *Cinephilia. Movies, Love and Memory* (Amsterdam: Amsterdam University Press, 2005).

Williams, Raymond, *Television: Technology and Cultural Form* (London: Collins, 1974).

Zielinski, Siegfried, *Audiovisions: Cinema and Television as Entr'actes in History* (Amsterdam: Amsterdam University Press, 1999); German edition: *Audiovisionen. Kino und Fernsehen als Zwischenspiele in der Geschichte* (Reinbek/Hamburg: Rowohlt, 1989).

SPECIAL SECTION:

MATERIALITIES OF THE INTERFACE

Usually, the relationship between user interfaces and materiality is addressed via a problematisation of differences. Whereas user interfaces are often considered 'surfaces' which hide the 'materiality' of the 'deep' technological structures in order to establish a more 'intuitive' or 'fluid' user experience, critical perspectives on user interface analyses such processes as a form of 'concealment' of the material side of these technologies. Breaking with common perceptions, user interfaces are considered to be technologies which implement an artificial 'naturalness' of their use and consequently their use as a consumer product. Yet, to criticise the, much quoted, 'invisibility' or 'transparency' of interface-materialities is in turn committed to dualistic assumptions such as 'frontend/backend' or 'human/machine.' By now, it is generally accepted that user interfaces cannot be primarily regarded as technologies of controlling a computer, but as networked configurations which enable complex human-machine interactions. In consequence, challenges to this kind of 'critical' thinking have emerged. Critical interface theory has to take into account the fact that the materiality of interfaces has changed considerably (and is constantly changing). With the rise of the internet of things, the rapid development of machine learning and the subsequent proliferation of 'smart devices' and their respective 'medialities,' it is no longer enough for a critical approach to uncover a materiality 'behind' the interface. For example, in the era of so-called 'Natural User Interfaces' it is necessary to transform old distinctions like those between 'semiotic' and 'material' structures. The user interfaces of today are technologies in which semiotic, cognitive and material aspects of digital media technologies converge in habitualised practices ('interactions'), e. g. now ubiquitous gestures like 'pinch-to-zoom'. Hence, to engage in a critical interface-theoretical discussion leads almost necessarily to a discussion on the status of materiality in media theory in general. A critical perspective on interfaces must discuss theoretical notions of materiality with regard to everyday practices as well as with regard to highly specific forms of interface use. This includes a consideration of the materiality of practices and media that are usually not part of the core area of the paradigm of the traditional GUI (Graphical User Interface). Interesting theoretical notions can be found e. g. in specific media theories such as film theory or general media theory and media philosophy.

The following essays address this issue by giving insights into the contemporary discussion about the materiality of interfaces. In the first article Christoph Ernst discusses the concept of "material metaphors" as it is proposed by Marianne van den Boomen. For Ernst, van den Boomens concept of material metaphor ignores the boundary between non-discursive and discursive aspects of the production of meaning in interfaces. Although the idea of material metaphors is problematic, insofar the 'materiality' of interface metaphors is positioned against a more traditional view of the semantics of interfaces, van den Boomens idea is on the right track giving interface theory a powerful concept to rethink the materiality of interfaces. In the second essay, Konstantin Haensch uses the example of smart speak-

ers to show how these technologies fit into everyday life as "strategic media objects." Based on the fact that the transformation of everyday objects represents a "new" way of interfacing with material culture, the essay shows to what extent new interface regimes are implemented. The essay calls for a critical analysis of these objects as visible "things" (and not invisible "objects"), drawing on ideas derived from media philosophy and discourse analysis. In the third and final text, Elisa Linseisen discusses the epistemic practice of zooming with regard to its interface-theoretical aspects. In contrast to the old distinction between "surface" and "depth" high-resolution interfaces represent a new media culture in which practices of interaction, change and creation of objects are in the foreground. Using a case study covering a period from 1958–2020, Linseisen argues that zooming can be used to grasp a media culture in which differences arise from the materiality of high-resolution digital images.

The three essays of this special section are based on a panel of the German Society for Media Studies (GfM) working group on Interfaces that took place during the annual conference of the GfM at the University of Köln in September 2019. The authors are grateful to the other panelists, Till Heilmann (Bonn) and Sabine Wirth (Marburg), for their contributions to the panel and its conception, and Karoline Kozlowski, for her great help during the finalization of the manuscript.

Christoph Ernst,
Konstantin Haensch
and Elisa Linseisen

ARE THERE MATERIAL METAPHORS? A COMMENT ON MARIANNE VAN DEN BOOMEN'S INTERFACE THEORY

By Christoph Ernst

"The question of how practices are configured in interfaces is undoubtedly a key question in interface theory. But are we doing ourselves a favour by explaining interface arrangements or interface processes as material metaphors?"

Suggested citation:
Christoph Ernst, Are there material metaphors? A comment on Marianne van den Boomen's interface theory. *Interface Critique* 3 (2021), pp. 277–284.
DOI: https://doi.org/10.11588/ic.2021.3.81318.

Materiality and media theory

In interface theory, Marianne van den Boomen's concept of "material metaphor" brings together two things that for many do not belong together, namely semantics and materiality. With the relation between semantics and materiality a key issue of media theory is touched. The history of media theory is also the history of tracing meaning, which was for a long time primarily regarded as exclusively an issue of semiotics, back to its material foundations.[1] Traditionally this is expressed in an argument consisting of two premises: First, the thesis of 'invisibilisation through immaterialisation' is put forward. According to this thesis, media can be described historically as technological entities which carry a double promise of immaterialisation. On the one hand, photography, telegraphy, television, digital media all 'immaterialise' the reference to the world, on the other hand they do this in an almost 'invisible' way. The immaterialisation is not recognised as such. Second, in media studies this thesis is linked to the claim, that the main task of media theory is to clarify the material conditions of this process. With critical intent, media theory attempts to remind us of the 'materiality' of the medium and to reveal specific socio-cultural circumstances and contexts that are incorporated into the constitution of meaning. User interfaces of digital media are a paradigmatic example of this dual perspective. On the one hand, user interfaces can be understood historically as an attempt to render material conditions of the medium invisible. Within media theory, on the other hand, this puts interface theory in the position to 'reveal' the arrangement and embedding of interfaces in their material context. Such an attempt is made by the concept of the material metaphor by Marianne van den Boomen. In the following remarks, I would like to reconstruct this concept of the material metaphor in van den Boomen's work and provide a brief comment.[2]

The concept of "material metaphors"

Van den Boomen speaks of material metaphors in order to describe "digital-material transcodings by metaphors," which are paradigmatically formed in user interfaces: "[...] material metaphors not only organize ways of reading, referring, and interpreting, but they also configure social and cultural praxis."[3] Material metaphors thus 'configure' digital practices. In order to think of this

1 Hans Ulrich Gumbrecht and Karl Ludwig Pfeiffer (eds.), *Materialities of communication* (Stanford, CA 1994).

2 I'm grateful to Jan Distelmeyer for introducing me to the works of Marianne van den Boomen.

3 Marianne van den Boomen, *Transcoding the digital. How metaphors matter in new media* (Amsterdam 2014), p. 22

configuration of practices, a concept of metaphor is put forth that goes beyond a cognitive definition of the metaphor as it is first and foremost developed in cognitive linguistics.[4] This transgression is indicated by using the term 'materiality.' Metaphors are regarded to be entities in the material world of things which structure social and cultural practices of using an interface.

In order to substantiate this rather usual view on metaphor, van den Boomen reinterprets the traditional metaphorical relationship between "source-" and "target-domain."[5] She postulates that this fundamental relationship actually consists of two relations that can be understood as "representation" and "performativity." According to her argument, representation means that in a metaphorical relation 'something stands for something else.' Metaphorical performativity, on the other hand, means that the metaphor is an active vehicle that mediates and organizes in a network of meanings. This is what van den Boomen is getting at when she writes that metaphor is a "productive and performative material-semiotic-device":[6] "[...] material metaphors indicate a general way of mediating and organizing a network of traffic between words and world."[7] And in all clarity:

> *Decisive is the traffic they [the metaphors, C.E.] enable, conduct, or invoke between the symbolic and the material, thereby constituting what can be known, imagined, and narrated, and how it can be addressed, appropriated, and enacted. These material metaphors do not just signify and represent – as all metaphors do – they are also able to evoke acts in the material world with their mobilization of particular physical-material attributes.*[8]

This consideration leads to the assumption that metaphorical relations exist not only between two separate *semantic* domains, but also between two separate *ontological* domains: "What is needed is a theory of metaphor which not only maps transferences between different semantic domains [...] but also between different ontological domains: from concepts to objects, from software instructions to visual icons, from signs to tools [...]."[9] Thus, relations carrying meaning should not only be thought of in terms of a "conceptual reference" to the world of human drawing practices, but also be understood on the level of material indexical references.[10] This is the only way to grasp the operability of characters processed in computers. However, the flip side is a very broad definition of metaphor: "Whenever an image or an object functions as a symbol and is able to entail a change of affairs when enacted

4 George Lakoff, and Mark Johnson, *Metaphors we live by. With a new afterword* (Chicago, IL and London, 2003).

5 Lakoff, The contemporary theory of metaphor, in: *Semiotics. Critical concepts in language studies. Vol. II: Linguistics*, ed. Frederik Stjernfelt & Peer F. Bundgaard (London [et. al.], 2011 [1992]), pp. 264–311.

6 Boomen, *Transcoding the digital*, p. 187.

7 Ibid., p. 54.

8 Ibid., p. 55.

9 Boomen, Interfacing by material metaphors. How your mailbox may fool you, in: *Digital Material. Tracing new media in everyday life and technology*, ed. Marianne van den Boomen et al. (Amsterdam 2009), pp. 253–265, here 262.

10 Ibid., p. 261.

in the proper context, it can be considered a material metaphor."[11]

At this point, it is useful to briefly introduce the theoretical premises of this reinterpretation of the metaphor by van den Boomen. Important are three premises regarding media aesthetics, cognitive theory and semiotics.

Premise 1: Media aesthetics

As is well known, in interface design, metaphors serve as design-principles to make specific functions of digital media available to the user, e. g. the 'desktop metaphor' for file management in traditional personal computing. Van den Boomen, however, uses the example of traditional Graphical User Interfaces to remind us that this availability of certain functions of a medium also means, that machine processes are concealed systematically by the interface:

> *The visual tools on our screen thus seem to work as metaphorical stand-ins for complex machine processes. After the metaphorical translation of machine code into human code, there seems to be no way back. Metaphorical sign-tools acquire a life of their own, cannibalizing everything else that might be there. By showing they hide, by translating they substitute.*[12]

What is going on here is an 'invisibilisation' of material processes:

> *This concealment of software and hardware processes cannot be seen as coincidental "non-representing"; it is a necessary and deliberate act against representation. I propose to call this act of deliberate concealing depresentation. We could then say that computer icons do their work by representing an ontologized stable state, while depresenting the procedural complexity.*[13]

In Graphical User Interfaces, the meanings derived from subjective human action contexts are reified, while material machine processes are disguised ("depresentation").

Premise 2: Cognitive Theory

Such an 'invisibilisation' of material processes at the level of symbols can be analysed by drawing on the cognitive theory of metaphor by Georg Lakoff and Mark Johnson. According to van den Boomen an exemplary "cross-domain mapping" for the metaphor "E-MAIL IS POSTAL MAIL" looks like this:[14]

Source Domain: postal mail	**Target domain: e-mail**
mailbox	inbox of mail program
letters, packets	messages, attachments
sending and receiving	send or get mail button
sorting, disposing	distribution to folders, deleting
[postal distribution system]	[mail-server network at ISPs]
[delivery by postman]	[consulting a mail server, fetch mail command]

11 Ibid., p. 262.

12 Ibid., p. 254.

13 Ibid., p. 256.

14 This table can be found in Boomen, Interfacing by material metaphors, p. 260.

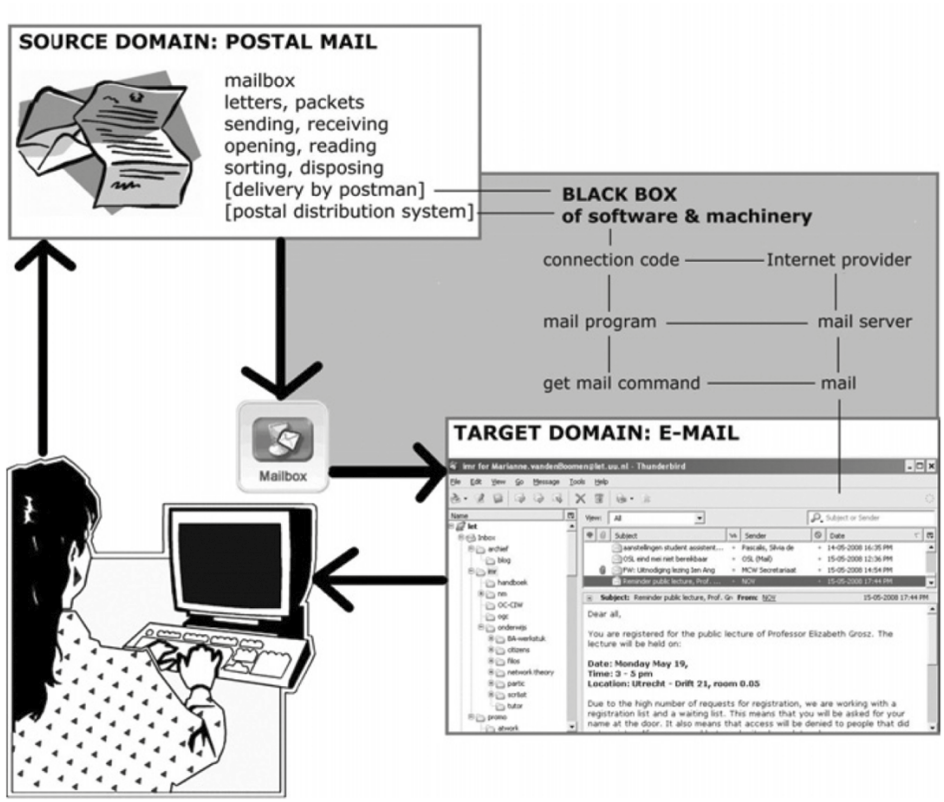


Figure 1: Input-output mechanism of the conceptual metaphor E-MAIL IS POSTAL MAIL

Fig 1: Diagram in Marianne van den Boomen, Interfacing by material metaphors. How your mailbox may fool you, in: *Digital material. Tracing new media in everyday life and technology*, ed. Marianne van den Boomen et al. (Amsterdam 2009), pp. 253–265, here 261.

