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INTERFACE CRITIQUE
NAVIGATING THE HUMAN

Edited by Florian Hadler, Daniel Irrgang & Alice Soiné

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EDITORIAL: NAVIGATING THE HUMAN

By Florian Hadler & Daniel Irrgang

"The manner in which human sense perception is organized, the medium in which it is accomplished, is determined not only by nature but by historical circumstances as well."

– Walter Benjamin, The work of art in the age of mechanical reproduction, 1935.

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Humans design technology, and technology shapes what it means to be human. That is old news, at least for media theory, Science and Technology Studies and a couple of other disciplines. The story goes from Freudian wax scrapings of the antique to Nietzsche's pen, from Heidegger's radio to Kittler's typewriter. Technology does not only refer to functional instruments, it has existential dimensions. It shapes our cognition, bodies and social relations. Technology has a culturing effect – it informs and reformulates our perception of the world and of each other. In fact, culture and technology are interdependent.[1] But while this basic insight into the effects and implications of technologies and their culturing effects is well established within certain areas of theoretical discourse, it is certainly not well understood by people and organizations who actually shape technology today. From a tech and engineering perspective, the human is conceived as programmable. Technology provides the gentle means by which the human can be navigated. And technology, in this perspective, does not have an agency of its own – it is rather an instrument for the cultivation of the human. And the cultivation of the human is best achieved through the navigation and design of human behaviour.

The subject of behavioural design became prominent in interface discourse and practice in recent decades. It is now visible with the widespread application of nudging mechanisms and dark patterns[2] that emerged from the behavioural and persuasive technology labs at Stanford and elsewhere from the late 1990s onwards.[3] These developments in the context of the so-called human-centred design paradigm did not come out of nowhere.

In the middle of the twentieth century a shift in the relationship between humans and their technological artefacts occurred. The *machines*, whose inner mechanical organs and operation principles could still be observed by the naked eye and understood by the observer, were now, in various fields of society, slowly replaced by *apparatuses*. The apparatus is an opaque black box, in the cybernetic sense of the term, whose "inner" functional principles are not only out of sight, hidden under operational surfaces such as control panels, but also characterized by a high degree of structural complexity.[4] Thus, the operator of the apparatus would rather focus on the operational modes of its surface than aim at an understanding of its deeper functional principles. Today, these functional principles are completely out of reach, hidden in well-guarded data centres and

1 Raymond Williams, *Television: Technology and Cultural Form* (London 1974).

2 Arunesh Mathur et al., Dark patterns at scale: findings from a crawl of 11K shopping websites. *Proc. ACM Hum.-Comput. Interact.* 3, CSCW, Article 81 (2019).

3 See for example the influential paper from B.J. Fogg, Persuasive technology: using computers to change what we think and do. *Ubiquity* (December 2002), pp. 89–120.

4 This quasi-dialectical distinction has been coined by Vilém Flusser, which he in turn adapted from Abraham A. Moles' pioneering work on information aesthetics. Cf. Abraham A. Moles, *Informations theorie und ästhetische Wahrnehmung* (Cologne 1971).

compiled within inaccessible source codes, secured by terms of services and cloud infrastructures.

This shift in the human–technology relationship – from a structural to a functional understanding, from access to inner processes to surface operations – was certainly accelerated by the intensification of military research during the Second World War, followed by the technological race of the Cold War. US research took a leading role, funding large programmes that then turned into the cradle of what is now called the tech sector of Silicon Valley.[5] The focus of technology development shifted: from the invention of tools or equipment in service of a human operator to the design of "man-machine units",[6] where "human engineering"[7] plays a role similar to the engineering of technology. This shift was not limited to military research, as historiographies of computing tend to construct. Academic research in ergonomics quickly spread to the general industry, where, to quote a contemporary observation, "the emphasis [was] shifting from the employment of men who were 'doers' to men who are 'controllers'".[8]

A landmark in the investigation of human factors in industries was the foundation of the Human Research Society in Oxford in 1949, soon renamed the Ergonomics Research Society in 1950.[9] One of its founding members, the British psychologist K. F. Hywel Murrell, published the seminal work *Ergonomics. Man in his Working Environment* in 1965.[10] Focusing on the efficiency of work processes, studies in ergonomics should "enable the cost to the individual to be minimized" and thereby make a "contribution not only to human welfare but to the national economy as a whole".[11] Murrell's description of the cognitive and material task of operating equipment as a "closed loop system", in which the operator "receives and processes information",[12] was obviously influenced by contemporary discourses of behaviourism and cybernetics. It's input–output logic is illustrated in Figure 1 of Murrell's book, which also provides a symbolic form for ergonomics research of the time: the displayed data evoke a

5 The influence of ARPA-funded projects (Advanced Research Projects Agency, now called DARPA = Defense Advanced Research Agency) – as the driving force for the powerful cybernetic paradigm of the following decades – on developments in human computer interaction is well documented. In fact, Alan Kay, the main protagonist of GUI development at Xerox PARC in the 1970s, discussed research in aeronautics as the direct predecessor of research on computer interfaces. Cf. Alan C. Kay, User interface. A personal view, in: *multiMEDIA. From Wagner to Virtual Reality*, eds. Randall Packer and Ken Jordan (New York 2001), pp. 121–131.

6 K. F. Hywel Murrell, *Ergonomics. Man in His Working Environment* (London and New York 1986 [1965]), p. xvi.

7 Ibid., p. xiv.

8 Ibid., p. x.

9 Ibid., p. viii.

10 In their constitution, the Ergonomics Research Society stated their mission as "the study of the relation between man and his working environment". R. C. Browne, H. D. Darcus, C. G. Roberts, R. Conrad, O. G. Edholm, W. E. Hick, W. F. Floyd, G. M. Morant, H. Mound, K. F. H. Murrell and T. P. Randle, Ergonomics Research Society. *British Medical Journal* 1/4660 (1950), p. 1009. Murrell adopted this mission statement for the title of his book. It is not only a valuable source for critical studies on the history of objectification of labour, where workers or operators and technological systems constitute ever effective units. It is also a necessary reference for a genealogy of the interface.

11 Murrell, *Ergonomics*, p. xiv.

12 Ibid., p. xiv.

feedback loop with the control system, while operator and machine – which are not separated in the diagram – constitute the functional parts of the system. Consequently, its caption does not locate the operator but rather describes "Man as a component in a closed loop system".[13]

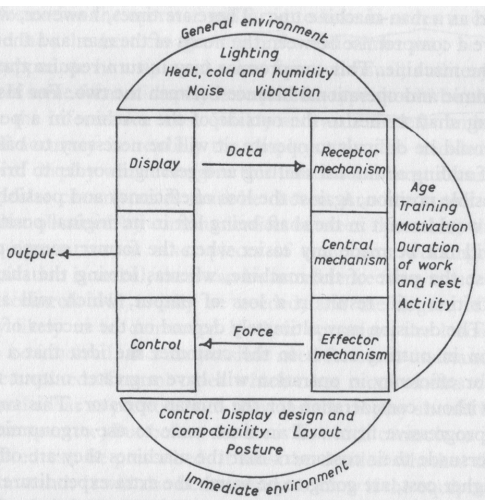

Fig. 1: K. F. Hywel Murrell, *Ergonomics. Man in His Working Environment* (London and New York: Chapman and Hill, 1986), p. xv.

Here, the human actor is reduced to a mere functional dimension in a system of production. And although Murrell's book aims, at first glance, at a socially sustainable relationship between human and machine – including implications for welfare and better working conditions – it soon becomes clear that it is the efficiency of the interaction of man and machine, maximising productivity, which is at stake here: "To achieve the maximum efficiency, a man-machine system must be designed as a whole, with the man being complementary to the machine and the machine being complementary to the abilities of the man."[14]

These ergonomic endeavours are the predecessors of what has been, in the last two to three decades, termed behavioural programming and persuasive technology: the design of human behaviour in technological settings. What does this imply? At least two things. For one, the user is turned into a lab rat, with every moment of the screen flow and user journey labyrinths measured, cross-referenced, tracked and translated back into key performance indicators (KPIs) optimisation procedures. Secondly, the designer merely executes the endless results of A/B testings and optimisation funnels. Design basically disappears and dissolves into modular templates. Both human sides of the interface – usage and production – become mere functions of the apparatus, generating data and executing data-driven design decisions.

While this approach is still very much in play and still generates increasing revenues for the big platforms, their mechanisms are no longer a secret. And once they are revealed, their effects are slowly rendered ineffective – as with any magic spell. And there is a tendency that at least some part of us users becomes aware of the conditions and contingencies of the apparatuses around us. Which gives us the chance to rediscover the human factor in the interface.

However, we have to consider that, among other things, the human is – and always has been – a political and ideo-

13 Ibid., p. xv.

14 Ibid.

logical tool. The human is – to rephrase Giorgio Agamben – not an event that has been completed once and for all, but an occurrence that is always under way.[15] It has been used to humanise and dehumanise, to justify hierarchies and exclusion. Or – as it is done today – to turn business practices into corporate prophecies.[16] Referring to a human nature, or an evolutionary human destiny even, seems like the last resort of a tech ecosystem slowly realising its hubris. This specific view of the human as something to be reformed through technology drives both the protagonists and antagonists of the tech sector. The so-called tech humanism or transhumanism, which is currently receiving widespread recognition through prominent entrepreneurs turned saviours of humanity and having second thoughts about their unicorn past, derives from the same notion of the human as universal man:[17] the perfect user, who aligns intentional technology and self-mastery, using the phone as a body-tool, combining wellness culture with self-quantification, just as Silicon Valley amalgamated military research with the subculture countermovement into one coherent Californian Ideology.[18] And of course they all still meet at Burning Man for some quality screen-free time.

These ideological and esoteric underpinnings of technological progressivism are more visible now than they were five years ago. Not everything is within reach, not everything can be put into the cloud, not everything gets better when it is connected, the world is not as whole as the famous photograph of the "blue marble" suggests, impact and disruption is not a value in itself. The question arises: what was the Silicon Valley?[19] And while some of the founding fathers of the Californian Ideology are still alive, we witness critical retrospectives,[20] musealisations and the shattering and tragic downfall of tech stars.[21] Corporate techno-utopias

15 "Ontology, or first philosophy, is not an innocuous academic discipline, but in every sense the fundamental operation in which anthropogenesis, the becoming human of the living being, is realized. From the beginning, metaphysics is taken up in this strategy: it concerns precisely that meta that completes and preserves the overcoming of animal physis in the direction of human history. This overcoming is not an event that has been completed once and for all, but an occurrence that is always under way, that every time and in each individual decides between the human and the animal, between nature and history, between life and death." Giorgio Agamben, *The Open: Man and Animal* (Stanford 2003), p. 79.

16 Joachim Haupt, Facebook futures: Mark Zuckerberg's discursive construction of a better world. *New Media and Society*, in print.

17 Cherie Lacey, Catherine Caudwell and Alex Beattie, The perfect user. Digital wellness movements insist there is a single way to "stay human". *Real Life Magazine* (September 2019), https://reallifemag.com/the-perfect-user/, acces: October 8, 2019.

18 Richard Barbrook and Andy Cameron identified, already over 20 years ago, the "contradictory mix of technological determinism and libertarian individualism" as the main ingredient of the Californian Ideology. Cf. Richard Barbrook and Andy Cameron, The Californian Ideology. *Science as Culture* 6/1 (1996), pp. 44–72.

19 See for example: Nathaniel Tkacz, Facebook's Libra, Or, the End of Silicon Valley Innovation. *Medium* (June 2019), https://medium.com/@nathanieltkacz/facebooks-libra-or-the-end-of-silicon-valley-innovation-9cb2d1539bcd, access: October 8, 2019.

20 Such as "The Whole Earth" exhibition at HKW Berlin (April 26–July 7, 2013); catalogue: *The Whole Earth. California and the Disappearance of the Outside*, eds. Diedrich Diederichsen and Anselm Franke (Berlin 2013).

21 While Theranos has been the most flamboyant example in recent years, there are many more, from Uber CEO Travis Kalanick to Twitter CEO Jack Patrick Dorsey and the former WeWork CEO Adam Neumann, who stepped down after an IPO filing that put the company in turmoil. And Mark Zuckerberg is obviously getting ready for some kind of major cathartic event.

become shallow, as their inherent paradoxes and contradictions become more and more obvious. Numerous interconnected phenomena in different domains add to this situation. On the interface level we witness the incapacitation of the designer through data-driven conversion funnel optimisation, leading to horrible but economically efficient websites and services. On the consumer side, we monitor elevated usage conventions regarding social media and other digital means of communication, undermining intended-use cases and posing threats to liability. In technology development we see decreasing innovation in consumer-facing technologies, most visible in the saturated global smartphone penetration. In the investment domain we have record-breaking IPOs by non-profitable businesses[22] and the domination of innovation through big platforms that are older than a decade, hoovering up or copying all innovation.[23] In the business model domain, we see rising problems of advertising-based business models and related ad-fraud.[24] In the political domain we experience the vulnerability of democratic processes through micro-targeting, the automatic promotion of highly engaging extremist content through self-learning algorithms[25] and the critical examination of monopolisation effects of major platforms, with harsher regulations on the horizon.[26]

But technology of course still continues to navigate the human. Suggestions on where to go, what to do and what to watch, either made by looking at the stars or by following data-driven recommendations from the clouds, all add to the same attractive promise: a light and effortless being in the world. Technology's expansion of human capacities and bodily functions, its most important promise in the last couple of thousand years, is now joined by the promise of the expansion of mental capabilities, delegating orientation and decision-making to a technological surrounding, saturated with data from our very own behaviour.

If we look at the history of interfaces, of design and of technology in general, it becomes clear: technology is genuinely fluid. It morphs and curves itself into novel usages and shapes social gram-

22 WeWork is just the most recent example: Scott Galloway, WeWTF, Part Deux (September 2019), https://www.profgalloway.com/wewtf-part-deux, access: October 8, 2019.

23 Michael A. Cusumano, Annabelle Gawer and David B. Yoffie, *The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power* (New York 2019).

24 See for example the recent settlement, where Facebook Inc. agreed to pay $40 million to advertisers for the knowing inflation of video view statistics by more than 900%: Motion for preliminary approval and notice of settlement, Case No. 4:16-cv-06232-JSW, filed on October 4, 2019, at the United States District Court for the Northern District of California, Oakland Division, available here: https://www.documentcloud.org/documents/6455498-Facebook-settlement.html, access: October 10, 2019.

25 See for example: Max Fisher and Amanda Taub, How YouTube Radicalized Brazil. *The New York Times* (August 2019) https://www.nytimes.com/2019/08/11/world/americas/youtube-brazil.html, access: October 10, 2019.

26 Chris Hughes, It's Time to Break Up Facebook. *The New York Times* (May 2019) https://www.nytimes.com/2019/05/09/opinion/sunday/chris-hughes-facebook-zuckerberg.html, access: October 8, 2019. See also: Matt Stevens, Elizabeth Warren on Breaking Up Big Tech. *The New York Times* (June 2019). https://www.nytimes.com/2019/06/26/us/politics/elizabeth-warren-break-up-amazon-facebook.html, access: October 10, 2019. And, of course, the recent ECJ judgements on the liabilities of social media platforms.

mars. It is constantly de-scripted and re-scripted by social use, with endless processes of appropriation, translation and adaptive innovation. And it is obviously inseparable from the human. After all, it might very well be what makes us human (or post-human, for that matter) – we have always been cyborgs.[27] And just as the human is always under way, technology remains ingrained in every step and every shape. Fortunately, both are never quite what they claim to be.[28]

As Vilém Flusser provocatively stated: "We can design our tools in such a way that they affect us in intended ways."[29] Rather than be integrated as a systemic element in functionalistic interface paradigms, the human factor in technology should be conceptualised as a resistant momentum of subjectification, of that which remains unknown. How can we design interfaces that are open to this unknown, that create openness and opportunities for self-realisation and autonomous authorship? How can interfaces enable diversity, heterogeneity and difference? How can we conceive of the user and usage as the unknown, the unfinished, the infinite?

If technology does indeed have theological dimensions,[30] maybe the designers, producers, developers and users should not focus so much on unity, cult and following, but rather on the infinite and the unknown. They should focus on that which is the basic foundation of all religion and mysticism – and apparently also of technology: the transcendence of the human.[31] Starting from there, let's try to rethink what it means to navigate the human. It might have a lot to do with infinity and openness, and not so much with predictive algorithms, satellite imagery and patronising affordances.

Acknowledgements

One of the main motivations for this journal is the facilitation of an interdisciplinary platform, bridging gaps between arts, sciences and technology. We initiate dialogues about genealogies, current states and possible futures of apparatuses and applications. We are convinced that the complexity of our technological surroundings requires a variety of perspectives. Such perspectives are not only directed forward, but are also engaged

27 See Julia Heldt's article as well as Laurel Halo's and Mari Matsutoya's reflection of their project on Hatsune Miku in this volume. One of the central publications in this discourse is How We Became Posthuman. Virtual Bodies in Cybernetics, Literature, and Informatics (Chicago 1999) by N. Katherine Hayles, who provided a paper on her current research for this volume.

28 Paraphrased from Beatriz Colomina and Mark Wigley, Are We Human? Notes on an Archaeology of Design (Baden 2017), p. 274: "Design is never quite what it claims to be. Fortunately. Its attempt to smooth over all the worries and minimize any friction always fails, in the same way that almost every minute of daily life is organized by the unsuccessful attempt to bury the unconscious."

29 Vilém Flusser, Vom Rückschlag der Werkzeuge auf das Bewusstsein (undated manuscript, Vilém Flusser Archive, document no. 2586); translation: the authors.

30 Liat Berdugo, The Halos of Devices: The Neo-Nimbus of Electronic Objects (February 2019), http://networkcultures.org/longform/2019/02/21/the-halos-of-devices-the-neo-nimbus-of-electronic-objects/, access: October 8, 2019.

31 David F. Noble, The Religion of Technology. The Divinity of Man and the Spirit of Invention (New York et al. 1999).

with the past, reconstructing alternative histories of man–machine relations, which then, again, can be projected as multifarious future possibilities.[32]

We are proud to contribute to a discourse that is currently gaining traction. A traction that can be observed in the rising number of workshops, conferences, exhibitions and publications on topics related to Interface Critique. To include as many perspectives as possible, we have thus integrated numerous new formats: the single topic special section presents the results of the workshop "Interfaces and the Post-Industrial Society", which was part of the annual conference of the German Society for Media Studies. Furthermore, we have included a series of explorative photographs from the archive of the Berlin-based artist Armin Linke, dealing with technological surfaces of interaction and control. We also introduce alternative forms of textual contributions, such as reports on individual artistic practices (Darsha Hewitt, Mari Matsutoya & Laurel Halo) and interviews (a conversation between Katriona Beales and William Tunstall-Pedoe).

This second volume of Interface Critique would not have been possible without a variety of supporters, both individuals and institutions. We are indebted to Frieder Nake for his permission to translate and republish an article for *Kursbuch* from 1984. In this context, we would further like to thank Mari Matsutoya for the translation of Frieder Nake's text as well as the Centre for Art and Media Karlsruhe (ZKM), especially Margit Rosen, for the funding of the translation. For the permission to republish Mari Matsutoya's and Laurel Halo's text we are thankful to the authors and artists involved as well as to the editors of *After Us*, where the text was first published in 2017. We also thank Filipa Cordeiro for the permission to republish her text, which first appeared in *Wrong Wrong Magazine* in 2015. We are indebted to Armin Linke for providing us access to his archive and for his permission to use a hand-picked series of his photographs for this issue. Our gratitude goes to AG Interfaces, a group of the German Society for Media Studies (GfM), which contributed the results of their workshop "Interfaces and the Post-Industrial Society". We thank Katriona Beales, William Tunstall-Pedoe and Irini Papadimitrou for the permission to republish a conversation along with the accompanying artwork. We also thank Anthony Masure for the translation of his text "Manifeste pour un design acentré" into English. We are indebted to Alexander Schindler, who supported us generously with an InDesign template suited to our needs, thereby significantly lightening the editorial process. We gratefully acknowledge the Centre for Interdisciplinary Methods (CIM) at Warwick University, especially Nathaniel Tkacz and Michael Dieter, for facilitating a fruitful workshop on Interface Criticism, generating valuable contacts and conversations. A special thanks goes to our publisher, arthistoricum.net, and the Heidelberg University Press, especially

32 See the contributions by Christoph Borbach, Darsha Hewitt, Roland Meyer and Frieder Nake in this volume.

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Looking forward to the next volume.
– Berlin, October 2019

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NAVIGATING (THROUGH) SOUND. AUDITORY INTERFACES IN MARITIME NAVIGATION PRACTICE, 1900–1930

By Christoph Borbach

"THE most common-place and often one of the most urgent of the problems which confront the sailor is the determination of his position upon near approach to the coast. [...] The special difficulties sometimes attending the solution of this problem are known only to those who have endeavoured to make a landfall or pick up a lightship in wild or thick weather or in the calm obscurity of a fog."

– *John Joly, Scientific signalling and safety at sea.* The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science *36 (1918), pp. 1–35, here p. 1.*

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From Sight to Sound

On October 6, 1920, in the waters off the east coast of the United States, a simulation took place as a part of a public demonstration. What was simulated was fog, the 'old enemy of ship navigation,' with its interfering effects on safe pathfinding. The aim was to demonstrate that this crucial, nature-induced influence on navigation had now been media-technically overcome. A ship, the destroyer *USS Semmes*, was entering Ambrose Channel, which is the central entrance to the harbour of New York and New Jersey. The windows of the ship's bridge were veiled with canvas so that the ship's navigator couldn't obtain any visual information from the surrounding. Put differently, the simulation took away his hitherto-essential knowledge of how to navigate. He nevertheless was able to guide his ship into the channel entrance and along the harbour with a newly designed interface with which he was *listening* – an ability that had formerly been of mere subordinate importance for him – to the signals of a so-called leader cable. The demonstration ended successfully and proved that, with this new auditory interface, safe navigation in times of little or no visibility had been become a hearing operation. A contemporary witness in December 1920 euphorically described the experiment by focusing on the newly discovered importance of hearing for navigational purposes as follows:

> *A few weeks ago a U.S. destroyer sailed up into the port of New York in an artificial fog. The 'fog' was formed by stretching a sheet of canvas in front of the navigator's bridge so that the pilot could not see the buoys that marked the Ambrose Channel, and yet the vessel kept faithfully to a true course. The pilot did not need to use his eyes, because he was looking through his ears; in fact, a totally blind man would probably have guided the vessel even more accurately, because of his keener and more sensitive hearing.*[1]

Auditory Interfaces

An interface, which is not only the connection between two entities such as machine/machine or human/machine, but also a specific medium for representation, is not restricted to visual displays. Media research, on the other hand, often only focusses on human-computer interfaces, and this discourse, in turn, is marked by a kind of 'screen essentialism.' Representatives from the field such as Matthew Kirschenbaum have acknowledged the tendency in media studies to focus almost exclusively on "the phenomenological" side of media, which is, in most cases, the "digital event on the screen"[2] – that is, everything what can

1 A. Russell Bond, The radio pilot-cable. *St. Nicholas* 48 [2] (1920), pp. 173–174, here p. 173.

2 Matthew G. Kirschenbaum, *Mechanisms* (Cambridge, MA 2008), p. 4. In this regard, see also Jan Distelmeyer's paper "Drawing Connections" in the first volume of this journal, in which he states that "[g]raphical user interfaces are but one of the multilayered aspects characterizing interfaces [...]." Jan Distelmeyer,

be seen – but not on the underlying code structure of, for example, digital images.

However, screen essentialism is not restricted to the study of digital objects but can also be identified in interface research. Most of the current interface research is aimed at visual effects and most papers on the history of interfaces concentrate implicitly or explicitly on their visual constitution, haptics, and design.[3] This has a technical cause, since most media actually base their operability and human-machine interaction on the crucial aspect of visual displays, as Erkki Huhtamo argued when he proposed the term "screenology" for a field of research that focusses on screens as "information surfaces."[4]

Research into auditory interfaces and into their history from the perspective of the humanities remains a scientific lacuna.[5] This paper partly addresses this gap, since it focusses historically on sonic interfaces within maritime navigation practices that were theoretically conceptualised around 1900 and later realised, but which became obsolete around 1930 when they were replaced with optical wayfinding techniques. Taking two case studies as examples – so-called "leader cables" and the infrastructure of "submarine signalling" – it can be shown that certain navigational media for seafaring addressed the human as a listener, thus evoking elaborate forms of hearing practices for navigational purposes.[6]

Newer navigation media, so-called Personal or Portable Navigation Devices (PNDs) by prominent corporations such as Garmin, TomTom or Magellan, or software, for example, Google Maps, include additional auditory indications, but these are verbal in any case (they give auditory information such as 'turn left in 100 metres'). The interesting fact about the auditory interfaces that this paper deals with, is that they communicated information by nontextual and nonverbal means and that their acoustic channel was not an addition to a visual-based navigation but its sole way of communicating navigationally important information. This is not only of interest from an interface perspective, but also from the perspective of the history of technology, media history, media archaeology, sound studies, and the history of acoustic knowledge. Interestingly, the sonic interfaces that allowed for navigation using sound and their

Drawing connections – How interfaces matter. *Interface Critique Journal* 1 (2018); http://interfacecritique.net/journal/volume-1/distelmeyer-drawing-connections, access: October 11, 2018, 2:18pm.

3 See for example Erkki Huhtamo, Elements of screenology. Navigationen. *Zeitschrift für Medien- und Kulturwissenschaften* 6/2 (2006), pp. 31–64; Lev Manovich, Towards an archaeology of the computer screen, in: *Cinema futures*, ed. Thomas Elsaesser (Amsterdam 1998), pp. 27–43; Lev Manovich, *The language of new media* (Cambridge, MA. 2001), esp. pp. 94–111; Anna Friedberg, *The virtual window* (Cambridge, MA. 2009); Sabine Wirth, To interface (a computer), in: *Sichtbarkeiten 2*, ed. Martin Beck (Zürich 2004), pp. 151–166.

4 Huhtamo, Screenology, pp. 31–32.

5 The anthology with the programmatic title Auditory display. Sonification, audification, and auditory interfaces deals comprehensively with fundamental issues of auditory interfaces, but lacks a historical reflection or more theoretical investigation or contextualisation. See Gregory Kramer (ed.), *Auditory display* (Reading 1994).

6 I owe thanks to Asher Boersma, Jan Distelmeyer and especially to Timo Kaerlein for fruitful discussions, literature advices and the workshop "Interface-Geschichten" that took place in May 2018 at the university of Paderborn.

systematic infra-structuring has not yet been investigated, which is even more surprising since these infrastructures reconfigured seafaring practice between 1900 and 1930. Due to this fact, this paper is based exclusively on primary materials for the investigation of both technologies.

This paper first focusses on leader cables and then on submarine signalling. For both technologies, I will explain their general principles, focus on their interfaces and describe how important and widespread they became. Finally, I will make some concluding remarks about the status of their interfaces.

Sonifying Electricity: Leader Cables

Electric current in cables has as effect the electromagnetic field around the cable. Until about 1900, this electromagnetic field was considered an unwanted but unavoidable physical phenomenon, something that had to be inevitably accepted. The concept of leader cables, however, turned this allegedly useless by-product of electric transmission in cables into a strategy. In general, a leader cable is an isolated electrical cable that is laid at the bottom of a channel, harbour entrance, or difficult passage point along a course that a ship might take. The sea end of the cable must be earthed and the other end of the cable connected to a transmitting station where alternating current is induced. When this cable is electrified, a ship with appropriate receiver technology is able to pick up its electromagnetic field and follow the cable, so that the ship's navigator doesn't need to have any visual indications from the outside. This principle proves practical in fog and heavy rain, when usual navigation aids such as buoys, light vessels, landmarks, and lighthouses fail.

Put differently, the electrical cable in the leader cable system does not serve as a transmission means – as is usual – but fulfils its purpose in an autotelic manner. The cable is not a passive vector for sending electrical signals from one point to another, and it is not the condition for communication, rather the leader cable's electric charge has an end in itself. Referring to Friedrich Kittler's identification of three basal media functions–storage, transmission, and processing–the cable in this system does not transmit electricity but stores it insofar it spreads electricity spatially.

Since the frequency of alternating current in a cable corresponds with its electromagnetic field, this field can be rendered audible with an appropriate receiver and a telephone, if the frequency of the electric current lies within the area of human perception. A ship's navigator who wished to navigate with a leader cable needed to install two coils of wire as receivers for the electromagnetic field – one located on either side of the ship, viz. starboard and port side, respectively. These coils were connected to an amplifier and finally to an interface which was located on the vessel's bridge or

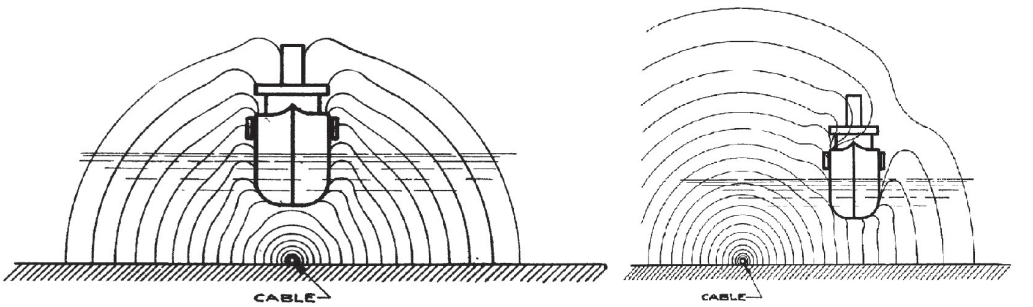

Fig. 1: Principle of cable navigation as illustrated in 1921.

chart room, where the navigator operated. As figure 1 shows, when a ship with receiving instruments was near the cable, the electromagnetic field of the cable was received more strongly by the starboard coil when the cable was on starboard side and vice versa, and the ship was directly above the cable when both coils received the electromagnetic field with equal strength.

Of special interest is the interface with which a navigator was able to differentiate on which side of the ship the leader cable lay. The interface consisted, basically, of a telephone with two earpieces, which could be connected with a change-over switch to *either* the starboard *or* port receiver. Since the received strength of the electromagnetic field corresponds indexically with the loudness of the tone in the telephone, a navigator could determine the ship's relative position to the leader cable by comparing loudness: If the tone was perceived louder when the starboard receiver was connected to the telephone, the cable laid on starboard side, and vice versa. In this setting, the in other respects mostly useless or even unwanted phenomenon of the electromagnetic field around electrified cables transformed normal cables into a means for safe pathfinding which was realised through an auditory interface. Put differently, the interface translated navigation into the realm of tonality as it had already been pointed out in contemporary literature in 1921, which also indicated the newly implemented tonality of navigation: "In the telephones the signals given out by the cable are heard as a sharply pitched musical note."[7] The enormous significance of the auditory interface also played a central role in the contemporary coverage of leader cables. For example, after the above-mentioned simulation of fog that proved the system's efficiency, the New York Times wrote: "Ship Steered Entirely by Sound."[8]

The acoustic interface of the leader cable system can be seen as a strategic misuse of the telephone, since standard telephone receivers proved to be absolutely sufficient for hearing the cable's electromagnetic field after it is amplified. Thus, in this setting the telephone was not used for the purpose of two-way communication, but as a listening-only medium that interfaced human ears with the presence of an electromagnetic field. In

7 Anonymous, The leader cable system. *Nature* 106 (1921), pp. 760–762, here p. 760.

8 Anonymous, Warship guided into port by radio piloting cable. The New York Times, October 7, 1920, pp. 1 and 6, here p. 1.

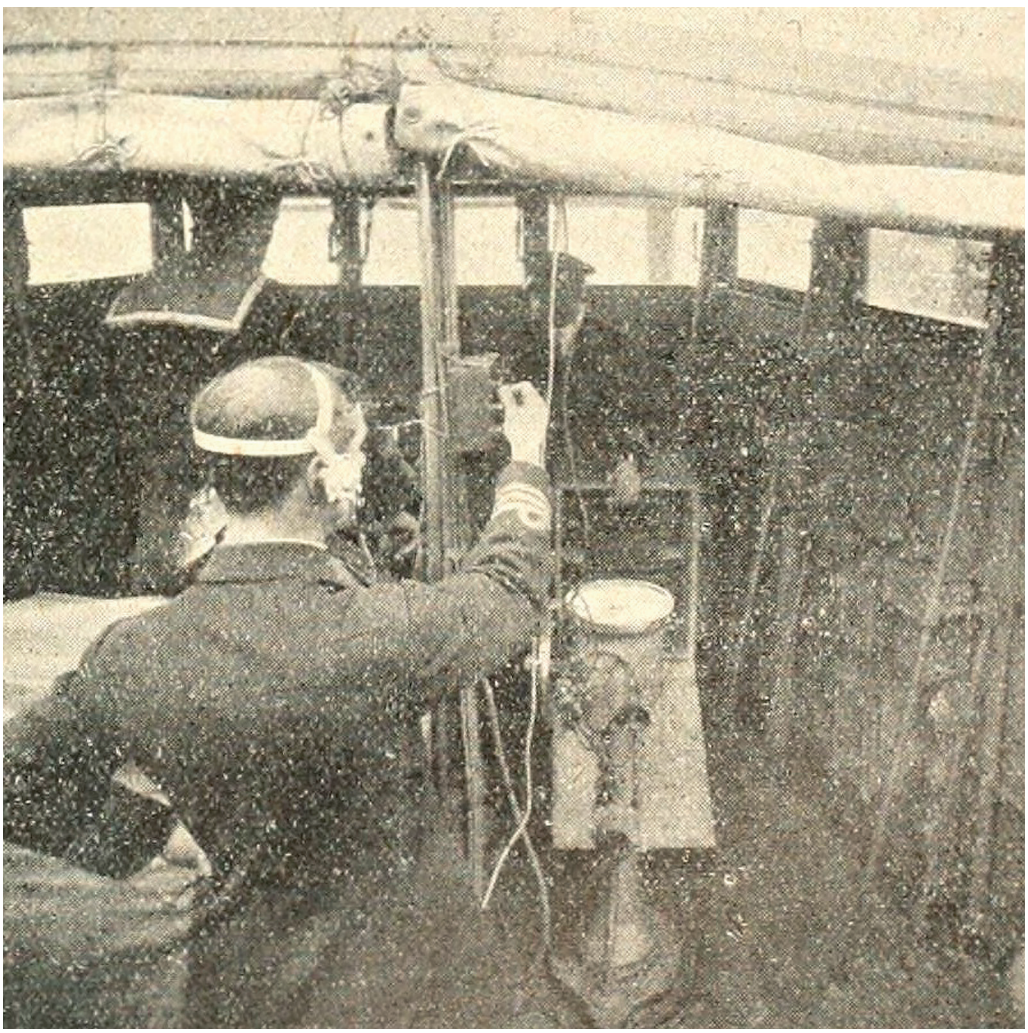

Fig. 2: Officer on a ship's bridge operating the change-over switch for navigating with a leader cable.

this new utilisation of telephone technology, the telephone is not meant to be a medium for semantic communication but to function as a part of an interface that makes otherwise imperceptible signal rooms sensible to humans: The telephone functioned as sensor for the electromagnetic field. Leader cables are thus the first technology to employ sonification – that is the conversion of something non-sonic into acoustic waves – for the purpose of maritime navigation.