Van den Boomen illustrates this with the diagram in fig. 1.

As it is typical for metaphors, a process of "highlighting and hiding" takes place.[15] The grey spaces of the diagram represent the hidden aspects of the machine processes. According to the diagram, objects that are accessible to the bodily actions ("Zuhandenheit")[16] tend to be represented symbolically, while the structural material-indexical processes – which van den Boomen also considers metaphorical – are concealed. This, in turn, is formulated through a recourse to a premise derived from semiotics.

Premise 3: Semiotics

Van den Boomen grasps the "material indexicalicaty"[17] with the help of Charles S. Peirce's distinction between an "immediate" and a "dynamic object." According

15 Lakoff, and Johnson, *Metaphors we live by*, pp. 10–13.

16 Boomen, *Transcoding the Digital*, p. 40–42.

17 Ibid., p. 47.

to Peirce, in semiotic processes the relation of the "object" has two poles. Peirce writes in his famous *Prolegomena to an apology for pragmaticism* from 1906:

> *But it remains to point out that there are usually two Objects, and more than two Interpretants. Namely, we have to distinguish the Immediate Object, which is the Object as the Sign itself represents it, and whose Being is thus dependent upon the Representation of it in the Sign, from the Dynamical Object, which is the Reality which by some means contrives to determine the Sign to its Representation.*[18]

Van den Boomen claims that in a mailbox icon, for example, an immediate object constituted by the sign is represented as the source domain and the target domain of the metaphor. In this process, symbols are preferred which are integrated into situated contexts of bodily action (are 'highlighted'). However, the indexical dimensions of "machine mediations" which tend to take on the role of what Peirce calls the dynamic object remain outside of this process (are 'hidden').

By using Peirce's terminology van den Boomen tries to describe the fact that in interfaces 'metaphorical immediate objects' require – given the above-mentioned difference between representation and performativity – not only a "reading" (symbol), but an "action" in the sense of material indexicality, which is negotiated between user and networked machines. The processuality of this indexical "action" is the really critical relation in user interfaces, because it is this relation through which human practices are correlated with the 'invisibilised' and machine-sided 'scripted objects', i. e. fixed algorithmic processes which gain their meaning as material metaphors.

The broad concept of material metaphor

The consequence of the three premises is a very broad concept of "digital material metaphors":

> *Without metaphor, there are no boundaries, and no digital object. While non-digital material objects can exist without built-in metaphorical power (say, a stone or a table), there are no digital material objects (or spaces) without a metaphorical form and address. This even holds for seemingly abstract non-metaphorical concepts such as data table, logical address, or command line. These interfacial entities are also already metaphors, imported from other domains in order to construe manipulable material entities in the digital domain, on the edge of language and objects, enabling [...] the traffic between symbols and physical artifacts.*[19]

Where this leads to is finally made clear in this quotation:

> *[…] the very thingness of digital objects consists of metaphors made material and operational.*

18 Charles S. Peirce, *The collected papers of Charles S. Peirce*, 8 Vol. (electronic edition), ed. by Charles Hartshorne, Paul Weiss & Arthur W. Burks (Cambridge, MA and London 1994), CP 4.536.

19 Boomen, *Transcoding the digital*, p. 69.

> *Such digital-material metaphors go beyond mere representation and language. They act as signs and metaphors, but also as things and procedures.*[20]

This last quote illustrates the basic idea very clearly. Material metaphors in interfaces are explicitly defined as the *superseding category to a conventional notion of 'signs and metaphors' because they material metaphors include 'things and procedures.'* It thus can be said that material metaphors 'configure' the socio-cultural reality of the practical use of digital media.

Comment – Metaphor ≠ Materiality

The question of how practices are configured in interfaces is undoubtedly a key question in interface theory. But are we doing ourselves a favour by explaining interface arrangements or interface processes as material metaphors? It seems that van den Boomen is right to point out that the metaphor is more than a dimension of meaning attached to linguistic representation. As is well known, there are "absolute metaphors" (Hans Blumenberg), "multimodal metaphors" (Charles Forceville), "visual metaphors" (Virgil Aldrich), "cinematic metaphors" (Trevor Whittock) – to name just a few. All of these are explored in detail in their respective contexts of research. However, as far as I can see, all these notions and theories remain – and with good reason – within what van den Boomen calls a "conceptual reference" between two *semantic* domains.

Especially problematic is van den Boomen's attempt to locate metaphors via a "material indexical references" as relations between ontologically heterogeneous domains. One problem of van den Boomen's approach is that an *indexical* relation on the level of material causality cannot easily be reinterpreted into a semantic *metaphorical* relation. Peirce had already worked out that a distinction has to be made whether an indexical sign operates within a non-discursive material-causal relationship or whether this material-causal relationship is part of a conclusion in a discursive practice.[21] In the context of his inferential semantics Robert Brandom puts it this way: when a parrot expresses the sounds 'red' in response to a red object, it is an indexical relationship that can be traced back to its materiality. But it does not follow from this *existential* relationship that the parrot understands the meaning of 'red,' hence the parrot makes no meaningful *reference* by uttering the sounds. Thus, the essential condition to establish a metaphorical relation in the first place is not fulfilled. What the parrot lacks is an understanding of the holistic relationship of the articulated sound sequence

20 Ibid., p. 188.

21 See Peirce's distinction between "genuine" and "degenerate" indexicality, e. g. Peirce CP 2.283. See on the issue of indexicality also Jan Distelmeyer, *Machtzeichen*.

'red' to all other elements of language and the norms of its correct use, not to mention metaphors.[22] In short, to read "conceptual references" as "material-indexical references" ignores the difference between discursivity and non-discursivity.[23]

In van den Boomen's work, therefore, a very important question for interface theory is posed, but at the same time the possibility of an answer is obstructed by combination of metaphor with material conditions. From an ideology-critical perspective, it is certainly right, for example, to question processes of 'cloud computing' with regard to their metaphoricity. But does such a broad concept of "material metaphors" need to be applied in such an endeavour? An analysis of the relationship between machine semantics and human semantics can only be successful if the materiality of the interfaces and the semantics of the metaphor are *not* considered as one but are still understood as opposites. Given the involvement of the materiality of interfaces with human action, isn't it much more important to clarify how points of difference and rupture emerge in human-machine relations, through which technological attempts are made to align machine processes with the elementary processes of human semantics, for which ‚metaphor' is, in turn, fundamental?

22 Robert B. Brandom, *Articulating Reasons*, pp. 17, 48, 162.

23 Ibid., pp. 2–3, 14–15, 82–84.

References

Boomen, Marianne van den, Interfacing by material metaphors. How your mailbox may fool you, in: *Digital material. Tracing new media in everyday life and technology*, ed. Marianne van den Boomen et al. (Amsterdam: Amsterdam Univ. Press, 2009), pp. 253–265.

Boomen, M. van den, *Transcoding the digital. How Metaphors matter in new media* (Amsterdam: Institute of Network Cultures, 2014).

Brandom, Robert B., *Articulating reasons. An introduction to inferentialism* (Cambridge, MA and London: Harvard Univ. Press, 2000).

Distelmeyer, Jan, *Machtzeichen. Anordnungen des Computers* (Berlin: Bertz + Fischer, 2017).

Gumbrecht, Hans Ulrich, and Karl Ludwig Pfeiffer (eds.), *Materialities of communication* (Stanford, CA: Stanford University Press, 1994).

Lakoff, George, The contemporary theory of metaphor, in: *Semiotics. Critical concepts in language studies. Vol. II: Linguistics*, ed. Frederik Stjernfelt and Peer F. Bundgaard (London: Routledge, 2011 [1992]), pp. 264–311.

Lakoff, George, and Mark Johnson, *Metaphors we live by*. With a new afterword (Chicago, IL and London: University of Chicago Press, 2003).

Peirce, Charles S., *The collected papers of Charles S. Peirce*, 8 Vol. (electronic edition), ed. Charles Hartshorne, Paul Weiss and Arthur W. Burks (Cambridge, MA and London: Harvard University Press, 1994).

FROM "INTERFACING OBJECTS" TO "INTERFACE THINGS"? MATERIAL-STRATEGIC NOTES ON THE SMART SPEAKER DESIGN

By Konstantin Haensch

"The slick, cold, metallic 'outer opaque shell' that preserved the degree of the otherness of laptops and smartphones is replaced by forms and materialities evoking a familiar closeness, inevitably conjuring uncanny interfaces."

Suggested citation:
Konstantin Haensch, From 'Interfacing Objects' to 'Interface Things'? Material-Strategic Notes on the Smart Speaker Design. *Interface Critique* 3 (2021), pp. 285–300.
DOI: https://doi.org/10.11588/ic.2021.3.81321.

Fig 1: Product communication by Google for the Google Home smart speaker. An example of the strategic object camouflage in the thing-world of everyday life to initiate processes of domestication. Source: Google Press Material.

With the emergence of the smart speaker Amazon Echo in the years 2014/15, ideas, which has been conceptualized for many decades in *ubiquitous computing* and *internet of things* discourses, have finally manifested themselves in the customer's lifeworlds as a mass-market artifact. With their mass circulation, Amazon Echo, Google Home, and Apple HomePod transform the material[1] worlds and interface cultures[2] of everyday life substantially. New design paradigms accelerate this change. From its cylindric beginnings, newer generations of smart speakers utilize design tactics to strategically withdraw from the user's gaze, fulfilling the long-cherished hope of the "disappearance"[3] as well as "invisibility and dissolution"[4] of interfaces. In this regard, smart speakers do not present themselves, taken literarily, as "black boxes", but as round, pastel-coloured, fabric-covered objects that are closer to a vase than to a laptop, smartphone, or television. The slick, cold, metallic "outer opaque shell"[5] that preserved the degree

1 The following makes these observations against the background of the discourses of a "material turn" and "new materialism": e. g. Hans Peter Hahn (ed.), *Vom Eigensinn der Dinge: Für eine neue Perspektive auf die Welt des Materiellen* (Berlin 2015) and Diana Coole and Samantha Frost (ed.), *New Materialisms: Ontology, Agency, and Politics* (London 2010).

2 Stephen Johnson, *Interface Culture: How the Digital Medium – from Windows to the Web – Changes the Way We Write, Speak* (San Francisco 1997); Christa Sommerer, Laurent Mignonneau, and Dorothée King, eds., *Interface Cultures: Artistic Aspects of Interaction* (Bielefeld, 2008); Florian Hadler and Daniel Irrgang, Instant Sensemaking, Immersion and Invisibility. Notes on the Genealogy of Interface Paradigms. *Punctum* 1 (2015).

3 Mark Weiser, Rich Gold and John S. Brown, The Origins of Ubiquitous Computing Research at PARC in the late 1980s. *IBM Systems Journal* 38 (1999).

4 Florian Hadler, Beyond UX. *Interface Critique* 1 (2018).

5 Alexander R. Galloway, Black box, black bloc, in: *Communiza-*

of the *otherness* of laptops and smartphones is replaced by forms and materialities evoking a familiar closeness, inevitably conjuring *uncanny interfaces*.[6]

The short essay argues that such design paradigms go beyond "surface effects"[7] or a general notion of "distrust of surfaces".[8] Deconstructing the surfaces cannot, as Andersen and Pold point out, "unveil"[9], with Frieder Nake, the apparatus' "subfaces".[10] Conversely, by taking the smart speaker's materiality seriously, in Flusser's sense of a "praise of superficiality,"[11] we can explore the object's strategic and economic calculation and engage in, with Sabine Wirth, the "complexity of the surfaces"[12] that eerily is hiding in plain sight.[13] From this perspective, the essay discusses smart speakers as a strategic bridge technology that catalyses new (not solely voice user-)interface regimes. This *temporary and tactical object arrangement* represents an important intermediate step to the old utopia, to turn "all surfaces of architectural space"[14] into *interfacing objects*. Consequently, due to their central role in establishing new markets and interface normalities, smart speakers have to be considered strategic media objects. Alexander Galloway famously stated ten years ago on the first page of *The Interface Effect that*, "Interfaces are not things, but rather processes that effect a result of whatever kind." He continues: "For this reason I will be speaking not so much about particular interface objects (screens, keyboards), but *interface effects*."[15] Interfaces might not be things, but things can be interfaces. With this provocation, the short essay turns back to media superficiality and briefly outlines the material qualities that strategically configure processes of media domestication. It makes a case for a project in critical media and interface studies that examines media objects' *thingness* to address the often overlooked material-cultural and strategic-economic entanglements of media materiality.

tion and Its Discontents: Contestation, Critique, and Contemporary Struggles, ed. Benjamin Noys (New York 2011), p. 239.

6 Konstantin Haensch, Matthias Planitzer and Lara Nelke (eds.), *Uncanny Interfaces* (Hamburg 2019)

7 Friedrich Kittler, *Grammophon, Film, Typewriter* (Berlin 1986), p. 7.

8 Sabine Wirth, Gehäuse, Black Box, Interface – Zur Opazität der Oberflächen des Computers, in: *Hüllen und Enthüllungen: (Un-) Sichtbarkeit aus kulturwissenschaftlicher Perspektive*, ed. Inga Klein et al. (Berlin 2017), p. 240.

9 Christian Ulrik Andersen and Søren Pold (eds.), *Interface Criticism. Aesthetics Beyond Buttons* (Aarhus 2011), p. 9.

10 Frieder Nake, The Disappearing Masterpiece. Digital Image & Algorithmic Revolution, in: *xCoAx 2016: Proceedings of the Fourth Conference on Computation, Communication and X*, ed. Mario Verdicchio et al. (Bergamo 2016), p. 13.

11 Vilém Flusser, *Lob der Oberflächlichkeit. Für eine Phänomenologie der Medien*, ed. Stefan Bollman and Edith Flusser (Bensheim 1993).

12 Wirth, Gehäuse, Black Box, Interface, p. 240.

13 Konstantin Haensch, Nach dem Unheimlichen – Das "nicht ganz Geheure" der Interface-Dinge, in: *Uncanny Interfaces*, ed. Konstantin Haensch, Matthias Planitzer and Lara Nelke (Hamburg 2019).

14 Jun Rekimoto and Masanori Saitoh. Augmented surfaces: a spatially continuous work space for hybrid computing environments, in*: Proceedings of the SIGCHI conference on Human Factors in Computing Systems (CHI '99)* (New York 1999), pp. 378–385, here 378.

15 Alexander R. Galloway, *The Interface Effect* (Cambridge, UK, 2012), p. vii.

Late materializations of discourse

Discourses of the *internet of things*, *smart things*, and *smart connected products* have been capturing attention and resources (also from the military and economic sector) since the end of the 1980s, increasingly since the beginning of the 1990s. The phantasma of ubiquitous computing promised the (market) potential of radical transformation of the thing-world in the sphere of everyday life. Nevertheless, the long tail of discourse is incongruent to the market development: only slowly markets have responded to the technological trend. As it is well known, early concepts such as "ubiquitous computing," famously coined by Mark Weiser in the late 1980s at the Xerox Palo Alto Research Center,[16] as well as other terms like "calm technology"[17] or "pervasive computing" (coined at IBM 1998), were emerging from R&D departments of Silicon Valley-based companies. The concept's economic roots stand out in the term "internet of things," as suggested by Kevin Ashton from Procter & Gamble in 1999.[18] Its terminological career is predominantly driven, also in its many variations like "industrial internet of things," by the economic and industrial system. While the term 'internet of things,' according to the trend- and tech-analysts at Gartner, has lost its *hype* potential, thus, discursive agency,[19] the rhizomatic ever-evolving formation of concepts and ideas is still present and prevailing. The, with aspects such as autonomy and augmentation, updated idea of a new class of smart and connected things still is capturing imaginations, channelizing enthusiasm, and is promising a "virtuous cycle of value improvement,"[20] as the Harvard Business School professor Michael Porter puts it.

An extensive body of work on these topics can be found in computer science, science & technology studies, sociology, and marketing. In German-language computer science and media studies, the discourse forms increasingly from 2001.[21] While acknowledging these con-

16 Mark Weiser, The Computer for the 21st Centur. *ACM SIGMOBILE Mobile Computing and Communications Review 3/3* (1999), pp. 3–11; https://doi.org/10.1145/329124.329126.

17 Mark Weiser and John Seely Brown, Designing Calm Technology, Xerox PARC, December 21, 1995; http://www.ubiq.com/hypertext/weiser/calmtech/calmtech.htm, access: June 1, 2020.

18 Kevin Ashton, That "Internet of Things" Thing. *RFID Journal* July 22, 2009; https://www.rfidjournal.com/that-internet-of-things-thing, access: January 15, 2020.

19 Kasey Panetta, Gartner Top 10 Strategic Technology Trends for 2019. *Gartner* (2018); //www.gartner.com/smarterwithgartner/gartner-top-10-strategic-technology-trends-for-2019/, access: June 3, 2020.

20 Michael E. Porter and James E. Heppelmann, How Smart, Connected Products Are Transforming Competition. *Harvard Business Review* (2014); https://hbr.org/2014/11/how-smart-connected-products-are-transforming-competition, access: June 3, 2020.

21 A few incomplete examples of contributions of the German-language media studies: Friedemann Mattern, Ubiquitous Computing – der Trend Zur Informatisierung und Vernetzung aller Dinge, 2001; http://www.vs.inf.ethz.ch/publ/papers/Internetkongress.pdf, access: June 3, 2020; Jürgen Josef Bohn, Vlad Constantin Coroama, Marc Langheinrich and Friedemann Mattern, Allgegenwart und Verschwinden des Computers – Leben in einer

tributions' achievements, it seems rather important to notice that these studies' outcome is based on something which – at that time – has not been realised its equivalents *in the world*. Michel Foucault remarks that discourses should be treated not only "[…] as groups of signs […] but as practices that systematically form the objects of which they speak."[22] The 'speech' of the internet of things mainly produced a discursive praxis without the necessary non-discursive reification. According to Foucault, these factors are conditions of a dispositive formation.[23] After examining this discourse, we can declare a vast discrepancy between, on the one hand, the quantity of intellectual concepts/prototypes/critiques of this complex, and, on the other hand, the lack of *realisations* of these concepts on a significant level. Examples of fully realised, mass-distributed, commonly used, domesticated, and normalised formations of IoT products are – until 2015 – sparse. This inadequacy is getting adjusted with the release and market success of the technological class of smart speakers alongside many other smart connected products of the *smart home* product segment. After the diffusion of these technologies into the mainstream, research outside of intellectual and prototypical speculation and anticipation can be conducted. As a consequence, in the last years, *new* fabrics of everyday culture have been knitted.

Smart speakers carry the potential of transforming the worlds of everyday life and its material cultures while establishing completely new interface regimes. Moreover, this change is driven by the strategic efforts of powerful market actors. Marketing plays a vital role in establishing these new regimes since – as discussed next – the objects of transformation are resisting the change.

Forces of transformation

At all times, the "universe of things"[24] has been an object of *negotiations* between forces of change and continuity, novelty and the ordinary, stasis and kinesis. In philosophy – from Heraclitus to Bergson and Whitehead – a long thinking tradition is concerned with processes and potentiality of change, flux, and becoming. On a (more noticeably) level of *thingness* (Heidegger) in the object class

Welt smarter Alltagsdinge, in: *Privat! Kontrollierte Freiheit in einer vernetzten Welt*, ed. Ralf Grötker (Hannover 2003); Friedemann Mattern (ed.), *Total vernetzt: Szenarien einer informatisierten Welt* (Berlin and Heidelberg 2013), Bernard Robben and Heidi Schelhowe, *Be-greifbare Interaktionen: Der allgegenwärtige Computer: Touchscreens, Wearables, Tangibles und Ubiquitous Computing* (Bielefeld 2012) and the multi-perspective publication Florian Sprenger, and Christoph Engemann (eds.), *Internet der Dinge: Über smarte Objekte, intelligente Umgebungen und die technische Durchdringung der Welt* (Bielefeld 2015).

22 Michel Foucault, *Archaeology of Knowledge* (London and New York 2002), p. 54.

23 Siegfried Jäger, *Handbuch Sozialwissenschaftliche Diskursanalyse, Band 1: Theorien und Methoden*, ed. Reiner Keller, Andreas Hirseland, Werner Schneider and Willy Viehöver (Wiesbaden 2006), p. 107.

24 Konrad Paul Liessmann, *Das Universum der Dinge: zur Ästhetik des Alltäglichen* (Vienna 2010); Steven Shaviro, *The Universe of Things: On Speculative Realism, Posthumanities* (Minneapolis 2014), pp. 45–64.

of, with Herder, "midsize things," physical change is manifesting itself by the *come and go* of things in the "near-experience world" (Husserl). These dynamics have been accelerated by the high availability of globalised goods in a "consumer society"[25] and its backside a "throwaway society," the "downside of consumption."[26] As a result, the negotiations through the dialectic of old and new, habituation and novelty transform the universe of things continuously.

As the domestication theory[27] puts it, the early, novel phases of product appropriation are critical for social discourse.[28] This window of novelty may be already closing for the smart speaker. Edmund Burke identifies in his standard work on the sublime –here concerning everyday things in the chapter entitled "Novelty" – that all new things are rapidly falling in the valley of "stale unaffecting familiarity."[29] Vilém Flusser echoes these observations when he describes "apparatuses" as a class of complex and initially unordinary objects that are getting "obscured by thick layers of the habituality of these things and the habituation to them."[30] "Aesthetic of disappearance"[31] is the fate of all new things, also smart and connected ones. Against the background of product innovation autopoiesis, continuous processes of domestication and appropriation are taking place. Subsequently, powerful forces of an *innovation-driven* market economy, which is continuously implementing new products and updating old consumer goods, are enabling and cultivating these processes strategically.

In this context, the established thing-world provides the material, the matter, for these depicted strategic transformation processes in continuous cycles of change. The market logic of the internet of things aims for a rapid, accelerated transformation of the existing base of things. How is the material condition of this technological revolution structured? If we want to put the stock of everyday things in some order, we could project two scenarios for how smart things come into the world:

a) In the first case, the old, known, domesticated, normalised, and banal things of everyday life are getting replaced by similar things, (slightly) transformed by *smartification, datafication, digitalisation*. (The suffix '-ation' implies that something is being done to these things.)

b) In the second case – and this sepa-

25 Guy Debord, *Society of the Spectacle* (Detroit, MI 1984); Jean Baudrillard, *Die Konsumgesellschaft: ihre Mythen, ihre Strukturen*, ed. Kai-Uwe Hellmann and Dominik Schrage, trans. by Annette Foegen (Wiesbaden 2014).

26 Wolfgang König, *Geschichte der Wegwerfgesellschaft: Die Kehrseite des Konsums* (Stuttgart 2019).

27 Eric Hirsch and Roger Silverstone, *Consuming Technologies: Media and Information in Domestic Spaces* (London 1994).

28 Nancy K. Baym, *Personal Connections in the Digital Age* (Cambridge, UK and Malden, MA 2010), pp. 45–49.

29 Edmund Burke, *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful*, ed. Adam Phillips (Oxford 2008), p. 12.

30 Vilém Flusser, *Dinge und Undinge: Phänomenologische Skizzen* (Munich 2012), p. 7.

31 Paul Virillo, *Ästhetik des Verschwindens*. Internationaler Merve-Diskurs 132 (1986), p. 47.

ration can only be maintained heuristically – not old things (e.g., dishwashers) are changed, but something – in the literal sense – *radically new*[32] appears and emerges in the lifeworlds.[33]

Let us – for a moment – take this distinction seriously. It might illustrate to what extent the existing matter of everyday things represents a significant environmental factor of the portrayed transformations. It determines what is possible, what is thinkable, what is transformable.