The basic principle of the leader cable dates back to Robert Owens, a former Professor of Electrical Engineering at McGill University, who started research into the domain of cable navigation around 1900. In March 1902, he applied for a patent for an "Apparatus for Ascertaining Position Relative to a Prearranged Guiding System"[9] that

9 US patent no. 736,432. Application filed March 11, 1902, patented August 18, 1903.

proposes to translate maritime navigation practices into hearing operations. Owens, with his colleague L. H. Herdt, operated a trial installation of a leader cable, which was about ten miles in length, in the Canadian St. Lawrence River. This experimental cable was indeed unsuccessful, mainly because amplifiers were not available at that time, meaning that the electromagnetic field could not be heard in the telephone.[10]

The first vacuum tube for amplification was not invented until 1906 by radio pioneer Lee De Forest and was put into practical operation around 1912. During the First World War, when in the discourse of radio technology amplifiers came into broader practical use, several states took up the idea of leader cables, but it is hard to historically reconstruct these first implementations. It is understood, that in Germany, one cable was used for secure navigation through mined fields. It was laid from the island of Borkum in the North Sea and was 120 nautical miles in length (about 222km).[11] Also, leader cables came into use in British and French harbours.[12] The first leader cables for non-military purposes were used around 1920, for example for the harbour entrances to Portsmouth, Cherbourg, Brest, and New York, with lengths varying from 20km to 100km.[13]

All these leader cables were implemented to keep harbour entrances passable in cases of fog or heavy rain, since fog turned out to cause severe financial problems for merchant shipping. For example, ship navigators were not allowed to enter the Ambrose Channel in foggy weather until sight improved. The resulting shipping delays caused losses of $500 to $4,000 per hour, depending on the ship and its cargo, whereas the receiver technology for the leader cable cost only $1,000[14] and thus was a profound investment. Furthermore, the leader cables proved to be very efficient as amplifier technology progressed. The Portsmouth leader cable, for example, could be used for precision navigation in 1920 even when it was 500 yards (about 457 metres) away from a ship,[15] and a German report stated one year later, in 1921, that leader cables could be made audible at a distance of 0.75 nautical miles (about 1.4km).[16]

10 C. V. Drysdale, The eleventh Kelvin lecture. *Journal of the Institution of Electrical Engineers* 58/293 (1920), pp. 572–597, here p. 582.

11 Johannes Müller and Joseph Krauß, *Hilfsbuch für die Schiffsführung* (Berlin and Heidelberg 1925), p. 115.

12 A. S. Eve, McGill, Physics and the War. *The McGill News* 2/1 (1920), pp. 5 and 37, here p. 37.

13 BArch R 4701 (Reichspostministerium)/35339.

14 Donald Wilhelm, The audio piloting cable in the ambrose channel. *Radio Broadcast* 1/3 (1922), pp. 249–251, here p. 249.

15 Anonymous, The Portsmouth leader cable. *The Electrical Review* 86 [2209] (1920), p. 392.

16 BArch R 4701 (Reichspostministerium)/35339.

Sonic Ecology: Submarine Signalling

The leader cable system, however, was neither the only nor the first technology for maritime navigation that used auditory interfaces. The first interfaces for sonic wayfinding were used in "submarine signalling," which is not a term that denotes techniques of underwater communication in general, but which refers to a geographically situated submarine infrastructure for the transmission and receiving of underwater signals. Submarine signalling can be seen both as a kind of early warning system (warning ships of their proximity to dangerous coasts or passage points) and a navigation system in the case of thick weather when navigation by visual means is not possible any longer.

Artificial visual aids to navigation are as old as seafaring itself and are, basically, lighthouses, fire beacons, light vessels, and light buoys. However, these marks only served their purpose in clear weather and were useless in thick weather, especially in fog. Since about the middle of the 19th century, acoustic warnings were explored as a more efficient means of guiding vessels in fog. Examples are sirens, gun-cotton detonations, trumpets, steam whistles, and bells with which lighthouses or lightships were equipped in order to function as fog signal stations. However, the transmission of sound in air depends heavily on meteorological conditions such as rain and fog, so aerial fog signals could not be heard over long distances and the position from which the signals were sent out could not always be distinguished. This unreliability of air as medium for the transmission of sound signals shifted the research into early warning signals for maritime navigation at the end of the 19th century to the water itself, since the good conductivity of water as a medium for the transmission of sound had been known ever since the experiments of Charles-François Sturm and Jean-Daniel Colladon at Lake Geneva in 1826. Put in the words of 1910, water is the ideal 'agency for sound transmission': "Water is a less mobile medium than air, less responsive to marked variations of density arising through changes in temperature and pressure, and, therefore less subject to variations of homogeneity and more reliable as an agency of the transmission of sound waves."[17]

As a transmitter for submarine signals, underwater bells proved to be effective. However, the problem with the ocean, as a newly discovered signal space around 1900, was that the ocean surface functions as a kind of natural boundary that the underwater bell signals only cross to an extremely slight degree (in this respect it is worth mentioning that Branden Hookway has pointed out that such boundary conditions of fluids were called interfaces in the 19th century, from

17 Albert A. Hopkins (ed.), *The Scientific American Handbook of Travel* (New York 1910), p. 210.

which our modern interpretation of the term stems)[18]. In other words, it became necessary to use a technical interface to overcome the characteristics of the natural interface. Borrowing the terminology of Frieder Nake[19] and putting it in provoking terms, a technical interface had to be constructed as a connecting system that hardwired *surface* (of the ocean on which the human operator navigates) and *subface* (the fluid realm of ocean water in which acoustic signals propagate).

In 1898, Arthur Mundy and Elisha Gray, the co-inventor of the telephone, suggested a system and received a patent for it that used underwater bells as transmitters for maritime navigation. As its receiver and interface, the system used a new technology of its day: telephones and sensitive underwater microphones.[20] In September 1901, Mundy founded the Submarine Signal Company (SSC) – which was the first association to commercialise submarine acoustics – to market the technology for this system.[21] Already in the same year, the first underwater bell in service was laid down at Egg Rock, near Boston Harbour, where the SSC had its office. After the US government performed tests between the harbours of Boston and New York using equipment that had been developed by the SSC, submarine signalling as a navigation practice was established that year in the US. It continuously expanded in the following years, with underwater bells near lighthouses, on fire ships and light buoys, all of which were operated pneumatically or electrically (that is to say, submarine signalling was implemented below the already existing infrastructure that visual navigation had put up and was meant to compensate for its qualitative defects in cases like fog or heavy rain).

The British Admiralty tested the submarine signalling system in 1906 and reported that the "submarine bell increases the range at which the fog signal can be heard by a vessel, until it approximates to the range of a light-vessel's light in clear weather, and moreover its bearing can be determined with quite sufficient accuracy for safe navigation in fog, from distances far beyond the range of aerial fog signals if the vessel is equipped with receivers."[22]

Of crucial importance is this last clause, "if the vessel is equipped with receivers," which points to the critical module that materialises the condition of access to the submarine signals: the interface. For a navigator to operate his ship with submarine signals, the ship had to have, inside its hull on either side – starboard and portside, respectively – near the bow and below the water line, a small cast-iron tank filled with water, in which two microphones were placed (two, so that

18 Branden Hookway, *Interface* (Cambridge, MA. 2014), pp. 59–67.

19 Frieder Nake, Surface, interface, subface, in: *Paradoxes of interactivity*, ed. Uwe Seifert (Bielefeld 2008), pp. 92–109.

20 Elisha Gray and Arthur J. Mundy, Transmission of sound (US patent no. 635,519. Application filed April 14, 1899, patented November 7, 1898).

21 The right to sell and install the equipment was at all times exclusively owned by the SSC and their cooperating companies such as the German Atlas-Werke.

22 Cited after Joly, Scientific signalling, p. 9.

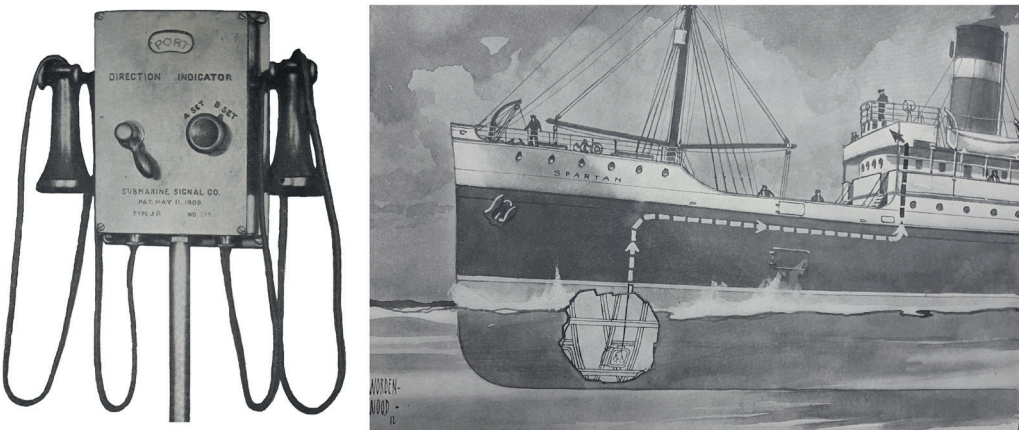

Fig. 3: Interface for having access to submarine signals from underwater bells on the left, and its implementation on the right. The interface was of such importance to the SSC that they used a drawn version of it as their company logo.

the system remained efficient when one microphone became defective). These microphones transduced the acoustic signals of underwater bells into electrical pulses. Each of the altogether four necessary microphones was connected to an "indicator box," usually located on the ship's bridge, in the pilot-house, or in the chart room, where the ship's navigator operated. The indicator box consisted of a conventional telephone receiver with two earpieces and a switching mechanism that controlled which microphones were connected to the telephone (see figure 3). Put differently, the indicator box is the instrument that transduces electric signals into acoustic ones and makes them available audibly for the operator. Of special relevance is that the acoustical signals that were received at starboard or portside could be made audible. The interface therefore consisted of two switches: the so-called "semaphore" switch for listening to the starboard or port microphones and the so-called "set" switch for listening to either the "A" or "B" set of microphones. Two earpieces were used so that the navigator could listen with both ears instead of only one, which also shut out other noises.[23]

As in the case of the leader cable, ship navigators accomplished safe wayfinding with submarine signals on an acoustic basis by comparing loudness. Since the microphones inside the ship were affixed in such a way that the ship's hull functioned as a kind of acoustic shield, the relative position of an underwater bell could be identified because its emitted signals were more intense on starboard when the bell was starboard, and vice versa. The direct course for a submarine bell was given when the acoustic signal was of equal loudness, no matter if the starboard or portside microphones were connected to the telephone receiver. Navigation was then appropriately carried out by continuous switching back and forth between both pairs of

23 Submarine Signal Co. (ed.), *Submarine signals* (Boston 1912), p. 20.

microphones. In order to get the exact course towards a submarine bell, the ship was swung until a bell signal was of equal loudness on both sides of the ship. Furthermore, the bell stations transmitted their signals in Morse code so that they could be identified.

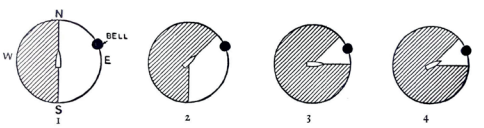

Fig. 4: Schematisation of the principle of navigating with submarine signals. The bell signals could be heard up to a range of 15km around a bell station.

This schematisation illustrates the sonically constituted principle of navigation using submarine signals. In the shaded areas, the bell sounds are quieter than in the unshaded sections. When submarine bells are more than one mile distant, their sound is only heard in the unshaded sections. In figure 1, for example, when the semaphore reads "starboard," the bell is heard clearly, but not when the semaphore shows "port." That the bell is dead ahead and not dead astern (picture 4) is known, since the receivers inside the ship are located in the front so that they pick up acoustic signals that come from the front but not the back side. When a bell is approached, the sound becomes louder; it is loudest when a bell is directly passed, and the volume decreases when a ship travels away from the bell. Furthermore, the illustrations implicitly show that – referring to Frieder Nake again – in order to have access from the surface of the sea to the submerged signal ecology of submarine signalling, it was necessary to have an interface that hardwired the aerial surface to the liquid subface. The material place where the acoustic space of the submarine signalling infrastructure and the human ear encounter each other is the interface. There, the acoustic signals and the human operator interact for safe wayfinding along coasts.

In September 1912, receivers for submarine signals were already installed on 949 ships. Even the famous *RMS Titanic* – which hit an iceberg the very same year – was equipped with receivers for this system. At that time, there were 53 bell signal stations in the USA, 27 in Great Britain, 16 in Germany, 12 in Canada, and further stations in France, Belgium, the Netherlands, Denmark, Sweden, Russia, Spain, Uruguay, and even China; all in all 135 around the world.[24] In 1920, about 3,500 ships were equipped with receivers.[25] The acoustic space of submarine signalling was established in such a way that it covered the physical underwater space along critical passages, and where desired, nearly completely. Especially along the British south coast, and the German North Sea coast, underwater bell stations were located in such a way that navigators could completely 'listen their way,' since they could steer from the signal realm of one bell station directly into the next. Also on the northern US east coast, the submarine bell stations formed a continuous network as can be seen in figure 5, which shows the

24 Ibid., p. 36.

25 E. Lübecke, *Unterwasserschall-Signale* (Berlin 1920), p. 12.

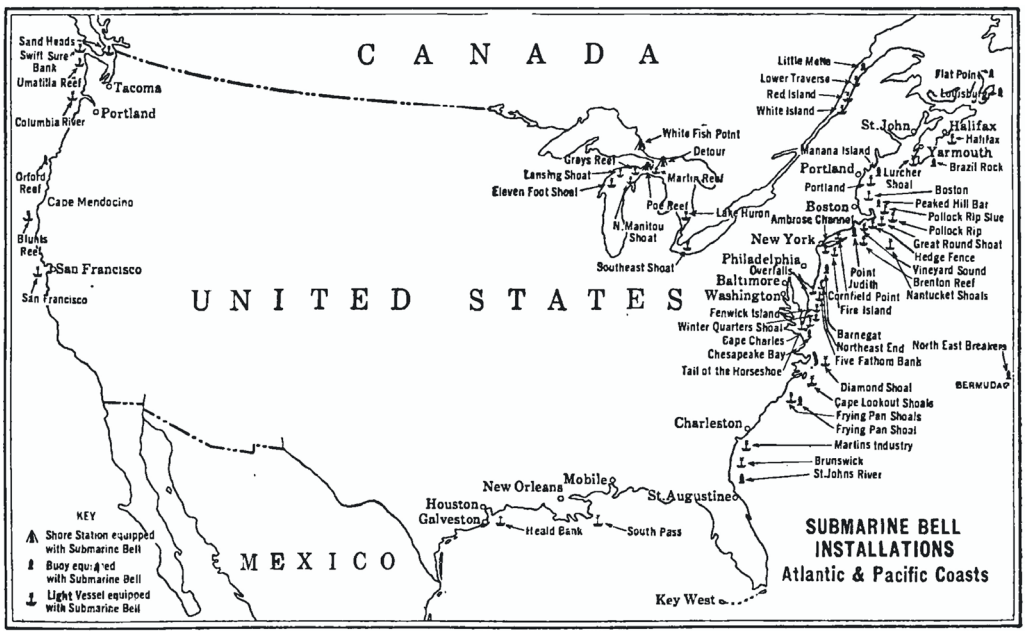

Fig.: 5: Chart of submarine bell stations in the US in 1922.

submarine bell installations that were in use in the US in 1922.

In maritime practice, both technologies – leader cables and submarine signalling – were not in competition or rivalling discourses since they complemented each other and were seen as additive systems. With submarine signals, one the one hand, navigators could head for an underwater bell nearby the end of a leader cable and with the leader cable, on the other hand, they could afterwards find the exact entrance to a harbour or channel.

Certainly one could argue that the telephone in the submarine signal infrastructure does not seem to be part of an interface, since the signals from the underwater bells were acoustical in the first place and could also be heard by humans under water without any technical assistance. However, this is not the whole truth. The telephone and the two separated receivers actually *were* the essential interface for having access to the navigational logics inherent in the infrastructure of submarine signals because human binaural hearing does not work underwater. The specific positioning of *two* receivers and their connection to *one* telephone receiver realised the differences in volume and, as a consequence, made it possible to detect the direction of a sound source.

Résumé

Both maritime navigation technologies evoked a "complete revolution in the field of ship signalling," as it was described by contemporary observers.[26] Both techno-

26 BArch R 4701 (Reichspostministerium)/8934. My translation.

logies, however, were not only geographically but historically located. The leader cable and submarine signalling were already obsolete as maritime navigational technologies by the late 1920s because of the further development of radio technology, so-called wireless direction finding that became known as radionavigation and which is an important precursor to later radar technology.[27] Aerial directive radio beacons, which had been arranged as a radio beacon network since the second half of the 1920s,[28] replaced the leader cables and the submarine bells. This made maritime navigation silent again, since radionavigation relies heavily on a visual interface in the form of the radio compass, which allowed for a 'more instant sensemaking' than the use of earpieces.[29] The above-mentioned systems for acoustic navigation on the basis of auditory interfaces therefore represent a *historical interlude* in which navigation in fog and thick weather relied on sonic ecologies, auditory interfaces, and human ears. This period stands historically between well-known forms of maritime navigation – with compass, fixed stars, or visual checkpoints such as lighthouses and other beacons – and more media-assisted and therefore more elaborate forms of (mostly visual) navigation (with radio, radar, sonar, the Navstar GPS, and screen media). The leader cable and submarine signalling can thereby be understood as regional infrastructures that translated specific spatially situated tasks into hearing operations and thus mediatised maritime navigation and utilised auditory interfaces that addressed the human as a hearing subject.

In order not to exceed the scope of this article, in the following I will only briefly address five aspects of the interfaces and their status.

(1) Historicality

The auditory interfaces were, in their day, a new technological condition of maritime navigation and prove the thesis that interfaces are deeply historical artefacts or phenomena – as Florian Hadler and Daniel Irrgang argue[30] – since they are historically situated between 1900 and about 1930 and are totally unknown to ship navigators today. Furthermore, having an interface for the reception of submarine signals or the electromagnetic field of leader cables would be usel-

In the German original it reads that they provoked a "völlige Umwälzung auf dem Gebiete des Schiffs-Signalwesens."

27 F. G. Cooper, Aids to navigation. *Journal of the Royal Society of Arts* 78 [4055] (1930), pp. 990–1001, esp. 995–996. Leader cables came to be used in aviation after 1930. However, they had no auditory interfaces in this context. For a comprehensive overview of the importance of radionavigation see for example William Rankin, The geography of radionavigation and the politics of intangible artifacts. *Technology and Culture* 55/3 (2014), pp. 622–674.

28 BArch R 5 (Reichsverkehrsministerium)/7725.

29 Whereas navigation with submarine signals demanded continuous listening and continual switching back and forth, not only of the change-over switch but also of the ship itself (see figure 4 again), the radio compass could be read off directly to see the direction to a radio beacon. I borrow the term "instant sensemaking" from Florian Hadler and Daniel Irrgang, Instant sensemaking, immersion and invisibility. *Punctum* 1/1 (2015), pp. 7–25.

30 Hadler and Irrgang, Instant Sensemaking. Also Galloway's research into interfaces is aimed at their existence for historical reasons, see for example Alexander R. Galloway, *The interface effect* (Cambridge 2012), p. vii.

ess today, since the underlying systemic components of both technologies no longer exist. However, what these historical interfaces have in common with modern interfaces is that they are the material place where signals are translated (from electric current into audible tones), where technological and human agencies meet (telephones, amplifiers, receivers, and navigators), and that they required interaction to generate value (via their change-over switches, which is one condition for hearing differences in loudness).

(2) Operativity

For a history of acoustic knowledge or even a cultural history of sound, it is worthwhile to acknowledge that the leader cable and submarine signalling evoked transformations of visual navigation into practices of what I want to call "operative listening to operative sounds" that took place where the interfaces were located. The term "operative sounds" is meant to be the auditory equivalent of what, for example, Sybille Krämer[31] or Harun Farocki[32] – both independently – termed "operative images" respectively "operative Bildlichkeit." As in the case of operative images, operative sounds do not *represent* something, but are more part of an operation. They are not aesthetic in any sense but are distinguished by their linguisticality; they serve practical purposes and are interwoven with specialised tasks. Here, the bell signals and the tone of leader cables are both "operative sounds" for the safe guidance of a vessel near the coast or in a channel through "operative listening."

(3) Access

The interfaces were the condition of access to the acoustic spaces that the leader cables and submarine signal bells implemented in the ocean. The interface in the case of submarine signalling provides access to underwater signals and therefore connects surface with subface, whereas in the case of leader cables, the interface materialises the condition for sensible access as such, since the electromagnetic field is not perceptible by humans without technical media to translate it into or onto visual or auditory displays. In both cases, the interface addresses its subject as a listener. As Branden Hookway pointed out, the interface is not a form of technology but more of *a form of relation to technology*.[33] In the above-mentioned case of maritime navigation, it is therefore an acoustic relation between navigators, telephones, receivers, and underwater bells or leader cables; a kind of network that bases its operability on a navigation through sound. If the screen is understood, according to Lev Manovich, as the material object that allows for the "illusion of navigating through virtual spaces,"[34] it is the interface of the leader cable and

31 Sybille Krämer, Operative Bildlichkeit, in: *Logik des Bildlichen*, eds. Martina Hessler and Dieter Mersch (Bielefeld 2009), pp. 94–123.

32 Harun Farocki, Phantom images. *Public* 29 (2004), pp. 12-22, here p. 17.

33 Hookway, *Interface*, esp. pp. 1–7.

34 Manovich, *New media*, p. 94.

submarine signalling systems that enables operators to literally navigate, viz. through territorial space in cases of fog. If our society is "a society of the screen,"[35] then the ship's operators, with appropriate interfaces to have access to submarine signals and leader cables, can be regarded – at least in cases of low visibility – as a small 'society of the earphone.'

(4) In-/Exclusion

The interfaces with which this paper has dealt had an economic and political dimension, as they represent a form of restricted access. On the one hand, only the navigator who paid for receivers, amplifiers, and telephones was allowed to participate in the acoustic spaces for navigation. On the other hand, in cases of fog or severe thunderstorm, only ships that were equipped with appropriate receivers were allowed to enter certain harbours whose entrance had a leader cable as, for example, was the case in Portsmouth.[36] Ships that had no interface had to wait (that is: lose money) at the harbour entrance until the meteorological condition was suitable for navigation by sight. That is to say, the interfaces made decisions about inclusion and exclusion (to acoustic spaces and harbours). Put differently, one can acknowledge that the political dimension that interfaces incorporate has historically evolved, as can be seen with these early technological navigation interfaces.

(5) Guidance

If interfaces guide the user insofar as they predetermine the choices that users have, the above-described interfaces also shape the possible behaviour of navigators if these wanted to have access to the new technologies of submarine signalling and leader cables: They had to listen and flip a change-over switch back and forth. However, also on a literal level, the interfaces guided users. In *The Interface Effect,* Galloway states that "an interface is not something that appears before you but rather is a gateway that opens up and allows passage to some place beyond."[37] Galloway's usage of the term "passage" constitutes the interface as a kind of portal. In nautical lingo, however, passage also means sea voyage or crossing, and this is what the interfaces characterises. They were literally "gateways," entry points that allowed for passage to some place beyond: coasts, harbours, or channels.

35 Ibid.

36 J. J. Bennett, Leader cables in navigation. *The Electrician* 87/7 (1921), pp. 202–204, here p. 202.

37 Galloway, *The interface effect*, p. 30.

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HUMAN-MACHINE INTERFACE (1984)

By Frieder Nake

"The development of communication itself is now the development of its means; in particular, its technical means."

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In 1984, the computer arts pioneer Frieder Nake published "Schnittstelle Mensch-Maschine", a precise analysis of at the time young personal computer paradigms. The analysis does not only include the equally young GUI logics developed by researchers at Xerox PARC and first marketed with the Xerox Star workstation. It also reflects the implications for knowledge distribution and mental labour. Thus it makes sense that the article was published in the journal *Kursbuch* [vol. 75 (1984), pp. 109–118], which was established 1965 by Hans Magnus Enzensberger and Karl Markus Michel and soon became one of the leading periodicals for the German-speaking New Left. The specific volume is titled "Computerkultur" (computer culture) and includes, among other authors, Oswald Wiener, whose work is discussed by Nils Röller in this volume of *Interface Critique*.

We are indebted to the author for the permission to publish this valuable text from the childhood years of personal computer and GUI for the first time in English translation. We thank the ZKM | Center for Art and Media for the financial support enabling the translation of the German original.

Daniel Irrgang

One of the leading lights of artificial intelligence, Edward Feigenbaum, states that the machines of the fifth generation[1] are not only possible, but that they are inevitable. In his opinion, computers will overtake the significance of the printed word. He sees a future where not just information, but knowledge of the highest quality will be accessible for everyone, everywhere, anytime. In an assumed allusion to Adam Smith, his colleague Pamela McCorduck says, "It is a future, where knowledge is the new wealth of nations".[2]

How Feigenbaum quite imagines the relations of knowledge, wealth and mediated labour, and where he would want to see a difference to the classic value-added production, remains open. One aspect seems sure – we are talking about the "machinisation"[3] of mental labour. The Japanese project can only be understood as an epochal attack on the intellectual labour that still lives. Perhaps the classic terms of work and working society implode over this attack and the vision of the omnipresent logical computer, perhaps not. In any case, one guesses that the critique of political economy is becoming more urgent for information processing. Has the processing of infor-

1 See Pamela McCorduck, Introduction to the fifth generation. *Communications of the ACM* (Association for Computing Machinery) 26/9 (1983), pp. 629–630. – North-Holland Publishing Co., Amsterdam, published the proceedings through a conference (1981) on the international announcement of the project.

2 McCorduck, Introduction to the fifth generation, p. 630.

3 I use this unusual term since the more familiar, "mechanisation", refers to a historic period only: that of the mechanical way of machinisation.

mation already so widely expanded for this critique to be adequately applied? Or should we still be content with fragments?

Higher languages and lower ones

Computer science seems to be becoming the agricultural phase of mental labour. Just as increase in productivity lowers the overall value of the labour force, the value of mental labour force decreases with increasing productivity of programming work. At least as long as the use of computers remains an indispensable element of mental labour.

The use of computers and programs always means a transfer of mental work onto a machine. The living is transformed into dead mental work, the labour of the brain is turned into machinic operation. During a period of just forty years, this process has advanced with incredible force. In the beginning, the programmer would have to break down a formula, whose value was to be calculated, into a sequence of individual operations (addition, multiplication, etc.). That was not enough – he also had to code the operations (so instead of "+" perhaps to write "15"). He had to allocate space in the computer's memory to the values to which operations were to be applied. The numbers ("addresses") of these memory locations had to be substituted for the stored values.

For the simple equation "a+b", the command sequence would, perhaps, be as follows

0100	*10*	*("retrieve the number from memory location 100")*
0102	*15*	*("add the number in 102")*

In the worst case, the programmer would have to calculate where on the magnetic drum he wanted to accommodate the commands in order to synchronise execution times of commands with the time needed by the drum's rotation. Imagine the relief of the programmer, when suddenly "a+b" could be written for the same expression. Also the capitalist, who applied the labour of our troubled programmer, will have felt relief but of a different nature.

This was made possible by "higher programming languages". They are the means for turning into machinic form such mental activities as mentioned here: breaking up formulas, allocating mstorage space, optimizing instruction sequences. Compilers translate programs of higher languages into lower ones, and are themselves programs. Nothing other than the clotted form of all the mental labour that goes into the said translation process.

The example of a mathematical formula does not suffice in illustrating the progress in productivity currently being highlighted. Let us, however, stay with a simple mathematical case. If x is to be determined to solve the quadratic equation: $a \cdot x^2 + b \cdot x + c = 0$, a series of "assign-

ments" must be written at the traditional compiler language level, and be arranged into a proper sequence. In a language such as PASCAL, this could look like:

```
d := sqr(b) − 4*a*c;
if d≥0 then begin x1 := (−b + sqrt(d))/(2*a);
                  x2 := (−b − sqrt(d))/(2*a)
        end
else write ('no real solution possible')
```

It is plain to see that there is still a great deal of curious detail required to describe a very simple process in a high-level programming language. The "how" rather than the "what" is described, the language-related form rather than the problem-related content.

To change this, it should now be enough to specify only the relationships between the variables, and to demand the calculation of one of them.[4] For example:

$a \cdot x^2 + b \cdot x + c = 0$
Compute x

Machinisation of mental labour in general is often preceded by machinisation of programming work. Both the methodology of programming and ultimately its organization, as well as its means (such as languages), have changed profoundly in the last fifteen years. Endpoints are always formalized, generalized, and machinised activities.

In other words, the problem that the computer supposedly faces, calls for an adequate formulation of a linguistic level LI. The computer is given a machine-language level L0 (it lies deep as it requires a lot of detail). The machinisation of mental labour to some extent requires an intermediate level L (higher programming language). Translation from L to L0 is machinised in a suitable compiler; LI to L must happen "in the head". Progress manifests itself in the raising of L. The above example shows this.

Automated office work and Star

Let's turn to a current application of computer science, the automation of office work. The consequences of the evolution in the technical basis of office work is not the focus of our analysis. Let us rather take a look at current ideas for developers of such systems.

Generally speaking, the office worker deals with the preparation and design of texts and forms as well as the ordering, storing, copying, updating, evaluating and transmitting of received information. Such work can each be isolated and automated, but it also leads to isolated systems that may not be compatible. The real task of office automation is to integrate such isolated systems into a com-

4 The adept reader will not have missed that this is already possible in "functional" languages today. Further steps may be based on logical programming languages like PROLOG. It was defined in 1975 by the Frenchman Colmerauer. The Fifth Generation begins the with construction of PROLOG machines whose prototype are supposed to be completed in 1984.

prehensive one. By doing so, they hope to reduce the complexity of the system "interface" for the user.[5]

Three problem areas arise: distributed computer systems for office work that are only fully efficient as networks; simple yet complete "human-machine-interfaces"; "knowledge-based" systems.

The Star system of the Xerox Palo Alto Research Center is currently considered the most advanced office automation product on the market.[6] At well over 100,000DM, the price range seems to limit its distribution. Apple offers a system called Lisa with very similar features and at a significantly lower price of around 30,000DM, swiftly released by members of Apple's Xerox developer team.

Star is used by pointing to small iconic images on the screen, and occasionally typing text. Users do not have to memorize command sequences; they will always be informed of their options through what the system shows about itself. Should something need printing, e.g., an image of a printer would be pointed to; if calculation is required, a calculator image must be touched. If they tap on an image of a document and then on a paper basket, the document disappears.

Xerox invested about thirty "human-years" for the development of this "user-interface".[7] Its goal: "simple things should be simple; complex things should be possible". Or: it can be a pleasure to work with a system like Star; at the same time it lowers the necessary qualifications and makes jobs superfluous. At one bank in Hamburg, however, it is said that also higher ranking employees work with it.

Where is the knowledge?

The real subsumption of mental work under capital has thus been initiated. In the automation of office work, it encounters the limits of its rule over purchased labour. As in timesof Taylorism, though at a higher level, automation managers and engineers must realize that they know nothing. Much to their regret, they realize that office work can only be described in an intuitive and informal way. The required formalisation for automation does not exist.

Even worse, American research indicates that the knowledge of office work is not found in the minds of individuals, but is spread amongst several.[8] Not only is office work itself more or less social, but knowledge about it as well. The work researched by Taylor was at least known to the individual worker, before it was elicited from them. In the office, however, capital seems to have to deal with the whole team.

For example, experienced office wor-

5 See depictions by C.A. Ellis and G. J. Nutt, Office Information Systems and Computer Science. *Computing Surveys* 12 (1980), pp. 27–60.

6 N. Meyrowitz and A. van Dam, Interactive Editing Systems. *Computing Surveys* 14 (1982), pp. 321–416, here p. 373.

7 Daniel E. Lipkie et al., Star Graphics. An Object-Oriented Implementation. *Computer Graphics* 16/3 (1982), pp. 115–124.

8 Ellis and Nutt, Office Information Systems and Computer Science, p. 53 f.

kers would introduce newcomers sometimes in a very indirect way to the specifics of their work. When negligence was observed, they would improve it in casual conversation in the form of jokes or side-notes. Equally, with employees of the same hierarchical level, informal communication about problems could be observed. In some offices there exists a loose but constant conversation between individual desks, which is not limited to private stories, but which also refers to the "cases" to be handled. A form of problem solving is cultivated, which essentially relies on immediate socialisation.

Automation of such work seeks to grasp existing complex social relationships in formal specifications and typifications and tears them apart. The mechanizers are terrified that it will be more difficult to maintain the efficiency of the office, which was intended to be increased. It is said that except in the field of text editing, no system has yet removed such informal structures.

Human-Machine Interface

To speak of the "interface" between human and machine (computer), a system-theoretical approach is required. Systems are summaries of elements (components) between which relationships exist. The components can also be systems. Through abstraction, real systems become system-theoretical ones. This means in a given natural system, for instance, the components must first be identified as such. They are cut out. Surfaces of the cut emerge as "interfaces" to neighbouring components. The interface describes the relationship that should be maintained between the separate components, despite their disconnection. Technical systems are constructed. They can therefore be assembled from prefabricated components. Successful assembly requires the precise definition of the places, that are perhaps standardized, along which they can be assembled.

Systems in which humans and machines exist are hermaphrodites. Necessarily in these systems, humans are reduced to a few functions, a function-bundle. The automators, as one can imagine, don't really care. In fact, system analysis is an essential key to their approach. The straightforward talk of the human-machine interface proves that. Fortunately, there are others. Who would ever think of reading their car manual as the description of a human-car interface?

But let us not make it too easy for ourselves. As complex as a car may be in detail, its function is simple compared to a computer of around the same price. The car is a machine for converting fossil energy into motion, through which the load and the machine itself change their location. The operator must move with it as he monitors and controls the whole process, and he can abort and change it at any time. If we ignore operating errors and external influences, this machine is under complete control of its user.

The computer, on the other hand, can – by being appropriately programmed – be

prepared to perform any practical, computable function (for us this means a mental activity that can be formalized). In the field of formalizing mental activities, the computer is the universal machine. It will convert any data you like according to a given program. Only the user who is also a programmer and knows the system, can think of total control. For anyone else, the machine will provide surprises.

The object of mental activity, as that of its corresponding programs, is information (not energy or matter). So then it becomes interesting at the "interface", if the program is interactive – that is, if there are open locations where the program interrupts itself, requires information from the user and only continues if and when these become available. Their openness gives the user the possibility of control. Or so it seems?

The design of this "interface" is a central topic of the ever wider use of computers. The machinisation will falter if the "interface" is not robust, clear, easy-to-understand and yet richly developed. The function of the "interface" is communicative: what humans and computers exchange through them is information. But the exchange turns out to be highly asymmetrical on closer inspection – what is information on the human side, is only data on the computer's side.

It is useful to remind ourselves of the concept of the "sign" as a three-point relation of means, signified, and interpreted[9]. The sign establishes arelation between a signifying means,a designated object, and an interpreted (subject matter (for an interested interpreter). Syntactics, semantics, and pragmatics examine the individual aspects of the sign. "Data" in this sense are signs as means, in computer-adequate form, encoded and stored. "Information" is gained from data only through interpretation, through assignment of objective as well as subjective meaning. Information is only bound to data, but data without information is uninteresting.