Resistance of the existing

Hence, to the first polarity and its processes of *occupying* existing and well-known things with technology. Here, banal, normalised, domesticated, well-known, ordinary, and appropriated everyday-objects exist in the light of a "normalistic mentality pattern."[34] The producers – and considering the agency of things,[35] the new objects themselves – have to overcome the condition of stasis and the "cognitive, ethical and affective dispositions"[36] that are interwoven with objects of the lifeworlds. In this way, new things such as smart speakers are challenging the thing- and lifeworlds' resistances. This challenge weighs particularly heavily when these innovations should or have to reconfigure existing mentality patterns. Marketing, including product communication and advertising, is one of the driving forces of cultivating these transformations of a "media culture of living".[37] The product discontinuity has to find a way of dealing with the prevailing "continuities, resemblances, repetitions."[38] The most private (if it still exists[39]) sphere of living must be cultivated in order to overcome these obstacles.[40] The institution of living is particularly resistant to change due to its, as Thomas Düllo puts it, "structurally conservative"[41] constitution. The cultural-material practice of living is attributed

32 For a critique of the prefix "neo-" see Flusser, *Dinge und Undinge*, p. 62.

33 This case is rather unlikely, because "innovations always contain a lot of old and little new," as Wolfgang König puts it so well (at the 35th Hybrid Talk at Hybridplattform, Technical University of Berlin and Berlin University of the Arts, May 9, 2020).

34 Thomas Düllo, *Kultur als Transformation: Eine Kulturwissenschaft des Performativen und des Crossover* (Bielefeld 2011), p. 35.

35 As proposed by the Actor–network theory as well as a multitude of contributions in a material turn/new materialism. To the agency of the internet of things: Mercedes Bunz and Graham Meikle, *The Internet of Things* (Cambridge, MA 2018), pp. 42–53.

36 André Burguière and Ulrich Raulff, Mentalitäten-Geschichte, in: *Mentalitäten-Geschichte: Zur Historischen Rekonstruktion Geistiger Prozesse*, ed. Ulrich Raulff (Berlin 1987), p. 12.

37 Stefan Rieger, Smart Homes. Zu einer Medienkultur des Wohnens, in: *Internet der Dinge: Über smarte Objekte, intelligente Umgebungen und die technische Durchdringung der Welt*, ed. Florian Sprenger and Christoph Engemann (Bielefeld 2015), pp. 363–381.

38 Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (London 2006), p. 132.

39 Florian Hadler, Die Invasion des Interieurs, in: *Texturen Nr. 1: Wohnen*, ed. Thomas Düllo and Konstantin Haensch (Berlin 2013), pp. 138 f.

40 Franz Liebl and Thomas Düllo, *Strategie als Kultivierung: Grundlagen – Methoden – Prozesse* (Berlin 2015), pp. 123ff.

41 Thomas Düllo, Themenfeld und Textanlass: Wohnen, in: *Texturen Nr. 1: Wohnen*, ed. Düllo and Haensch, pp. 17.

to a "strange persistence and constancy […]. Viewed broadly, everything has remained the same."[42] This persistence of *installed* things (from *installare* and *stallum*: 'chair, choir chair', i. e. 'putting into a chair') also applies to home electronics and their "[…] inertia of installed technology and their diverse factual and social interweaving […]."[43] It takes enormous marketing efforts to work against or with this resistance of the prevalent.

Producers of the new can strategically and tactically 'tackle' these obstacles with different approaches. In the case of the Amazon Echo, according to Chief Marketing Officer Neil Lindsay, the heavy lifting of cultivating the socio-cultural innovation is done by the product itself and its "magical"[44] effects. In that regard, the user experience is obliged to overwrite and rewrite existing mentality patterns: "In fact, at our best, the experience is so magical that it disappears into our customer's every day as their new normal."[45]

42 Wolfram Hoepfner, Ulf Dirlmeier, Jürgen Reulecke, Gert Kähler, Ingeborg Flagge and Wüstenrot Stiftung Deutscher Eigenheimverein, *Geschichte Des Wohnens* (Stuttgart 1996).

43 Werner Rammert, *Technik aus soziologischer Perspektive 2: Kultur – Innovation – Virtualität* (Wiesbaden,2013), p. 60.

44 On these premodern motifs in technological contexts: Natascha Adamowsky, Smarte Götter und magische Maschinen, in: *Total vernetzt*, ed. Friedemann Mattern (Berlin and Heidelberg 2003), Konstantin Haensch, The Magic Interface. Media-Archaeological Notes Based on F. W. Murnau's "Faust" (1926), in: *Interface Critique*, ed. Florian Hadler and Joachim Haupt (Berlin 2016).

45 Amy Gesenhues, A CMO's View: Amazon's Neil Lindsay says customer obsession is core to company's DNA. *Marketing Land* (2016); https://marketingland.com/a-cmos-view-amazons-neil-lindsay-says-customer-obsession-is-core-to-companys-dna-160153, access: April 1, 2020.

Connectification of the thing-universe

In the radical vision of ubiquitous computing and its "computerisation and interconnection of all things,"[46] *analogue* things such as a table, chair, and the bed should have been "totally interconnected"[47] for a long time. Meanwhile, only a few compelling examples of marketable, and above all, *successful* products can be found to this day. An insight of the last decade could be that the old *analogue* world can easily exist alongside the *new* world of connected things. Thing nostalgia is even used strategically as a source of familiarity and soothing, as seen in the respective marketing material of Amazon, Apple, Google, and others. Moreover, new objects such as smart speakers imitate the material-aesthetically innocence of *dumb* things in the lifeworlds, as seen in Fig 1. Most everyday analogue things seem to resist their smartification so far. This circumstance does not carry much weight in a *post-ubiquity* and *pro-practicality* paradigm, where not everything has to be an interface.

Looking at a different class of things in the analogue-electrical realm, different results can be observed: Kitchen and household appliances, radiators, or

46 Mattern and Katz, *Ubiquitous Computing*.

47 Mattern, *Total vernetzt*, p. 1.

Fig 2: In the so-called "Easy Chair" (1933), a radio was *installed* in an armchair. Source: Forty, Adrian, *Objects of Desire: Design and Society since 1750* (New York, N.Y: Thames and Hudson, 1992). The text-mechanic's similarity in the naming seems remarkable: by utilizing a 'bland' adjective, a ‚normal' object is branded and thus marketable. From *easy* chairs to *smart* speakers.

electronic circuit/light products are connected and successfully marketed as *Smart Fridge*, *Smart Microwave*, *Smart Lighting*, et cetera. The sensation of a washing machine that automatically orders washing powder and commissions inspections is always related to smart technology's mesh inside and outside the living environment. Such a "life in a world of smart everyday things"[48] generates a constant information stream of human and non-human objects. These objects are part of a datafied environment where continuously visible and invisible processes of interaction and action occur.

Finally, let us look at the world of things of digital devices, home computers, laptops, smartphones (and newer automobiles). A qualitative difference amongst these things becomes apparent when compared to a table, shoe, refrigerator, and washing machine. These things are on top of the hierarchy of smart things, operating as devices for control,[49] *leading*[50] interface processes through the agency of their operating systems (also the IoT platform of voice assistance services such as Alexa) and via the platform's *less* smart satellites, with reduced functionalities. These a-level devices represent the material side of the exercise of power, the control, and organisation of the rest of the world of things.

48 Bohn et. al., *Allgegenwart*, pp. 195–245.

49 Bunz, and Meikle, *The Internet of Things*, pp. 95.

50 Jan Distelmeyer, An/Leiten: Implikationen und Zwecke der Computerisierung, in: *Navigationen* 2 (2017): Medien, Interfaces und implizites Wissen.

The materiality of smart speakers

Along that line, we can also interrogate the smart speaker regarding the artificial taxonomies of old/new and analogue/electric/digital. The findings have to be – not surprisingly – ambivalent: On the one hand, the smart speaker follows the logic of the *occupation* of everyday things by implementing smart and connected functionality into an object, which at first glance has notable similarities to the product class of wireless/Bluetooth speaker. These observations are based on shape, function, and naming. Additionally, smart speaker are in shape and form similar to a vase, pot, or carafe on a strictly phenomenological level. The appearance of these objects supports a perceived closeness to the materiality of the analogue thing-world. Their muted colour schemes and textile fabrics are citing materiality used in the homely sphere.

On a functional level, one could make a case that the smart speaker's closest relative is not a speaker but a *smart phone*. Smartphones and smart speakers share, despite all material-aesthetic differences, technology, software/services (Siri, Alexa, Google Assistant), functionalities, and generate an intersection of variable use cases. Every smartphone with installed voice assistance services is also, in a way, a smart speaker. The virtual assistant Siri first was *contained* in the smartphone device Apple iPhone.[51] The *inner values* of smart speakers and smartphones are – on a material level due to shared technologies of speakers, haptic interfaces, the microphone, and the common software – comparable. Besides, both devices, smartphones and smart speakers, operate as voice user interfaces (VUI) in the household, sometimes even sharing *interface duties*.

Additionally, on naming and basic construction, these objects are referring to the speaker box. If we follow the path of this product class's naming, we would assume that the smart speaker is a 'smartified' speaker box. Such a term conceptually only grasps the functions of producing and delivering sound signals. However, this is only one side of the coin: The opposite side represents sound recording technology and language understanding (as speech and language processing). This innovation required far greater technological development efforts, remaining one of the most outstanding smart speaker technology achievements. In this logic, one could justifiably speak of *smart microphones* or maybe a *smart listener*. Back in the realm of marketing, these kinds of naming ideas are quite unimaginable when data security and surveillance are social and political issues in public discourse. That said, one could push the naming variations of the smart speaker even further: *smart home hubs,*

51 For a short overview of the development history of smart speaker and voice assistants: Bunz and Meikle, *The Internet of Things*, p. 96.

smart stereos, smart alarm clocks, smart radios, smart light rings. The object exceeds what *speakers* can be. Instead, the smart speaker is a hybrid,[52] a "mixed object"[53] with manifold yet undetermined potentials of usage. Therefore, the branding of the "smart speaker" is strategically motivated and, at the same time, conceptually under-complex and therefore misleading. With the rise of these *undefined objects*, a new class of things has emerged, which is categorical neither near everyday things, nor does it represent material-aesthetic evolutions of home computers, smartphones, or laptops.

Consequently, these devices stand out as dedicated objects of power. Smart speakers are pods (as the name of the Apple HomePod indicates), *containers* as "media encapsulations."[54] The speaker, as a *cybernetic* thing, functions like the smartphone as hub of control, also of other, "dumber" things. While smartphones utilize their functional status by a locally directed use of the graphic interface by *one* person, as well as through their singular haptic-tactile materiality *in the hands* of the user, the smart speaker with its multi-person use potential of the language-based interface is establishing new social power structures in the sphere of everyday life. Who is permitted to speak out, to control, to command? The idea of control of the smart home has been part of the product premise and promise from the start: "Amazon's vision for the Echo now relies heavily on the speaker serving as a hub for the so-called smart home. Limp jokes that it's only a matter of time before some enterprising developer writes a program to use the Echo's voice controls to flush the toilet."[55]

Towards a critique of Interface Things

To conclude, the changes in the world of things in everyday life can reconfigure the thing-relationships of the everyday sphere in a different, perhaps even a new way. Not in the sense of replacement, but any case in terms of diversification. Media products such as the Amazon Echo, Google Home, and Apple HomePod offer nothing less than a reconfiguration of what interfaces can be: New interface regimes are forming and replacing, complementing and reconfiguring current regimes. These objects bridge the ubiquity of mobile media use with stationary paradigms. What previously was domesticated in marked out zones of

52 Bruno Latour, *Die Hoffnung der Pandora: Untersuchungen zur Wirklichkeit der Wissenschaft* (Frankfurt/Main 2017), pp. 7 ff.; Gustav Roßler, Kleine Galerie neuer Dingbegriffe: Hybriden, Quais-Objekte, Grenzobjekte, epistemische Dinge, in: *Kontroversen zur Entgrenzung des Sozialen*, ed. Georg Kneer, Markus Schroer and Erhard Schüttpelz (Frankfurt/Main, 2008), pp. 79–82.

53 Roland Barthes, *Das Reich der Zeichen* (Frankfurt/Main, 2012), p. 33.

54 Christina Bartz, Christoph Neubert, Monique Miggelbrink and Timo Kaerlein, *Gehäuse: Mediale Einkapselungen* (Paderborn 2017), pp. 1–32.

55 Joshua Brutstein and Spencer Soper, The Real Story of How Amazon Built the Echo, *Bloomberg.com* (2016); http://www.bloomberg.com/features/2016-amazon-echo/, access: March 31, 2020.

Fig 3: The refugium of "interface things" (Haensch, Nach dem Unheimlichen, p. 86) in the "Interface-Mise-en-scène" (Jan Distelmeyer, *Machtzeichen. Anordnungen des Computers* [Berlin 2017], pp. 81–82) of product marketing and display advertising. Photograph of the Gucci store located in the Trump Tower, September 2019. Photo: K.H.

media use (TV and computer *corners*) is now radiating within smart spaces and the mesh of media environments – even outside the borders of Euclidean spaces and beyond what is typically labelled human-machine-interface. These innovations break into the spheres of everyday life and materialize themselves as new things or configure established objects. With Bill Brown, we can distinguish between "objects" and "things."[56] Borrowing from Heidegger, Brown emphasises objects as functioning, inconspicuous entities. Precisely the items in Burke's modes of a "stale unaffecting familiarity" obscured by Flusser's "layers of the habitual of these things and the habituation to them." With the broad diffusion, normalisation, and domestication of smart speakers, the *thingness*, understood as an awareness of certain qualities of things is fading into the background of attention. The old idea of ubiquitous computing has manifested itself not only in the media materiality of the smartphone, but also in the hybrid materiality of the smart speaker. These stationary, dusty, camouflaged products are operating outside of perception as continually listening, data-producing, *interfacing objects*.

56 Bill Brown, Thing Theory. *Critical Inquiry* 28/1 (2001), pp. 1–22.

Eventually, it is the task of cultural and media critique to bring out the thingness of these and other media ensembles to re-transform smart speakers and their silent satellites. From *interfacing objects* to *interface things*, thus enabling the object's re-entry in the realm of critique. The interfacing objects are among us, are with us, we have become. A critical media theory and praxis aim to reclaim these active objects, which act outside of perception and availability – if only in moments – as *interface things*. By exploring the *thingness* of mediating, invisible, processual modes of interaction, we can map the opaque space of mediality and access the implicit knowledge[57] beyond the ritualistic everyday life and the strategically calculated materiality of camouflage, withdrawal, and passivity of, as Jan Distelmeyer puts it, "interface-staging."[58] The interfacing objects on the shelfs do not, as Alexander Galloway noted on the laptop, "beg to be touched, […] to be interfaced"[59] but, in contrary, to be left alone. In reclaiming the surfaces, we have the chance to advance to the *subfaces* not only of technology but also strategic, economic, and political agenda. Bringing things back into a critical space of immediate materiality seems to be an urgent task which demands engagement with the material-cultural surpluses and strategic-economic calculations of current interfacing objects, like smart speakers.

57 *Navigationen* 2 (2017): Medien, Interfaces und implizites Wissen.

58 Jan Distelmeyer, An/Leiten: Implikationen und Zwecke der Computerisierung in: *Navigationen* 2 (2017), p. 38.

59 Galloway, *Black box, black bloc*, p. 239.

References

Adamowsky, Natascha, Smarte Götter und magische Maschinen, in: *Total vernetzt: Szenarien einer informatisierten Welt*, ed. Friedemann Mattern (Berlin and Heidelberg: Springer, 2003).

Assmann, Jan, Karl H. Hörning, Susanne Küchler, Harald Meller, Hans-Jörg Rheinberger, Monika Wagner et. al., *Vom Eigensinn der Dinge: Für eine neue Perspektive auf die Welt des Materiellen* (Berlin: Neofelis, 2015).

Barad, Karen, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham: Duke University Press Books, 2007).

Barthes, Roland, *Das Reich der Zeichen*, trans. Michael Bischoff (Frankfurt/Main: Suhrkamp, 2012).

Bartz, Christina, Christoph Neubert, Monique Miggelbrink and Timo Kaerlein, *Gehäuse: Mediale Einkapselungen* (Paderborn: Wilhelm Fink, 2017).

Baudrillard, Jean, *Die Konsumgesellschaft: Ihre Mythen, ihre Strukturen*, trans. Annette Foegen (Wiesbaden: Springer, 2014).

Baym, Nancy K., *Personal Connections in the Digital Age* (Cambridge, UK and Malden, MA: Polity, 2010).

Bohn, Jürgen, Josef Vlad, Constantin Coroama, Marc Langheinrich and Friedemann Mattern, Allgegenwart und Verschwinden des Computers – Leben in einer Welt smarter Alltagsdinge, in: *Privat! Kontrollierte Freiheit in einer vernetzten Welt*, ed. Ralf Grötker (Hannover: Heise Zeitschriften Verlag, 2003).

Brown, Bill, Thing Theory. *Critical Inquiry* 28/1 (2001), pp. 1–22.

Brutstein, Joshua, and Spencer Soper, The Real Story of How Amazon Built the Echo, *Bloomberg.com* (2016); http://www.bloomberg.com/features/2016-amazon-echo/, access: March 31, 2020.

Bunz, Mercedes, and Graham Meikle, *The Internet of Things* (Cambridge, MA: Polity, 2018).

Burguière, André, and Ulrich Raulff, Mentalitäten-Geschichte, in: *Mentalitäten-Geschichte: Zur historischen Rekonstruktion geistiger Prozesse*, ed. Ulrich Raulff (Berlin: Wagenbach, 1987).

Burke, Edmund, *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful* (Oxford: Oxford Paperbacks, 2008).

Coole, Diana, and Samantha Frost, *New Materialisms: Ontology, Agency, and Politics* (Durham, NC and London: Duke University Press Books, 2010).

Debord, Guy, *Society of the Spectacle* (Detroit, MI: Black & Red, 1984).

Distelmeyer, Jan, An/Leiten: Implikationen und Zwecke der Computerisierung. *Navigationen* 2 (2017): Medien, Interfaces und implizites Wissen.

Distelmeyer, J., *Machtzeichen. Anordnungen des Computers* (Berlin: Bertz + Fischer, 2017).

Düllo, Thomas, *Kultur als Transformation: Eine Kulturwissenschaft des Performativen und des Crossover* (Bielefeld: Transcript, 2011).

Düllo, T., Themenfeld und Textanlass: Wohnen, in: *Texturen Nr. 1: Wohnen*, ed. Thomas Düllo and Konstantin Haensch (Berlin: Universität der Künste Berlin, 2013).

Ernst, Christoph and Jens Schröter (eds.), *Navigationen: Medien, Interfaces und implizites Wissen* 17/2 (2017).

Flusser, Vilém, *Lob der Oberflächlichkeit. Für eine Phänomenologie der Medien*, ed. Stefan Bollman and Edith Flusser (Bensheim: Bollmann, 1993).

Flusser, V., *Dinge und Undinge: Phänomenologische Skizzen* (Munich: Hanser, 2012).

Forty, Adrian, *Objects of Desire: Design and Society since 1750* (New York: Thames and Hudson, 1992).

Foucault, Michel, *Archaeology of Knowledge* (London and New York: Routledge, 2002).

Foucault, M., *The Order of Things: An Archaeology of the Human Sciences* (London: Routledge, 2006).

Galloway, Alexander R., Black box, black bloc, in: *Communization and Its Discontents: Contestation, Critique, and Contemporary Struggles*, ed. Benjamin Noys (New York: Minor Compositions, 2011).

Galloway, A. R., *The Interface Effect* (Cambridge, UK and Malden, MA: Polity, 2012).

Gesenhues, Amy, A CMO's view: Amazon's Neil Lindsay says customer obsession is core to company's DNA. *Marketing Land* (2016); https://marketingland.com/a-cmos-view-amazons-neil-lindsay-says-customer-obsession-is-core-to-companys-dna-160153>, access: April 1, 2020, access: June 3, 2020.

Hadler, Florian, Die Invasion des Interieur, in: *Texturen Nr. 1 – Wohnen*, ed. Thomas Düllo and Konstantin Haensch (Berlin: Universität der Künste Berlin, 2013).

Hadler, F. and Daniel Irrgang, Instant Sensemaking, Immersion and Invisibility.

Notes on the Genealogy of Interface Paradigms. *Punctum* 1, 2015, p. 8.

Hadler, F., Beyond UX. *Interface Critique* 1 (2018).

Haensch, Konstantin, Nach dem Unheimlichen – Das "nicht ganz Geheure" der Interface-Dinge, in: *Uncanny Interfaces*, ed. Konstantin Haensch, Matthias Planitzer and Lara Nelke (Hamburg: Textem, 2019).

Haensch, K., The Magic Interface. Media-Archaeological Notes Based on F. W. Murnau's "Faust" (1926), in: *Interface Critique*, eds. Florian Hadler and Joachim Haupt, Kaleidogramme, vol. 139 (Berlin: Kulturverlag Kadmos, 2016).

Haensch, K., Matthias Planitzer and Lara Nelke (eds.), *Uncanny Interfaces* (Hamburg: Textem, 2019).

Hirsch, Eric, and Roger Silverstone, *Consuming Technologies: Media and Information in Domestic Spaces* (London: Routledge, 1994).

Hoepfner, Wolfram, Ulf Dirlmeier, Jürgen Reulecke, Gert Kähler, Ingeborg Flagge, and Wüstenrot Stiftung Deutscher Eigenheimverein, *Geschichte Des Wohnens* (Stuttgart: Deutsche Verlags-Anstalt, 1996).

Jäger, Siegfried, *Handbuch Sozialwissenschaftliche Diskursanalyse: Band 1: Theorien und Methoden* (Wiesbaden: VS Verlag für Sozialwissenschaften, 2006).

Johnson, Stephen, *Interface Culture: How the Digital Medium – from Windows to the Web – changes the Way we Write, Speak* (San Francisco: HarperOne, 1997).

König, Wolfgang, *Geschichte der Wegwerfgesellschaft: Die Kehrseite des Konsums* (Stuttgart: Franz Steiner, 2019).

Latour, Bruno, *Die Hoffnung der Pandora: Untersuchungen zur Wirklichkeit der Wissenschaft*, trans. Gustav Roßler (Frankfurt/Main: Suhrkamp, 2017).

Liebl, Franz, and T. Düllo, *Strategie als Kultivierung: Grundlagen – Methoden – Prozesse* (Berlin: Logos Verlag, 2015).

Liessmann, Konrad Paul, *Das Universum der Dinge: Zur Ästhetik des Alltäglichen* (Vienna: Zsolnay, 2010).

Mattern, Friedemann (ed.), *Total vernetzt: Szenarien einer informatisierten Welt* (Berlin and Heidelberg: Springer, 2013).

Mattern, F., *Ubiquitous Computing – der Trend zur Informatisierung und Vernetzung aller Dinge* (2001); http://www.vs.inf.ethz.ch/publ/papers/Internetkongress.pdf, access: June 3, 2020.

Nake, Frieder, The Disappearing Masterpiece. Digital Image & Algorithmic Revolution, in: *xCoAx 2016: Proceedings of the Fourth Conference on Computation, Communication and X,* ed. Mario Verdicchio et al. (Bergamo 2016).

Navigationen 2 (2017): Medien, Interfaces und implizites Wissen.

Panetta, Kasey, Gartner Top 10 Strategic Technology Trends for 2019. *Gartner.com* (2018); //www.gartner.com/smarterwithgartner/gartner-top-10-strategic-technology-trends-for-2019/, access: June 3, 2020.

Porter, Michael E., and James E. Heppelmann, How smart connected products are transforming competition. *Harvard Business Review* (2014); https://hbr.org/2014/11/how-smart-connected-products-are-transforming-competition, access: June 3, 2020, 01:10pm.

Rammert, Werner, *Technik aus soziologischer Perspektive 2: Kultur – Innovation – Virtualität* (Wiesbaden: Springer, 2013).

Rieger, Stefan, Smart Homes. Zu einer Medienkultur des Wohnens, in: *Internet der Dinge: über smarte Objekte, intelligente Umgebungen und die technische Durchdringung der Welt*, ed. Florian Sprenger and Christoph Engemann (Bielefeld: Transcript, 2015).

Robben, Bernard, and Heidi Schelhowe, *Be-greifbare Interaktionen: Der allgegenwärtige Computer: Touchscreens, Wearables, Tangibles und Ubiquitous Computing* (Bielefeld: Transcript, 2012).

Roßler, Gustav, Kleine Galerie neuer Dingbegriffe: Hybriden, Quais-Objekte, Grenzobjekte, epistemische Dinge, in: *Kontroversen zur Entgrenzung des Sozialen*, ed. Georg Kneer, Markus Schroer and Erhard Schüttpelz (Frankfurt/Main: Suhrkamp, 2008).

Shaviro, Steven, *The Universe of Things: On Speculative Realism, Posthumanities* (Minneapolis: University of Minnesota Press, 2014).

Sommerer, Christa, Laurent Mignonneau and Dorothée King, *Interface Cultures: Artistic Aspects of Interaction* (Bielefeld: Transcript, 2008).

Sprenger, Florian, and Christoph Engemann, *Internet der Dinge: Über smarte Objekte, intelligente Umgebungen und die technische Durchdringung der Welt* (Bielefeld: Transcript, 2015).

Virilio, Paul, *Ästhetik des Verschwindens*, trans. Marianne Karbe and Gustav Roßler (Berlin: Merve, 1986).

Weiser, Mark, The Computer for the 21st Century. *ACM SIGMOBILE Mobile Computing and Communications Review* 3/3 (1999), pp. 3–11; https://doi.org/10.1145/329124.329126.

Weiser, M., and John Seely Brown, Designing Calm Technology, Xerox PARC, December 21, 1995; http://www.ubiq.com/hypertext/weiser/calmtech/calmtech.htm, access: June 1, 2020.

Wirth, Sabine, Gehäuse, Black Box, Interface – Zur Opazität der Oberflächen des Computers, in: *Hüllen und Enthüllungen: (Un-)Sichtbarkeit aus kulturwissenschaftlicher Perspektive*, ed. Inga Klein et al. (Berlin: Reimer, 2017).