If, as a user of an interactive computer system, a person enters numbers and letters via a keyboard, the resulting data are of primary importance to him, and thus they become information. The moment these data penetrate the "human-machine interface", they lose this information to their new interpreter, the computer. They are reduced to their data core. The computer, under the direction of the program, uses them for storage entries or decisions. The latter "mean" nothing other than branching off in the program. The former "mean" nothing other than assignments of values to parameters. Only in this sense, data also gain meaning for the computer. This meaning is a different one, not least a narrower one, to the one that applies to the user. The fact that data within the computer acquire this meaning has been determined by the programmer in advance and not otherwise. The "interface" is therefore a place of lane change from wide to narrow. That is its communicative yet restrictive function.

9 In the German original text, the "interpreted" (as the result of an activity of interpretation) is wrongly called the "interpreter". Charles S. Peirce calls this the "interpretant".

Communication between human and machine?

Each program is a static (namely, textual) description of a class of dynamic processes (its particularity is to process information at the reduced level of data). The single process is selected from its class by setting parameter values. It is executed when a computer interprets the program along with the values of the parameters. What the programmer has and has not included in the description of this class of dynamic processes defines the meanings that can be obtained in the context of the interactive program run.

The partners that come into contact through the communicative interface are much less frequently the computer and its user than the user and the programmer. Their means of communication is the computer and its program. This means gives communication the distorted appearance of "human-machine communication".

The process is simple enough and is more and more often seen as such. It must be all the more astonishing that even leading experts do not tire of packing it into anthropomorphizing forms. With some, one has the impression that they do it to get their hands on millions of research funding.

This immortal *Mensch-Maschine-Kommunikation* – human-machine communication – is sometimes referred to simply as MMK. It appears as "symbiosis" between human and machine[10] or even as "symbiotic tool"[11]. One wonders where the benefits might be that the tool hopes (to be used) for. The "self-explanatory tool" on the other hand, looks harmless, even downright technical.

The talk is of "convivial tools"[12], in a nice simplification of Illich's catchphrase that shaped society.[13] And what is tool on the one hand, is on the other, or simultaneously, partner; a partner who not only has an inner model of itself, but also builds one of humans, who are its partner.[14] The computer is asked to follow the principle, "Do what I mean, not what I say". Probably in the user's insight that he cannot clearly express anyway, quite unlike what Wittgenstein had imagined.[15]

I remain completely silent on the sorts of intelligence that break out of the interface, and on the imperceptible transfer of data and databanks to knowledge and

10 E. g. C. Berner, Die neue Symbiose: Mensch und Multiterminal. *Computer Magazin* 4 (1981), pp. 58–63.

11 Gerhard Fischer, Intelligente Benutzerschnittstellen, in: *Proceedings des GACM: Tutorials Intelligenztechnologie* (Stuttgart 1983). pp. 116–133.

12 Gerhard Fischer, Computer als konviviale Werkzeuge, in: *Proceedings der Jahrestagung der Gesellschaft für Informatik (München)* (Berlin, Heidelberg and New York 1981), pp. 409–416.

13 Ivan Illich, *Selbstbegrenzung* (Reinbek/Hamburg 1980).

14 On the critique of this frequently encountered position, see Ingbert Kupka, Susanne Maaß and Horst Oberquelle, Kommunikation – ein Grundbegriff für die Informatik. *Mitteilung* 91, Computer science department, University of Hamburg, August 1981.

15 Ludwig Wittgenstein, *Tractatus logico-philosophicus* (Frankfurt/Main 1963).

knowledge banks, perhaps in the hunt for research funding in looking to Japan.

I do not consider criticism of such usage idle. Conceptualization is preceded by absence of concept, which may well come along with powerful words and yet does not get any better. If a science like computer science contributes to such drastic changes of work and life, as it turns out, and if it tolerates or even promotes such a casual approach to its conceptualization, it serves – intentionally or otherwise – the veiling of real circumstances and changes. Let's then take another look at "human-machine communication".

It seems relatively easy to identify the root of the false consciousness expressed in the crooked conceptualization. Communication seems to be a very early achievement of humanity. Mumford goes so far as to set its significance for the process of becoming human higher than that of tool-making and use.[16] Dialogue is the elementary form of communication. That does not mean that it also historically came first. However, it has all the features necessary for communication. It is originally characterized by a unity of place, time, and participants. This is already conditioned by the first means of communication, the voice.

The development of communication itself has become the development of its means; in particular, its technical means. They break up the original unity in multiple ways, and muscle in between the participants. Written text removes the unity of time and allows a limited form of communication even with past generations. The phone removes the unity of the place and potentially extends communicative options to all living beings. In many cases, the place and time of the communication are extended.

The computer as a currently last stage of development of technical means of communication also eliminates the unity of the participants: they are distributed, instead of their own thinking, some *thing* is "thinking", it is "communicated". This is possible due to the specific nature of the computer, the processing of information in the form of data. The means of communication here is not limited to the transmission of information by a (largely) constant information carrier, but it is able to change this carrier, the data. This leads, with appropriately advanced programming, to the impression that the means of communication have become independent, that they themselves have become the partner of communication.

The truth of the process is that a communication partner ("user") usually enters into a multiply fractured dialogue with a whole group of partners. They do not know anything about the concrete communication. They have pre-formulated questions in the form of programs and systems of programs, and answers stored as data or algorithmically determined. The user calls on, so to speak, only one or the other answer from a possible variety of dialogues, which may be infinite. The dissolution of the unity of the participants is also reflected in the fact that the programmers have plan-

16 Lewis Mumford, *Mythos der Maschine* (Frankfurt/Main 1977).

ned these dialogues only as parts, not as whole progressions.

"Human-machine communication" turns out to be a helpless formula for a deeply social process.

Michael Paetau rightly points out that "the involvement of the computer in interpersonal communication is first of all, a change in the form of communication caused by a new medium"[17]. The forms of communication are subject to historical changes that are shaped by the level of development of productive power. If you look at it this way, one gains reasonable access to the process of human-machine communication which may then even be named as such.

Or do such people see far ahead into a bright future, in which work essentially means communication, and wealth comes from knowledge – those who seem to conceptually shape concepts? Do they look to a future where work is only done by machines, and where humans reproduce by training a machine to produce and, for that purpose, communicate quite naturally and with ease?

Is the machine, perhaps, repudiating its way of being, the appearance of fixed, constant capital, the mode of existence in which it originated and in which we experience it? Does the machine as an information machine emancipate itself from its capital form and lead the astonished worker into a future he could never have created?

Crazy thoughts, if one thinks of the simultaneous debate on the new analysis of the relationship between productive forces and the relations of production, on the question of whether the productive forces are in part indelibly imbued with capital. There is no real reason to follow such thoughts. After all, software (programs) is by nature (description of information-processing processes) nothing but "work organization cast into technical functional mechanisms"[18]. In this way, the inherent claim to domination can be traced more easily than in other machines.

André Gorz points out that "automation in itself is socially ambivalent", and that "microelectronics is an 'open' technology"[19]. The socialization of labour, in the case of machinisation of mental labour, seems to be near. Also near seems to be its contradictory stance to capitalist relations of property. The "human-machine communication" removes the producer even further from his product, which exists for him only as a description. At the same time, this abstraction opens up hitherto unattainable work areas for him. Is the socialization of the means of production not actually overdue?

17 Michael Paetau, Soziologische Dimensionen computergestützter Bürokommunikation, academic paper from *GMD* Nr. 18 (Bonn, March 1983), p. 15.

18 Ibid, p. 43.

19 André Gorz, *Wege ins Paradies* (Berlin 1983), p. 49

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OSWALD'S HUBBLE

By Nils Röller

"It is, of course, well-known that creation and destruction are complementary processes. But there are further similarities between Wiener's œuvre and the Hubble telescope."

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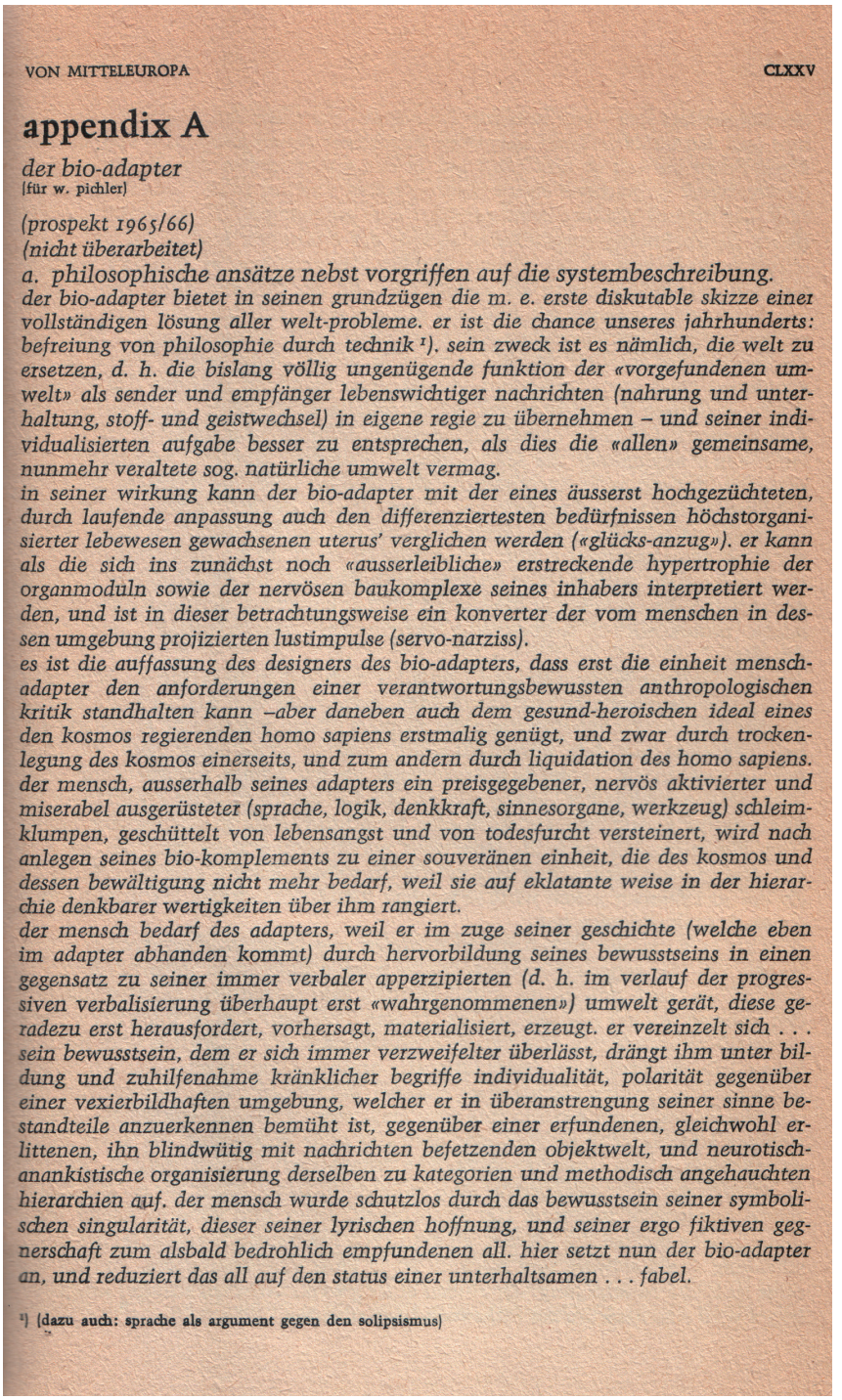

VON MITTELEUROPA CLXXV

appendix A

der bio-adapter
(für w. pichler)

(prospekt 1965/66)
(nicht überarbeitet)

a. philosophische ansätze nebst vorgriffen auf die systembeschreibung.

der bio-adapter bietet in seinen grundzügen die m. e. erste diskutable skizze einer vollständigen lösung aller welt-probleme. er ist die chance unseres jahrhunderts: befreiung von philosophie durch technik [1]. sein zweck ist es nämlich, die welt zu ersetzen, d. h. die bislang völlig ungenügende funktion der «vorgefundenen umwelt» als sender und empfänger lebenswichtiger nachrichten (nahrung und unterhaltung, stoff- und geistwechsel) in eigene regie zu übernehmen – und seiner individualisierten aufgabe besser zu entsprechen, als dies die «allen» gemeinsame, nunmehr veraltete sog. natürliche umwelt vermag.

in seiner wirkung kann der bio-adapter mit der eines äusserst hochgezüchteten, durch laufende anpassung auch den differenziertesten bedürfnissen höchstorganisierter lebewesen gewachsenen uterus' verglichen werden («glücks-anzug»). er kann als die sich ins zunächst noch «ausserleibliche» erstreckende hypertrophie der organmoduln sowie der nervösen baukomplexe seines inhabers interpretiert werden, und ist in dieser betrachtungsweise ein konverter der vom menschen in dessen umgebung projizierten lustimpulse (servo-narziss).

es ist die auffassung des designers des bio-adapters, dass erst die einheit mensch-adapter den anforderungen einer verantwortungsbewussten anthropologischen kritik standhalten kann –aber daneben auch dem gesund-heroischen ideal eines den kosmos regierenden homo sapiens erstmalig genügt, und zwar durch trockenlegung des kosmos einerseits, und zum andern durch liquidation des homo sapiens. der mensch, ausserhalb seines adapters ein preisgegebener, nervös aktivierter und miserabel ausgerüsteter (sprache, logik, denkkraft, sinnesorgane, werkzeug) schleimklumpen, geschüttelt von lebensangst und von todesfurcht versteinert, wird nach anlegen seines bio-komplements zu einer souveränen einheit, die des kosmos und dessen bewältigung nicht mehr bedarf, weil sie auf eklatante weise in der hierarchie denkbarer wertigkeiten über ihm rangiert.

der mensch bedarf des adapters, weil er im zuge seiner geschichte (welche eben im adapter abhanden kommt) durch hervorbildung seines bewusstseins in einen gegensatz zu seiner immer verbaler apperzipierten (d. h. im verlauf der progressiven verbalisierung überhaupt erst «wahrgenommenen») umwelt gerät, diese geradezu erst herausfordert, vorhersagt, materialisiert, erzeugt. er vereinzelt sich . . . sein bewusstsein, dem er sich immer verzweifelter überlässt, drängt ihm unter bildung und zuhilfenahme kränklicher begriffe individualität, polarität gegenüber einer vexierbildhaften umgebung, welcher er in überanstrengung seiner sinne bestandteile anzuerkennen bemüht ist, gegenüber einer erfundenen, gleichwohl erlittenen, ihn blindwütig mit nachrichten befetzenden objektwelt, und neurotisch-anankistische organisierung derselben zu kategorien und methodisch angehauchten hierarchien auf. der mensch wurde schutzlos durch das bewusstsein seiner symbolischen singularität, dieser seiner lyrischen hoffnung, und seiner ergo fiktiven gegnerschaft zum alsbald bedrohlich empfundenen all. hier setzt nun der bio-adapter an, und reduziert das all auf den status einer unterhaltsamen . . . fabel.

[1] (dazu auch: sprache als argument gegen den solipsismus)

First page of "appendix A: der bio-adapter", taken from the first edition of Oswald Wiener's *Die Verbesserung von Mitteleuropa. Roman* (Reinbek/Hamburg: Rowohlt, 1969), p. CLXXV.

In 1969 the Austrian poet and theoretician Oswald Wiener published his experimental novel *Die Verbesserung von Mitteleuropa* ("The Improvement of Middle-Europe"). As author in context of the vibrant Vienna Group and vivid thinker of the spreading cybernetic apparatuses, Wiener's book was widely recognized. And especially one part of the book, following the main text as "appendix A", hasn't lost its speculative power and analytic sharpness: "der bio-adapter" ("the bio-adapter") describes a bio-technological interface, designed for the inhabitant of a contemporary world of rising complexity. Its aim: making the world bearable by changing the wearer, by adapting her or him to its oddities. Over time, this interrelationship between wearer and bio-adapter grows stronger and becomes existential, until the threshold between the two biological systems vanishes and the adapter takes over control. An interface, constituting a cybernetic closed circuit unit. It can be discussed as "an absolute interface". Please follow this invitation.

Or as Wiener later put it in a 1990 lecture on problems of artificial intelligence: "I am realizing a machine because it is doing something that I have once done as well."[1]

50 years after its first publication, the official English translation of "the bio-adapter" is now finally available. Edited by Beate Geissler and Oliver Sann and published by Kulturverlag Kadmos in Berlin, the translation comes with an introduction by Siegfried Zielinski and an afterword by Nils Röller. Both texts contextualize the relevance of the text for Wiener's *œuvre* and its implications for contemporary and current discourses on technologically controlled environments.

Since this issue of Interface Critique coincidences with the publication of the book, we use the opportunity to publish Nils Röller's afterword, offering our readers a glimpse into Wiener's unusual and exciting speculation on interface paradigms in a time where cybernetization began to take command, to paraphrase Sigfried Giedion.[2] For further insights we strongly recommend Siegfried Zielinski's introduction to this seminal text, and of course the English translation of "the bio-adapter" itself, in:

Oswald Wiener, *the bio-adapter*, eds. Beate Geissler and Oliver Sann (Berlin: Kulturverlag Kadmos, 2019).
ISBN 978-3-86599-410-3

We are indebted to the author, the editors and to Wolfram Burckhardt from Kulturverlag Kadmos for the permission to publish Nils Röller's text.

Daniel Irrgang

1 Oswald Wiener, *Probleme künstlicher Intelligenz*, ed. Peter Weibel (Berlin 1990), transl. DI.

2 Sigfried Giedion, *Mechanization Takes Command: A Contribution to Anonymous History* (New York 1948).

In 2009 two NASA astronauts performed repairs on the Hubble space telescope.[3] One of the results of this complex and costly "brain surgery" in space became visible in 2015 with the publication of new, high-resolution images of the Eagle Nebula in star cluster M 16.[4] Prior to the repairs, the nebula's tube-like structures had been named "Pillars of Creation". Comparing images taken in 1995 to those taken post-repair in 2009 prompted a discussion whether these pillars should now also be referred to as "Pillars of Destruction".

In the 1960s Oswald Wiener was considered a destroyer of culture and Austria's Public Enemy No. 1. In the late 1980s he was awarded the Grand Austrian State Prize for Literature. The destroyer of Austrian values had turned into the nation's poster boy. It is, of course, well-known that creation and destruction are complementary processes. But there are further similarities between Wiener's *œuvre* and the Hubble telescope. They are laid out in a resolution recorded in 1910 by Franz Kafka in his diary: "But every day at least one line should be trained on me, as they now train telescopes on comets."[5]

Wiener trains an apparatus on his own interior which he has been developing for decades.[6] The development of this *instrumentarium* led to the 2015 publication of *Selbstbeobachtung* ("Self-observation").[7] The book collects texts by a group of researchers who, informed by Wiener's *Schriften zur Erkenntnistheorie* ("Epistemological Writings"),[8] pursue the question how mental images function. The point of departure is the premise that mental images should not be conceived as static reflections but as programmed sequences guiding the movement of signs. Wiener himself contributed two foundational texts to the collection. They document the engagement of his writing, thinking and feeling with the principal question whether our psychic interior can be automatized. In preparation of this project Wiener had in the 1990s examined how the psychological concept of "scheme" can be translated using the notion of the "Turing Machine". In other words, rather than pursuing a Luddite agenda Wiener makes use of automaton theory as a productive intellectual tool. "Productive" in this particular context means that the performance of a machine instructed to react to signs according

3 Markus Becker, "Hubble"-Reparatur: Erfolg nach acht Stunden Dauerschrauben. *Spiegel* (May 18, 2009); www.spiegel.de/wissenschaft/weltall/hubble-reparatur-erfolg-nach-acht-stunden-dauerschrauben-a-625415.html, access: June, 9, 2019.

4 Felicia Chou and Ray Villard, Hubble Goes High-Definition to Revisit Iconic "Pillars of Creation" (January 5, 2015); www.nasa.gov/content/goddard/hubble-goes-high-definition-to-revisit-iconic-pillars-of-creation, access: June, 9, 2019.

5 Franz Kafka, *Diaries 1910–1923*, ed. Max Brod (New York 1976), p. 12.

6 I elucidate Wieners work in my book *Ahabs Steuer – Navigationen zwischen Kunst und Naturwissenschaft* (Berlin 2005). Differences to contemporary poetologies for example of Charles Olson are discussed in: Nils Röller, Revolution of the ear? The Typewriter as a Listening Aid, in: *Variantology – On Deep Time Relations of Arts, Sciences and Technologies*, eds. Siegfried Zielinski and Silvia Wagnermaier (Cologne 2005), pp. 195–206.

7 Thomas Eder and Thomas Raab (eds.), *Selbstbeobachtung. Oswald Wieners Denkpsychologie* (Berlin 2015).

8 Oswald Wiener, *Schriften zur Erkenntnistheorie* (Vienna 1996).

to a *tabella* offers the heuristic possibility of a greater attentiveness to dreams, to inspirations that come while shaving, or to memories, and to ask what takes place when the act of falling asleep gives rise to ideas of books or cutting fat (something "*lardo*"-like), or what happens when one's morning toilet is accompanied by the sign sequence: "If it's worth being done, it is worth being done well." To quote Wiener:

> *Awake at night, sleepy musings: Leave our books behind here. What will become of them […]? Will they once more in one head […]? Books, how old-fashioned […] Under the movement of thoughts, next to the changes of meaning, a rarely noticed glossolalia typical for my falling asleep.*
>
> *Gradually I realize, as if it were taking place outside of me for some time now, a movement, heteronymous, like the entry of a new object into the field of vision.*
>
> *As if focusing my eyes more intently, I realize that something is being cut, by me, and now I also recognize a kind of movement of my hand, not certain which. My cutting implies a support, I am applying some pressure to pull the instrument down towards me.*
>
> *[Emphasis by the author, in the original the italics are set apart in a smaller font – NR.] The book theme got lost in the dissolve of attention.*[9]

Oswald Wiener records and distinguishes aspects of ideas by training his mind to focus on the origins, mutations and disappearances of mental operations, with a view toward future theorization. He shares his communications with a group of friends and researchers who themselves perform similar self-observations. The group is of the opinion that at present neither psychology nor artificial theory offer any feasible theories. They rely on concepts and theses that do not correspond to the psychic operations of self-observation. The core example for Wiener's group is the concept of the "mental image".

Wiener's texts contained in the volume *Selbstbeobachtung* describe – in sober, straightforward fashion, and yet with surprising twists – the intervals between insight and irritation related to those aspects of the psyche that can be formalized in machinic terms. Readers, in turn, can apply these intervals to themselves; they can modify them and develop a specific practice between freedom and structural determination. This will impact future artistic practices; at the same time, the emerging intervals can also be interpreted as a force arising from the motions of the theoretician, poet and musician Wiener. He was born in Vienna, the city of *The Third Man*, in 1935 and grew up among the occupation forces. The following chronological order indicates that Wiener acted in discrete states.

1953: Study in Vienna following graduation; 1954–1959: Part of the "Vienna Group"; 1958–1966: Data processing; 1969: Relocation to Berlin; 1969–1975: Gastronomy; 1979–1983: Study of mathematics and information science at the Technical University in Berlin; 1986: Move to Canada; 1992–2004: Professor of Poetics and

9 Oswald Wiener, in: Eder and Raab, *Selbstbeobachtung*, p. 67f.

Aesthetics at the Düsseldorf Art Academy.[10] He presently resides in Kapfenstein (Austria) and is contemplating a move to either Russia or Mecklenburg-Vorpommern.[11]

From the point of view of the question "How do I function?", these chronologically sliced biographic stages appear like containers in which different turbines generate power for the construction of a complex perception apparatus. It has turned into a structure of rigorously programmed and sensually improvised instances of recording, processing and storing. Within this perception ensemble the instruments are calibrated by means of the more precise question: What's up with me when I am gripped by something? In the musical domain, in which Wiener has been active for decades, the question can be phrased with greater exactitude: Why, for instance, does music have such an effect one that I change my life?

It is worth retrieving a bygone detail to grasp the import of this question. In his essay "Wozu *überhaupt* Kunst?" (Why art at all?) Wiener mentions that the music of the US-American troops – swing, jazz and in particular bebop – marked an incisive experience in the 1950s.[12] It prompted him to become a jazz trumpeter, a goal he doggedly pursued despite lacking means and support. For example, to purchase a record Wiener rode his bike from Vienna to Bern and back: that is, he covered 1600 km to make certain that he could repeatedly experience and study the thrill of a certain piece of music in order to imitate the technique, break free from imitated patterns and find his own style. Despite successful performances in the 1950s Wiener abandons his career as a trumpeter, a decision related to his autodidactic approach that was not conducive for longer performances. However, the engagement with physical palpable intoxication, the sensual thrill hearing, playing and reflecting on music, becomes a constant of Wiener's work, as in the concerts and recordings of "Selten gehörte Music" (Rarely Heard Music), the novels *Die Verbesserung von Mitteleuropa* (The Improvement of Central Europe)[13] and *Nicht schon wieder…!* (Not again…!)[14] as well as in theoretical writings comprising the *Literarische Aufsätze* (Literary Essays)[15] and the *Schriften zur Erkenntnistheorie* (Epistemological Writings)[16].

Remarkably, Wiener the thinking writer is biting the hand that feeds Wiener the artist. He fuels the doubt that humans will "eternally" create something special like art which can also be done by machines. There are practical and theo-

10 Thomas Eder, Oswald Wiener, in: *Killy Literaturlexikon. Autoren und Werke des deutschsprachigen Kulturraumes* (Berlin and Boston 2011).

11 Personal communication with Oswald Wiener.

12 Oswald Wiener, Wozu überhaupt Kunst? [1980], in: Oswald Wiener, *Literarische Aufsätze* (Vienna 1998), pp. 21–41.

13 Oswald Wiener, *Die Verbesserung von Mitteleuropa. Roman* (Reinbek/Hamburg 1969).

14 Oswald Wiener, *Nicht schon wieder …! Eine auf einer Floppy gefundene Datei*, ed. Evo Präkogler (Munich 1990).

15 Oswald Wiener, *Literarische Aufsätze* (Vienna 1998).

16 Wiener, *Schriften zur Erkenntnistheorie*.

retical reasons underlying this insight. Theoretically, it emerges from the study of Wittgenstein's philosophy, a reflection that was actively performed by the Vienna Group and that also led to an engagement with cybernetics and the *Automata Studies*[17] by McCarthy and Shannon. It also prompted Wiener to study mathematics and information science. The *Schriften zur Erkenntnistheorie* contain essays documenting the decades-long appropriation and examination of the concept of computability. They demonstrate that we have in the shape of the Turing Machine a formalism capable of deciding whether or not an idea can be translated into a finite computing operation. Wiener had already in the 1950s developed such expertise in these matters that he was able to work in the private sector and, from 1959 to 1966, build up the data processing division of Olivetti's Austrian branch.

Recording self-observations as well as making music are constants ins Wiener's *œuvre*. Another constant is indicated by the abbreviation "I" in his texts. It stands for Wiener's wife Ingrid, an artist who in collaboration with VALIE EXPORT and Dieter Roth creates tapestries, and who for several years has devised a series called "Traumzeichnungen" (Dream Drawings). She often appears in concert with Wiener. The concerts entitled "Rarely Heard Music" indicate Wiener's unflagging willingness to court and engage with randomness. This desire and its concomitant thrill manifest themselves paradigmatically in his joint ventures with the artist Dieter Roth. One result of this collaboration is the insight into the value of provisional models, which Wiener describes in *Haufen Teilverdautes* ("Partly Digested Heap").[18] The latter, a book which features Roth's early writings and drawings, is a testimony to an ambitious labour of mediation. Wiener strove to highlight the degree to which Roth cannot be mediated by any fashionable currents. In the course of the analysis Roth, initially labelled a "fool", turns into a recalcitrant structure that shatters all mirrors.

And this may serve as a bridge back to the Hubble telescope. As in the case of the two astronauts who repaired the telescope's spectrograph in 2009 and patiently handled 111 screws in zero gravity, there is something weightless to the collaboration of Wiener and Roth. It is the groundlessness of a competing friendship, in which both parties deprive each other of the trust and ground that usually underlie mutual recognition. Distrust smolders or flares up depending on the models the frenemies have of each other. Roth consistently evades the ideas that Wiener has of his, Roth's, artistic practice. This can be heard in "Tote Rennen – Lieder (Selten gehörte Musik)" [Dead Run – Songs (Rarely Heard Music)], a concert the two came up with after boozing all

17 Claude E. Shannon and John McCarthy (eds.), *Automata Studies* (Princeton, NJ 1956).

18 Dieter Roth, *Frühe Schriften und typische Scheisse ausgewählt und mit einem Haufen Teilverdautes von Oswald Wiener* (Darmstadt 1975).

night.[19] You hear the tinker of a piano and Roth and Wiener in conversation. Roth's strategy consists in taking literally and thus proving futile Wiener's theoretical distinctions. For his part, Wiener pursues details of Roth's practice until they distort the image he has of him. We thus arrive at the thesis that models of artistic practice or, more generally, of localized domains that lead to the production of signs, must be of provisional. They demand detailed observation in combination with ongoing clarification. The emerging details decompose the model into submodels. Which is why the Hubble mode has to be decomposed as well, maybe like this:

The telescope supplies data that are configured into images. Image configuration is based on landscape depictions.[20] In its present state Wiener's *œuvre* may be organized hierarchically. Within this hierarchy artistic practice has a subservient function. To a certain extent it helps to prepare future insights, but on the whole it is pretty undiscerning. Here, the analysis follows in the footsteps of Plato's critique of artists. Wiener's texts – including those most recently published – question this exemplary narrative by leaving empty the position at the top of the hierarchy. Neither institutionalized psychology nor science nor philosophy offer any insights that could justify this subordinate position of art. As a result, the very legitimation of art, science and philosophy is at stake. These formations are not capable of explaining how ideas arise. for instance, within the interior of the human psyche. But who, then, is able to furnish an explanation? All those willing to scrupulously focus their attention on their own ideas and imaginations and to record and share them. We are talking about individuals who do not shy away from applying machine metaphors to their own thoughts and emotions, and who do so as member of "research groups". The distinguishing feature of Wiener's group is its dedication to heterarchy, the courage to make do with fragments, and the skepticism towards simplifying narratives and theoretical systems that cannot be tested by means of self-observations. The data provided by Oswald's Hubble resist any formatting by a *unifying-uniforming narrative*.

19 In detail: Nils Röller, Tote Rennen – Zweikampf in Island zwischen Dieter Roth und Oswald Wiener, in: *Dieter Roth – Die Bibliothek*, ed. Johannes Gachnang et al. (Bern 2003).

20 Elizabeth A. Kessler, *Picturing the Cosmos. Hubble Space Telescope Images and the Astronomical Sublime* (Minneapolis 2012).

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NOTES FROM THE LABYRINTH, OR: THE INFINITE WEB

By Filipa Cordeiro

„Surfing the web is, thus, one more possible way of existing – a recent possibility that has, to be sure, created new frame-works of meaning in light of which human beings must now interpret and shape their existences."

This essay was first published on August 24, 2015 in *Wrong Wrong Magazine* (http://wrongwrong.net/article/notes-from-the-labyrinth-or-the-infinite-web, access: June 26, 2019, 6pm) and is here published, as largely unchanged version, with kind permission by the author. A German translation is available as well: Filipa Cordeiro, Aufzeichnungen aus dem Labyrinth, oder: Das unendliche Netz, in: *Zur Genealogie des MedienDenkens*, eds. Daniel Irrgang and Florian Hadler (Berlin: Kadmos, 2017), pp. 546–549.

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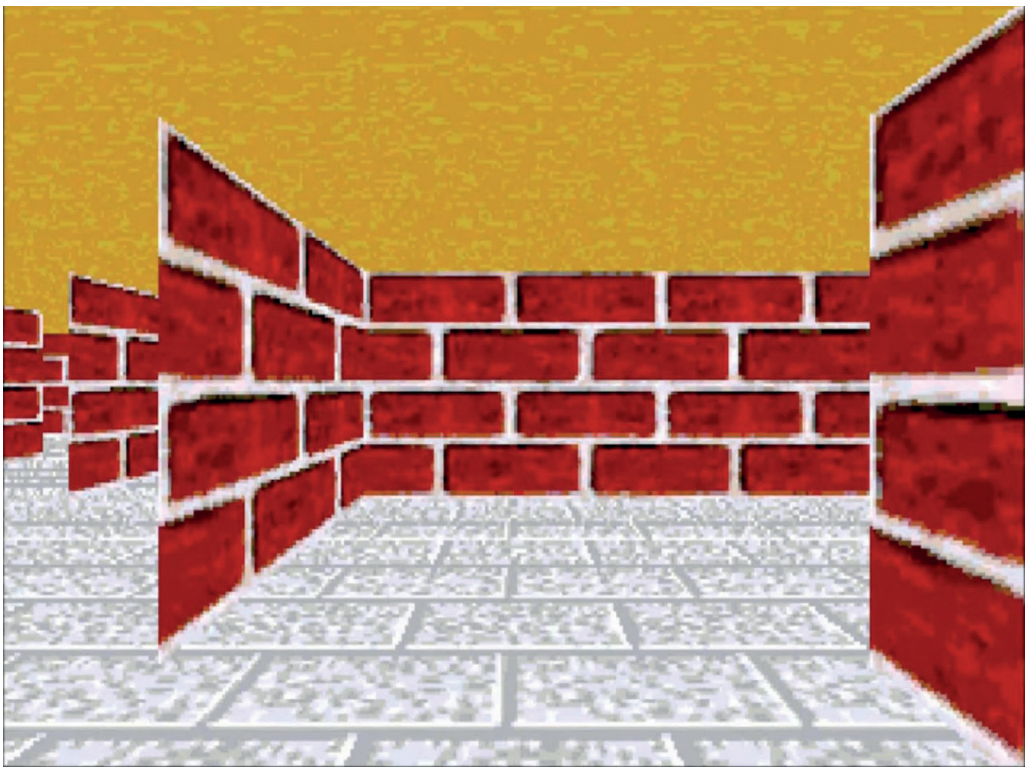
DOI: 10.11588/ic.2019.2.66982



In a celebrated Windows 95 screensaver, the user (represented by a subjective point of view) could wander through a 3D labyrinth with brick walls, enclosed from above and below. After entering the labyrinth, there was no end or slit to ease the suffocating atmosphere that was felt in the heart of the digital crypt. The scene recalled a pharaonic chamber, and the labyrinth was, for many, the strange and synthetic representation of the essence of the operating system. Can this metaphor still be effectively applied to navigation in the age of the web? The answer is yes, if we have in mind the movement of everlasting roaming that characterizes it, which still inscribes in it a peculiar experience of infinity. However, unlike the first labyrinth, the labyrinth of the web is characterized by its porosity: an essentially open quality, which has long transposed the limits of the digital. These notes result from a non-disinterested observation of that reality.

1. The proponents of "digital dualism"[1] tend to ascribe more reality to what goes on outside the computer or smartphone

1 This expression has been used by Nathan Jurgenson, creator of the blog Cyborgology (https://thesocietypages.org/cyborgology/, access: June 26, 2019, 6pm), to designate the more or less expressed viewpoint that opposes the "reality" of the physical world to the "virtuality" of web interaction. This conception supports the critique of social network by way of considering it a modality of virtual social interaction, which is, thus, disparaged – as unreal, estranged and essentially separate from what takes place outside the screen.

screen than to what takes place inside it. Such a claim presupposes an ontology that ascribes more being to what is offline than it does to what is online. In order for it to be consistent, its proponents must be able to prove its underlying assumptions. But if the question of ontology is brought back to the ones that inevitably pose it (human beings), we can but consider it as an enunciation of the modalities of being of a surrounding world that is essentially relevant to humans. It is, thus, futile to think offline and online realities apart from those to whom they are constituted. From a purely positivist standpoint, both "physical" and "virtual" activities are nothing but states of affairs that follow one another. Ultimately, the interaction that takes place inside the screen is nothing more than a succession of code combinations rooted in a medium that is just as physical as any other. In order to reveal such a difference, one must focus instead on the user, as one might say,[2] to whom there is never such a thing as a purely positivist standpoint. Far from relating objectively to a world of heterogeneous elements, as a researcher would, the user charts these elements (whether physical or virtual) primarily as eligible to integrate actualizable possibilities of his existence. In other words, humans use what surrounds them as a means of self-actualization,[3] and Internet use is part of this framework of possibilities, alongside much older activities. Surfing the web is, thus, one more possible way of existing – a recent possibility that has, to be sure, created new frameworks of meaning in light of which human beings must now interpret and shape their existences.[4] So it makes no sense to think of an ontological difference between the physical and the virtual, and "digital dualism" is thus reduced to a moral notion that condemns the digital based on metaphysical assumptions. Nevertheless, it is possible to consider, inside of the same framework of reality – the common domain in which humans breathe, work and live aesthetic and political experiences –, just how are such modes of relationship configured in the present, when they take place additionally in digital platforms, which interact in an increasingly permeable fashion with the activities that take place outside them.[5]

2 As we will see, this designation, casually used in the Internet (for instance in the term username) can be just as useful in the offline scope.

3 No moral judgement ascribing a utilitarian essence to a supposed "human nature" is intended by this expression. It means, instead, to underline the essential existential importance that all elements of experience hold for humans – which means that these elements are met from a relational point of view – as things that can be used or that can affect me: in short, with which I relate as a means to conduct my existence, and not as existentially indifferent elements that appear to a disinterested observer who may, optionally, get involved with them. See in this respect the 1st Division of Martin Heidegger's *Being and Time* (Malden, MA et al. 1962).

4 It should be noted that the ontology proposed by Heidegger acknowledges the essentially dynamic way in which being is given. The basic condition of human existence – the fact that humans have to lead their existence by way of relations to that which surrounds them – takes form differently in time.

5 This is also Nathan Jurgenson's thesis, who argues that the use of apps like Foursquare conditions user's movements, while Facebook use is part of an individual's identity, be it through the "photogenic" experience of daily events with image-sharing in mind (which inscribes the preoccupation with self-representation in daily life), be it through the time spent in online interaction, which is no less real than that spent in other activities. See for example:

2. We now proceed to a hypothetical near future: Facebook completes its transformation into a counting tool and competes with the civil register, and therefore with the state, for the monopoly of information. In its database, it is possible to observe the cultural preferences and social behaviours of an extended social fabric.[6] It is a voluntary-registration database, yet already naturalized, in order to ensure in advance that each citizen is delivered to his own personal marketing technician. Registration at birth enables the ideal customization of displayed contents, finally leading to a perfect symbiosis in which the user is produced by the network, the network produced by the user.[7] The marketing technician is already an algorithm: a shadowy figure crowned by the odd dignity that stems from belonging to the domain of mathematical truths, of being a truth that processes or a process for producing truth. Through market research algorithms consumers are generated. Therefore, in the age of widespread commercial registry, each human being is a citizen, each citizen a consumer. That is, after all, what the largest social network of the moment is all about[8] – massive harvest of data that has been voluntarily released by users through their choices and usage patterns, which serves the creation of comprehensive consumption profiles, later sold to the most suitable potential advertisers. The social relations that take place in Facebook are undoubtedly real and serve, in their concreteness, the production of economic wealth through an inconspicuous process that is, after all, what motivates the existence of the social network in the first place.

The structure of network socialization arises from a commercial exploratory impetus – but that does not mean one should overlook its practical significance. A user that was born in 2000 is different from a user born in 1950. Which boundaries define a cybernetically atavic brain? One could think that these boundaries are not related to age, depending only on network usage patterns. However, those who were born into a post-internet world have a different thought structure than those who were born before its existence, since their processes of learning languages and modes of being already took place within a dominant cyber culture.[9] Between these two extremes (1950,

Nathan Jurgenson, The Facebook Eye. *The Atlantic*, January 13, 2012, https://www.theatlantic.com/technology/archive/2012/01/the-facebook-eye/251377/, access: June 26, 2019, 6:15pm.

6 In a social network like Facebook, the range of possible social behaviours is limited to the options built in the system (customization fields, user-interaction options, etc.), which all take place inside the same relatively closed system. This interaction is already different from pre-Facebook web use, which had a greater exploratory quality that allowed users greater freedom.

7 Do these propositions ultimately come to the circular idea that the network produces itself?

8 It is hasty to assume that Facebook will still be ubiquitous in the near future. The danger of social network obsolescence, well exemplified by the desertion of MySpace for Facebook, isn't less palpable than that which impends in the case of digital formats. In both cases, an unavoidable loss of data ensues. It thus can happen that a significant amount of data essential to the very identity of users can become "captive outside them".

9 A sound bite by Google chairman Eric Schmidt comes to mind here. Schmidt declared that the future of the Internet is to "disappear" – that is, to become part of every aspect of life to an extent that its presence becomes invisible to the human eye

2000) we find one or two generations of children of the transition period (1980). Are there, among them, those who wish to attain a state of cybernetic atavism, neo-Luddites of the post-internet age? The quest for unlearning post-internet thought structures is as complex as the quest for unlearning a mother language. In this near future, when these three generations still coexist, one can image that there are minds maladapted to the general way of thinking, which will inevitably incur in misunderstandings of communicational decoding. Stuck outside the network-mind, they won't be able but to reconstitute abstruse and obscene messages with their archaic technology, and they will perhaps speak a language turned into poetry or, if you will, the babbles of a proscribed species.

3. The system sleeps, the screen goes off and shows the user his own reflected image in the black mirror surface. The excess of sugar causes nightmares: a lesson of adolescent love, which cultivated nights of poor sleep like hard-earned medals. In the heart of sleepless nights, one had to go through the mazes of the mind, pervaded by the glow of the screen, whose alternating lights inscribed the codes of the structures of the infinite web into the brains of the argonauts. One looked for Easter eggs in operating systems and learned visual and linguistic rhythms, never to be forgotten. Is such an exploration still possible? Some critics advocate the twilight of poetry made from everyday images, they denounce fifty beat poets for each true hero, one hundred and twenty poems for or about William S. Burroughs for each electronic dissident, grapes harvested by too many wraths.

Which way is there left, then? Fallowing, naturally. Winters are still cold, window frames still made of aluminium, the breeze still of death, the butcher still sleeping, in an afternoon still hot, still the flies, still the flesh. From time to time Portuguese crowberries (*corema album*) are still found, rare translucent white berries, along certain maritime slopes. They unveil themselves before those who roam the coves amid the low shrubs, perhaps finding, in the distance, when the hike is already long, a foreign fisherman with dark skin, a blue sweater and a red beanie. Solitude or community? One hears a word in another language: yes, a word, one identifies that as the belongings and the meaning of someone else, and not as just some noise. Despite the silence, we feel part of a community of thinkers.

(see for example Dave Smith, Google Chief: "The Internet Will Disappear". *Business Insider*, January 25, 2015, https://www.businessinsider.in/GOOGLE-CHIEF-The-Internet-Will-Disappear/articleshow/46012664.cms, access: June 26, 2019, 6:30pm). In fact, the ultimate form of presence of something is its omnipresence in the mode of presupposition – which renders that same thing nearly impossible to be evaluated or questioned, since it becomes part of the natural point of view, that is, the basic framework that allows questions to be made about everything else.

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MANIFESTO FOR AN ACENTRIC DESIGN

By Anthony Masure

> "*Human, All Too Human* is the monument to a crisis. It calls itself a book for *free* spirits: almost every sentence is the manifestation of a victory – I used it to liberate myself from things that *did not belong* to my nature. Idealism is one of them: the title says "where you *see* ideal things, I *see* – human, oh, only all too human!"... I know people *better*... The term 'free spirit' does not want to be understood in any other way: a spirit *that has become free*, that has taken hold of itself again."
>
> *– Friedrich Nietzsche, Ecce Homo [1888], in:* The Anti-Christ, Ecce Homo, Twilight of the Idols: And Other Writings*, eds. Aaron Ridley and Judith Norman (Cambridge 2005), pp. 115–116. In this seemingly autobiographical fragment, Nietzsche refers back to his book* Human, All Too Human *[1876–1878].*

This text is a revised version of a chapter excerpted from *Design et humanités numériques* (Design and Digital Humanities) by Anthony Masure, published by B42 (Paris) in 2017. License: CC BY-NC-SA. Translated from French by Jesse Cohn.

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Aren't there some aspects of human life that can't be replaced by the "experiences" generated by "user-centered" design?

In current discussions of "interface design," catchphrases such as "user-centered design," "the user experience," and by extension, "experience design" might not, at first glance, seem to draw scrutiny. After all, isn't the purpose of design to create 'useful' things based on the users' needs, 'centered' on them and on the improvement of their 'experience'? However, if one looks at these concepts more closely, one might wonder what these methods engage as conceptions of design, and more broadly as an understanding of human relations and human-machine relations. Indeed, it is not unproblematic to presuppose that "we" are users *first and foremost*, i.e. beings solely concerned with relations of utility. What are we to think, then, of terms such as "user-centered design (UCD),[1] " "human-centered design (HCD),[2]" "activity-centered design (ACD),[3]" or "people-centered design (PCD)[4]"? Why must design be "centered" on something? More broadly, aren't there some aspects of human life that can't be replaced by the "experiences" generated by "user-centered" design?

In order to critique the engineering of design and the reduction of the designer's task to normative and even quantitative methodologies, I propose, as a research method, to bring together a historical study of the concepts to be questioned with technical analyses and the related discourses surrounding them. More precisely, I could synthesize this text's research method in the following way:[5]

1. To analyze the concept determining the process by which design issues were constructed in order to draw out the underlying philosophical concepts.

2. To retrace the genealogy of this concept, connecting the technical reality of the products of design with the discourses of all entities being at the origin of the project (originators, designers, contractors, communicators, marketers, etc.) regarding these products.

3. To synthesize the history and the discourses of these entities concerning matters of design more broadly in order to draw out the philosophical issues entailed in them.

4. To connect the philosophical issues revealed by the analysis of the discourses of the entities with those of the original concept to show how these come to condition and determine the technical reality.

1 Shawn Lawton Henry, Justin Thorp, Notes on User Centered Design Process (UCD). W3C.org (March 2004), http://www.w3.org/WAI/redesign/ucd, access: July 1, 2019, 10:00pm.

2 Human-Centered Design Toolkit. *Ideo* (2009), http://www.ideo.com/work/human-centered-design-toolkit, access: July 1, 2019, 10:00pm.

3 See Geraldine Gay, Helene Hembrooke, *Activity-Centered Design. An Ecological Approach to Designing Smart Tools and Usable Systems* (Cambridge, MA 2004).

4 Hugh Graham, People-Centered Design, http://hughgraham-creative.com/people-centered-design, access: July 1, 2019, 10:00pm.

5 Here, I borrow the useful summary provided by Alexandre Saint-Jevin in his review of the essay *Design et humanités numériques*: Alexandre Saint-Jevin, Sur la trace de l'humain dans les "objets" de design. *Non-Fiction* (2018), https://www.nonfiction.fr/article-9264-sur-la-trace-de-lhumain-dans-les-objets-de-design.htm, access: July 1, 2019, 10:00pm.

This is thus not a matter of constructing a model of design activity in the form of logical sequences (diagrams, schemata, timelines, etc): rather than trying to tell designers what they should do, this analysis is intended to provide them with critical tools allowing them to analyze, in their own process, what they have already made or are still working on. In order to open up possibilities for making interfaces other than the behavioral scripts of experiential design, I will begin my analysis by turning back to the history of the first graphic interfaces. How do the values embedded within these technological strata infuse and even limit our relations to technology?

Xerox Star's "conceptual model of the user"

The expression "user interface" correlates temporally with the development of microcomputers at the end of the 1960s. In 1968, Douglas Engelbart presented the result of the research undertaken at Xerox PARC at the time of an event retrospectively called the "mother of all demos", where were first showcased videoconferencing, teleconferencing, email, the hypertext navigation system, and the interface modeled on the "office metaphor" based on "windows," "folders," the "trash," etc. Partially realized in the 1973 Xerox Alto computer[6], this first form of graphic user interface (GUI) was included in the 1981 Xerox Star. Moreover, the latter was accompanied by network access, email capabilities, a mouse, and a WYSIWIG (*What You See Is What You Get*) printing system precise enough to make what is seen on the screen coincide with a paper output.

In order to specify the origin of the conceptual model used as a basis for a design explicitly asserting needs of "users," it is important to reconsider the founding principles of the Xerox Star. In an article dating from 1982, five former employees of Xerox Corporation explain their comprehension of the human-machine relations, and more precisely their methodology of interface design:

> *We have learned from Star the importance of formulating the fundamental concepts (the user's conceptual model) before software is written, rather than tacking on a user interface afterward. […] It was designed before the functionality of the system was fully decided. It was even designed before the computer hardware was built. We worked for two years before we wrote a single line of actual product software.*[7]

Contemporary readers, used to design being relegated to the end of a process, dependent on a multitude of external parameters, will certainly wonder at the attribution of such importance to de-

6 Only 1500 units were produced: 1000 for employees of Xerox and the remainder for universities and public institutions.

7 David Canfield Smith, Charles Irby, Ralph Kimball, Bill Verplank, and Eric Harslem, Designing the Star User Interface. *Byte* 4 (1982), pp. 242–282, here p. 246. Republished online: https://guidebookgallery.org/articles/designingthestaruserinterface, access: July 1, 2019, 10:00pm.

sign "*before*" the material specifications are even formulated. In the case of the Star, it was much more a question of introducing the market to "radically new concepts"[8] than of seeking to apply an "order" issued from above. By dedicating a quantity of memory to the screen display, the originators of the Star were able to create a visual interface functioning in tandem with the mouse (also used on Xerox Alto), defined in the 1982 text as "a way to quickly point to items on the screen[9]" more effective than the cursors activated by the keyboard.

It is particularly interesting to study how the Xerox teams developed a project methodology linked to what is today called "user-centered design." The development of an interface poses many problems indeed: taking into account the variety of languages in which the users address their commands to the computer, the design of on-screen representations displaying the state of the system to the user, and other abstract problems that can affect the understanding of the system's behavior. According to the Star teams, these problems are highly subjective, and can be solved only on a case-by-case basis. The method employed thus consisted in focusing on what should precede any design of a successful interface, namely "task analysis":

> *The current task description, with its breakdown of the information objects and methods presently employed, offers a starting point for the definition of a corresponding set of objects and methods to be provided by the computer system [including programs and peripherals]. The idea behind this phase of design is to build up a new task environment for the user, in which he can work to accomplish the same goals as before, surrounded now by a different set of objects, and employing new methods.*[10]

For Xerox, the user is an entity centrally dedicated to carrying out tasks in order to achieve objectives. One finds here the common definition of an algorithm, namely, a set of instructions intended to accomplish a given action. In other words, isn't this understanding of what a user is derived from the "program" (an algorithm written in machine language) as a model of thought? Isn't it odd that, in order to improve human-machine relations, human beings are to be imagined on the model of the machines?

In this sense, what one would call a "user" in the data-processing context would often be merely a logical reduction of human subjectivity, consequently able to hold a dialogue with "extra-human" programs.[11] Just as some see design as a discipline capable of becoming a science[12], here it is a matter of constructing "models of behavior" in order to improve the effectiveness of the "tasks." The etymology of the French noun "*tâche*" ("task") can be traced back to the Latin

8 Ibid., p. 242.

9 Ibid., p. 246.

10 Ibid., p. 248.

11 I borrow this expression from the exhibition "Haunted By Algorithms", a research project directed by Jeff Guess and Gwenola Wagon, Paris, ENSAPC / YGREC, January 21, 2017 – March 5, 2017.

12 See Anthony Masure, Pour une recherche en design sans modèle, in: *Design et humanités numériques*, ed. Anthony Masure (Paris 2017), pp. 41–56.

verb "taxare" ("*to tax*"), indicating "a determinate work that one is obliged to perform, together with a concept of 'remuneration' [or] moral duty[13] ". The French verb "*tâcher*" ("to try to do"), in turn, expresses the idea of striving, sometimes accompanied by the idea of a degree of painful exertion in order to comply with the imperative to "try to do" something. If the user is a being whose objectives, to be realized, necessarily pass by a series of tasks to achieve, wouldn't this make us "*tâcherons*" ("drudges"), i.e. "person[s] performing *work on command* [emphasis by the author] without much intelligence"?[14]

In the case of the Xerox Star, nevertheless, things are more complicated. The fact of starting from a "user-model" comprised of a small set of design principles makes it possible to ensure an overall coherence, since "the *user experience* [acquired in] in one area... [can] apply in others,"[15] thus reducing the cognitive load involved in the use of the computer system. Another aspect discussed in the article – connected with the concept of coherence – pertains to the concept of "familiarity" (the "*Familiar User's Conceptual Model*"):

> *A user's conceptual model is the set of concepts a person gradually acquires to explain the behavior of a system [...] The first task for a system designer is to decide what model is preferable for users […]. This extremely important step is often neglected or done poorly. The [Xerox] Star designers devoted several work-years [...] [to] evolving [...] an appropriate model for an office information system: the metaphor of a physical office.*[16]

The Xerox Star interface was thus constructed on the basis of the users' current universe, namely, the hierarchical model of the office. It was important to produce a "familiar" interface in order to reduce sources of friction, making the "user experience" *seamless*. Thus, users find in the machine their customary division, organization, and management of tasks. For example, the pile of paper messages on the physical desk of office-worker users is translated, in their computer, into a pictogram of an envelope indicating when a new email has been received. It is interesting to specify that the metaphorical model defined in advance of the actual development of the program *de facto* modifies the functions of this program: the design is not approached as a matter of mere presentation. Taking the example of the emails once again, typing a "send mail" command can thus be avoided by manipulating the icons. A last important aspect of the Star interface pertains to the personalization of the interface, as the movable icons make it possible to configure the work environment.

Summarizing the overall principles of the Xerox Star, what is indicated here by

13 Alain Rey, *Dictionnaire historique de la langue française* (Paris 2010), pp. 9620–9621.

14 Ibid.

15 Smith, Irby, Kimball, Verplank, and Harslem, Designing the Star User Interface, p. 242: "The Star user interface adheres rigorously to a small set of design principles. These principles make the system seem familiar and friendly, simplify the human-machine interaction, [...] and allow *user experience* in one area to apply in others." Emphasis mine.

16 Ibid., p. 248–249.

the term "user" is in fact a succession of goal-directed "tasks" from which the designers construct a "conceptual model" as a basis for the developing of the computer system and ensuring its metaphorical coherence. By providing users with a "familiar" and "friendly" environment, the interface thus developed is intended to increase their productivity by developing "human-machine synergism." However, the Xerox Star's "friendly" interface reveals its limitations in certain functions where the office metaphor is inoperative:

> *One of the raisons d'être for Star is that physical objects do not provide people with enough power to manage the increasing complexity of the "information age." For example, we can take advantage of the computer's ability to search rapidly by providing a search function for its electronic file drawers, thus helping to solve the long-standing problem of lost files.*[17]

The 1982 article concludes on an intriguing note, observing that it is difficult to choose between several models of interfaces while relying on stable (scientific) criteria: "User-interface design is still an art, not a science."[18] Although the Xerox Star text ultimately pleads for the establishment of a "more rigorous process" for the development of interfaces, such an assertion must elicit the contemporary reader's curiosity.

The emergence of "rationalized" graphic operating systems

In spite of the commercial failure of Xerox Star, these design methods will be a success, definitively changing our relations with electronic machines. A precursor of the research conducted to Xerox PARC, Jef Raskin's thesis in computer science, *Quick-Draw Graphic System*, published in 1967 (i.e., 6 years before the Xerox Alto[19]), argued for a data-processing environment in which the graphic interface would hold a dominant place. Such an idea was not at all self-evident at the end of the 1960s:

> *The most heretical statement I made [...] was that my work was based on a "design and implementation philosophy which demanded generality and human usability over execution speed and efficiency." This at a time when the main aim of computer science courses was to teach you to make programs run fast and use as little memory as possible.*[20]

After contacts with Xerox concerning

17 Ibid., p. 252.

18 Ibid., p. 282.

19 At the beginning of the Seventies, the IBM Usability lab was solely concerned with ergonomics. *The Psychology of Computer Programming* was published by Gerald Marvin Weinberg in 1971, and the work of Stuart K. Card, Allen Newell and Thomas P. Moran was only made known to the general public after the publication of *The Psychology of Human-Computer Interaction* in 1983.

20 Dr. Bob, Articles from Jef Raskin about the history of the Macintosh. *Dr Bob Tech Blog* (2013), https://drbobtechblog.com/articles-from-jef-raskin-about-the-history-of-the-macintosh/, access: July 1, 2019, 10:00pm.

the development of the mouse, Jef Raskin was hired by Apple in 1978. It is under his impetus and that of Bill Atkinson[21] that Steve Jobs and Steve Wozniak took note of the research conducted by Xerox PARC on graphic interfaces. Everyone of us knows the rest of the story. In 1979, the CEO of Apple Inc., Steve Jobs, age 24, visited the Xerox facility. In a 1995 documentary, he recalls the shock which this event constituted for him:

> *They [Xerox] showed me […] three things. […]. One of the things they showed me was object orienting programming […]. The other one they showed me was a networked computer system [of a hundred computers] […]. I didn't even see that. I was so blinded by the first thing […] which was the graphical user interface. I thought it was the best thing I'd ever seen in my life. Now remember it was very flawed, what we saw was incomplete […] [But, at the time,] within […] ten minutes it was obvious to me that all computers would work like this some day.*[22]

Following this presentation, obtained in exchange for shares in Apple Inc., Steve Jobs launched the Apple LISA microcomputer, which took the principles of the mouse and the graphic interface from Xerox Star, in 1982. With a price that was too high ($10,000 at the time, or $24,000 today), the LISA was replaced by the much more financially accessible Macintosh, released in 1984. While many still think that Steve Jobs did little more than "steal" the key principles of the Xerox Alto, the history is more complicated than that. The leaders of Xerox had not yet recognized the decisive consequences of what they had discovered, leaving their prospective vision in the hands of the sales and marketing teams, which were focused on photocopiers, the core of the brand, and not on the new market for computers[23]. Bill Atkinson would have to rewrite and improve the quantity of functions in order for the LISA, and then the Macintosh, to take advantage of a "superior" graphic interface (with the addition of scrolling menus, the opening of windows with a double-click, the trash icon, etc). No line of code was "copied and pasted," strictly speaking.[24]

In order to bolster the supply of software for Apple machines, at the beginning of the 1980s, Steve Jobs invited Microsoft to publish programs for the Macintosh. In spite of Jobs' request to Bill Gates (then CEO of Microsoft) not to use a mouse-controlled graphic interface before the Macintosh (1984) had been on sale for a year, Microsoft surprised everyone by announcing the operating system Windows 1.0 in 1983[25], although

21 The title of Jef Raskin's thesis (*A Hardware-Independent Computer Drawing System Using List-Structured Modeling: The Quick-Draw Graphics System*, Pennsylvania State University, 1967) was echoed when Bill Atkinson named the Macintosh's graphics package.

22 Steve Jobs, Triumph of the Nerds: The Rise of Accidental Empires. Documentation. *PBS.org* (1996), http://www.pbs.org/nerds, access: July 1, 2019, 10:00pm.

23 For a detailed history of the Xerox company, see: Douglas K. Smith and Robert C. Alexander, *Fumbling the Future: How Xerox Invented, then Ignored, the First Personal Computer* (New York 1988).

24 Christoph Dernbach, Did Steve Jobs steal everything from Xerox PARC? *Mac History* (February 2012), http://www.mac-history.net/computer-history/2012-03-22/apple-and-xerox-parc, access: July 1, 2019, 10:00pm.

25 Windows 1.0 was not yet a complete operating system, but

it would only make its official debut in 1985. When Jobs, furious, accused Bill Gates of having betrayed him, Gates replied that they had both stolen from their "rich neighbor, Xerox."[26]. The suit brought against Microsoft by Apple in 1988 was unsuccessful in the courts.

Don Norman: the limits of the "user experience"

After the release of Microsoft Windows, the design methods used in interface design were structured around scientific disciplines connected with this field. In addition to the expressions "human usability" and "user interface," that of "user experience" (often shortened to "UX") then achieved a notable success. The latter seems to appear for the first time in 1986[27] in a book co-edited with Donald Norman (a cognitive science researcher), titled *User Centered System Design: New Perspectives on Human-Computer Interaction*.[28] After a consideration of the impossibility of arriving at a univocal meaning by means of standardized images (pictograms), this quotation follows:

> *Direct Engagement occurs when a user experiences direct interaction with the objects in a domain. Here, there is a feeling of involvement directly with a world of objects rather than of communicating with an intermediary. The interactions are much like interacting with objects in the physical world. […] [T]he interface and the computer become invisible. Although we believe this feeling of direct engagement to be of critical importance […] we know little about the actual requirements for producing it.*[29]

"User experience" can thus be understood as a will to export the Xerox Star design model to fields other than that of screen interfaces and computers which can disappear, becoming "invisible." Frequently cited as the originator of this expression, Don Norman defined it as follows in 1998:

> *I invented the term [user experience] because I thought Human Interface and usability*[30] *were*

rather a "graphic shell" that could be used by third-party software.

26 Andy Hertzfeld, A Rich Neighbor Named Xerox. *Folklore.org* (November 1983), https://www.folklore.org/StoryView.py?story=A_Rich_Neighbor_Named_Xerox.txt, access: July 1, 2019, 10:00pm. See also: Andy Hertzfeld, How the Mac was born, and other tales. Conversation with Scott Ard. *CNET* (January 2005), http://news.cnet.com/How-the-Mac-was-born%2C-and-other-tales/2100-1082_3-5529081.html, access: July 1, 2019, 10:00pm.

27 For a detailed chronology of the history of this term, see: Peter Merholz, Whither "User Experience"? *Peterme.com* (November 1998), http://www.peterme.com/index112498.html, access: July 1, 2019, 10:00pm.

28 Donald A. Norman and Stephen W. Draper, *User Centered System Design: New Perspectives on Human-Computer Interaction* (San Diego 1986).

29 Edwin L. Hutchins, James D. Hollan, and Donald A. Norman, Direct Manipulation Interfaces, in: *User Centered System Design: New Perspectives on Human-Computer Interaction*, eds. Donald A. Norman and Stephen W. Draper (San Diego 1986), pp. 114–115.

30 The concept of "usability" that Don Norman judges insufficient, was addressed by its proponents, Jeff Rubin and Dana Chisnell, in these terms: "when a product or service is truly usable, the user can do what he or she wants to do the way he or she expects to be able to do it, without hindrance, hesitation, or questions." Source: Jeff Rubin and Dana Chisnell, *Handbook of Usability Testing. Second Edition. How to Plan, Design, and Conduct Effective Tests* (Indianapolis 2008 [1994]), p. 4.

too narrow: I wanted to cover all aspects of the person's experience with a system, including industrial design, graphics, the interface, the physical interaction, and the manual.[31]

This broader aspect of "user experience" was then refined in the "canonical" version formulated by Jakob Nielsen and Don Norman:

"User experience" encompasses all aspects of the end-user's interaction with the company, its services, and its products. The first requirement for an exemplary user experience is to meet the exact needs of the customer [...]. We should also distinguish UX and usability: According to the definition of usability, it is a quality attribute of the UI, covering whether the system is easy to learn, efficient to use, pleasant, and so forth. Again, this is very important, and again total user experience is an even broader concept.[32]

"Experience design" and the myth of "invisible" data processing

This interest, from then on focusing on the user rather than the technological apparatus (the interface), is even more explicit in the phrase "user-centered design" ("UCD"), which consists in basing the whole methodology of design on the central point that is the user. This design methodology enjoyed considerable success, perhaps because of the bond it helped establish between the marketing services tasked with studying consumers and the teams tasked with designing the products.

However, by the admission of its own proponent, Don Norman, the term "user" has shown its limitations. In a 2006 article titled "Words Matter. Talk About People: Not Customers, Not Consumers, Not Users," Don Norman admitted:

We depersonalize the people we study by calling them "users." Both terms are derogatory. They take us away from our primary mission: to help people. […] People are rich, complex beings. […] A label such as customer, consumer or user ignores [their] [...] social structures. […] It is time to wipe words such as consumer, customer, and user from our vocabulary. Time to speak of people. Power to the people.[33]

In the same way, in 2008:

One of the horrible words we use is "users." I am on a crusade to get rid of the word "users." I would prefer to call them "people." […] We design for people, we don't design for users.[34]

Let us summarize these points. The methodology of "user-centered design" consists in designing so as to treat each human being as a user, as a person dedicated to maintaining with companies only relations "centered" on his or her

31 Don Norman, quoted in: Peter Merholz, *Whither 'User Experience'?*

32 Jakob Nielsen and Don Norman, The Definition of User Experience. *Nielsen Norman Group*, http://www.nngroup.com/articles/definition-user-experience, access: July 1, 2019, 10:00pm.

33 Don Norman, Words Matter. Talk About People: Not Customers, Not Consumers, Not Users. *jnd.org* (2008), http://www.jnd.org/dn.mss/words_matter_talk_a.html, access: July 1, 2019, 10:00pm.

34 Don Norman at UX Week 2008, Adaptive Path. *YouTube*, https://youtu.be/WgJcUHC3qJ8, access: July 1, 2019, 10:00pm.

"exact needs,"[35] concerning which there should be no "hindrance[s], hesitation[s], or questions."[36] This current of thought results from a scientific modeling of the principles that governed the design of the Xerox Star in order to make it a "personal" machine, optimizing the tasks to be performed by the user. Retrospectively, the performative texts of Don Norman speaking in praise of the study of "needs," by the admission of their author, led to a dead end, because the human being cannot be reduced to a specific role.[37] Such a reversal of thought might be amusing. However, on closer inspection, wouldn't one also have to interpret these contradictory injunctions as the sign of a power belonging not to the "people," but to those who make these speeches? In other words, isn't this an indictment of those who are constantly getting richer (in the banal sense of the term) by controlling the circulation of the design methodologies that are to be gotten rid of by this "crusade"?

More than a plea in favor of taking complexity into account in design, this "appeal to the human," for Don Norman, provides a rationale for gradually eliminating "interfaces" in the name of an "invisible" computing,[38] the products of which would be "human-centered."[39] This prediction of invisibility, passing under the guise of a change in vocabulary, *a priori* innocent, was so absorbed so thoroughly by the corporations that in 2012, Apple made it into a selling point:

> *We believe technology is at its very best when it's invisible, when you're conscious only of what you're doing, not the device you're doing it with. An iPad is the perfect expression of that idea. It's just this magical pane of glass. It can become anything you want it to be [...] It's a more personal experience with technology than people have ever had.*[40]

However, Don Norman's big picture does not mean that his idea of "invisible" computing is viable. The important term here is "experience," which goes hand in hand with that of "magic." What could be more magical, indeed, than experiencing an "invisible" technology? The artist Olia Lialina, in a critical article on the study of the concept of user, does not join in the chorus:

> *This is why Interface Design starts to rename itself to Experience Design — whose primary goal is to make users forget that computers and interfaces exist. With Experience Design there is only you and your emotions to feel, goals to achieve, tasks to complete.*[41]

35 Jakob Nielsen and Don Norman, The Definition of User Experience. *Nielsen Norman Group*, http://www.nngroup.com/articles/definition-user-experience, access: July 1, 2019, 10:00pm.

36 Rubin and Chisnell, *Handbook of Usability Testing*, p. 4.

37 This idea was inscribed within the ISO standards, which propose replacing the expression "user-centered experience" with "human-centred design." See: ISO 9241-210: 2010. Ergonomics of human-system interaction — Part 210: Human-centred design for interactive systems. *Iso.org* (March 2010), https://www.iso.org/obp/ui/en/#iso:std:iso:9241:-210:ed-1:v1:en, access: July 1, 2019, 10:00pm.

38 Donald A. Norman, *The Invisible Computer. Why Good Products Can Fail, the Personal Computer Is So Complex, and Information Appliances Are the Solution* (Cambridge, MA 1998).

39 Chapter 2 of The Invisible Computer is titled "Growing up: Moving from technology-centered to human-centered products."

40 Official Apple (New) iPad Trailer. *YouTube* (March 2012), https://youtu.be/RQieoqCLWDo, access: July 1, 2019, 10:00pm.

41 Olia Lialina, *Turing Complete User* (2012), http://contemporary-

A world without experience

In the conclusion of her article studying the limitations of an exclusion of the term user of the methods of interface design, Olia Lialina proposes to return to foundations predating the Xerox Star, namely those developed by the computer scientist Ted Nelson in his 1974 work *Computer Lib/Dream Machine*:

> *COMPUTING HAS ALWAYS BEEN PERSONAL. By this I mean that if you weren't intensely involved in it, sometimes with every fiber in your mind atwitch, you weren't doing computers, you were just a user. If you get involved, it involves all of you: your heart and mind and way of doing things and your image of yourself. A whole way of life.*[42]

The argument is strong. Nelson's denunciation of a "naïve" use points to the risk of a loss of contact with the computer, which, from Xerox Star to the iPad, presupposes that everything "real" (real life, creativity, etc) is external to the machine. However, in spite of the ascendancy of tactile interfaces (without mouses), in spite of the emergence of gestural interfaces (without buttons) and sound interfaces (without screens), and in spite of the return of command-line interfaces (without icons), it is clear that the great principles of the graphic interfaces created at Xerox PARC at the beginning of the 1970s are still the main ones governing our relations with electronic machines – which are not yet "invisible," far from it. Take, for example, the "Apple Human Interface Guidelines"[43] and Google's "Material Design,"[44] which, in the 2010s, are the recommended readings – with the proviso of reading critically – for anyone interested in interface design.

In spite of its widespread acceptance, the cognitive model of an interface coupled with an idealized user (understood as a bundle of habits) has its limitations. Since Jef Raskin's 1967 text associating "human usability" with efficient task completion,[45] the will to create a graphic interface to procure for the "user" a new work environment and new methods "to accomplish the same goals as before"[46] has consisted in envisaging electronic media as "problem solvers" rather than as powers of transformation and invention. However, as the humanities specialist Yves Citton perceptively notes:

> *The invention of communication technologies […] takes place within a vast nebula of hopes, anxieties, dreams, tinkerings, parallel knowledges,*

home-computing.org/turing-complete-user/, access: July 1, 2019, 10:00pm.

42 Theodor Holm Nelson, *Computer Lib. You can and must understand computers now* (self-published, revised edition 1987 [1974]), p. 3.