GIRLS AND THEIR CATS: ZOOMS – HIGH RESOLUTION – MAKING A DIFFERENCE

By Elisa Linseisen

"High resolution image surfaces are overfull with data – pixels – and zooming in them is a process of inquiry that leads to meaningful and sensual exclusions, distortions or intensifications."

Suggested citation:
Elisa Linseisen, Girls and Their Cats: Zooms – High Resolution – Making a Difference. *Interface Critique* 3 (2021), pp. 301–311.
DOI: https://doi.org/10.11588/ic.2021.3.81324.

Making a Difference

1957, 1998, 2020 – based on these seemingly randomly chosen dates I will tell a media-philosophical story, maybe a *science fiction* in the sense of Donna Haraway, about various zooms in visual worlds, questioning a specific media materiality: the high resolution of digital interfaces. This narrative is neither teleologically nor media-ontologically defined, but rather uses book pages, data environments and windowpanes to span a conceptual field in order to illustrate how high-resolution interfaces of smartphones, tablets, laptops, smart TVs and advertising surfaces line our reality. Screens do not disguise reality in a delusive, simulated or hyperreal way. This requires a theoretical view to abandon the idea (dedicated to Platonic philosophy) that a deeper (or more) meaning is hidden behind or beneath the surface of an image. I argue that HD zoomable user interfaces show that movement in the high-resolution image initiates the potential for interaction, change and creation – rather than an abstraction or complete control – of reality. High resolution image surfaces are overfull with data – pixels – and zooming in them is a process of inquiry that leads to meaningful and sensual exclusions, distortions or intensifications. I will correlate zooming and high resolution in order to refer to processes of differentiation in these data-dense images, which must not be recognised as a misrepresentation of reality, but rather as its exploration and the entanglement in it, and which, as my chosen examples will show, begin with girls and often also with (their) cats.

1957

"The first picture, from which we start, is as we said already one of a child sitting in front of a school, with a cat on her lap."[1] The girl and her cat are appearing on the first page of the children's book *Cosmic View: The Universe in 40 Jumps* by the reform pedagogue and activist Kees Boeke, only to vanish again from the book on the third page: "It is surprising that already in this forth illustration the child, who filled the greater part of the first picture, has completely disappeared."[2] Soon after, all that remains is imagination – "there is the little girl: we know she must be there, but we cannot see her!"[3] The girl and the cat have dissolved from a concrete representation into an abstract memory of their visibility, smaller than or equal to one pixel of the depicted, which comprises – staggered in size, the girl and the cat, top views of cars, a blue whale, houses and fields, the cartography of the Netherlands, the free-standing earth globe and the solar system and – in the opposite direction – a mosquito in the fur, then the skin and cell structure of

1 Kees Boeke, Compton, Arthur H, *Cosmic View: The Universe in 40 Jumps* (New York 1957), p. 9.

2 Ibid., p. 12.

3 Ibid., p. 14.

the cat. By turning the pages of the book, different scales of the world viewed are related to each other. The girl's dissolution into the information density of the representation of a world surrounding her is, according to Zach Horton, a media-theoretical problem of high resolution. A ratio between representation and medium has been introduced in COSMIC VIEW between the resolution, i. e. the quality of representation of the ink-printed paper and the resolution, i. e. the detail of the reality depicted: "Resolution […] is highlighted as a material property or relationship between two scales: the scale of the book in the reader's hands and the scale of the surface [of reality] that each page depicts."[4] The illusory trick, namely that the girl is present with her cat, even though she is no longer visible on the page of the book, reveals the selective negotiation of every representational relationship, i. e. the medium itself. COSMIC VIEW explores this process of mediation in 40 different views, each providing different details of reality in alignment or absence with the granularity of the illustration. According to Horton, the book would remind us that we cannot change scales without gaining as much information about reality as we lose about it. These contingencies call for a constellation of reception that negotiates the differences of the variables in the process (of turning the pages and weighing thoughts) and that does not passively and contemplatively surrender to a self-contained world view: "The reader must work within the material limitations of resolution and the discontinuity between scales, yet generate virtual connections between these scalar slices of the universe."[5]

1998

In 1998, a girl draws similar virtual relationships between different parts of a universe when she attends the exhibition 'Digital Earth' in a local museum. Using a head-mounted display and a data glove, the girl is able to explore reality, which first reveals the solar system and, within it, the earth globe against a black background. Due to the ever-increasing resolution, the girl changes her field of vision and moves from continents, countries, cities, houses to a scale that corresponds to the world she lives in. Inquisitive, during her virtual exploration of the world, the young exhibition visitor does not look for the well-known house cat but prefers to research bison and bighorn sheep. She constantly requests new information in order to further discover reality, and with her curiosity she shapes the image surrounding her, the virtual reality of a digital earth, which Al Gore in turn spelled out for his audience at a lecture at the California Science Center in Los Angeles with a similar pedagogical approach as Boekes.[6] Once again it is

4 Zach Horton, Composing a Cosmic View: Three Alternatives for Thinking Scale in the Anthropocene, in: *Scale in Literature and Culture*, ed. Michael Tavel Clarke and David Wittenberg (Berlin and Heidelberg 2017), pp. 35–60.

5 Ibid., p. 53–54.

6 Al Gore, The Digital Earth: Understanding our Planet in the 21st

about the relationship between different resolutions, namely human perception, which Gore concedes a "very high resolution" when the information density of the reality, which has a much higher resolution, has been correctly formatted or compressed. This requires, according to Gore, a "multi-resolution, three-dimensional representation of the planet, into which we can embed vast quantities of geo-referenced data."[7] The girl as epistemological proxy, placed in the middle of the narrative as well as in the middle of the digital earth, demonstrates that this form of representation must be designed to interact with data, to bring data sets into relation to each other, in order to make the "complex interaction between humanity and our environment" comprehensible and its various proportions negotiable.[8]

2020

The tactile and tangible nature associated with the change in the level of detail of her environment seems to be a given mode of world exploration for a seven-year-old girl who, some twenty years after Gore's vision, is standing at the window on the third floor of her parents' apartment and looking into the backyard of the house. The girl's gaze wanders from the rustling leaves of the chestnut tree to the neighbour's daughter's bicycle, until her attention is focused on a prowling, black-grey cat. The girl is interested in the animal, she wants to take a closer look at it and therefore places her thumb and index finger on the glass pane "as if it were a touchscreen:" "*The girl spreads her two fingers, moving them back and forth in what is called the 'pinch-to-zoom' gesture.*"[9] Curator and theorist Doreen Mende recognizes in her description of the child's behaviour how the internalised, techno-physiological automatism – the pinch-to-zoom gesture – becomes a mental apparatus for exploring the world, even if there is no interactive display at all, but rather the analogue window-pane that establishes the relationship to reality: "The code of touch programs the brain into a screen of producing a world."[10] The screen, mentally stretched open by the movement of the two fingers, once again aligns the graininess of reality with the dissolving capacity of perception and, based on this relationship, establishes reality anew by 'framing', i. e. medializing, a certain section of it. Following Mende, with a brief reference to Virilio, the pinch-to-zoom gesture is connoted as imperial imagination, rendering the distance accessible, without any restriction: the framing of the emerging reality and the effortless navigation within it does not reach its

Century. *Digital Earth* (1998) www.digitalearth .gov/VP19980131.html, access: May 31, 2020.

7 Ibid., p. 1.

8 Ibid., p. 2.

9 Doreen Mende, The Code of Touch: Navigating Beyond Control, or, Towards Scalability and Sociability. *e-flux* (2020); https://www.e-flux.com/journal/109/331193/the-code-of-touch-navigating-beyond-control-or-towards-scalability-and-sociability/, access: May 31, 2020; emphasis in original.

10 Ibid.

limits, nor does the supposed knowledge about it; the screen is no longer an "*interface that serves as a portal of connectivity to the world outside*," but an "*intraface*" and connects a physical (gaze/touch) situatedness within reality to the promise of its control.[11]

Zoom Pedagogics, Zoom Politics

Mende is not the only one to raise a political, representation-critical issue in the exploration of reality through the media's weighing up of degrees of resolution. It seems to be a well-established commonplace in current theories concerning the relationship between humans, non-humans and the environment: namely that zooms are not suitable for addressing reality's complexity via media-ecological or network-like, lateral connections, even if, or precisely because, 'the large' and 'the small' can be easily related to each other. Before I elaborate further on this point, I would like to briefly summarise what unites the three stories described in my argument, and why I place them in the context of a representational-critical unease with zooms. One characteristic that brings the examples from 1957, 1998 and 2020 together is that none of them are zooms that negotiate scalability through the relationship between media resolution and the level of detail of reality. Indeed, Horton even chooses the well-known zoom from Charles and Ray Eames' animation 'Powers of Ten' (1977), which moves from humans to the galaxy and then on a cellular level, as a counter example to *Cosmic View*.[12] More on that in a moment.

First of all, my three examples deal with relations of reality, e. g. between the Netherlands and the solar system, a museum and the planet and of course between the girl and a cat. Further, the discussion of these different realities in all of the stories is carried out through a haptic practice: turning pages, the data glove in surrounding visual environments and the pinch-to-zoom gesture on the glass pane. What all three examples have in common, moreover, is that a girl was chosen as the protagonist in order to specify the location 'in the midst of a visual reality', an "intraface" (Mende), which seems to be oriented less towards representation and more towards interaction, albeit mental or virtual. Finally, a pedagogical claim can be identified which aims at conveying complexity and which opposes an imperial position of overview or the appropriation of a density of details of reality – its high resolution – in the scale of universe/earth/human/cell.

Following the pedagogy of the described examples is the mentioned cultural and media science zoom criticism, which has its most prominent advocate in Bruno Latour. Latour nurtures

11 Ibid.

12 Horton, Composing a Cosmic View, p. 55.

an immense epistemological suspicion against zooms, which he describes as "disastrous metaphor"[13], which "poisons thinking sustainably."[14] Zooms would reduce the complex relationships of reality, the different scales of the universe, to a hierarchical gradation and, by means of continuous movement from small to large, would suggest their anthropocentric controllability.[15] 'Powers of Ten" or the Google Earth zooms, which are undoubtedly anticipated in Gore's fictitious visit to the "Digital Earth" exhibition, would smooth out scalar differences in reality and create an even, undisturbed surface, which would immediately give rise to platonic criticism of an hallucination that conceals the diversity of reality: For Latour, the zoom is completely implausible, a figment of the imagination, an uncritical effect, "an assemblage as artificial as a fake perspective in a stage set."[16]

As already mentioned, Boecke's children's book *Cosmic Views* is considered a positive counterpart to the populistic zoom, calling on its pedagogical impetus to use the mental and media sidesteps to reveal the gaps that arise when one tries to grasp the complexity of reality. Mende, too, argues against the continuity of the zoom, which she supplements by a frameless representation. As a counterexample, she refers to the cinematic theory of montage and to the political potential of making the joints between images visible. Montage, however, does not only unfold the power of a (moving) image during projection (in the cinema), but, according to Mende, at the editing table, where the image can be perceived as "a working instrument that creates a space-time of thought"[17], similar to, for example, turning pages in COSMIC VIEW or structuring data in 'Digital Earth': "It turns the image viewer into an image-thinker-cum-worker."[18] (ibid.) According to Mende, simply pressing a touch screen is „the least of all possible labor-exhaustive activities – *kinderleicht*."[19] This assessment that zooms are to be used "as uncannily easy as the most powerful tools of control"[20], brings me back to the beginning of my argument, namely to the most qualified recipients of such zooms: the girls and their cats.

Little Girls …

If one had nothing to add to the zoom criticism just outlined, then the girls with their cats could, as a naive type of recipient, complement it, if they were

13 Bruno Latour, Anti-Zoom, in: *Scale in Literature and Culture*, ed. Michael Tavel Clarke and David Wittenberg (Berlin and Heidelberg 2017a), pp. 93–101, here 98.

14 Bruno Latour, *Kampf um Gaia: Acht Vorträge über das neue Klimaregime* (Berlin 2017b), p. 235; my translation.

15 Bruno Latour, Zoom auf Paris. Die sichtbare Stadt, die totalisierte Stadt, die unsichtbare Stadt. *Lettre International* 92 (2011), pp. 52–53; Bruno Latour, *Eine neue Soziologie für eine neue Gesellschaft: Einführung in die Akteur-Netzwerk-Theorie* (Berlin 2014); Latour, Anti-Zoom; Latour, *Kampf um Gaia*.

16 Latour, Anti-Zoom, p. 98.

17 Mende, The Code of Touch.

18 Ibid.

19 Ibid.

20 Ibid.

perceived, for example, in the sense of Siegfried Kracauer's 1928 described "little shop girls".[21] Narcotised by the concealing social ideology of the Weimar Republic's cinema, Kracauer argues that any political potential of the projected images is suffocated by the female innocence. The essay "The little shop girls go to the cinema" has, as Kracauer explains, similar pedagogical intentions as the given examples and "is conceived as a small collection of samples whose textbook cases are subjected to moral casuistry."[22] However, the moral lessons taught by Boeke, Gore and Mende, which we have encountered above, seem to be convinced, quite the opposite of Kracauer, of the curiosity, the critical engagement and above all the involvement of the girls in the knowledge production process of the images. The girls act as a participatory counterpart to the imperial construction of reality, for example because they are not only depicted in *Cosmic View*, but were also involved in the production of the book, a result of Boekes' communitarian and anarchist educational doctrine;[23] or because the girl includes her own data in the composition of "Digital Earth," the virtual reality described by Gore.[24]

The three scaling aspects that I presented are inseparably linked to world exploration and the girl in particular, which does not follow a patriarchal order, but rather *queers* it, is therefore, also for Mende, in a position "to make sure that we do not leave navigational tools [like the pinch-to-zoom gesture] to the world-destroyer."[25] The girl creates reality – "not only one universal world that the imperial navigator has claimed, but rather many worlds" and is capable of doing so, if one follows Mende further, not because she obeys pedagogical guidelines so well, but because she appropriates and rededicates the existing, supposedly ideologically intended modes of world exploration via a subversive strategy of "unlearning" and opens them up for a changed world view. The girl is not the professional engineer or scientist who authorizes the representation of a reality, but rather takes an accepting but yet acting role of receiving and applying, which, according to the established assertion, also produces reality through a certain disposition to modify given media forms.

Potentials of High Resolution

This possibility of rededicating existing visual worlds allows me to return to zooms, or more specifically: to internal movements within the image, which, through similar finger pointing as the pinch-to-zoom gesture, currently and ubiquitously determine the reception of zoomable user interfaces. In conclusion,

21 Siegfried Kracauer, The little Shopgirls go to the Movies, in: *The Mass Ornament: Weimar essays*, ed. Thomas Y. Levin (Cambridge, MA 1995 [1928]), pp. 293–304.

22 Ibid., p. 294.

23 Horton, Composing a Cosmic View, p. 52.

24 Gore, The Digital Earth, p. 2.

25 Mende, The Code of Touch.

I would like to argue that precisely such simple forms allow effortless navigation within the supposedly frameless cadre of digital screens that make the potential for interaction, change and the creation of reality, which was called for at the outset, feasible. The properties of the executed non-zooms between book pages, in data environments and on glass panes can then, in the sense of 'unlearning', be understood as digital zooms – i. e. continuous, calculated movements as a negotiation of different scales. In order to escape the accusation of illusion, zooms into digital screens must be understood less as *forms* of representation of and more as *formats* of interaction with reality – digital formats that produce knowledge in the process of reformatting and constant rescaling; elsewhere I am using the term "epistemological zooming".[26] Through epistemological zooming it becomes evident that reality is embedded in the data layers, in the density of information, in the processable scope for re- and post-processing, in the incompatibilities and consequently in an operative understanding of visuality, which seems to be stimulated by digital materiality – by high resolution. Knowledge must then be gained practically and materially, through exploring and questioning the digital images: Knowledge process is image processing. Mende also argues in this direction when she refutes her assertion that digital images appear frameless on displays and when she recognizes the plurality of frames in the high-resolution of the images, in the separation of each individual pixel from the other. The potentials that seem to be hidden between the pixels and not behind or below the surface of the image, but within it, require zooming, in order to unfold their reality-exploring and critical potential: "One can see these tiny frames by zooming into the digitized or computer-generated image, as if looking behind the scene from the front; the extreme close-up disrupts the image's representational function by imposing its own condition of producing."[27] Following the aforementioned montage theory according to Esfir (Esther) Schub, Mende emphasises a social dimension of scalability, in terms of collective work, if one correlates, as I also suggest, zooming with the materiality of high resolution – "the excess of thousands of pixel frames per centimeter (pixel density) introduces a mass scale of practices of mediated communication."[28] Revealing the condition of fabrication would reveal "the enmeshment of technology with politics, violence, images, and labor."[29]

26 Elisa Linseisen, *High Definition. Medienphilosophisches Image Processing* (Lüneburg 2020); Elisa Linseisen, Epistemological Zoomings into Post-Digital Reality, or How To Deal With Digital Images? Mimesis as a Methodological Approach, in: *Re-/Dissolving Mimesis*, ed. Sebastian Althoff, Elisa Linseisen, Maja-Lisa Müller and Franziska Winter (Paderborn 2020b), pp. 158–85.

27 Mende, The Code of Touch.

28 Ibid.

29 Ibid.

… and Their Cats

In conclusion, the consequence of such an operative characteristic of digital images is that both reality and its perception can be understood as enmeshment with the world. Subsequently, the easy gesture of zooming into smooth, seamless surfaces follows the participatory structure that I have called up with the three non-zoom examples: Zoomable user interfaces also constitute surrounding pictorial worlds that are to be engaged with and that establish lateral relationships between the environment, humans and non-humans, e. g. the girl at the windowpane and the cat in the garden. For this purpose, prescribed gestures, especially for the users of a Western culture, must not be understood as control or abstraction, but as modes of 'new' or 'different ways of learning', as the girls demonstrate. Especially the situation when standing at a windowpane and supposedly failing to zoom closer to the cat would be a productive conclusion of image processing, namely that the negotiation of the proportions of reality via images always means an entanglement of the negotiator with this reality, a "situatedness"[30] in it. That is, the media-technical ensemble in which the girl is positioned at the glass pane is not attributable to her supposed naivety, or to the imperial control of the gaze that zoomable user interfaces have taught the young user. Trying to easily access the world via pinch-to-zooms takes the girl to a certain limit, which causes an epistemological vertigo effect that reveals commonplaces and predetermined standards: "*for a second, the girl loses her sense of orientation.*"[31] The loss of orientation in the standard format of reality is a precondition for the entanglement in it and its negotiation of scale, which can be brought back to the cat at the very end of this text.

In the words of Donna Haraway, one could say that zoomable user interface brings a world view of the cat into play – not Wiener's cat as a cybernetic circuit[32] and also not Schrödinger's quantum-mechanical cat – but the cat as a "practice of turning tropes into worlds,"[33] "[q]ueering specific normalized categories […] for the hope for livable worlds,"[34] a practice of "*materialized refiguration*,"[35] that Haraway calls "cat's cradle". Cat's cradle is a game for children, which, like the turning of the pages, the data glove and the pinch-to-zoom gesture, is a manual one – a string-figure that allows to establish links and relationships between different (human and non-human) actors and that, above all, underlines the involvement of the players in the game.

30 Donna J. Haraway, Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies* 14/3 (1988), pp. 575–99; Donna J. Haraway, A Game of Cat's Cradle: Science Studies, Feminist Theory, Cultural Studies. *Configurations* 2/1 (1994), pp. 59–71.

31 Mende, The Code of Touch.

32 Norbert Wiener, *Cybernetics, or Control and communication in the animal and the machine* (Cambridge, MA 2019).

33 Haraway, A Game of Cat's Cradle, p. 60.

34 Ibid., p. 59.

35 Ibid., p. 61, emphasis in original.

With cat's cradle Haraway introduces a "knotted analytical practice" of the "anti-racist multicultural feminist studies of technoscience"[36], with the intention "that readers will pick up the patterns, remember what others have learned how to do, invent promising knots, and suggest other figures that will make us swerve from the established disorder of finished, deadly worlds."[37] Drawing on Haraway's theoretical/science fiction, one might say that the girl at the window, the cat in the garden, the techno-physiological automatism of zoomable user interfaces and the epistemological zooming all together play cat's cradle. Thus, differences are produced in a reality that has the materiality of high-resolution digital images. In doing so, the girl abandons an imperial model of technology and, with an operative understanding of the image, generates new insights into reality as image processing. The final pedagogical call in this text therefore is to go out and play cat's cradle with girls and (their) cats.

36 Ibid., p. 68.

37 Ibid., p. 65.

References

Boeke, Kees, and Arthur H. Compton, *Cosmic View: The Universe in 40 Jumps* (New York: The John Day Company, 1957).

Gore, Al., The Digital Earth: Understanding our Planet in the 21st Century. Digital Earth (1998); www.digitalearth.gov/VP19980131.html, access: May 31, 2020.

Haraway, Donna J., Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies* 14/3 (1988), pp. 575–99.

Haraway, D. J., A Game of Cat's Cradle: Science Studies, Feminist Theory, Cultural Studies. *Configurations* 2/1 (1994), pp. 59–71.

Horton, Zach, Composing a Cosmic View: Three Alternatives for Thinking Scale in the Anthropocene, in: *Scale in Literature and Culture*, ed. Michael Tavel Clarke und David Wittenberg (Berlin and Heidelberg: Springer, 2017), pp. 35–60.

Kracauer, Siegfried, The little Shopgirls go to the Movies, in: *The Mass Ornament: Weimar essays*, ed. Thomas Y. Levin (Cambridge, MA: Harvard University Press, 1995 [1928]), pp. 293–304.

Latour, Bruno, Zoom auf Paris. Die sichtbare Stadt, die totalisierte Stadt, die unsichtbare Stadt. *Lettre International* 92 (2011), pp. 52–53.

Latour, B., *Eine neue Soziologie für eine neue Gesellschaft: Einführung in die Akteur-Netzwerk-Theorie* (Berlin: Suhrkamp, 2014).

Latour, B., Anti-Zoom, in: *Scale in Literature and Culture*, ed. Michael Tavel Clarke and David Wittenberg (Berlin and Heidelberg:

Springer, 2017), pp. 93–101.

Latour, B., *Kampf um Gaia: Acht Vorträge über das neue Klimaregime*, trans. Achim Russer and Bernd Schwibs (Berlin: Suhrkamp, 2017).

Linseisen, Elisa, *High Definition. Medienphilosophisches Image Processing* (Lüneburg: Meson Press, 2020).

Linseisen, E., Epistemological Zoomings into Post-Digital Reality, or How to Deal With Digital Images? Mimesis as a Methodological Approach, in: *Re-/Dissolving Mimesis*, ed. Sebastian Althoff, Elisa Linseisen, Maja-Lisa Müller and Franziska Winter (Paderborn: Fink, 2020), pp. 158–85.

Mende, Doreen, The Code of Touch: Navigating Beyond Control, or Towards Scalability and Sociability. *e-flux* (2020); https://www.e-flux.com/journal/109/331193/the-code-of-touch-navigating-beyond-control-or-towards-scalability-and-sociability/, access: May 31, 2020.

Wiener, Norbert, *Cybernetics, or Control and communication in the animal and the machine* (Cambridge: MIT Press, 2019).

BIOGRAPHICAL NOTES

Authors

Hannes Bajohr received his doctoral degree from Columbia University with a dissertation on Hans Blumenberg's theory of language. His research focuses on theories of the digital, German 20th century philosophy with a focus on phenomenology and philosophical anthropology, as well as political theory. He is a postdoctoral researcher at Basel university's media studies department. Most recent publications: *History, Metaphors, Fables: A Hans Blumenberg Reader* (co-edited with Florian Fuchs and Joe Paul Kroll), Ithaca, NJ: Cornell University Press, 2020, and "Algorithmic Empathy: On Two Paradigms of Digital Generative Literature and the Need for a Critique of AI Works," in: *Basel Media Culture and Cultural Techniques Working Papers* 1, no. 4 (2020).

Alex Beattie is a Research Fellow at the Center for Science in Society, at Victoria University of Wellington, Aotearoa New Zealand. He researches science communication, interface design and ethics, digital wellbeing and disconnecting from the internet. Alex has published in *Convergence* and is a contributing author of *Making Time for Digital Lives: Beyond Chronotopia* and *Reckoning with Social Media: Disconnection in the Age of the Techlash* (both Rowman & Littlefield).

Ulrike Beck is head of the BMBF-funded research project "Innovation research on dress and its complex interconnection to society" at Berlin University of the Arts. Beck pioneers the field of constructional textile research, which utilizes the compelling logic of the three-dimensional construction of the clothes as an essential dimension to understand strategic problem-solving in the historical and ancient textile industry. She developed a new scientific methodology, which combines forensic techniques with those of reverse engineering to extract relevant primary data from the material culture in order to scientifically reconstruct the functional and aesthetic behaviour of the textile finds in motion as well as their fabrication strategies. Beck understands clothing production as a complex task, which is solved by converting creative ideas into a mathematical concept and applying it to a specific problem. Therefore, her research focusses on pattern recognition and translating the consistent logical language of the dress into comparable data models. Beck received her PhD in design research at Berlin University of the Arts, where she developed her research methodology. She collaborates internationally with various Universities, collections, and colleagues from different research fields.

Catherine Caudwell

Catherine Caudwell (PhD) is a lecturer in User Experience Design at the School of Design, Victoria University of Wellington. Catherine's research takes a qualitative and interdisciplinary approach to exploring how relationships with emerging technologies are created, reinforced, and reimagined through the nexus of design, marketing, media, and public adoption.