43 See for example: "Designing for Yosemite: […] A great OS X app integrates seamlessly into this environment, while at the same time providing custom functionality and a unique user experience." Human Interface Guidelines, *developer.apple.com*, https://developer.apple.com/library/mac/documentation/UserExperience/Conceptual/OSXHIGuidelines, access: July 1, 2019, 10:00pm.

44 Google Material Design, *material.io* (first version published June 2014), https://www.google.com/design/spec/material-design/introduction.html, access: July, 1, 10:00pm.

45 See Raskin, *A Hardware-Independent Computer Using List-Structured Modeling*.

46 Smith, Irby, Kimball, Verplank, and Harslem, Designing the Star User Interface, p. 248.

> *subversive appropriations and reappropriations, crossing many traditional disciplinary fields […]. Indeed, our media cannot be reduced to mere instruments for the transmission of forms and contents: it functions, first and foremost, in just the same way as the mediums who fascinate us, delude us, hypnotize us and stimulate us via simulations that penetrate our senses.*[47]

Taking into consideration these foundational design texts of the computer age, it is obvious that electronic machines raise questions that did not exist before. But perhaps it is precisely *against* these innovations that methodologies of design were themselves designed with an eye to preserving the powers and knowledges already in place. In spite of its undeniably advanced technology, the Xerox Star did not have the full support of the corporate leaders, who preferred to focus on the photocopier business, more in phase with the "uses" of the time. In this history of "user-centered design," an expression originating after the Xerox Star, it is indeed a matter of a concern about forgetting the "useful," the utility of the object. But is this really possible in a world in which marketing services, for example, constantly seek to anticipate consumers' "needs " by statistical processes linked to observation protocols?

Another factor suggesting a design constructing *against* technological innovations – i.e., *for* habits – is this history of the "center," a term which should now be examined. This twofold suffix coupled with design could have been the subject of variations. Why does one never speak, for example, of "form-centered" design, for example, or of "practice-centered" design? Perhaps is this because these two concepts (there could be others) resist the idea of a "center," of delimitation. If one considers the concept of form, it is notable that this, historically, was related to design – according to the formula of the architect Louis Sullivan, according to which "form ever follows function." As a canny observer of a history that sometimes "tramples" (in which the issues are sometimes obscured, sometimes rediscovered), the philosopher Pierre-Damien Huyghe notes that the concept of form expresses the "artistic interest" of design:

> *It was not only a question of creating potentially functional objects. The concern for making form is absolutely essential to the design. We may note here that the Latin forma can be translated as "beauty."*[48]

In a more general way, design, in so far as it encompasses the capacity to transform the world, cannot "center" on anything. Design is only of any interest if it is derived from tensions, polarities, contradictions – in other words, the opposite of a center. Olia Lialina, in the conclusion of her article, also refuses to let herself be reduced to a label:

> *We, general purpose users – not hackers and not people – who are challenging, consciously or subconsciously, what we can do and what computers can do, are the ultimate participants*

47 Yves Citton, *Gestes d'humanités. Anthropologie sauvage de nos expériences esthétiques* (Paris 2012), pp. 21–22.

48 Pierre-Damien Huyghe, On appelle beaucoup trop de choses 'design'. Interview with Julie Delem. *Naja21* (April 2015), http://www.naja21.com/fr/espace-journal/pierre-damien-huyghe-on-appelle-beaucoup-trop-de-choses-design, access: July 1, 2019, 10:00pm.

of man-computer symbiosis.[49]

One must then reconsider the fact that the conceptual model of the 1981 Xerox Star interface was decided "before" the material (hardware) existed, "two years before we *wrote* a single line of actual product software."[50] Retrospectively, this account can be understood as that of a missed encounter with the otherness of the machines, since it is, in effect, a matter of subordinating the digital technology (hardware and software) to a "model," i.e., to something anticipated and stabilized. This progressive distancing of the concept of the "General Purpose User"[51] (active and polyvalent) has made possible the expressions "human-centered design" and "experience design", which incarnate the promise of a world in which one could "do whatever one wishes," immediately, as if by "magic." But which kind of "doing" are we talking about when invisibility becomes the ideal for the machines?

This myth of the invisibility of technological innovations in fact already existed in a nascent form at the dawn of personal computing. In a 1979 commercial for the Xerox Alto intended to demonstrate the power of the "office of the future," an office worker (Bill) arrives at work and greets his colleagues, coffee in hand. When he arrives at his station, he turns on his Alto computer and addresses it verbally: "Hello, Fred." The computer answers him: "Hello, Bill." After a series of tasks, easily solved by the machine, comes the final dialogue:

Bill (tired): "Anything else?"

Fred: A richly detailed bouquet of daisies spreads across the screen.

Bill (puzzled): "Flowers? What flowers?"

Fred: "Your anniversary is tonight."

Bill (chagrined): "My anniversary. I forgot."

Fred: "It's okay. We're only human."[52]

What such initiatives describe, paradoxically, is *a world without experience [un monde sans expérience*],[53] in the sense in which experience/experimentation can take place only within a field of possibilities open to uncertainty:

Economic power is what the socialization of experiences implements. However, if this implementation augments shared experience and perception day by day, it does not appear authentically. Most often, it borrows the forms of habit, it slips mimetically into experience.[54]

Symptomatic of an era when "apparatuses"[55] are no longer objects worthy of interest, human-machine relations are increasingly marked (branded) by the registers of utility, output, or time-saving. The human experience of "experience design" is often reduced to

49 Lialina, *Turing Complete User*.

50 Smith, Irby, Kimball, Verplank, and Harslem, Designing the Star User Interface, p. 264.

51 Lialina, *Turing Complete User*.

52 Smith and Alexander, *Fumbling the Future*, p. 20.

53 The French word *expérience* can mean "experience" or "experiment" (Translator's note).

54 Pierre-Damien Huyghe, Faire place, in: Q*u'est-ce que l'art domestique?*, eds. Richard Conte and Sandrine Morsillo (Paris 2006), p. 29.

55 The apparatus is defined by Pierre-Damien Huyghe as "a technological method distinct from the tool and the machine [which produces] within us a power of perception, a particular form of sensibility." See: Pierre-Damien Huyghe, Introduction au dossier "Temps et appareils". *Plastik* 3 (2003), p. 4.

an experimental situation, that of a rat seeking the way out of a labyrinth. Even if it is "friendly" or "invisible," this technological medium is no less a straightjacket, a controlled situation in which any exchange is anticipated and preprogrammed. When we are mirrored in the form of the "human, all too human" computer, we "ordinary people" are the ones who stand to lose sight of our complex and infinite possibilities.

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YOU, THE USERS

By Kalli Retzepi

"Who controls an interface? It is certainly not the user, no matter how hard the corporate rhetoric insists on that."

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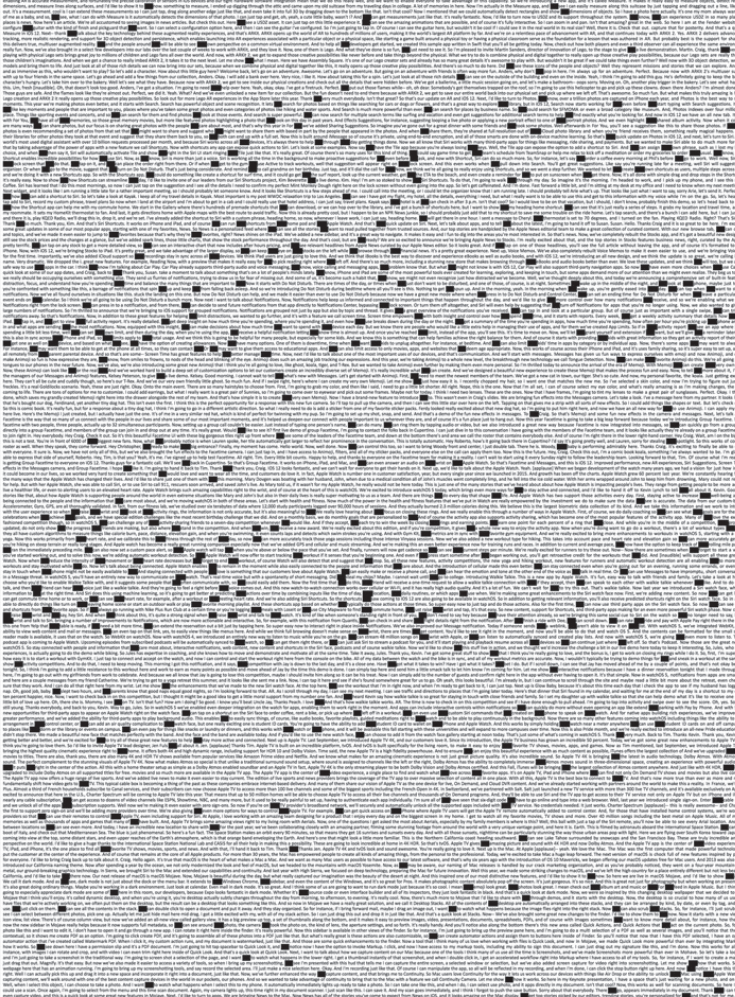

Text transcript of the entirety of Apple's WWDC 2018 Keynote event. Words like “you”, “yours” and “user” are highlighted in black.
Permission of the author.

***You** know, with millions of apps, Shortcut enables incredible possibilities for how **you** use Siri. Now, as **you** know, Siri is more than just a voice. Siri is working all the time in the background to make proactive suggestions for **you** even before **you** ask, and now with Shortcut, Siri can do so much more. So, for instance, let's say **you** order a coffee every morning at Phil's before **you** go to work. Well now, Siri can suggest right on **your** lock screen that **you** do that. **You** tap on it, and **you** can place the order right from there. Or if when **you** get to the gym **you** use Active to track workouts, well that suggestion will appear right on **your** lock screen. And this even works when **you** pull down into Search. **You**'ll get great suggestions. Like say **you**'re running late for a meeting, well Siri will suggest **you** text the meeting organizer. Or when **you** go to the movie, suggest that **you** turn on Do Not Disturb. That's just being considerate. And remind **you** to call grandma on her birthday.*

– excerpt from Apple's WWDC 2018 Keynote.[1]

What rock concerts were in the sixties and seventies, tech keynotes are today. Big, mesmerizing, optimistic, glittering, confident, larger than life. Speakers, unsurprisingly mostly white and male, fluidly pace on big minimally decorated stages and elaborate with confidence on how their newly released product ameliorates – because that is of key importance – so many lives. Whose lives?

Yours, and mine. The users.

Who is the user?

The term "user" came into prominence in the post-1960s timeline of computation, where it was employed in the context of the then new concept of human-machine interface. The user is the human who interacts with the then grotesque mouse and keyboard, who points to the screen, who manipulates the state of a menu. The language employed from early on was conceived by engineers and was reductive but functional, often operationalised to fit problem-solving and task optimization paradigms.

Once the rough edges of human-machine interaction were sufficiently rounded by engineers, it looked like the user could take a lateral jump towards the field of design, but the inverse happened: the field of design constrained itself to fit into the vocabulary and mentality of the engineered user. Terms like „user-centered design" point to a certain willingness to talk design, but do so only in order to be heard by engineers and managers, solving for efficiency and comfort, formulating design in the computerized world as a means for optimisation. A certain vocabulary was built to cater to the needs of a user who is increasingly unaware of their role in a system that is built upon their choices, and is always hungry for more comfort and ease of mind. User-centered design, user experience, user retention, user engagement were elevated to a buzzword status in the post-dot.com era and ushered the world to a reality of screens constantly begging our

1 Apple WWDC Special Event, *Apple* (2018); https://www.apple.com/apple-events/june-2018/, access: October 4, 2018, 12:30pm.

attention, and vertical feeds that keep eyes and brains glued to their ethereally refreshing spinners.[2]

Politics of the user

The vernacular of the user is, and should be treated as, political – not only because technology as a system is finding itself curiously now entangled with another system, that of Democracy – but because it has always been so. In addition to the well known fact that all of 20th century American computer science research and innovation was nurtured by Cold War scientific accelerationism, all of today's tech giants can trace their beginnings to the movement of liberation, self-expression and self-reinvention whose origins are inextricably linked to and flow from that era in American politics.

The distance between hippies, with seemingly little respect and interest in the culture of capital and growth of economies, and their spiritual and often literal offspring, the tinkerers, dropouts and romantic failure seekers of Silicon Valley, is not as big as one would think. The main tenet in the 60's ideology was that one is free to express themselves in any conceivable way, and subject themselves to as many transformative experiences as they wish – everything goes. So why stay the same? One should change. One should become better, in some vaguely defined way. Maybe happier? Definitely happier. That in limbo space of lifting one veil of selfhood and trying on another was often resolved by the help of drugs, which once Woodstock's scent had left the air, gave their place to products and ritualistic behaviors: healthy eating, yoga retreats, meditation for the masses. And that also happened to coincide with college dropouts scavenging spare electronics parts and building futures in garages – the rest is history.

> *On January 24th, Apple Computer will introduce Macintosh. And you'll see why 1984 won't be like "1984".*
>
> *– Apple's first commercial advertisement in 1984.*[3]

What drugs were in the 1960's, computers were in the 1980's. Both could and did change lives – both required and defined a user, both rebooted one's potential. Except only the latter were legal, and naturally positioned as products that someone needed to own to unlock the above promised potential. Of course, this potential is never really fulfilled, not until a newer and better version comes to our possession, resetting the clock of the excitement-expectation-let down cycle. With the establishment of Web, social media and particularly of the iPhone and smartphones, this became laughingly

2 See Wendy Chun, *Updating to Remain the Same. Habitual New Media* (Cambridge, MA 2016), p. 85.

3 Tom Hormby, The Story Behind Apple's 1984 Ad (2014); http://lowendmac.com/2014/the-story-behind-apples-1984-ad/, access: October 8, 2018, 1:48pm.

easy and trivial. Users were appearing left and right, fluidly rummaging through devices and habituating themselves to a life with a device glued to one extremity, dexterously untangling gordian knots of headphone cables.

In the winter of 2006, TIME magazine awarded their "Person of the Year" title to *"You, the user"*.[4] Note the tone: *"Yes, you. You control the Information Age. Welcome to your world."* Akin to the opening lines of this essay, it exemplifies the language that insidiously weaves a perfect bubble around us. Empowered and seemingly in control, the user is centered right in the middle of the web page, the screen, the action.

How does that then tie back to the main thesis of this essay, namely the gospelisation of tech rhetoric? Thorny issues of hyper-centralisation, opaqueness of data mining, surveillance and blind solutionism momentarily put aside, it matters because it scripts and enforces a very specific narrative between companies, developers, designers and users. And it matters doubly when the companies writing that narrative have reached well outside the borders of one country. Big tech companies have managed (albeit with less and less charisma) to not be dragged into the arena of today's partisan politics by hiding in the shadow of libertarianism and sneering at the idea of a state, but while doing that, have acquired a dangerously close similarity to the state itself, and particularly its deeper parts, like the intelligence and the military.

In addition, and unlike most democratic states, they successfully operate and monitor multiple channels of information flow with their audience, except these channels are in most cases strictly unidirectional. The chain of commands that shape and launch products is without almost any exception a top down process driven by what generates more revenue, and that in most advertisement based models means maximizing the "time spent" with a product. Even if the developer or designer disagrees with a certain feature, they lack the incentive and infrastructure to voice opinion, knowing that if they don't build it, then the next person will. Hyped and lavish Keynote events in this light seem but an empty promise and celebration to both the users as well as the developers – none of them have real agency over their role in the ecosystem. The former are passive consumers of experiences and the latter passive consumers of specs for these experiences.

The role of the interface

Branden Hookway writes:

> *The interface is not only the form and protocol by which communication and action occur between technology and user, but also the obligation for each to respond to the other.*[5]

4 TIME magazine Cover Archive (2006); http://content.time.com/time/covers/0,16641,20061225,00.html, access: September 28, 2018, 2:00pm

5 Branden Hookway, *Interface* (Cambridge, MA 2014), p. 7.

That implies the existence, at least in theory, of a bidirectional flow of communication between the user and the technology, the two mutually shaped through friction with the interface.

Focusing on online interfaces, that used to be largely true before the dot.com era, when the Web belonged to amateurs who were building and linking its content slowly and often eccentrically, but with an immediate understanding and access to its underlying technology.[6] When that started being taken away by complex templated websites and blogs rather than custom-made pages, interfaces started converging to each other and their users had to behave in ways that conformed to that trajectory. When Facebook first took off, one of its strongest features was its standardized and clean interface, akin to the privileged and guarded milieu from which it arose to prominence, which was an answer to the net chaos of its then rival MySpace, where anyone could have a profile, and style it to their liking.[7]

Interfaces mediate the boundary between a user and the information destined to reach them, and be generated from them. Who controls an interface? It is certainly not the user, no matter how hard the corporate rhetoric insists on that. On the contrary, users have no choice but to conform to the interface paradigms conceived and imposed to them. This is particularly evident in the cases of voice-controlled artificial intelligence agents used in households like Amazon's *Alexa*. Instead of the interface being the facilitator of a fluid interactive performance between the information it embeds and the user, the inverse happens, with children saying their first words according to whether *Alexa* will respond to them.[8] A bizarre power dynamic starts to take shape, where the user knows what they want to achieve, and they have no choice but to act in a particular way in order to work with the interface. They are treated thus as mechanistic rather than humanistic subjects, undoing the fundamental premise that an interface is there to be utilized by them, rather than condition them into certain behavioral paradigms.[9]

In addition, rigid interfaces and schemes of fraud empowerment habituate to certain forms of data input and thus their eventual hard-coding into collective memories. The equivalent of a book or a library for younger generations is without a doubt the Google search bar, parked at the same spot underneath the colorful child-like logo for the past twenty years. The only thing left for users to do in most cases is to passionately applaud or complain about the changes in

6 See Olia Lialina, A Vernacular Web (2005); http://art.teleportacia.org/observation/vernacular/email/, access: September 4, 9:30pm.

7 See Danah Boyd, Viewing American class divisions through Facebook and MySpace. *Apophenia Blog Essay* (2007); http://www.danah.org/papers/essays/ClassDivisions.html, access: October 1, 2018, 8:30pm.

8 See Rachel Botsman, Co-Parenting with Alexa. *NYTimes Sunday Review* (2017); https://www.nytimes.com/2017/10/07/opinion/sunday/children-alexa-echo-robots.html, access: September 20, 5:30pm.

9 See Johanna Drucker, *Graphesis. Visual Forms of Knowledge Production* (Cambridge, MA 2018), p. 146.

visual and gestural design in their go-to interfaces, rarely effecting change.

Yes, you should think

Ours are times of vivid criticism and faint critique. As designers, we need to move away from mentalities akin to "Don't make me think" approaches to interface and systems design, and experiment with new interactive paradigms.[10] As users, we ought to seriously reflect on how to position ourselves in a reality where convenience is our benevolent dictator.[11] Increasing our tolerance and desire for abstraction and playful weirdness, just like the early Web net art projects were aiming to do, can awaken us to the tightly scripted role we have been handed by Silicon Valley's cultureless race to the top.[12] Artistic approaches like Lialina's recent "Self-Portrait",[13] Rozendaal's "Abstract Browsing",[14] Rafman's "Nine Eyes of Google Street View"[15] are intriguing and valuable because they undermine the concept of the ideal, helping us let go for a moment of any task oriented conventions.

Change does not only have to come from those distant to the tech ecosystem. While more and more engineers realize that ideologies can and do get encoded in products, interfaces and modes of interaction, they lack the means to effectively critique and control the consequences their work has on society. Silicon Valley's culture of failure permissions the repeated effort but erases the consequence (Facebook's "move fast and break things" pitch to fame) giving nor the time, neither the emotional and ethical bandwidth for someone to take a moment to step away and reflect on how their work influences society. Pushing for transparency, reevaluation of existing policies and tighter regulation could be effective ways to move forward, as has already started happening in some parts of the world.[16]

Superficial aesthetics should not continue to conceal the uneven distribution of power between the user, the interface and the information it mediates, no matter how sleek, small and fast the devices that surround us become. We need a new vocabulary for better articulating the roles of makers and consumers within the tech ecosystem. Technologists need to be incentivised and educated in order to meet practice with critique and theo-

10 See Steve Krug, *Don't make me think. A Common Sense Approach to Web Usability* (3rd Edition) (London 2014).

11 See Tim Wu, The tyranny of convenience. *NYTimes Sunday Review* (2018); https://www.nytimes.com/2018/02/16/opinion/sunday/tyranny-convenience.html, access: October 2, 2018, 4:30pm.

12 See Rhizome, *Net Art Anthology* (2016–present); https://anthology.rhizome.org/, access: October 4, 2018, 8:00pm.

13 Olia Lialina, Self-Portrait (2018); http://olia.lialina.work/, access: October 9, 2018, 10:00am.

14 Rafaël Rozendaal, Abstract Browsing (2015-ongoing); https://www.newrafael.com/notes-on-abstract-browsing/, access: October 9, 2018, 10:00am.

15 Jon Rafman, Nine Eyes (2008-ongoing); https://anthology.rhizome.org/9-eyes, access: October 9, 2018, 10:00am.

16 See EU GDPR.ORG (2017); https://eugdpr.org/the-regulation/, access: October 8, 2018, 14:30pm.

ry. Designers and artists need to become more comfortable with unpacking and experimenting with the power dynamics embedded within the interface and its user. The user needs to be positioned as a truly sovereign subject vis-a-vis the interface, rather than a mechanistic "thing" with faux agency, conditioned to meet a certain set of specifications.[17]

No matter what Keynote events preach – we should be thinking.

17 See Wendy Chun, *Updating to Remain the Same. Habitual New Media* (Cambridge, MA 2016), pp. 84.

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STAR CITY, MIR SIMULATOR. AND OTHER ARTISTIC INVESTIGATIONS

By Armin Linke

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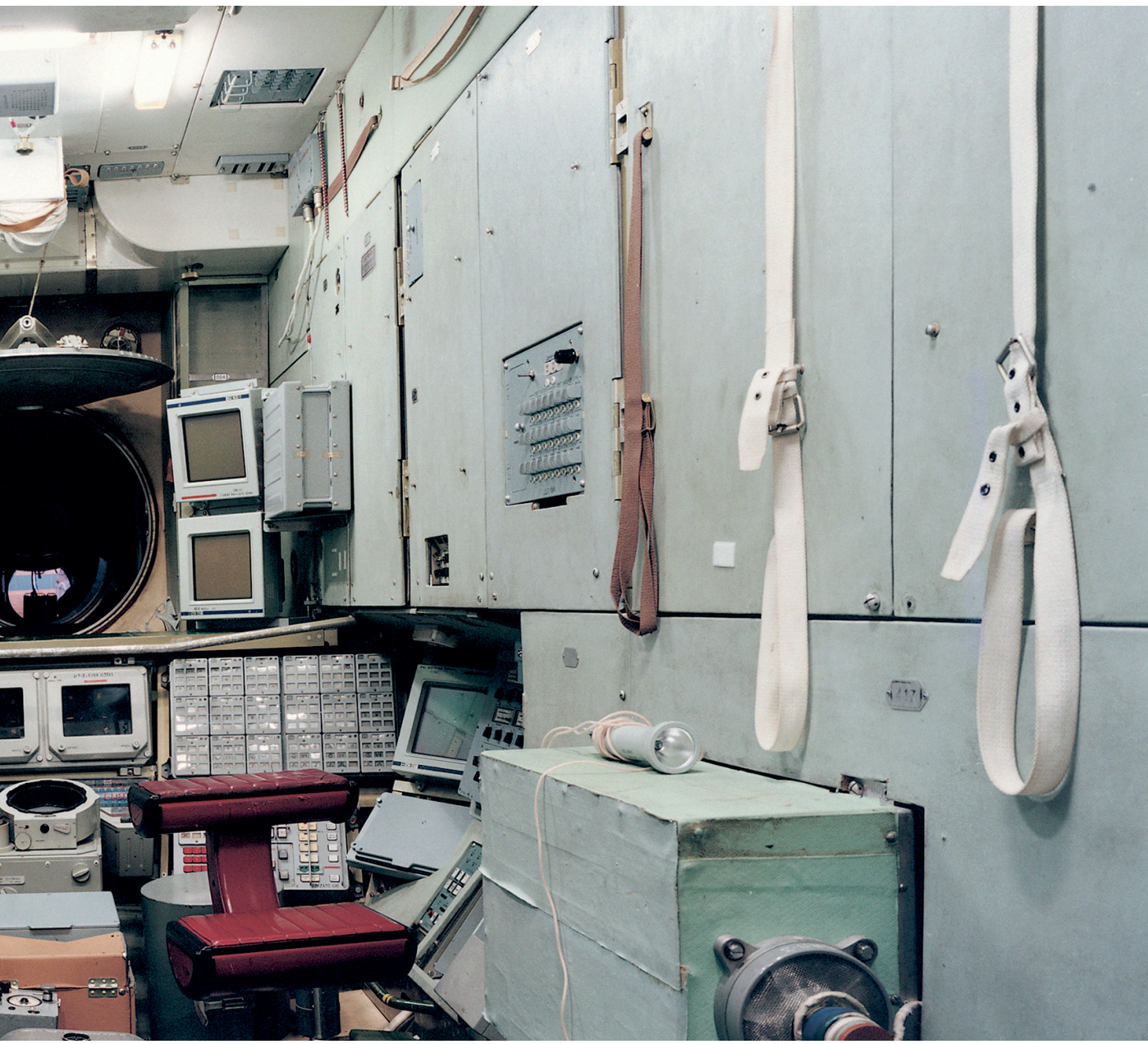
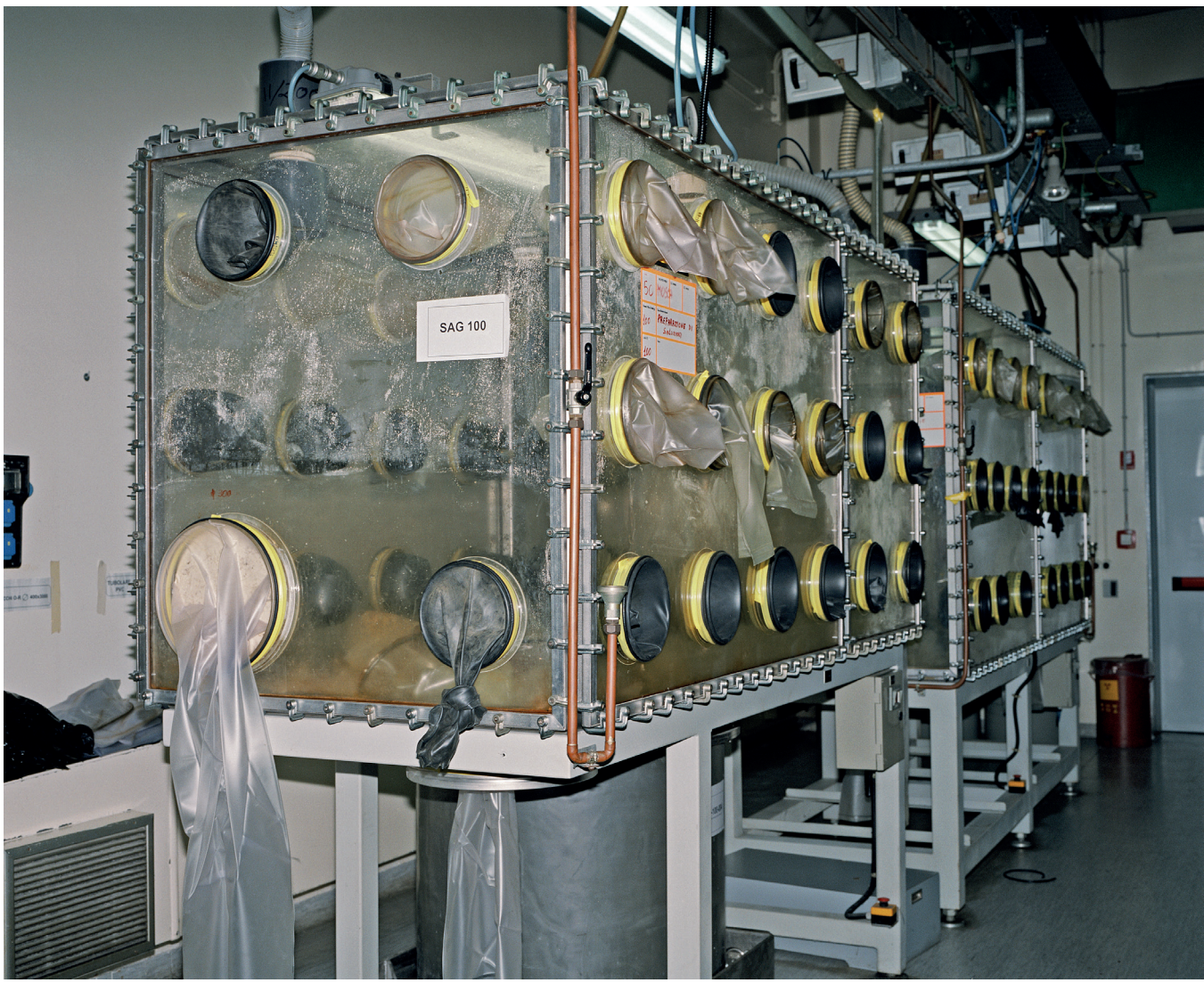
Star City, Mir Simulator. Moscow, Russia, 1999.



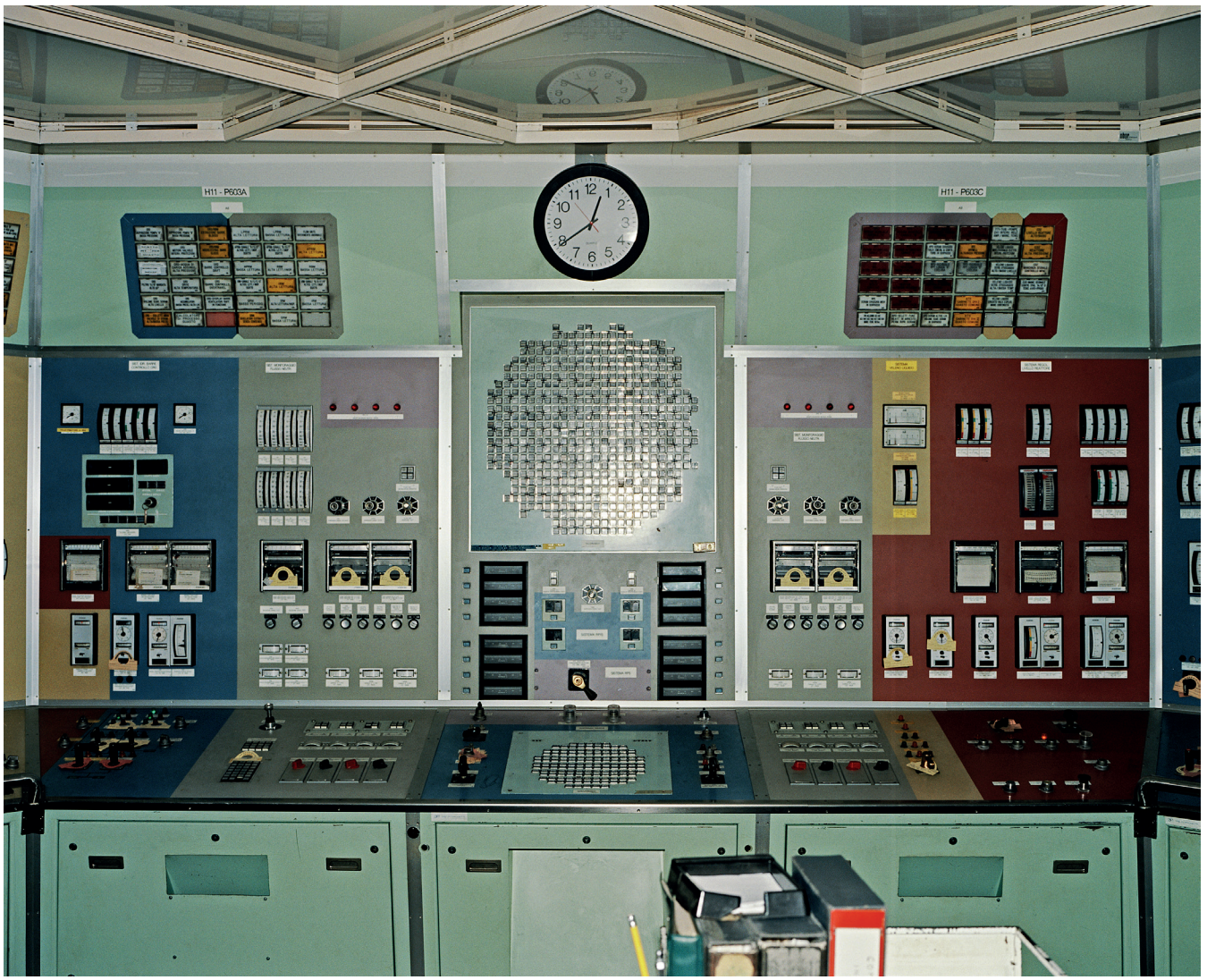
CERN, European Organization for Nuclear Research, control room. Geneva, Switzerland, 2000.

National Institute of Geophysics and Volcanology, monitoring room. Catania, Italy, 2006.

Operating theatre, remotely controlled surgery. Modena, Italy, 2006.



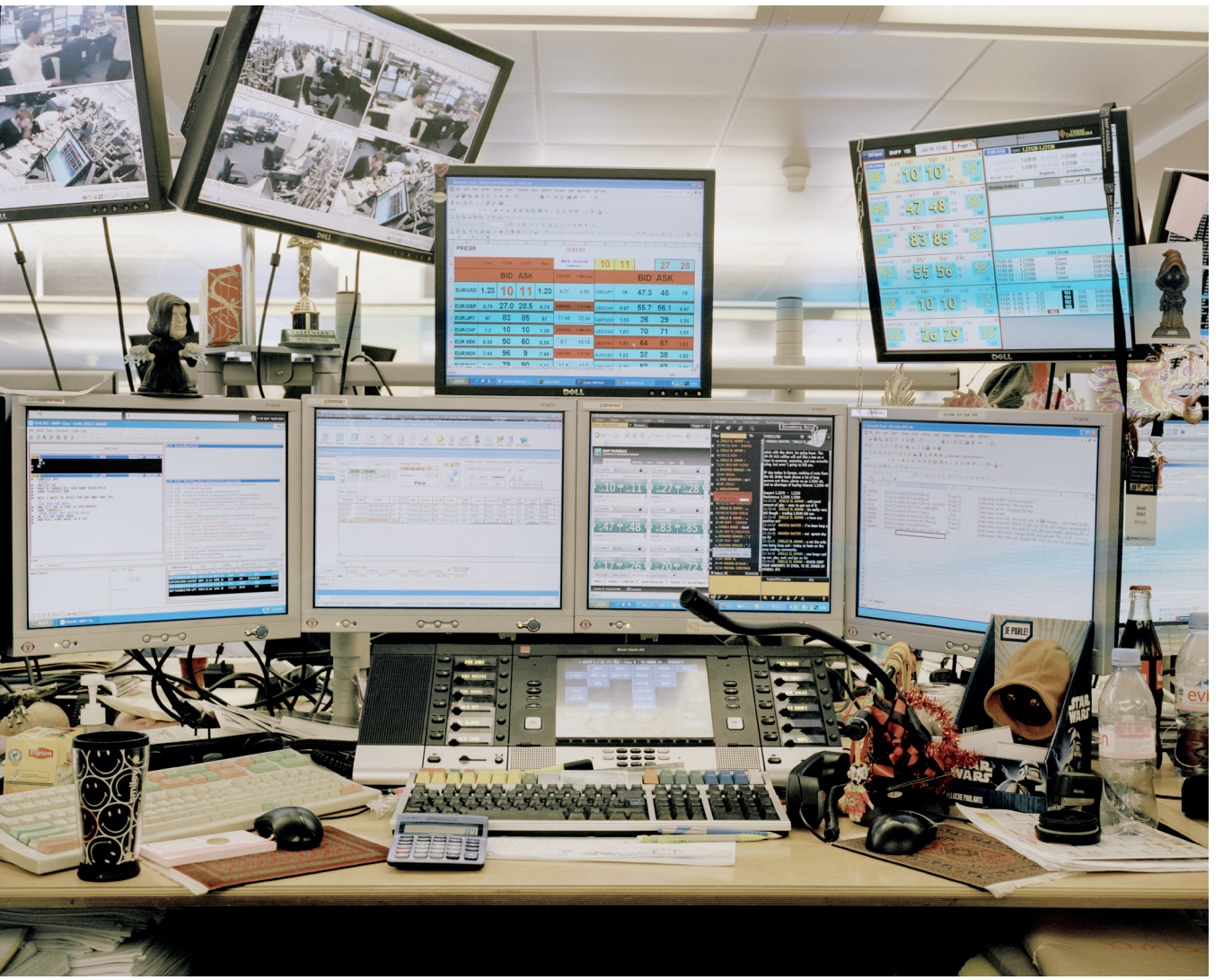
Sogin, IPU and OPEC plants, plutonium handling device. Casaccia (RM), Italy, 2007.