Thomas Elsaesser (1943–2019) was professor emeritus in film and television studies at the University of Amsterdam, and between 2013 and 2019 taught part-time at Columbia University, New York. He gained his PhD in 1971 at the University of Sussex and subsequently taught for nearly 20 years at the University of East Anglia, where he co-founded one of the first Film Studies departments in the United Kingdom. Appointed professor in Amsterdam in 1991, he founded (and chaired until 2001) the Department of Film and Television Studies – the first in the Netherlands. His writings include the fields of film theory and film history, genre theory, Hollywood cinema, European cinema d'auteur, media archeology and the theory of new media. On December 4, 2019 Thomas Elsaesser unexpectedly passed away in Beijing.

Christoph Ernst (PD Dr.) is assistant professor at the Department of Media Studies of the University of Bonn. Main research interests: Diagrammatic reasoning & media aesthetics of information visualization; theory of tacit knowledge & digital media, esp. interface theory and artificial intelligence; media theory & media philosophy, esp. media and imagination. Selected publications: *Diagramme zwischen Metapher und Explikation – Studien zur Medien- und Filmästhetik der Diagrammatik* (Bielefeld: Transcript, 2021); *Media Futures. An Introduction* (London: Palgrave McMillan, 2021 forthcoming). Further information: www.christoph-ernst.com

Victor Evink is a Dutch artist and researcher based in Utrecht. After receiving a MSc in History and Philosophy of Science from the University of Utrecht in 2013, his practice has focused on the evolution of knowledge, technology and peripheral subcultures. As a person with autism, his focus is shifting towards issues surrounding inclusion of people with a disability in a socio-technical context. His conceptual and curatorial work under the research umbrella Zhōuwéi Network has been shown in exhibitions and screenings such as 'Zero Emissions by 2099' at gallery MAMA and 'Earthrise x Zhōuwéi Network' geocaching in Rotterdam (2021). Under the name Liminal Vision he collaborates with the designer-filmmaker Emilia Tapprest. Their transdisciplinary practice tackles themes such as human connectedness and agency in the quantified age, exploring how a system's underlying logic produces particular 'affective atmospheres' in interaction with its social fabric.

Vilém Flusser (1920–1991) was a cultural philosopher and media theorist. Born and raised in Prague, he emigrated in 1939 to Brazil following the German invasion. After his appointment as a member of the Brazilian Institute of Philosophy (1962) he worked as a lecturer in communication science. He returned to Europe in 1972. He published numerous books and countless contributions in magazines and newspapers. On November 27, 1991 Flusser died in a car crash near the German-Czech border.

Katharina Groß first studied sculpture, then animation film and graduated with a master's degree in New Media in the class of Prof. Dammbeck at the HfBK Dresden. She is currently doing her doctorate in media philosophy at the Bauhaus University in Weimar. She was co-founder of CYNAL-Neue Kunst im Dialog and currently collaborates with neueraeume; to explore the artistic-technical possibilities in software for virtual environments and sensor technology. She exhibited "a. o." at Tonlagen Festival, WISP and several times at CYNETART. Her work focuses on artistic research with current media technologies, media aesthetics and knowledge culture as well as practice as research / theory as practice.

Konstantin Haensch graduated from the Berlin University of the Arts, where he later worked as a Research Assistant. He was a Visiting Scholar at the Department of Anthropology at the Chinese University of Hong Kong and currently holds a stipend at Princeton University. Situated at the nexus of aesthetics, media culture, and design/economics, his research looks into the economic and material conditions of the Smart speaker. Konstantin is co-editor of the eight-volume ongoing book series *Texturen* (Logos), the *Forum zur Genealogie des MedienDenkens* (UdK Press), as well as the anthologies *Uncanny Interfaces* and *Uncanny Entrepreneurship* (Textem).

Daniel Irrgang is a research associate at Weizenbaum Institute within the Berlin University of the Arts research group 'Inequality and Digital Sovereignty'. He holds a PhD in media studies on diagrammatics and expanded mind with a case study on Vilém Flusser's concept of technical image. Among other fields, his research focusses on visual depictions of information from a media theory/cognitive studies perspective, interface or HCI paradigms, exhibition concepts as well as epistemological problems, often in a media archaeological context. Daniel is affiliated researcher with the centre Art as Forum at the University of Copenhagen. He has been awarded a Marie Skłodowska-Curie Fellowship grant (European Commission/REA Horizon2020), with Art as Forum as host institution, starting from September 2022.

Martin Jess lives and loves data digitalization. Due to his background in software engineering and data management in combination with art history, he takes a great interest in the intersection between design research and information technology. His passion is to understand innovation strategies and to support and facilitate knowledge discovery by using standardized workflows. Jess earned a Master of Science from the Martin Luther Universität in Halle. In his ten years of work experience in digitalization as software engineer and data management expert, he contributed to various economic fields. Recently he was part of the team for the Swiss COVID-19 Research Project Registry. In his current research he focusses on designing and implementing data management platforms for artefacts in the field of archaeology and art history.

Vladan Joler is SHARE Foundation co-founder and professor at the New Media department of the University of Novi Sad. He is leading SHARE Lab, a research and data investigation lab for exploring different technical and social aspects of algorithmic transparency, digital labour exploitation, invisible infrastructures, black boxes, and many other contemporary phenomena on the intersection between technology and society.

Cherie Lacey (PhD) is a lecturer in Media and Communication at Victoria University of Wellington, Aotearoa New Zealand. Her research explores the ways in which interface design mediates relationships and shapes subjectivity. Cherie has published in the areas of data privacy and ethics, dark patterns, digital wellbeing, and user subjectivity.

Elisa Linseisen is postdoctoral assistant researcher at the Institute of Media Studies of the University Paderborn, Germany and associate member at the DFG Graduate Research Training Group "Das Dokumentarische: Exzess und Entzug" (Documentary Practices: Excess and Privation). December 2019: Doctorate (Dr. phil.) at the Institute of Media Studies of the Ruhr-University Bochum, Germany, with a thesis on high-definition images and image processing from a media-philosophical perspective (*High Definition. Medienphilosophisches Image Processing* [Lüneburg 2020]). Research interests, among others: digital imagery, media philosophy, video essayism, format theory.

Joana Moll is a Barcelona/Berlin based artist and researcher. Her work critically explores the way techno-capitalist narratives affect the alphabetization of machines, humans and ecosystems. Her main research topics include Internet materiality, surveillance, online tracking, social profiling, and interfaces. She has presented her work in renowned institutions, museums, universities and festivals around the world. Furthermore she is the co-founder of the Critical Interface Politics Research Group at HANGAR [Barcelona] and co-founder of The Institute for the Advancement of Popular Automatisms. She is currently a visiting lecturer at Universität Potsdam (DE), Escola Elisava (ES) and Escola Superior d'Art de Vic (ES).

Jussi Parikka (PhD) is Professor in Technological Culture & Aesthetics at the Winchester School of Art, University of Southampton. He is also Visiting Professor at FAMU at the Academy of Performing Arts in Prague where he leads the project Operational Images and Visual Culture (2019–2023). His books include the media ecology trilogy *Digital Contagions* (2nd. edition 2016), *Insect Media* (2010) and *A Geology of Media* (2015). This topic was continued in *A Slow, Contemporary Violence: Damaged Environments of Technological Culture* (2016) and in the short co-authored book *Remain* (2019). His new co-edited book is called *Photography Off the Scale* (2021, with Tomas Dvorak).

Matteo Pasquinelli (PhD) is Professor in Media Philosophy at the University of

Arts and Design, Karlsruhe, where he is coordinating the research group on Artificial Intelligence and Media Philosophy KIM. He edited the anthology *Alleys of Your Mind: Augmented Intelligence and Its Traumas* (Meson Press, 2015) and, with Vladan Joler, the visual essay 'The Nooscope Manifested: AI as Instrument of Knowledge Extractivism' (nooscope.ai). His research focuses on the intersection of cognitive sciences, digital economy and machine intelligence. For Verso Books he is preparing a monograph on the history of AI provisionally titled *The Eye of the Master*.

Josephine Pryde is an artist. Her recent solo exhibitions include "The Flight That Moved Them", Gandt, New York (2021); "Exterior, Night, Day", Galerie Neu, Berlin (2020) and "In Case My Mind is Changing", Simon Lee Gallery, London (2018). In 2022, she will have a solo exhibition at the Art Institute of Chicago. Her publications include *lapses in Thinking By the person i Am* (Berlin: Sternberg Press, 2018) and *The Enjoyment of Photography* (Zurich: JRP Editions, 2015). Her texts have been published in *Texte zur Kunst*, including "Men of the Left" (no. 109, 2017) and "Writing Out of My Armpit" (no. 11, 1993), as well as in other volumes, such as the essay "Constable" in *Anarchic sexual desires of plain unmarried schoolteachers*, edited by Chris McCormack (London: Selected Press, 2015). Her work is represented in various public collections: Tate Britain, London; MoMA, New York; Art Institute of Chicago; The Metropolitan Museum of Art (Met), New York; Stedelijk Museum, Amsterdam; Centre Georges Pompidou, Paris; Museum of Contemporary Art (MOCA), Los Angeles. She is currently Professor for Photography and Contemporary Art at the Berlin University of the Arts.

Lucy Suchman is Professor Emerita of the Anthropology of Science and Technology at Lancaster University in the UK. Before taking up that post she was a Principal Scientist at Xerox's Palo Alto Research Center (PARC), where she spent twenty years as a researcher. Her current research extends a longstanding engagement with the field of human-computer interaction to the domain of contemporary militarism. She is concerned with the question of whose bodies are incorporated into military systems, how and with what consequences for social justice and the possibility for a less violent world. In 2010 she received the ACM SIGCHI Lifetime Research Award, and in 2014 the Society for Social Studies of Science (4S) Bernal Prize for Contributions to the Field.

Emilia Tapprest is a Finnish artist and filmmaker. She is currently based in Maastricht, NL, and is resident at the Jan van Eyck Academie (2020/21). Arriving from a collaborative and industrial design background, she has turned to cinema as a means to engage with the complexity, interconnectedness and intensity of embodied, living experience. Her work has been shown in international exhibitions and film festivals such as IMPAKT / Speculative Interfaces (2019, Utrecht), DEMO moving image festival (2020, online), Vdrome (2021, Online), and

VISIO / Resisting the Trouble – Moving Images in Times of Crisis (2021, Florence). Under the name Liminal Vision she collaborates with the historian of science and music producer Victor Evink. Their transdisciplinary practice tackles themes such as human connectedness and agency in the quantified age, exploring how a system's underlying logic produces particular 'affective atmospheres' in interaction with its social fabric.

Jan-Henrik Walter is an intermedia designer, technology critic and research assistant at the Berlin School of Economics and Law. His work focuses on the narratives of design, games and interactivity.

Siegfried Zielinski is Michel Foucault Professor of Media Archaeology & Techno-Culture at the European Graduate School (C.H.), honorary doctor and professor at the Budapest University of Arts, and Professor Emeritus of Media Theory at Berlin University of the Arts. He was founding rector (1994–2000) of the Academy of Media Arts Cologne, director of the Vilém Flusser Archive (1998–2016), and rector of the Karlsruhe University of Arts & Design (2016–2018). Zielinski has published extensively on the archaeology and variantology of the arts and media.

Editors

Florian Hadler is currently visiting Professor for Creative Entrepreneurship at the Berlin University of the Arts, founder and managing director at the 25A0 Strategy Shop and partner at STATE Design Consultancy. He works across the public and private sector and at the intersections of academia, industry, culture and politics. His academic focus lies on digital culture and the philosophy of the unknown. More information on www.flohadler.com.

Daniel Irrgang is a research associate/postdoc at Weizenbaum Institute within the Berlin University of the Arts research group 'Inequality and Digital Sovereignty'. Among other fields, his research focusses on visual depictions of information from a media theory/cognitive studies perspective, interface or HCI paradigms, exhibition concepts as well as epistemological problems, often in a media archaeological context. More information on www.danielirrgang.com.

Alice Soiné is a doctoral student at the research group SENSING: On the Knowledge of Sensitive Media at ZeM – Brandenburg Centre for Media Studies. In her dissertation project she explores *Dream Interfacing* as wishful thinking regarding the interface figure, but also in the concrete sense of neurotechnological interfacing constellations to influence dreaming. Together with Daniel Stoecker, she examines the methodological productivity of tracing imaginaries in the context of technologies as well as their effects. She is also engaged in researching ways to innovate knowledge transfer in the field of media theory.
www.zem-brandenburg.de/en/sensing
www.imachinary.net

POSTSCRIPTUM

Interface Critique invites submissions (original papers, project or artwork descriptions) in English and does not charge any author fees. Please send an abstract of no more than 400 words to hello@interfacecritique.net. Please refer to the journal style guidelines and any additional information regarding call for papers on our website before the submission of a full manuscript.

Interface Critique is also looking for unknown or forgotten texts and artifacts that haven't been made public or haven't been translated into English yet. These are welcome in any language and we will do our best to resurface them at least partially as long as we can obtain the publishing rights. Please get in touch if you know of something you consider worthwhile.

Interface Critique is committed to open access. All of the articles are free to access immediately from the date of publication.

Please visit **www.interfacecritique.net** for further information.

All Articles are available online and Open Access at:

interfacecritique.net