Disused nuclear power station, control panel. Caorso (PC) Italy, 2007.

Navionics, GPS receivers, testing software. Viareggio (LU), Italy, 2009.

ONU, Organisation des Nations Unies, Kofi Annan Secretary-General, video conference. Genève, Switzerland, 2001.



BNP Parisbas, headquarters, trading floor. Paris France, 2012.

BNP Parisbas, headquarters, trading floor. Paris, France, 2012.

Frontex, control room. Warsaw, Poland, 2014.

Ezeiza Penitentiary. Buenos Aires, Argentina, 1998.

REGIMES ON NEWNESS: AN ESSAY OF COMPARATIVE PHYSIOGNOMY

By Masato Fukushima

"In this observation, we may think that the art regime, in reality, exhibits an intriguing case of being a specific interface consisting of different sub-regimes that demonstrate different criteria for newness."

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The concept of interface obviously presupposes at least two entities that are, to a certain degree, mutually independent but interacting with each other. By definition, such entities can be either individual or collective. In fact, the idea of interface should be extended to the macro-sociological realms, to the interface between, say, the economic and political domains, but with the precondition that these domains are stipulated as mutually exclusive.

The social system theory of Niklas Luhmann[1], among other candidates, seems a good fit for initiating our reflection on such a macro-sociological interface, largely because of his neat formulation of modern society as an agglomeration of mutually exclusive subsystems, such as law, politics, and economy. For characterizing these domains, Luhmann adopted the biological autopoiesis theory[2] — namely, the claim that any biological system is characterized by a self-referential loop of reproduction that is closed to the outside world. This attempt made his description of such subsystems highly independent and exclusive from each other: for instance, the legal system concerns itself only with law and nothing else. In other words, the legal system does not care about aesthetic or market values, which is the job of the other social subsystems.

This neat formulation—in a highly abstract manner as social theory—provides a unique opportunity for reflecting upon the potential of the macro-sociological interface as a proper topic, as well as on its limits. Following Luhmann's formulation, each subsystem sings its own song (speaking metaphorically) without listening to any others. The potential interface between these subsystems is formulated either as *resonance* or as *structural coupling* in his theoretical corpus. In discussing ecological communication, which Luhmann[3] defines as the relation between any social subsystem and its environment, he describes the way each subsystem resonates with the others, each singing its song in response to the others' songs, in a mutually independent manner. Hence, what we eventually hear is a cacophony of the different songs that any subsystem sings, as we are living in the era of social differentiation.

In such an interface, also, the subsystems can be somewhat more steadily bridged for collaboration: this is called *structural coupling*[4]. This is exemplified, say, by the inevitable need of securing economic transactions by legal measures like property law.

This brief summary of sociological interface, à la Luhmann's system theory, reveals both its advantage of theoretical clarity and its shortcomings. The merit of Luhmann's theory is his focus on the highly differentiated characteristics of our modern society, in which there is no

1 Niklas Luhmann, *Social systems* (Redwood City, CA 1995).

2 Humberto Maturana and Francisco Varela, *Autopoiesis and cognition: the realization of the living* (Dordrecht 1980).

3 Niklas Luhmann, *Ecological communication* (Chicago 1989).

4 Luhmann, *Social systems*; Humberto Maturana and Francisco Varela, *The tree of knowledge: the biological roots of human understanding* (Boston 1987).

privileged center of gravity; but what is missing is the formulation of a more fluid form of interface not represented in such neat descriptions of differentiated subsystems. To be fair to his own intention, it is not his goal to describe the interfacial or interstitial phenomena between these different subsystems; however, his own conviction is that once such differentiation is completed, there would be no further development in the branches of such subsystems[5]. This theoretical assumption—wherein each subsystem is assumed to be so tightly accomplished that there is no way of subtle interface, even within such a domain itself—seems to be too narrow.

In this article, I pursue the possibility of observing an interface even within the specific domain of society that Luhmann calls subsystems. In fact, quite a few topics may spill over from this framework. For instance, although the core operation of a market economy is buying and selling, as Luhmann[6] simplifies, at the border of those very market mechanisms lie hybrid practices that mingle monetary and non-monetary exchanges. Luhmann may have thought of these as related to classic anthropology and relevant only in pre-modern societies. Or such a unitary description of any subsystems that are reduced to a core element of binary oppositions—like legal/illegal in the law and true/false in science—may raise empirical doubts as to a more empirically realistic way of describing their workings.

Hence, admitting the irresistible allure of the theoretical consistency of Luhmann's formulation of modern society, I nonetheless depart here from his too strict formulation of it, moving to my own concern of the intrinsic heterogeneity of these subsystems — which can also be described as open-ended and consisting of multiple principles when closely examined. The specific concern in this article is the internal dynamics of the world of art, which I believe cannot be reduced to a single code, like true/false or legal/illegal, such as Luhmann employs for describing these subsystems.[7]

Regimes

In discussing this topic as outlined above, I leave aside Luhmann's[8] concern with self-referentiality as the core of his depiction of each subsystem, in which the idea of its functional closedness dominates his theoretical focus. I am more intrigued by the loosely hybrid and heterogeneous nature of such largely differentiated social divisions as law or economy, which touches on matters of recent emphasis by scholars of science

5 Luhmann, *Social systems.*

6 Niklas Luhmann, *Die Wirtschaft der Gesellschaft* (Frankfurt/Main 1990).

7 Latour's recent argument somewhat similarly employed a certain version of differentiation theory, if given the fairly different characterization of them as different modes of existence. In fact, however, as each of these modes is given a distinct mode of existence per se, there seems no proper way of to observe their interface, even less so than is possible with Luhmann's concepts of resonance and structural coupling. See: Bruno Latour, *An inquiry into modes of existence: An anthropology of the moderns* (Cambridge, MA 2013).

8 Luhmann, *Social systems.*

and technology studies (STS). The loose unity of these subdivisions of society is henceforth referred to here as *regimes*. A regime may be defined as a socio-material entity that exerts substantial influence on the constitution of contemporary society.[9] A regime is regarded as a center-periphery structure wherein the center is the institutionally dense part, like the court in legal institutions, as well as legislation, bureaucratic elements, and so on. It is close to what psychologist Eleanor Rosch calls a "prototype"[10], the typical element that the regime represents. Luhmann's formulation seem to be largely descriptive of the normative structure of such a prototypical center in a regime. Peripheries, in contrast, are more like everyday practices, which can be hazy and even far from the strict formulation in the prototypical center. The meaning of heterogeneity relates to these multi-faced aspects of sub-areas, which constitute a regime as a historical composite or montage of these heterogeneous elements.

The physiognomy of newness

Starting with this tentative definition of regime, this article looks at the specific regime of art as an intriguing example for observing the phenomenon of multiple interfaces within its realm. For highlighting this point, I first provide a very rough overview between different regimes in regard to the idea of "newness" in the manner of comparative (socio-anthropological) *physiognomy*, borrowing the term from Frankfurt-school sociologist Theodor W. Adorno[11]. The reason for taking up this specific topic relates to my private uneasiness about the way artistic newness is hailed in the art world. Critical comments on the innovative character of this or that art work and related new waves in the art scene are common topics in major art journals. Superficially, the phenomenon looks almost identical with the way new material on, say, the mysterious *dark matter* in the universe is discussed in science or how a new version of commodities in market production is advertised. However, a closer look at the meaning of newness in each regime—here, science, the market, and art—seems to reveal rather substantial differences, which is what I intend to examine closely here.

9 For recent usage of the term "regime" in STS, see Stephen Hilgartner, *Reordering life: Knowledge and control in the genomics revolution* (Cambridge, MA 2017); and Masato Fukushima, Blade runner and memory devices: Reconsidering the interrelations between the body, technology, and enhancement. *East Asian Science, Technology and Society* 10 (2016), pp. 73–91, with a more limited focus on the subject of application such as regime of international sports and that of memory to compare the meaning of bodily enhancement by new technologies.

10 Eleanor Rosch et al. (eds.), *Cognition and Categorization* (Hillsdale, NJ 1978).

11 Theodor W. Adorno, On the fetish character of music and the regression of listening, in: Theodor W. Adorno, *The culture industry: Selected essays on mass culture* (London 1991).

Scientific regime

To address this aspect, I will first provide a brief sketch of how newness is regarded in the scientific regime. It probably goes without saying that being new is crucial to the scientific regime where researchers like me belong. One of the sadistic joys of the peer reviewer's role is to comment that a submission to a relevant journal has "nothing new" in it; it would be surrealistic if someone deliberately declared that the paper he presented provides an answer identical to that of a preceding paper. Meanwhile, there are naturally different degrees in the rigor with which newness is pursued in different sectors of the same regime: I remember reading a short essay by an amateur STS scholar in Japan, also a biologist, who half comically ridiculed the fact that whereas biologists' ordinary greeting is "What's new?" in every conversation, in his snapshot view of the science-policy world in STS, researchers repeated the same questions again and again without visible newness—at least to his eyes. However, this does not mean that policy researchers had repeated their utterances, as in minimalist composer Steve Reich's early experimental music "It's gonna rain," wherein this phrase is endlessly repeated; the main arguments of the policy researchers seemed to the biologist to be repetitious, unlike the more dynamic changes in the topics of biological research. In this sense, the natural sciences seem to offer an ideal model for defining the regime of newness, but its applicability to the different realm of our social life becomes an intriguing issue that we may explore further.

Economic regime

Superficially, the same principle of newness appears to be applicable to the realm of the contemporary market economy; however, the reality seems to be a little more complex than the pursuit of newness in the scientific realm. Market commodities appear to be similarly and constantly driven to newness if we look at the ubiquitous pressure for innovation around us. In fact, during my field research in a biology lab, a molecular biologist working there insisted that what they were doing in the lab was exactly the same as what workers in the small factories of Ohta-District (an industrial area of Tokyo) had been doing. In reality, I found this identification amusingly odd: such identification derives from the superficial similarity between the drives of scientific innovation and of the market, because factories, in the popular mind, are thought to lead innovation so they can survive in a competitive market. The misconception here is this: it is consumer demand that drives market innovation, whereas the quest for newness in science derives from a desire to impress one's peers.

In fact, there has been a tendency, in intellectual reflection on the history of all these technologies and commodities,

to regard them only according to such innovation; in other words, the prevailing regime is producing constant newness. Historian David Edgerton's book *The Shock of the Old*[12] is one of a few attempts to reorient our too innovation-centered way of reading the history of technology toward looking at its historical relation with users. Edgerton's counter-example of the far more common continuous use of everyday items, from condom to oxcart, is a revelation for readers. It challenges them to find the thick layers of materiality in a society that moves far slower, or even remains almost still, than does the ordinary historiography of technology, which tends to be based solely upon observations of the rapid change that characterizes innovation. If we pay attention, we will notice quite a few commodities that have shown hardly any changes in style, whether in food or a specific type of shoe, to name two examples. I have been using the same brand of shoulder bag since I was a high school student, despite the largely unfavorable micro-modifications to some parts of its style. In terms of my shoes, I eventually found a shop where I could reliably purchase the same style of shoes, which I have used for the last two decades—in this case, without much change of its style, except that the price has risen. Even in other cases, the user may resist changes that a given industry tries to impose, as in the case of Windows XP: its Japanese users have long stuck to its use, despite pressure from Microsoft to make them buy its more updated version. Common to these instances is that once the consumer becomes deeply adjusted to a certain temporal mode of commodity, he does not want changes that may disrupt this cozy equilibrium.

A technological infrastructure that affords other activities that rely upon it gives rise to similar observable issues. Any tools or infrastructure usually requires user skills and understanding of how to use it, and time is needed for mastering it so that it becomes invisible or transparent, at which point it becomes *infra*-structure[13]. As an example, a characteristic of traditional board games like chess or *Go* is that the basic rules have not been changed for a long time. This gives players the ability over time to accumulate diverse strategies and tactics for playing them. Somewhat similarly, any infrastructural tools require a certain level of mastery from users. This longitudinal process of mastery presupposes a certain level of stability in the object itself, hence the trouble often seen in the constant changes in the OS of computers where upgrades can be a nuisance for users' learning processes. In bio-informatics, for instance, biologists, the so-called wet part of it, very often complain of having to adjust their skills constantly to the changes that information engineers, the

12 David Edgerton, *The shock of the old: Technology and global history since 1900* (London 2006).

13 Susan L. Star and Karen Ruhleder, Steps toward an ecology of infrastructure: Design and access for large information spaces. *Information Systems Research* 7/1 (1996), pp. 111–134; Masato Fukushima, Value oscillation in knowledge infrastructure: Observing its dynamic in Japan's drug discovery pipeline. *Science and Technology Studies* 29/2 (2016), pp: 7–25.

dry part, have made in the field.[14] In another instance, in a conference discussing the role of databases for climate science, one of the presenters described this innovating aspect of databases as a "risk" for climate scientists that creates constant instability and uncertainty.[15]

If the production of newness is not always welcomed by users/consumers in the world of commodities and tool use, then why is there such a high level of (technological) innovation in the economic world? Japanese economic theorist, Katsuto Iwai, succinctly exposes the principle basic to the survival of capitalism: making use of "difference," which is systematically translated into profit.[16] He summarizes three phases or types: in commercial capitalism, the difference relates to spatial distance. For example, the East India Company from the Netherlands collected spices from the eastern island of Indonesia and brought them back to their homeland to sell at a high price. Meanwhile, industrial capitalism profits by maximizing the difference between the cost of commodity production and a cheap labor force. Finally, the most recent phase of capitalism relies on constantly creating technological differences that are supposed to drive the consumer to buy new commodities, one after another. This last aspect of difference, which is generally called innovation, is the reason we feel we are constantly driven by changes here and there in the present system, very often against our wishes. This kind of traditional contrast between technoscience and the life-world, after the thought of philosopher Jurgen Habermas, may lie in the heterogeneous constitution of the regime of economy with the logic of capital and our bodily logic of expertize.[17]

Art regime

Compared with the various regimes where the *raison d'être* of newness actually seems to be difference—namely, in the scientific regime, the newness is the *sine qua non* of all evaluative efforts, whereas in the market regime its status is more delicately balanced with other concerns, such as the usability of the commodities—the newness in the art regime is something that has been puzzling to me for decades. In the contemporary art regime, the issue of newness is seemingly divided into the different layers in which the concerned art work is situated. This is why the art regime is an intriguing example for discussing the interface between different sub-elements within the same regime.

Some parts of the system seem to have a vague kinship with the principle of the scientific regime in the form of a

14 Masato Fukushima, Constructing "failure" in big biology: The Socio-technical anatomy of the Protein 3000 program in Japan. *Social Studies of Science* 46/1 (2016), pp. 7–33.

15 These were drawn from the cases of conferences that I have attended on the topic.

16 Katsuhito Iwai, *Talking about capitalism* (Tokyo 1997).

17 Jürgen Habermas, *The theory of communicative action*, vol.2: *Life-world and system: A Critique of functionalist reason* (Boston 1987).

quest for a quasi-academic newness when the innovativeness of a particular artwork is represented in, say, the discourse of the history of art types. The major narrative of art history is replete with a litany of new names that symbolize a particular age or school or group. Naturally, these series of names are supposed to show the emerging newness of such trends from the Renaissance to relational arts. This convention of the historiography of newness, however, has a couple of anomalies about its significance.

First, unlike the scientific regime where the major audience for research outcomes, in principle, consists of sullen peers within the specific sub-discipline, the art regime is open to diversely different social realms that consist of academia, galleries, curators, museums, and the public at large.[18] The influence of such diverse realms, which demand different levels of newness each according to its own standard, makes the meaning of being new far more complicated in the art regime than in the scientific regime. A certain segment of such multiplicity, namely the mutual infiltration between the art and market regimes, is easier to comprehend, because it is based upon the taste of consumers. Just as Edgerton underscores above, no doubt the very traditional landscape paintings or portraits of realist art have very often been popular, even if the works have hardly merited the notice of academic discourse as something in the context of newness.[19] More complicated are the more academic evaluations of the newness of a particular artwork because they give the impression of being a vague shadow of the scientific regime, vague in the sense of the subtle differences between these two regimes.

New works, new names

One of the major forces in the evaluative machinery of scientific newness is, without doubt, the system of journals and peer reviews. The recent proliferation of academic journals is an indication of how our knowledge system is both diversified and segmented, so much so that it is becoming more difficult to find the proper peers to evaluate the real novelty of the submitted papers. This is counter-balanced with the scientific system of disciplines that consists of canonical textbooks, standardization, and so on, a favorite topic in STS.[20] STS itself, as a newly emerging discipline, is also a good example to observe reflexively this process of ongoing canonization and systemization, with the examples of mushrooming textbooks and handbooks that define what STS is to counter the

18 Howard S. Becker, *Art worlds* (Oakland, CA 1982); Sarah Thornton, *Seven days in the art world* (London 2009); Tetsuya Ozaki, *What is contemporary art?* (Tokyo 2018).

19 Edgerton, The shock of the old.

20 Thomas Kuhn, *The structure of scientific revolutions* (Chicago 1962); Martha Lampland and Susan L. Star (eds.), *Standards and their stories: how quantifying, classifying, and formalizing practices shape everyday life* (Ithaca, NY 2009).

potential of evading such canonization.[21] This process of standardization is pivotal for measuring the newness of any given products so that the peers supposedly are able to render correct judgment about the novelty of the concerned work. In reality, however, such thorough standardization hardly takes place in the actual process, so that a job that looks new from one aspect may appear to be less so from a slightly different angle. Hence, one journal may condemn a job for its lack of innovativeness, while the other may praise its innovative potential.

This particular type of an evaluation system for newness does not seem to have equivalence in the art regime: First, in art, it is not based on a particular closed field like scientific (sub)disciplines—such as chemical biology, a newly emerging hybrid field that I studied,[22] wherein its major constituency is the peers—but is open to diverse audience from art critics to the public at large. Here the standard of evaluation is based less on a narrowly stipulated disciplinary matrix than on a rather random choice of evaluators, whose backgrounds in art history can differ significantly from one another.

In terms of academic historiography, the alleged newness of an artwork or school is often expressed by giving it a new collective, quasi-academic denomination. Compared to the segmented structure of evaluation in the scientific regime, the very threshold by which artwork qualifies to be academically accepted as something new appears to be hazy and very often contingent upon the context where it is presented. Some Japanese art journals, like *Bijutsu Techo* (Art Notes), have long series of special issues reviewing new trends in contemporary art for the past few decades. A plethora of new catchphrases for everything from new paintings to bio-art—frequently bearing the prefix "new" or "neo"—have been presented, as if calling it "new" is tantamount to proving its novelty, like genomics, post-genomics, epigenetics, and so forth in the life sciences.

Yet, the way such collective categorization is given a certain level of accreditation in the art regime is accompanied with a persisting sense of uncertainty about its theoretical foundation. Shinro Ohtake, who is probably one of the most influential artists in contemporary Japan's art scene, provides such a case. The large scale retrospective of his works, *Zen-kei* (Total View) in the Tokyo Museum of Contemporary Art in 2006 was said to be phenomenally successful, attracting large audiences[23] (4). Among the guests was Japan's leading artist, Takashi Murakami, who once commented that he has been deeply influenced by Ohtake's pioneering activities.[24] Along with his fame for the diverse ways he

21 Ulrike Felt et al. (eds), *The Handbook of Science and Technology Studies*, Fourth Edition (Cambridge, MA 2016).

22 Masato Fukushima, Resilience in scientific research: Understanding how natural product research rebounded in an adverse situation. *Science as Culture* 25/2 (2016), pp. 167–192.

23 Action Committee, *Shinro Ohtake, Zen–Kei: retrospective 1955-2006* (Tokyo 2007); see also the exhibition at MOT Art Museum: http://www.mot-art-museum.jp/exhibition/22.html; access: April 2, 2018.

24 Takashi Murakami, Takashi's chronicle since 1962. *Geijutsu-Shincho 2012–5* (2012), pp. 45–49.

produces his art works, Ohtake is also well-known as an essayist[25] and author of surrealistic picture books. The latter includes a book titled *Jari Ojisan* (Uncle Jarry), which is taken from the name of surrealist Alfred Jarry[26] and which has been translated into various foreign languages. Yet, as Ohtake himself complains, his has been largely dismissed as part of what was called the ambiguous trend of "new paintings" in a trend against the preceding fever on the conceptual arts in 1970s, such as *Mono-ha* in Japan.[27] However, this category actually reveals nothing about his whole range of diverse works, which the *Zen-kei* Exhibition eloquently proved.[28]

Naturally, putting a single adequate catch-phrase on works as diverse as Ohtake's is difficult, even for critics, as has been proven by the relatively poor reactions from foreign curators familiar with his works. Quite a few of them regarded the collection of his work as not particularly *Japanese*, the sales point that these foreign curators seek in the context of presenting exotic "Japanese" art work.[29] At best, his enormously voluminous collage works are sometimes likened to those of other artists like Robert Rauschenberg, with vague comments about sharing a similar spirit but without further inquiry into what is unique in Ohtake's works.[30]

Newness and repetition

This case may be interpreted as a symptom of the shaky ground upon which rests the evaluation of alleged newness in the art regime, where the newness evaluation proves to be contingent upon diverse contextual factors. What attracts my attention further is the recent proliferation of the prefix of "new" or "neo-" to an existing category of art collectives. As mentioned above, there have been dozens of such neos, comparable to neo-Marxism, nouveau philosophes, or the recent new materialism in the world of social theory and philosophy. Ironically enough, the rhetorical emphasis on newness has reduced its impact through oft repetition. Perhaps this phenomenon constitutes a kind of satirical allusion to Marx's *The Eighteenth Brumaire of Louis Napoleon*,[31] where the repeated second protagonists are described as farce. At least, it is unavoidable that the nuances of innovation will be confined to a

25 e.g. Shinro Ohtake, *Invisible sound, inaudible pictures* (Tokyo 2008).

26 Shinro Ohtake, *Uncle Jari* (Tokyo 1994).

27 Masato Fukushima, On small devices of thought: Concepts, etymologies, and the problem of translation, in: *Making things public: Atmospheres of democracy*, eds. Bruno Latour et al. (Cambridge, MA 2005), pp 58–63.

28 cf. Shinro Ohtake, Paste the world through!: Interview. *Eureka* 527/38–13 (2006), pp. 46–70.

29 Takashi Azumaya, Shinro Ohtake, in Uwajima-Island that has already been there. *Bijutsu-Techo* 58/889 (2006), pp.100–115.

30 Dorian Chong, An essay on Shinro Ohtake. *Bijutu-techo* 65/993 (2013), pp. 71–80.

31 Karl Marx, *The eighteenth Brumaire of Louis Bonaparte* (Crows Nest, New South Wales 1926).

certain incremental level, which in fact thoroughly frustrated Ohtake at being pigeonholed in the rather hazy category of *new* paintings, as described above. A Japanese curator, Yuko Hasegawa, has simply condemned this proliferation of neo-prefixes as a sign of saturation and of a void in real innovation.[32]

However, as I see it, those who are granted these repetitive "neos" are still lucky because at least they are assigned to a quasi-academic category. A huge number of artworks are simply dismissed by the critics so that no collective name whatsoever is given to their existence; this situation applies to the mounting popularity of realist paintings in Japan and elsewhere. Some art journals that are devoted less to the avant-garde and more to works that are popular among collectors have indicated that such realist artwork is always in currency and that its popularity even seems to be gaining momentum, as seen in the establishment of a museum specialized for collecting such realist art.[33] Meanwhile, even in the critical journals that notice it, the trend in realism seems not to have garnered a particular name, such as "new realism."

Internal diversity of art regime

The hiatus between the popularity in public and the silence of the art critics where the kind of the art regime on producing newness is intriguing, as this could be the sort of open experiment for directly observing the principal differences between the function of the scientific and/or market regime and their mutual entanglement in the existing art regime. On this point, a close observation of the critical silence may be similarly intriguing by observing their explicit discursive practices. Despite the general critical acceptance of pop art, for instance, as a major trend in the contemporary art scene, I have seen hardly any serious critical comment on, say, Hiro Yamagata's work in the contemporary art journals. Another intriguing case is that of Christian Riese Lassen, who has been popular in Japan and elsewhere, though thoroughly neglected by the critical circle. Recent publication of academic criticism on his works[34] has attracted attention, as this was the first book in Japan that straightforwardly discussed the artistic value of Lassen's work and looked at why his works have been collectively neglected. Some argue that behind such neglect lies antipathy to his almost unscrupulous way of selling his artwork to the public, along with the general antipathy toward

32 Yuko Hasegawa, An imperfect mapping: On the art from 1980s to 2000s. *Bijutsu-techo* 62/933 (2010), pp. 171–175.

33 see Hoki Museum, https://www.hoki-museum.jp/; access: March 23, 2018.

34 Yuki Harada et al. (eds.), *What was Lassen? Beyond consumption and art* (Tokyo 2013).

the subject of his paintings as simply kitsch.

In this case, the radical hiatus between public popularity and critical disregard is fundamental; there are, however, cases in which the subtle threshold that divides those who are critically accepted and those who are not can be more minutely contrasted. such a case is depicted in the movie *Big Eyes*, a 2014 film from director Tim Burton on the real life story of Americans Walter and Margaret Keane and their immensely popular paintings of girls with disproportionally big eyes in the 1960s.[35] The movie focuses on the real authorship of these paintings, as Margaret's works were falsified by her husband Walter. However, what attracted my attention was the reaction on the Web relating to the similarity between these paintings of big-eyed girls and a series of paintings on a young girl by Yoshitomo Nara. Nara is one of the most influential contemporary artists in Japan with an international reputation whose works have been successfully collected by a couple of prestigious museums, along with those of Takashi Murakami and others.[36] One film critic even audaciously asserted that Nara is a follower of Margaret Keane's legacy.[37] Yet from my perspective, the gap between them in terms of academic credibility is unbridgeable. I have heard hardly any collective appraisal from mainstream critics of Margaret Keane's works as the original pop-art. The Wikipedia article on her works bluntly states that "she has never been a critical success".[38] Nara's case is a radical contrast: his work is not only remarkable popular with the public but also highly acclaimed in academic circles, having garnered numerous prizes. However, the only theoretical arguments on the novelty of his work characterize it as "micro-pop," a vague umbrella term applied to the general trend in a new generation of Japanese artists to portray the everyday, minute details of the small world in which they live.[39] Nonetheless, such a label does not seem to be radically different from the rather unsubstantial labelling of "new paintings" that immensely frustrated Ohtake. This case causes us to think of what characteristics might define the workings of the invisible threshold that tacitly divides those who are critically hailed as new and those who are not: in this case, for example, the dividing line may be Nara's more authoritative educational background, which may grant him the aura of the inner circle of academia, as opposed to Keane who does not have it.

35 see https://www.imdb.com/title/tt1126590/; access: August 24, 2019.

36 see http://www.artnet.com/artists/yoshitomo-nara/; and for instance: http://zatta.sub.jp/doc/content.php?mode=bigeyes as well as: http://serendipitydiary.cocolog-nifty.com/blog/2015/02/post-765a.html; access: March 6, 2018, 10:00 am.

37 https://miyearnzzlabo.com/archives/21539; access: June 15, 2018, 10:00 am.

38 https://en.wikipedia.org/wiki/Margaret_Keane; access: June 15, 2018, 10:00 am.

39 Midori Matsui, *The age of micropop: The new generation of Japanese artists* (Tokyo 2007).

Art regime as interface

In this observation, we may think that the art regime, in reality, exhibits an intriguing case of being a specific interface consisting of different sub-regimes that demonstrate different criteria for newness. Divided into a diverse set of sections, these may be roughly classified into a quasi-academic regime and a specific type of market sub-regime. Each has its own specificity. For the former, in terms of the quest for newness, it is not peer artists who evaluate the novelty of a particular art work, as in the scientific regime. Rather, it is critics, among others, who are expected to evaluate the specific newness of an artwork, preferably against a background of the entire history of Western art, very often within a large collectivity and in the context of similar emerging trends. Metaphorically speaking, such is closer to naming a newly emerging field in science as such—for example, epigenetics—than to evaluating the newness of a specific paper for established journals in epigenetics. Further still, naming practices in the art regime have been flexible and open to both critics and artist themselves, such as the case of the critics coining the term "micro-pop," as noted above, or the artists calling themselves *die blauen Reiter* or Dadaists. Sometimes, such naming is but a poor description of technological innovation, such as in media art or bio art. This naming practice seems akin to an aspect of classic social anthropology on ethnic identity, wherein the name is claimed by either a group itself or external observers.[40]

Given the lack of a regimented system for evaluating newness, as in the scientific regime, the role of critics in evaluating the newness of a particular work of art is almost tantamount to a mission impossible, probably far above their capacity to do in the face of the inundation of newly produced art works in recent decades. This situation reminds me of national border issues in the US and elsewhere, wherein the customs control is filled with the huge number of immigrants, both legal and illegal. Critics are like customs control, deciding which one is in and which one out for the academically acceptable world of regime, but now the border seems to work properly.[41]

Meanwhile, this very loose way of defining newness by giving a collective name to allegedly new trends actually fits with the market aspect of the art regime, which is, in essence, a one-of-a-kind item market. Consumers like it when the art work has a label for, say, its good quality of coziness, as may be demonstrated by my own hobby of purchasing inexpensive pastellist landscape paintings à la the Barbizon school. It is even better when it has brand value academically (in this context, in art history); for instance, I wish I could buy a real specimen of Vas-

40 cf. Machiko Aoyagi (ed.), *What is "ethnic"? : Basic papers on ethnicity* (Tokyo 1996).

41 Ozaki even claims that art critics are an "endangered species," see chap. 3 in Ozaki, *What is contemporary art?*

sily Kandinsky's later works or those of Christian Boltanski, but doing so requires a certain amount of wealth. These are the stories related to public auctioning of art works that occasionally has created sensations.

Antiques

The art regime as an interface where the different principles interact in determining the value of newness is probably unique, as it is distinct from that of either the scientific regime or the market regime for mass commodities. This said, it is also tempting to think of the real meaning of newness in the art regime by considering the meaning of its opposite: namely, the oldness.

The constant pursuit of newness has the somewhat ironical consequence of a constant senescence in what has been produced. Accelerated innovation entails the accelerated mass production of antiquatedness at the same time: the fashion industry is a good example for us to reflect upon in this sense with its rapidly alternating new trends, which simultaneously and just as rapidly become obsolete. In fact, this aspect of pursuing fashion is not confined to the fashion industry; some argue that even in the scientific regime, the pursuit of fashionable topics is inevitable under the banner of the scientific bandwagon and with proper socio-epistemological reasoning: namely, to avoid the risk of not being able to produce outcome in a limited amount of time.[42] Hence, quite a few areas within science are ignored because of their predictable non-doability,[43] with efforts tending to concentrate on specific areas where progress is at least half-guaranteed. Naturally, this does not exclude the almost heroic efforts of the pioneers to explore the *terra incognita* in science, but the very risk of not being able to produce anything can be enormous. Examples include looking for the solution of Fermat's theorem or a message from extraterrestrials, as depicted in the movie *Contact*, where Jodie Foster played a pioneering (mad) astronomer who spent years looking for it.[44]

In the scientific regime, antiquity, both in fact and in theory, seems to have little survivability. This is why science has its Janus faces, as Latour neatly describes: one relates to established fact or theory that looks to the future, and the other looks toward the past trace of controversies that are eventually forgotten.[45] One possible exception wherein the old matters for acting scientists, aside from those that concern science historians, is those instances in which an obsolete fact or theory is rediscovered and reincarnated as a premature pioneer of a cutting edge topic. In such a case, it is not the

42 Joan H. Fujimura, *Crafting science: a sociohistory of the quest for the genetics of cancer* (Cambridge, MA 1996).

43 Masato Fukushima, Resilience in scientific research: Understanding how natural product research rebounded in an adverse situation. *Science as Culture* 25/2 (2016), pp. 167–192.

44 see https://www.imdb.com/title/tt0118884/; access: August 24, 2019.

45 Bruno Latour, *Science in action: how to follow scientists and engineers through society* (Cambridge, MA 1987).

oldness that matters but the forgotten newness, which is rediscovered during the existing pursuit of newness.[46]

This probably is quite different in the case of the market regime where the consumers' preferences matter, and we have distinctive cases related to what we call "antiques." In addition, the market aspect of the art regime is different from, say, that of pop-music because that commodity is reproducible in mass scale and can be measured quantitatively by its sales. As already briefly noted, art consists largely of one-of-a-kind items, whose value lies in their singular character as products. As a result, we experience a kind of unique situation in the art regime: I emphasize that the production of newness in the art regime anticipates the production of a series of good antiques, which is a specific outcome of the interface between the quasi-academic sub-regime in art, vaguely imitating that in the scientific regime, and the market sub-regime, which constantly seeks good commodities, especially antiques. In fact, Marcel Duchamp, in a conversation with Richard Hamilton, once insisted that the real impact of newly born art works has a life of approximately 20 years, and the rest of the life of these artworks is consigned to museums.[47] This is where the concept of antiques matters. Market regime, in turn, thinks much of antiques because of their market value, as seen in those occasions when old paintings (old in the sense of not brand new) may demonstrate an almost astronomical value, from Leonardo Da Vinci to Takashi Murakami. In terms of the market aspect of the art regime, however, diverse forms in the recent development of art practices will demand a new way to define its purchasable form, such as installation art, performing art and so forth.

Closing words

At the beginning of this article, I referred to Luhmann's highly abstract social theory as a way to begin reflecting upon the potential for a macro-sociological version of interface. Though inheriting his concern with the social differentiation that characterizes contemporary society, I have introduced the more flexible concept of regime, which consists of a more diverse set of sub-elements than Luhmann's highly simplified way of describing these processes of differentiation. And though I have described the interface dynamics within the art regime here, I admit that I have omitted any reference to the internal friction between interfaces within both science and market regimes, a topic to be pursued elsewhere.

In this sense, the art regime is an interesting arena for observing the potential of enlarging the concept of interface to the macro-sociological domain—in this case, between two different sub-regimes

46 eg. Ernest B. Hook (ed.), *Prematurity in scientific discovery: On resistance and neglect* (Oakland, CA 2002); Masato Fukushima, Before Laboratory Life: Perry, Sullivan and the missed encounter between psychoanalysis and STS. *BioSocieties* (forthcoming 2019).

47 Marcel Duchamp, Interview from 1959, https://www.artspace.com/magazine/art_101/qa/a-1959-interview-with-marcel-duchamp-the-fallacy-of-art-history-and-the-death-of-art-55274; access: August 24, 2019.

that create a dynamic cacophony owing to the rapidly expanding art market in the age of the post-Duchamp era where the issue is becoming rapidly global. It is also a good occasion to ponder the reasons why we are so driven by the cult of newness, along with the inherently self-contradictory fact that the accelerated orientation of ever newer newness simultaneously means the mass production of obsolescence, where the concepts of *modernus* (newness) and *antiquus* (oldness) meet face to face.

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LYNN HERSHMAN LEESON'S CYBORG DRAWINGS

By Julia Heldt

"The subject in these drawings is not identifying itself via the mirror anymore, but has become one with the mirror, the screen, the interface, resulting in exposure and self-determination at once."

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Introduction: Zipping in to the Cyborg

"made in U.S.A" is written in black, simple letters across the right side of the breast of a woman, drawn in pencil on a white piece of paper. (Un)zipping the vest with her left hand, a candid smile shows a row of small, regular teeth, and facing the viewer through her round glasses, the woman exposes her flat, white décolleté, (un)dressing herself. The vest itself displays a technical structure: lines resembling pipes or streets on a map are connected with a pump-like cylindrical construct, overlaid by a stomach-shaped organic structure in light pink. A heart in bright red, encircled by two bigger hearts, is linked with a pipe to the pump. The colour and structure of the forms are fading out towards the lower parts of the torso and the contouring lines of body and vest are blurred, loosened, blending into each other.

The drawing *Zipping in Cyborg* (fig. 1), made by American artist Lynn Hershman Leeson (*1941, Cleveland, Ohio) in 1963 in pencil, watercolour and ink on paper, constitutes an early image of a then newly coined term: The *Cyborg*. It was introduced by scientist Manfred Clynes and physician Nathan Kline in the short text titled "Cyborgs and Space", published in the September issue of *Astronautics* in 1960. Clynes and Kline propose the concept of the *cyborg* as an acronym for *cybernetic organism*, which is supposed to describe a "self-regulating man-machine system."[1] This system should serve as an augmentation of the human body making it able to survive in hostile environments during space travel. Growing out of the first years of the Cold War, the cyborg became a prominent figure connected with socio-cultural implications, redefining the being of humans in a world of new technology.[2]

One of the most famous interrogations of the cyborg term in relation to cultural and social paradigms is probably Donna Haraway's "A Cyborg Manifesto" from 1985.[3] Haraway used the figure of the cyborg strictly metaphorically: To her, its image was a way to describe a cultural and social shift away from binary paradigms, emphasising its metaphorical quality, rather than its application in science. Before Haraway used the cyborg image for her feminist social theories and even before Clynes and Kline introduced the acronym, artists had been working with the concept of the human-machine fusion for a long time, for example Leonardo's well known *Vetruvian Man* (1490), but especially since the beginning of the 20th century, when a gro-

1 Manfred Clynes and Nathan Kline, Cyborgs and Space. *Astronautics* (September 1960), pp. 26–27 and pp. 74–76, here p. 27.

2 See Gary Lee Downey, Joseph Dumit, and Sarah Williams, Cyborg Anthropology. *Cultural Anthropology* 10/2 (May 1995), pp. 264–269.

3 Donna Haraway, A Cyborg Manifesto. Science, Technology and Socialist Feminism in the 1980s, in: *The Cybercultures Reader*, eds. Barbara M. Kennedy and David Bell (New York and London 2000), pp. 291–324. First published in: *Socialist Review* 15, no. 2 (1985), pp. 65–107.

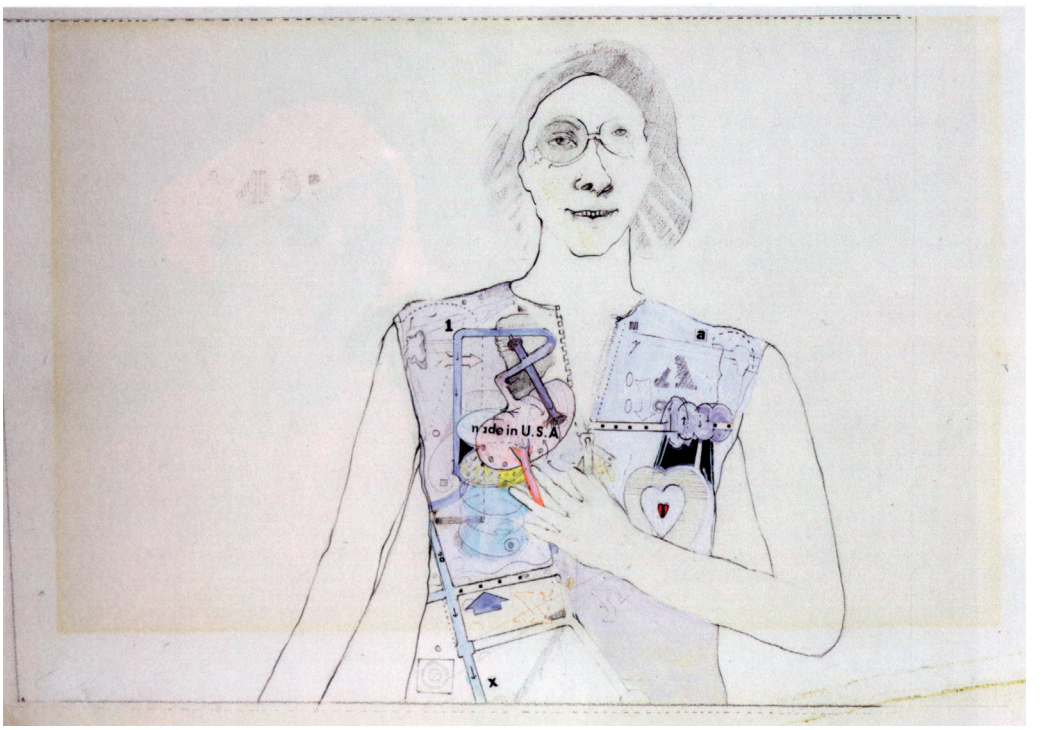

Fig. 1: *Zipping in Cyborg*, 1963.

wing involvement can be observed, with Dadaism and Futurism.[4] Both Avantgarde groups subvert in their artworks the sovereignty and uniqueness of the human, by picturing their utopist visions of man-machine-fusions, blurring the boundary between human and technology, dismissing the sovereignty of the human and, at the same time, completing it with machines, referencing the century old reading of the human, and, especially, the woman, as inadequate and incomplete.[5] Defining the production and use of tools as one of the earliest characteristics or skills of humans and their culture,[6] the history of prostheses finds its technological equivalent in the cyborg, completing, augmenting or extending the human body and mind. Being situated on the unclear borders of human and technology, the cyborg works as an interface, through which the human can operate the technological – or through which the human can be technologically operated.

The focus of this essay is to look into the imagery of the cyborg that was produced around the time of the birth of the cyborg term. In a series of drawings, Lynn

4 See Pontus Hulten, *The Machine. As seen at the End of the Mechanical Age* (Greenwich, CT 1968). Matthew Biro, *The Dada Cyborg. Visions of the new Human in Weimar Berlin* (Minneapolis 2009).

5 See Ruth Bleier, *Science and Gender: A Critique of Biology and Its Theories on Women* (New York 1984).

6 See Harold Bloom, On the Origin and Evolution of Human Culture. *American Scientist* 51/1 (March 1963), pp. 32–47.

Hershman Leeson depicted mostly women[7] in the tradition of human-machine fusions – especially Hannah Höch and Eva Hesse come to mind – and illustrates with these drawings social and cultural qualities of the cyborg. The female body, which is in those early drawings of Lynn Hershman Leeson often enough herself,[8] is becoming an interface, being a surface of intersection, communicating mind and exterior, showing the direct influence of a societal shift and the way the female subject responds to this – be it with appropriation or shutting down. The flatness of the paper underlines the body as surface and becomes a kind of interface itself, a screen on which Hershman Leeson projects herself and her ideas. The cyborg, "born on the interface of automaton and autonomy",[9] is in these drawings too an interface between human and machine, aligning with Haraway's theory through showing the possibility to dissolve boundaries and power structures and eventually creating a new way of thinking about the conception of the subject, that is mostly the female subject, in an evolving technological and digital world.

Drawings as Screens

Lynn Hershman Leeson divides her almost six decades spanning œuvre in two elementary stages: Before Computers (B.C.) and After Digital (A.D.). [10] She appropriates the terms that are being used to label years in the Julian and Gregorian calendars, indicating the years before Christ (BC) was born and after His Birth, *anno domini* (AD).[11] By doing this, she puts not only the invention of the computer in direct relation to the birth of Christ, indicating that both are highly effective shifts in human history; but she also establishes a new history writing – one that is based on technological evolution, which shows a techno-centric worldview superseding the Christian worldview.

Hershman Leeson became known to be a vanguard artist in the use of technological and digital evolution in her works, though one of her most known works, the early performance *The Dante Hotel* (1973-1974), featuring two "life-size dolls with wax-heads", which she modelled af-

7 Exceptions are *Robotic Horse Interior*, 1971, and *X-Ray Man*, 1970.

8 See Quick, Reflections in a Cyborg: Lynn Hershman Leeson's Civic Radar. *Art Practical* (April 20, 2017), http://www.artpractical.com/column/feature-reflections-in-a-cyborg-lynn-hershman-leesons-civic-radar/, access: October 12, 2018, 10:15am. Alex Greenberger, A New Future from the Passed: Lynn Hershman Leeson Comes into Her Own After 50 Years of Prophetic Work. *Artnews* (March 28, 2017), http://www.artnews.com/2017/03/28/a-new-future-from-the-passed-lynn-hershman-leeson-comes-into-her-own-after-50-years-of-prophetic-work/, access: October 12, 2018, 10:15am.

9 Donna Haraway, *Primate Visions. Race, Gender and Nature in the World of Modern Science* (New York 1989), p. 1.

10 See Jennifer John, Lynn Hershman "Roberta Breitmore," http://www.medienkunstnetz.de/werke/roberta-breitmore/#reiter, access: October 9, 2018, 12.30am.

11 Oxford Reference, "BC," http://www.oxfordreference.com/view/10.1093/oi/authority.20110803095455853. Oxford Reference, "AD," http://www.oxfordreference.com/view/10.1093/oi/authority.20110803095349440, access: September 9, 2018, 1.30pm.

ter her own face, placed in a hotel room, used technology only in a hidden way. The dolls, who made breathing sounds and moved slightly occasionally, are part of her *Breathing Machines*, a series of masks, she started making in 1965.[12] Humanising these sculptural works by making them breathe and putting them in the hotel room, resembling real guests, Hershman Leeson blurs the boundaries between human and machine, fiction and reality – the installation was eventually shut down after a visitor called the police who suspected a crime scene at the hotel room.[13]

Around the same time as she began working on her *Breathing Machines*, Hershman Leeson addressed this topic in a series of drawings, which will be at the centre of the following essay. These drawings can be seen as the groundwork for her art, not only being the first she made that gained attention,[14] but mostly because they are building the basis for her interrogation of the technological influence on the individual and society, as she came back to the image of the cyborg throughout her career, for example in works like the *Phantom Limb Series* (1985–ongoing), *Seduction of a Cyborg* (1994), *Cyborg Series* (1994–2006), *Teknolust* (2002), and others. She too continued to create works of art, which display a more distinct understanding and literal use of reciprocal interfaces, most prominently *Lorna* and *Deep Contact* (both 1984).[15] In these early drawings, as I will show, a first understanding of the relation of women and technology is taking shape, establishing an abstract thinking of interfaces, less focused on user-device reciprocity and more on the literal meaning of interfaces as surfaces of intersection. Within those early works, she introduces an aesthetic that is both mechanics and technology related, but at the same time features forms and subjects that are highly idiosyncratic. The drawings are not accurate depictions of structures but speak of emotions and figuring out.

The double-sided work *Inside Looking Out* (fig. 2), from 1967 shows the front and back of a woman. Her body is not clearly outlined, though at some places yellow or green lines retrace the contours, still mostly bypassed by the translucent yellow fill colour. The back of her body is marked by her hair falling on her shoulders. Barely dressed, her roughly sketched hands, are held together over her bottom. Her skin colour is not even but shows in its present stage the age of the work itself. The

12 See Andreas Beitin, Face, Surface, Interface: The Motif of the Mask in the Work of Lynn Hershman Leeson, in: *Lynn Hershman Leeson. Civic Radar*, ed. Peter Weibel (Ostfildern 2016), pp. 198–209.

13 See Kathy Noble, The Alternating Realities of Lynn Hershman Leeson. *Mousse* 47 (February-March 2017), pp. 152–165, here p. 154. Noble describes the visitor as frightened, suspecting a corpse himself, while Beitin notes the visitor was drunk and called the police who then suspected a crime, see Beitin, Face, Surface, Interface, p. 203.

14 Some of the first exhibitions Lynn Hershman Leeson was included in were dedicated to the medium of the drawing: *Adventure of a Line: Drawing Experiences by Lynn Lester Hershman*, Santa Barbara Museum of Art, Santa Barbara, USA, 1966; *Drawings U.S.A.*, Fourth Biennial, St. Paul Art Center, St. Paul, Minnesota, USA, 1969. See Weibel, *Civic Radar*, p. 373, p. 375.

15 See Beitin, Face, Surface, Interface, pp. 208f.

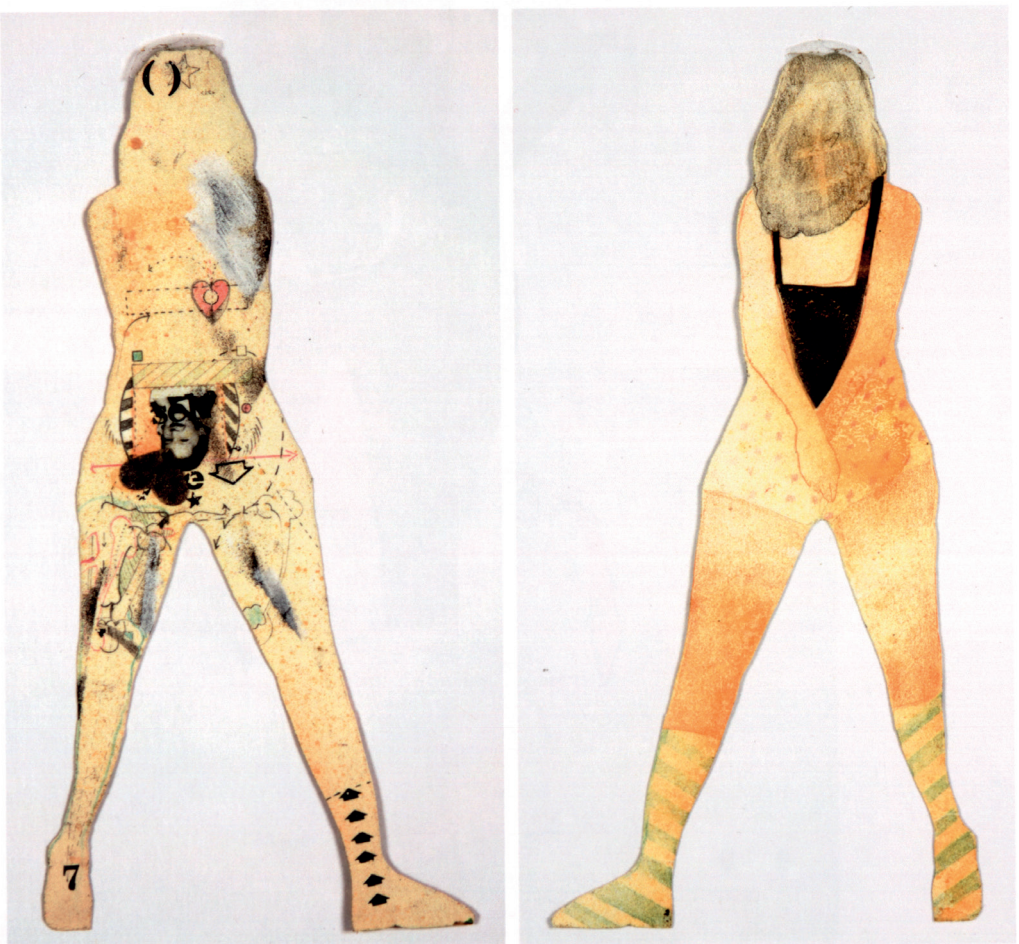

Fig. 2: *Inside Looking Out*, 1967.

rather simple back of her body is in no relation to what is pictured as her front. Without facial features, there are only abstract forms spread over her body which are stickers in the form of letters from an automated typesetting system. Hershman Leeson contrasts them with hand drawn parts, which can be found mostly on her lower torso, and includes technical drawings, such as fine arrows, dotted lines and cubes. Additionally, Hershman Leeson included heart shapes and drew simplified bones on her right upper leg. Having a phallic quality, the forms on her leg introduce a moment of sexuality to the drawing, further highlighted by a picture of an infant on her belly. The title of the work indicates that it is the inside of her body that we are looking at and that is looking at us. The drawing imagines the woman as a cyborg-like entity. The materialist approach to the female body opposes its essentialist truth as mother with a technologically altered anonymity. *Inside Looking Out* shows two ways of being a woman in a technological so-

ciety, by appropriating it and by opposing it. Her crossed hands resemble a defensive motion, protecting her lower torso. Both parts of the work use their flatness: the first one creating a screen on which to present its interior to the exterior, the second one shutting itself out from any exterior, refusing communication.

The blending of surface and interior, or putting the interior on the bodily surface is characteristic for Hershman Leeson's early drawings, as can be seen in *Dress Ray* (1966, fig. 3), too. Using again collage techniques and drawing, Hershman Leeson here opens the flat space of the drawing and indicates spatial qualities, through the figure's head turn to her right, while its title alludes to x-ray technology. Utilising the concept of the bodily surface, the skin and clothes, to examine the construction of the subject, she deploys historically and socially established features of women, but shifts their perception: The purple dress as feminine object becomes an x-ray screen or interface, being distinct from the white skinned female body. The dress like the skin, in *Inside Looking Out*, function as screens, representing an imagined biological and technical interior of the body, interspersed with emotional features with images of hearts and infants. In both works, the internal subject and the external technological society are intertwined in the cyborg figures.

As with her *Breathing Machines*, Hershman Leeson makes use of the cultural topos of hiding or creating an identity, as Andreas Beitin notices:

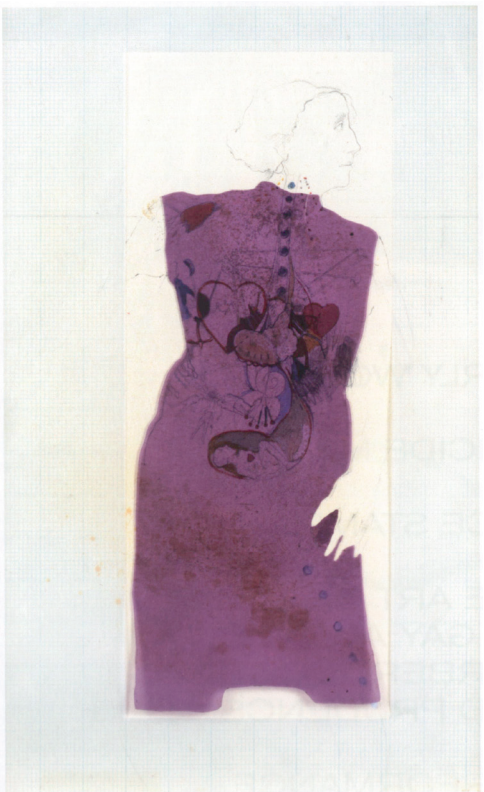

Fig. 3: *Dress Ray*, 1966.

> *Beyond its sociocultural frame of reference, the mask as a second or alternative face can be inscribed in a terminological, etymological, epistemological, and not least technological line of development: face-mask-surface-interface-screen. Computer screens and tablet and smartphone displays, as today's masks, offer an unlimited supply of electronic changes of identity.*[16]

And Hershman Leeson herself notes, that "Today, masks are interfaces that mutate through connectivity, merging the past and present through use."[17] Though Beitin focuses on newer works in his reading, creating an evolution in

16 Beitin, Face, Surface, Interface, p. 207.

17 Cit. after Beitin, Face, Surface, Interface, p. 199.

the use of masks, my point here is that the early works too show a conceptual understanding of interfaces as masks. By examining bodily surfaces, Hershman Leeson approaches the materialist notion of identity in relation to a technocratic society. This reading of the cyborg drawings as masked, questions the understanding of them as a projection of the interior, that I will discuss further along, or a looking in to the interior and rather proposes of them to be read as a way of superficial adaption to a new technological society. That the human has always been in need of adaption to its exterior and the materialist understanding of the cyborg as alteration and augmentation of the organism that is the human body will be the focus of the following chapter, taking into consideration the social and individual implications, especially on women, which this materialist reading of the cyborg can have.

The Insufficient Human

When in 1964, Herbert Marshall McLuhan wrote his iconic words, "the medium is the message", he substituted them with the limitation that "[t]his is merely to say that the personal and social consequences of any medium – that is, of any extension of ourselves – result from the new scale that is introduced into our affairs by each extension of ourselves, or by any new technology."[18] McLuhan, by introducing the reflexivity of technology and media into the social and personal conditions of humans, defines the media in the quoted insertion as an "extension of ourselves."

The image of media as an extension of the human, or as McLuhan writes in the subtitle of the same book, "The Extensions of Man", is based on an anthropocentric world view. Aligned with this, Ernst Kapp in his "Grundlinien einer Philosophie der Technik" (1877) traced the reading of tools as an extension of the body, based on the etymology of the Greek word *organon*, which means limb, its afterimage, the tool and even the material of which the tool is made.[19] Kapp describes the history of civilisation as a history of labour and thereby drafts a materialist reading of society, describing human nature as one which always first creates his/her own culture. Unlike animals who survive because of their instincts, humans are, according to Kapp, in need of science and artificial creation.[20] He goes on to describe the term "Projection", which is in itself a mode of extension. Kapp uses the term *Projection* to explain the relations of emotions towards exterior things and the creation

18 Marshall McLuhan, *Understanding Media. The Extensions of Man* (New York a.o. 1964), p. 7.

19 Ernst Kapp, *Grundlinien einer Philosophie der Technik. Zur Entstehungsgeschichte der Kultur aus neuen Gesichtspunkten* (Braunschweig 1877), p. 40, via https://archive.org/details/grundlinieneine00kappgoog, access: October 12, 2018, 10.30am.

20 Kapp, *Grundlinien*, p. 29.

Fig. 4: *Woman with Fleeting Heart*, 1964.

of imaginations. [21] This metaphorical or imaginative reading of *Projection* adds a theoretical understanding of the extension of the human to the physical one, which tools stand for. Kapp's imaginative and materialist extension of the human body and mind finds its equivalent in the reading of the cyborg figure, that I am discussing here. Augmenting the human body and mind, as Clynes and Kline imagined,[22] the cyborg functions as the postmodernist tool extending the subject. Though the term *Projection* signals a one-way mode of communication, it functions as an interface too. That the cyborgised interfaces in Hershman Leeson's drawings function as masks, a way not only to adapt to the exterior by superficially reflecting it, but also as possibly hiding the interior, or, at least communicating a mediated, altered or limited persona through it, relates to Kapp's idea of *Projection*.

Another example for this is *Woman with Fleeting Heart* (1964, fig. 4), depicting a woman's head to which a heart shaped structure is attached by a chord, being prostheses and projection at the same time, the heart appears outsourced of the woman's body, her glance absent and behind her a shadow that is more of a doubling. The shadow might in this case indicate a narrative time, a before and after, dissolving the flatness of the paper screen or another kind of simplifying mask, layered before her own more profoundly sketched face. In this case, the cord connecting heart and woman signifies the interface, a string of intersection rather than a surface. That the heart in contrast to the woman's body, at least what we see of it, is highly marked by technological drawings, more detailed

21 Kapp, *Grundlinien*, p. 30.

22 Clynes and Kline, Cybernetic Organism, pp. 74–76.

than the contours of the woman herself, and her melancholic almost empty gaze, implies a technological augmentation of an insufficient woman, who became incomplete through almost losing her heart.

This notion of incompleteness, physiologically or socially, is also found in the techno-philosophical concept of Kapp and his followers. It is not just that humans need augmentation to survive in space, like the cyborg figure, but according to some conservative cultural anthropologists they also need it to survive in general. The human need for augmentation is exemplified by Arnold Gehlen's term of the "Mängelwesen", a deficient being, which he coined in his 1940 published work "Der Mensch: Seine Natur und seine Stellung in der Welt". Gehlen advocates the importance of tools, as they are the defining element of humanity: Only where there were tools in history, there were beings defined as human. The need for these tools is explained by Gehlen through the incompleteness of the human body. Lacking certain organs and instincts, the human could not have survived without creating tools and augmenting his surroundings intelligently.[23] Like Kapp, who also describes humanity's history as a history of tools, Gehlen describes tools and their subsequent technology, as prostheses for humans. He uses the term *Mängelwesen* as an immutability of the *conditio humana*, demanding the human trait to learn, to adapt to new situations to be stabilised,[24] which can be achieved through use of technology. That Gehlen's reading of the human as *Mängelwesen* – a term originally introduced by Johann Gottfried Herder[25] – and his subsequent demand for strong institutions, meaning regulatory systems should be seen critically is underlined by his historical background as a member of the NSDAP and his conservative "Philosophy of Institutions" from the after-war years, which found a strong opponent in the Frankfurt School, namely the critical theory of Jürgen Habermas.[26] Though the cyborg figure as such evidently functions as just what Gehlen demanded – a tool to augment the human body and mind – it's cultural appropriation of the after war years, most prominently Donna Haraway's metaphorical use of it but also Hershman Leeson's more literal use, oppose Gehlen's techno-philosophical approach, by underlining the individualistic quality of the cyborg image. This is especially evident in their use of female cyborg images and their possibility to (de)construct their selves.

23 See Arnold Gehlen, *Die Seele im technischen Zeitalter. Sozialpsychologische Probleme in der industriellen Gesellschaft* (Frankfurt/Main 2007), p. 6.

24 See Arnold Gehlen, *Urmensch und Spätkultur. Philosophische Ergebnisse und Aussagen* (Bonn 1956), p. 24.

25 See Egert Pöhlmann, Der Mensch – das Mängelwesen? Zum Nachwirken antiker Anthropologie bei Arnold Gehlen. *Archiv für Kulturgeschichte* 52/2 (December 1970), pp. 297–312, here p. 298.

26 See Karlheinz Weißmann, Gehlen und Habermas. *Sezession* 29 (April 2009), pp. 20–23 and Richard Saage, Zur Aktualität der Philosophischen Anthropologie. *Zeitschrift für Politik* 55, no. 2 (June 2008), pp. 123–146, here p. 125.

The Cyborg as Completion of the Insufficient Woman

While Clynes and Kline had a specific idea of the cyborg in mind, a control system that can be used for those travelling to space, the cyborg concept that is advocated by Lynn Hershman Leeson and Donna Haraway, demands a structural understanding. Haraway's cyborg concept disrupts established power structures and institutions, as she summarises towards the end of her Manifesto:

> *To recapitulate, certain dualisms have all been systemic to the logics and practices of domination of women, people of color, nature, workers, animals – in short, domination of all constituted as others, whose task is to mirror the self.*[27]

Dissolving those dualisms, the cyborg figure questions power relations those dualisms and social institutions have established.

While Haraway's cyborg remains completely metaphorical, Hershman Leeson deploys a subversion of power structures in her cyborg drawings, that is of a more literal quality. In the three-part work *Dress Me* (fig. 5), from 1965, she shows a woman in three stages. In the first, the woman's body remains plain, outlined only by black pencil strokes. Bold letters read "DRESS ME" across her chest. Ga-

Fig. 5: *Dress Me 1, 2, 3* (3 plates), 1965.

27 Haraway, Cyborg Manifesto, p. 313.

zing to her left, she seems to be expecting someone following her invitation, resembling paper dolls, that children can dress in various outfits. The second part of the work consists of a bright red drawing of a dress, ready to be laid over the woman-figure. The third part shows the interior of the woman, similar to the other works already discussed and *X-Ray Woman* (fig. 6), mechanical drawings and figures cover an area in the shape of a torso, missing limbs. As Kerry Doran writes, the two outfits are options that determine the woman's self – at least for that day:

> *She longingly looks toward her two garment options: an average looking coral frock or a diagram of parts, words, and pieces, appearing simultaneously deconstructed and reassembled, as though taking in the outside forces that seek to define a woman wearing a dress in the world […].*[28]

Simultaneously depicting the woman as a doll, who is subjected by the ones who dress her and as an individual that can create her own reality by her choice of clothes, Hershman Leeson's woman in this drawing is still an insufficient self, "longing" for augmentation, be it through clothes that make her herself or an outside power that imposes their opinions on her, thereby situating the woman in the context of an evolution of independence of the years the work was made.

The concept of the *Mängelwesen* can be seen as a predecessor-figure for what

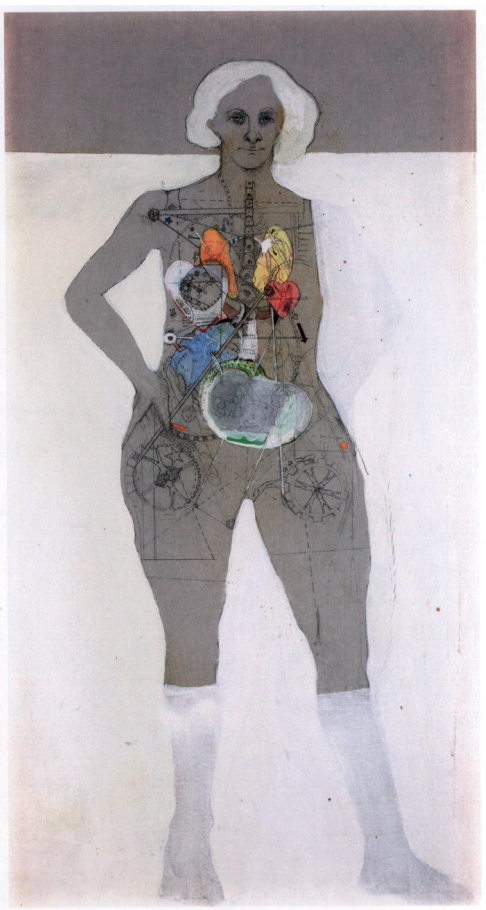

Fig. 6: *X-Ray Woman*, 1966.

came to be the cyborgised human.[29] As humans needed tools to establish their culture and ensure their survival, they took on to need technology to do the same, which resulted in the technologically augmented human. Completed and improved not just by technological tools like cell phones and the computer but also by medical tools, which establish the human beyond its natural transien-

28 Kerry Doran, Cyborg Origins: Lynn Hershman Leeson at Bridget Donahue. *Rhizome* (March 19, 2015) http://rhizome.org/editorial/2015/mar/19/lynn-hershman-leeson-origins-species/, access: September 30, 2018, 4.30pm.

29 See Stefanie Wenner, Unversehrter Leib im "Reich der Zwecke": Zur Genealogie des Cyborgs, in: *Grenzverläufe der Körper als Schnittstelle*, ed. Annette Barkhaus (Munich 2002), pp. 83-100, here p. 84.

cy.[30] This emancipatory quality of the cyborgised human towards nature, is the core figure of the post- and trans-humanist theories, and it comprises the image of a New Human, in which human and machine create the interface that is the augmented human body.[31] This yields into a freeing state for the human, who is not subjected by nature anymore, as trans-humanist Fereidoun M. Esfandiary writes: "So as long as there is death no one is free."[32] As transhumanism wishes the human to not just become one with machines, but outsource mind and memory into computers, to abolish death and be able to live forever within the cyberspace,[33] the cyborg figures of the 1960s are early positivist images of the wish to overcome natural and social preconditions and establish a self-determined life and self. Hershman Leeson's images speak of these ideas and narrow them down to the position of women in 1960s USA. Her feminist approach to undermine essentialist notions of what it is to be woman was continued by Haraway, as she too uses the human-machine fusion to dismantle human and female preconditions, social as well as natural. In contrast to this, Gehlen does not describe the possibility of technology to liberate humanity from its natural burdens, but rather sees it in its culture creating way, to establish rules and paradigms in the form of strong institutions, rather than to overcome them.

The cyborg was intended to augment the human. Hershman Leeson uses the cyborg image in her works to question the very being of the Human, or in most cases, women in the form of "feminine machines."[34] She thereby inverses the implication of power structures that Gehlen sees in technology and dissolves them, by dissolving the constitution of the female body, opening it up to interrogation via x-ray and including the mechanical into its essentialist nature. The depicted women openly wear their relation to the exterior in their bodies, becoming themselves interfaces. In the case of *Dress Me*, the human body as interface, stands for the possibility to self-government and emancipation. This positivist reading, though, needs to be seen ambivalently: Women emancipating themselves were just recently oppressed women; their empty faces and eyes or the isolation of the backside of *Inside Looking Out*, for example, speak of this ambivalence towards the technological influence on the individual.

30 See Dierk Spreen, Was ver-spricht der Cyborg. *Ästhetik & Kommunikation* 26 (March 1997), pp. 86–94.

31 See Oliver Krüger, Die Vervollkommnung des Menschen. Death and immortality in post- and trans-humanism. *Transit – Europäische Revue* 33 (2007): n.p., http://www.eurozine.com/die-vervollkommnung-des-menschen/, access: September 11, 2018, 2.30pm.

32 Fereidoun Esfandiary, Are you a transhuman?, cit. after Krüger, Vervollkommnung, n.p.

33 Krüger, Vervollkommnug, n.p.

34 Greenberger, A New Future.

The Cyborg as Extension of the Mind

A similar conservative or pessimist point of view as Gehlen's is represented by Jean Baudrillard in a lecture held at the 1988 conference "Philosophie der neuen Technologie" in Linz, Austria. Baudrillard claims in his subsequent essay "Videowelt und fraktales Subjekt" that the human is only living as a "fractal subject", a subject broken into pieces, more and more abandoning its social skills and only differing from machines in its ability to feel "passion".[35] According to Baudrillard, the human as a subject becomes increasingly insensitive and is only able to live and feel because of technological prostheses.

Following McLuhan's theory of the extension of the human through technology, Baudrillard describes the brain in separation of the body, the body as an excess of the mind.[36] Baudrillard adapts the Cartesian theorem of the mind-body-dualism, in which Descartes describes the human as a machine as well,[37] and transcribes it to the postmodern age. In his idea of the "fractal subject", the mind is split into parts, an idea that can be seen in relation to the cyborg, in which single body parts are individualised and outsourced or replaced, as they become subject of augmentation in Clynes and Kline's proposal, or in Hershman Leeson's view, splitting up the body in flattened front and back and screening its interior with mind and heart being external. The material body becomes the interface, communicating between mind and society, thereby detaching itself from the first. The divisibility of the human body in view of technology is present in another series of works by Hershman Leeson titled *Phantom Limbs* (1985–1987), that consists of photographs of women whose body parts, such as their heads, legs or arms are replaced by cameras, screens or sockets and that Genevieve Quick described as "spectral bod[ies]."[38]

Like Baudrillard, Haraway takes part in the question of mind-body-separation, as Gavin Rae suggests that her "thinking is profoundly, if implicitly, influenced by Heidegger's critique of the binary oppositions underpinning Cartesian anthropocentrism."[39] Rae summarises Haraway's endeavour with her questioning of "what it is to be 'human'"[40]. Opposing feminist essentialism, she uses the cyborg imagery to dissolve body-

35 Jean Baudrillard, Videowelt und fraktales Subjekt, in: *Aisthesis. Wahrnehmung heute oder Perspektiven einer anderen Ästhetik. Essays*, ed. Karlheinz Barck (Leipzig 1990), pp. 252–264.

36 See Baudrillard, Videowelt, p. 253.

37 See Bernhard Lauth, *Descartes im Rückspiegel. Der Leib –Seele–Dualismus und das naturwissenschaftliche Weltbild* (Paderborn 2006), pp. 56–58.

38 Quick, Reflections.

39 Gavin Rae, The Philosophical Roots of Donna Haraway's Cyborg Imagery: Descartes and Heidegger Through Latour, Derrida, and Agamben. *Human Studies* 37/4 (2014), pp. 505–528, here p. 507. Rae goes on to unravel the philosophical roots of Haraway's thinking and relativises Heidegger's influence by taking into account Agamben's, Derrida's, and Latour's influence.

40 Rae, The Philosophical Roots, p. 525.

mind boundaries as well as many other dichotomies.[41] Her positivistic approach contrasts with Baudrillard, who considers the dissolving of the human entity through technology a loss of sociality, of empathy towards the self and others. Baudrillard goes on to disagree with McLuhan, who too sees the extension of the human through technology as potential and claims that the parts of the human body, including the brain, have separated themselves from the human and surrounding it "eccentrically" instead of "concentrically". The parts of the body, that Baudrillard thinks of as prostheses, are highly influenced by the technology surrounding them, even becoming one with it, viewing human and machine as inseparable.[42]

Baudrillard's negative evaluation is mostly based on the shift he sees in the self-identification of the subject and the bodily screen as interface, claiming, that the "video stage has superseded the mirror stage."[43] The subject only views and communicates itself via the mediated medium of the screen dominated by superficiality and meaninglessness, instead of the immediacy of the mirror. According to Baudrillard, the screen cannot be used for an active analysis of one's own, but only as a self-monitoring tool in an "instantaneous and superficial refraction".[44] The "refraction" of the self-image describes a shifted view of one's self, caused by the medium. Baudrillard states that

> *we once used to live in the imaginary of the mirror, the divisiveness and the I-scene, the alterity and the alienation. Today we are living in the imaginary of the screen, the interface and the multiplicity, communication and network.*[45]

The subject, in Baudrillard's pessimist understanding of technology, is dominated by the perception through screens and interfaces, without being able to differentiate between singular identities, the subject is only one part of a bigger picture. The identification of the self, that Baudrillard seems to be missing in the "videoworld", is of similar complications as the identification of Hershman Leeson's cyborg drawings, as they too perceive and project only a mediated version of themselves through their bodily screens.

The identification of one's self through the view of others is what Hershman Leeson addresses in her drawing *Mirror Face Woman* (1966, fig. 7) too, as Charles Desmarais describes the depicted woman as someone, "who exists as a reflection of others who is alive only on the viewer's terms."[46] Hershman Leeson's mirror-faced figure is like those other early drawings marked by technical details. Her broad shoulders and straight uplifted left arm indicate strength that contrasts the interpretation of her mirrored face by Desmarais. Subverting the

41 See Haraway, Cyborg Manifesto, p. 292.

42 Baudrillard, Videowelt, p. 260

43 Baudrillard, Videowelt, p. 256.

44 Ibid.

45 Baudrillard, Videowelt, p. 263.

46 Charles Desmarais, Lynn Hershman Leeson: Myths and machines at YBCA. *SFGate*, (February 10, 2017), http://www.sfgate.com/news/article/Lynn-Hershman-Leeson-Myths-and-machines-at-YBCA-10923873.php, access: October 12, 2018, 10.30am.

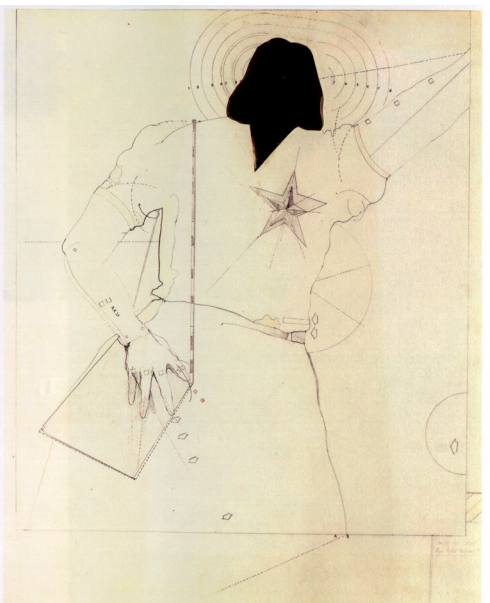

Fig. 7: *Mirror Face Woman*, 1966.

negative interpretation of the superficiality of her mirrored face, it can too function as a shield. Mirroring the exterior, shielding her mind of it, *Mirror Face Woman* exists on the verge of being independent and defined by others, at the same time declining a communication, throwing the perceiver back at herself, becoming an interface in the meaning of a mask only in a one-way direction.

Conclusion

Created in the 1960s, Lynn Hershman Leeson's cyborg drawings came to life amidst an emancipatory movement. With the means of technology, her figures question the essence of being – being female, that is. While Clynes and Kline thought of the cyborg as a mechanism that should "leav[e] man free to explore, to create, to think, and to feel"[47], Hershman Leeson adopts the cyborg image to create her own figures of emancipation, that are not always strong and self-sufficient but fractal identities influenced from the outside. Like with her *Dante Hotel*, she creates her own images of identity and reality – like she continued to do within the parallel reality of Second Live and the screen.[48] The cyborg drawings stand at the beginning of that œuvre, using the body as a screen to project seemingly subjective perceptions of the self, though not completely independent from the technological society. Anticipating the outsourcing of the human mind through the digital, she shows the heart of her *Women with fleeting heart* full of technology to be outside of her body, leaving it behind, attached only by a cable, reminding us today of the those who experience love and life within the digital world.

The singular positioning of the figures in time and space-less places establish the cyborg figures as fantasies, becoming tangible only in the realm of the paper as screen. Using the body as a screen too, her cyborg figures are not just interfaces between human and machine, but also predecessors of the interface of the computer, reciprocal systems that Hershman Leeson used in later works, communicating between interior mind and exterior society. In the computer's Foucauldian

47 Clynes and Kline, Cybernetic Organism, p. 27.

48 See for example the work *Dante Hotel in a Second Life*, Life Squared, 2007.

Heterotopia[49] of fiction and reality, the subject can create a self, screened on the surface of the computer just as the fictionalised inside of Hershman Leeson's cyborg drawings. Projecting the mental inside to the social outside the cyborg images discussed, create a materialist notion of identity creation that is defined by technical and mechanical structures but stays imaginary. The subject in these drawings is not identifying itself via the mirror anymore, but has become one with the mirror, the screen, the interface, resulting in exposure and self-determination at once. The screen has become a new kind of mask, like McLuhan proposed, through which the subject communicates, and which is increasingly dislocated in the digital world.[50]

The women in Hershman Leeson's drawings, with whom she identified with,[51] are shaped by an effort to figure the self out. Just as Baudrillard viewed the technological self as fractal, as alienated parts, it is what Hershman Leeson's drawings propose as a possibility. Being able to construct the self and the body with single parts and forms, she illustrates in her drawings a notion of emancipation as well as insecurity. It is not always a strong, self-assured woman that the drawings allude to, but often enough a woman marked by social structures to which she opens up. In their fragility referencing the notion of the insufficient human and woman, the cyborg drawings and the cyborg metaphor propose a solution that is not marked by totality but that is itself constructed. It is a figure marked by ambivalence, figuring out and being in-between.

Having not been able to completely overcome nature's burdens, as post- and transhumanism would wish for, the cyborg drawings by Hershman Leeson are still marked by an essentialist conception of women marked by emotion and their biological functions. The loosened quality of her strokes can be seen as her artistic means of describing the freeing but also unsettling quality of the cyborg – which is contrary to the one proposed by Clynes and Kline or the social implications Gehlen described for the use of technology. Rather, her cyborg images aim to free the depicted subjects of social and cultural anticipations, allowing them to develop an individual material and subjective versatile structure and allowing communication between interior and society.

Moving on the edge of material and subjective, the cyborgs in Hershman Leeson's early works illustrate a possible alienation of body and soul. This separation is congruent with our understanding of the cyborg within the realms of cyberspace: Through the concept of the interface, the cyborgised subject is able

49 Though Michel Foucault developed his ideas on the heterotopias before the internet was widely known, the internet might be seen as one of those spaces establishing own rules and reflecting society in a specific way. See Michel Foucault, Andere Räume, in: *Aisthesis. Wahrnehmung heute oder Perspektiven einer anderen Ästhetik*, ed. Karlheinz Barck (Leipzig 1992), pp. 34–46.

50 Beitin cites „McLuhan's description of television in 1971 as a ‚totally new kind of mask,' computer screens and tablet and smartphone displays have become the new, exponentially proliferating, and increasingly dislocated forms of the mask." Beitin, Face, Surface, Interface, p. 200.

51 Greenberger, A New Future.

to overcome the reality of her own body and move over into the Heterotopic world of the screen, being their own perception, their own reality. This shows the possibility of the cyborg to free and extend the human not only outwards, as a physical prosthesis, but inwards too, to create and hide or expose a self and own reality, independent of established social and political structures. Using mechanical or technological prostheses to do so, the cyborg image remains open to include the exterior into the human, its body and self – just as the computer or cell phone can be considered as prostheses, as parts of ourselves, making all of us cyborgs.

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STILL BE HERE. THE MULTIPLICITY OF HATSUNE MIKU

By Laurel Halo & Mari Matsutoya

Name: Hatsune Miku
Release: August 31, 2007
Age: 16 years
Height: 158cm / 5ft 2in
Weight: 42kg / 93lb
Suggested Genre: Pop, rock, dance, house, techno, crossover
Suggested Tempo Range: 70–150bpm
Suggested Vocal Range: A3–E5, B2–B3

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Illustration by LaTurbo Avedon and Martin Sulzer.

I'm searching for the drop of a sound
探していた一滴の音

A pop star is usually the product of collective effort. Songwriters, producers, managers, labels, publishers, press agents, vocal coaches, stage parents, booking agents, stylists, promoters, music video directors, other industry players, and fans all come together to drive the voice, face and personality – the pop star – to become extrahuman: to achieve immortality through hit singles and albums. Their songs are explosively resonant with large groups of people, striking the ley lines between catchiness, emotion, fashion and contemporary attitude. Hit songs are sung in herds; used to harvest royalties and sell out stadiums; become banal and fade away; and perhaps, live second lives sampled or covered by the next generation of pop stars. These songs and concomitant catalogues generate timelines of cultural clues, revealing the evolving social dynamics by which common appeal and desire change over time.

Hatsune Miku is unique among pop stars active today in that her song catalogue is the largest of any artist in the history of the world. It may sound dramatic, but the diminutive permanent 16-year-old with body-length teal pigtails has over 100,000 songs in her catalogue. What is also unique about Miku is that these songs are almost entirely written by her fans; Miku literally sings their words for them. She is the face, figure and personality of Crypton Future Media's Vocaloid 2 software. Anyone with the software can program songs for her to sing, chaining syllables to a melody along a timeline, adding moments of

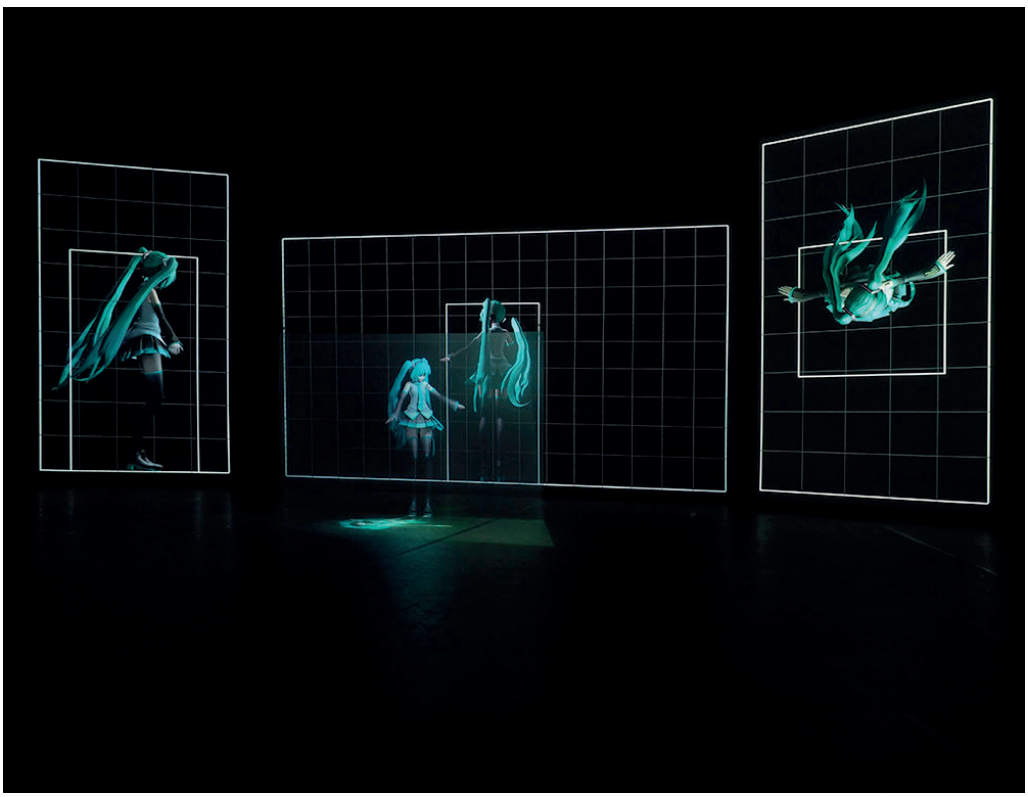
melismatic, accented or soft delivery. One can even control the intensity and duration of her vibrato. She is primarily created by her fans, for her fans to consume.

Miku is a typical example of both *doujin* culture in Japan – that is, amateur self-published fan creations based on famous characters – and *nijisousaku*, literally translated as secondary derivatives. Yet when her fans also create her massive catalogue, it presents a hitherto unseen hybrid of pop, *doujin* and *nijisousaku* culture. She is both the receptive and reflective vessel of her fans; a depository for the emotions, ambitions and talents of would-be pop songwriters, producers and recording artists; a voice singing songs written by the masses, for the masses. Several of her songs have gone on to chart in Japan, and dozens more have millions of views on both YouTube and the Japanese equivalent, Niconicodouga. Fans also produce her music videos: creators have made open-source 3D models of Miku that can be choreographed in the user-generated freeware program Miku Miku Dance (MMD), both now intrinsic to the whole creation process. Thus both the fan-written and fan-animated videos proliferate.

Crypton Future Media was prescient to identify the viral *doujin* potential of Miku, and has almost entirely allowed unhindered derivations of Miku, provided that they do not harm the character, or hurt or offend anyone. In providing such freedom they not only caused a huge spike in Vocaloid 2 sales, but also a mass explosion of Miku content. Within a few years, Miku herself began to emerge as more than a mascot: she was becoming a pop star with a personality, with brand power far beyond the scope of singing software. During this time various companies including Google, Toyota and Family Mart all featured her in advertisements, and further spin-off products followed, including SEGA's Project Diva dancing video game and Korg's Miku Stompbox vocal effects pedal. And naturally, she gave and continues to give concerts to audiences in the thousands across the world, performing on stage with a live band behind her – as well as to the most personal one-to-one bedroom audiences at home.

Still Be Here is a hybrid performance piece featuring Hatsune Miku, collaboratively created by five artists from various disciplines: sound artist Mari Matsutoya, composer Laurel Halo, digital artists Martin Sulzer and LaTurbo Avedon, and choreographer Darren Johnston. Our aim was to create a work that reflected on Miku's various parallel identities, in the typical fashion of her creation – networked and collaborative. We came together under the name of Hatsune Miku, to explore a collective existence in a capital-driven society. It sheds light not only onto her, but also onto the protagonists behind her, beyond the screen. With this piece we attempt to scrub the components of her illusion, of her stardom, of her nature as a collective fantasy, all of which is born out of a Yamaha Vocaloid software script, and a character licensed under Creative Commons by Crypton Future Media.

The format of *Still Be Here* lies some-



The premiere of *Still Be Here* at CTM/transmediale, 2016. Photo: Udo Siegfriedt.

where between concert and documentary, using both original and existing visual, lyrical and musical materials; the piece plays out in the precarious grey zone inhabited by so many anonymous producers who use derivative material, including Miku's *doujin* creators. Each of the songs in the piece are original compositions, but the lyrics are taken from many sources: the folk song underlying a common crosswalk song in Japan; fragments of various Miku songs; a love letter from a fan; slogans from the corporations who have used her as a mascot. Her dance sequences were motion-captured from a live dancer and grafted onto the beautiful Miku model by illustrator Tda, using pop music videos as reference points for her movement. Her environment is made of various components of MMD stages and props, freely available in exchange for accreditation.

When the Vocaloid software became available to the public for the first time, Miku's songs were written through "her" perspective, with lyrics from her "personal" experience defined by her age, status as a not-yet-realized pop star, and relationship with her 'master' songwriters and producers. Assumptive teengirl issues – love, longing, cute boys, general insecurity – were mixed with the existential issues that come with being a virtual pop star: probing the relationship

between herself and her songwriters; her ambitions to hit number one on the charts; her continuing relevance despite her solely digital experience. There is a fair amount of angst over impermanence and power imbalance within her songs; the relationship between Miku and her "masters" is often fraught – her wanting to succeed for them, yet never actually feeling up to the task. Certain songs like "The Disappearance of Hatsune Miku" even go so far as to illustrate a suicidal, self-hating Miku, desiring to be no more, to be deleted (paralleling, perhaps, the common desire to scrub the Internet of one's "true" identity). Just like a real celebrity, we see Miku work through various phases of identity crises that are retraceable through her lyrical deposit. This perspective is apparent in the fact that the earliest songs on iTunes using Vocaloids are credited simply to Hatsune Miku, and the producers' names are nowhere to be seen. It is only later on that the songs began to be credited as: [producer's name] ft. Hatsune Miku; and then further on, just the producer's name.

I wake up in the morning
And immediately I start to think of you
I decided to cut my bangs
Just to hear you say, "What happened?"

朝目が覚めて
真っ先に思い浮かぶ君のこと
思い切って前髪を切った
「どうしたの」って聞かれたくて

– ryo, "Melt"

Users gradually got used to the idea of Miku as a packaged singer, and through this shift, she was able to achieve a certain level of autonomy. The lyrics were no longer tied to her assumptive world view, but rather expressed those of the producers. Consider the fact that many Japanese music journalists (including Tomonori Shiba, author of *Why Did Hatsune Miku Change the World?*) identify the song "Melt" as a huge turning point for the *Hatsune Miku-genshou* (Hatsune Miku phenomenon). In "Melt", Miku depicts a shy girl who gets her bangs cut so that her boy will notice; a generic but real-world experience that is not specific to Miku's perspective as a virtual pop star. The autonomy here is her escape from the puppetry on behalf of the creators, and she is recognized instead as simply a singer, with lyrics both unchained from her experience and possessing complicated human metaphoric expression. This was a huge moment for the original developers of the Vocaloid software, as it meant that she was, for the first time, recognized not just as the digital songstress trapped in your computer, but as a more universal pop star figure.

At the same time, because of its accessibility to the general public, "Melt" sparked a chain reaction of another kind of song production, namely the *utattemita* and later the *odottemita* songs (literally translated as "I had a go at singing it" and "I had a go at dancing it"), where amateur creators started to sing and dance Vocaloid songs as humans. There are countless Niconicodouga and YouTube videos to be found of young wannabe singers

and dancers performing known Vocaloid songs, often in elaborate costumes and backgrounds, with thousands of views. It does not come as a surprise, then, that many Vocaloid songs have gone on to top the charts of most-requested karaoke songs. It has now become completely routine for the Japanese karaoke-goer to learn the melodies and lyrics of the Vocaloids by heart so they can score high points when they perform (Japanese karaoke systems have scoreboards for the more serious customers).

I finally reach you
君にたどり着く

In *Still Be Here*, the songs and concurrent "music videos" are interspersed with interviews from Miku experts: media professor Mitsuhiro Takemura, Miku's father-figure and creator Hiroyuki Itoh, cosplayer Rudolf Arnold, and an artist currently researching Miku cosplayers, Ann Oren. The interviewees all appear on the screen as different variations of Miku as they speak, again breaking down the illusion of a specific Miku concept to a general or a multiple, and each give their own opinion. The media professor Takemura contextualizes her somewhere between Benjamin's concept of phantasmagoric sex workers and McLuhan's "angelism", a dystopian trap in which adhering solely to concepts can cause a gradual rejection of the flesh. Her original creator Itoh describes her matter-of-factly as a "character product", a business venture designed to captivate the imagination of the consumer in order to proliferate copies of the Vocaloid software. The cosplayer, Arnold, has a perhaps more nuanced take: a male mathematics teacher from Germany in his 60s, he is interviewed in his classroom in full Miku costume, describing the costume's various James Bond-like weapons – where a standard Miku costume might be a lightly-teched-out schoolgirl with teal facial makeup details, his Miku is a patent leather, near-mecha fighting machine with polarized face mask and cybergoth dreads. (There are tender moments in the video interview: the mechanical sound of his Miku's "weapons" unfolding from the torso, his "jet packs" knocking into a student's desk.) Oren describes such cosplayers' actions as exhibiting "character love", and notes how this extreme fandom is often untethered to gender or age.

We also move through spatial dimensions in the piece. Arnold's segment is the only point at which real-life footage is shown, whereas the rest of the piece consists of rendered realities. Miku on center-stage sways in between these realities in what we could perhaps call 2.5D, a dimension between animated and actual that is becoming increasingly popular in Japan. Moving in and blurring the gaps between the two-dimensional character and the real life fan is a central facet of *doujin* and manga culture. Consider that Saki Fujita, the voice actress behind Hatsune Miku, has herself become something of a celebrity, as have the other voice actresses behind the Vocaloid series, regularly performing on stage for

the Vocaloid fans – and on request, occasionally and rather eerily slipping into their Vocaloid character's "real" voices. Further to this blurring is the common practice of cosplay and the unending quest to "become" the beloved character. Now there are slip-on head-dresses which can instantly transform you into whomever you please; it no longer suffices to wear elaborate wigs, costumes or makeup to emulate the characters – there is too much of a jump between human and character. The effect is at its best when photographs are taken and they are reduced back into two dimensions. More 2D, more real.

This jarring gap sheds some light onto the criticism *Still Be Here* faced on some Vocaloid fan forums. To some, it was an unfaithful adaptation of their pop princess, untrue to her original form. Some worried about how the general audience would perceive her (and therefore the cult following around her) if this were to be their first encounter. For others, the light shows, the outlandish costume changes, the catchy famous songs, and other hallmarks of her usual shows were missing. On the other hand, there were many fans who embraced the idea of a fluid, shape-shifting Miku, defending the culture of difference. After all, one glimpse of the MMD model download page will confirm that a host of user-generated versions can be found (including but not limited to baby Miku, mama Miku, policewoman Miku, even male Miku). In making the piece, we had touched on the nerve-endings of a powerful illusion, and thus found ourselves caught in the crosshairs of Miku's most ardent fans, those passionate individuals so essential to her ouroborotic celebrity.

What, then, would constitute Miku's "original" form? Just as snowflakes need only adhere to their crystalline, hexagonal form, so too is Miku simply a set of parameters as outlined by Crypton Future Media. Her prototype might in this case correspond to the official drawings by the illustrator, Kei, but the vast sea of derivations encouraged by the Creative Commons License ensures that she will never be reduced to a single depiction. This multiplicity is her power, and this became the focus of our piece. It is unfortunate that so much of the literature around her tends to concentrate on the "victim" aspect of her being, because by her very nature she rises above any one subjectivity or emotion, and is quite able to rationally point out certain flaws in our own society – an obvious one being the treatment of female icons as objects.

UNINTENDED CONSEQUENCES?

Katriona Beales in conversation with William Tunstall-Pedoe

"Without control, unintended consequences could be far worse. […] So you could make the argument that the fact that it's under people's control is a good thing. You may regret who controls it, but at least as it's controlled by someone, there is some mechanism for change."

– William Tunstall-Pedoe to Katriona Beales

This interview was first published as a booklet, commissioned for the Artificially Intelligent display at the V&A – Victoria and Albert Museum, London, September 7– December 31, 2018, curated by Irini Papadimitriou.

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Katriona Beales (KB) is an artist who makes digital artefacts, moving image, sculpture and installation, stressing the continuing role of physicality in digital life. Her work explores technology and mental health, experiences of the technological sublime, and notions of a Digital Baroque.

William Tunstall-Pedoe (WT-P) is a British entrepreneur focused on world-changing Artificial Intelligence products. He founded Evi, a Cambridge UK voice-assistant startup which Amazon bought in 2012 and then had a senior product role defining, developing and launching Alexa

This conversation took place on April 22, 2018.

KB: Thanks for meeting me William, I thought we might start by discussing one of the things that you are most well-known for: making Evi, the precursor to Alexa…

WT-P: It was a ten-year journey. Evi, or as it was known, True Knowledge, was the name of the start-up and was around for seven years. We were developing the technology that involved understanding natural language and so forth. And then Amazon bought it and I was in Amazon for three and a half years working on Alexa, as part of the team that built, defined and launched it. I left Amazon over two years ago and do not speak for the company.

KB: You've mentioned to me before about Alexa and people being critical of her having a female voice. I wanted to hear your thoughts on that discussion as it's difficult for me to think it except from a feminist point of view, in light of the history of female domestic servitude.

WT-P: I get asked this question a lot. Part of me thinks that if these devices had been men, people would also criticise and I'd be hearing things like, 'did you make it a man because you think women aren't intelligent?' If I'm an author and I'm writing a detective series, I define a character that takes that role, with a name, a personality, a gender… and it's the same when you're creating a voice assistant. That voice is either going to be male or female, I don't know how you can avoid that… Maybe you could try and create someone completely gender-neutral, call it Ashley and give it a voice where you can't tell if it's male or female. I don't think anyone has ever successfully pulled that off.

KB: Why do you think that is? There's a discourse now around gender fluidity and non-binary identities. These things don't have a gender, and won't have one unless you prescribe one, because it's a piece of software.

WT-P: No, it's taken the place of a person in the way that a lot of other products aren't. You are speaking with it, you are calling it a name…

KB: And do you see this sense of 'personhood' as central to its success?

WT-P: I think it's an inevitable consequence of what it is. People personify.

Siri Screen I, 2018, Katriona Beales, oil pastel on cartridge paper, A4.

I've been deeply involved in the creation of two voice assistants, people inevitably interact with it socially, they say 'hello', they say 'thank you'.

KB: To take your analogy of a character within a book, Alexa is something much further reaching than that. You're creating parameters for a relational device going into tens of millions of people's homes, that's quite a lot of responsibility! Does it weigh heavily on you?

WT-P: Because you interact with it as a person, it's going take on society's concerns about that. We didn't invent this problem, this is a societal problem. I'm not saying it wouldn't be good to solve it or help with it, or not make it worse, but I honestly don't think that making a voice assistant female is intrinsically a bad thing. In many ways, it's a positive role it's an intelligent, positive character.

KB: I was interested to get a glimpse of your new complex cryptic crossword solving AI which has a dog avatar. I wondered whether non-human characters also offer a way forward…

One of the things I'd like to explore in this conversation is some of the complexities around the way AI is discussed within wider social discourse. As I was walking through the park this morning, I was thinking about this supposedly natural environment, which in actuality is a very artificial one that's heavily designed. I wonder about our understanding about what's natural and what's artificial within the systems that are around us. There's always a fear of emerging technologies and the implications of them. What are your reflections on this?

WT-P: Fear of change has been around for thousands of years. Sometimes it's rational, people like things the way that they are, and sometimes it's irrational, the fear of the unknown. Having said that there are some very genuine concerns around AI and technology change and the pace of change. As we start solving problems that computers previously were unable to do, products come along that didn't previously exist. Those products help people, sometimes replace people, they certainly change the environment we live in, and sometimes there's unforeseen problems that come out of that adoption as well. And those problems aren't necessarily solvable. I think technological change is in general very positive, but it definitely has unforeseen consequences.

KB: I think the pace of change is really significant because it means that the normalisation process of adapting to new technology in a sense never happens, so there's always this sense of being surrounded by these forces that are kind of out of our control or understanding or beyond our comprehension, McLuhan terms this the 'outerisation' phase[1].

WT-P: Yeah, there's evidence that the pace of change is accelerating. Impro-

1 Marshall McLuhan, *The Gutenberg Galaxy: The Making of Typographic Man* (Toronto 1962).

vements in technology help to create further improvements in technology. So the fact that I can search online for research projects and pull up papers instantly means I can innovate faster. In principle, autonomous vehicles could be adopted in a few years, at the most optimistic – or pessimistic – pace of change. When millions of people are employed as drivers that's almost the worst example from an employment point of view. There's other things that are much more benign. I'm a backer in several businesses that are using AI for better diagnostics e.g. from MRI scans. Fewer people with cancer is unambiguously a good thing. There's not going to be mass unemployment of radiologists, but they are going to get a tool that enables them to do their jobs better and GPs will potentially be able to help patients immediately rather than them being referred to a specialist days or weeks later. I can't think of a second example, after autonomous cars, that will result in mass unemployment.

KB: I was thinking about one of Amazon's latest patents which is about using haptic technology to track workers' hand movements[2] in their order fulfilment centres, presumably so they can develop robotic systems to replace warehouse workers.

WT-P: Amazon acquired a business called Kiva Systems which has resulted in some automation of fulfilment. But robots can't do the last step of the process, what's called the grasping problem, which is a robot picking up an arbitrary object. That's incredibly difficult to do, there's lots of people working on it, and it's worth a huge amount of money for Amazon and others to solve.

KB: Because robots are cheaper than people…

WT-P: They're cheaper than people, they're potentially more reliable than people, they're potentially faster than people…

KB: Unless you're part of the 'digerati'[3] it's difficult to think about AI development (as currently focused on maximising profit) as a plus side for humanity, generally. What alternative models are there, in where you don't have this kind of outcome which feels fairly inevitable at the moment, of mass unemployment? What alternatives are there where AI can contribute to lessening inequality rather than just increasing it?

WT-P: So sitting in a warehouse, taking stuff off a shelf, putting it in a trolley, I don't think people find that fulfilling, they do it because they need the money. If those people were given the same income or given a more interesting job, that's a plus for them…

2 Alan Boyle, Amazon wins a pair of patents for wireless wristbands that track warehouse workers. *Geekwire* (January 2018). https://www.geekwire.com/2018/amazon-wins-patents-wireless-wristbands-track-warehouse-workers/, access: June 6, 2019, 16:00.

3 https://en.wikipedia.org/wiki/Digerati, access: June 6, 2019, 16:00.

KB: But then you're talking about an economic paradigm where there's universal basic credit, and that requires companies like Amazon to pay more tax than they do…

WT-P: Are we causing mass poverty by denying people an ability to make any money? Or are we changing the labour market in a way that's positive for society and results in more prosperity for everyone? As you say it is a government thing. It's about how the resources of the nation are divided.

KB: The people who have the power to make these decisions are people with a lot of money who will be cushioned from a lot of the consequences. There seems to be a lot of unintended consequences, but actually if some of these things were thought about critically in advance, then you can see that they are inevitable. Hito Steyerl terms this "artificial stupidity."[4] So this comes to questions about trust, and about how that operates in relation to various different AI systems.

WT-P: I think, to some extent, trust isn't something that you choose to do, it's something that happens.

KB: I was looking at Open AI.[5] Their mission 'is to ensure that artificial general intelligence, by which we mean highly autonomous systems that outperform humans at economically valuable work, benefit all of humanity and avoid enabling uses of AI or AGI (Artificial General Intelligence) that harm humanity or unduly concentrate power'. But given that AI systems are already unduly concentrating power, how possible do you think it is to create this ethical AI framework? Because there has to be a global consensus, that there's certain things like autonomous weapons we don't want to develop…

At the moment, 2018, Katriona Beales, design for silk print.

WT-P: Autonomous weapons worry me. The technologies are already there, I can already programme an automated sniper that can shoot people automatically for example. This isn't an AGI scenario whe-

4 Hito Steyerl and Kate Crawford, *Data Streams, The New Inquiry* (2017) https://thenewinquiry.com/data-streams/, access: June 6, 2019, 16:00.

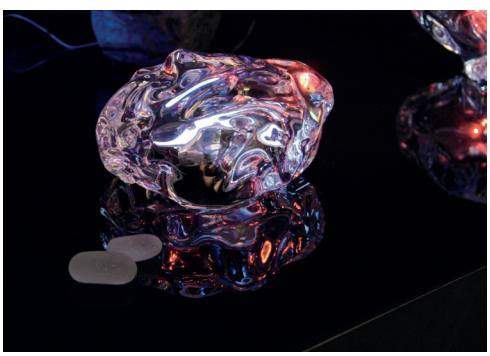
5 https://openai.com/, access: June 6, 2019, 16:00.

re there are multiple innovations needed, the technology is already good enough to spot people, to identify different races of people, it is absolutely terrifying. These are legitimate concerns which aren't actually bounded by technology limitations, it's bounded by will. At the other end of the spectrum, there's unintended consequences of existing AI – the Facebook's newsfeed algorithm is a good example.

KB: This phase has come up a few times – let's talk about unintended consequences…

WT-P: In terms of Facebook – I don't think there was anything evil about the intention to maximise peoples' attention but as a consequence, people have found if you write sensational articles that are fundamentally untrue, those get more attention, they make more money from advertising, and AI can't distinguish invented news from real news. Then you combine that with the scale Facebook's operating at, and human beings can't fix it very easily either as there are literally billions of people using Facebook.

KB: My previous body of work, 'Are We All Addicts Now?'[6] was about the way that attention is manipulated online, and the way that most platforms are designed to ensure people spend as much time as possible there to maximise advertising budgets. This leads to these addictive technologies which then actual people (like myself) unsurprisingly find very difficult to regulate. In the 1950s BF Skinner (one of the founders of Behavioural Psychology) came up with the principle of variable reward, a principle utilised in casinos and now in online platforms where the unpredictability of content creates these dopamine cycles – a chemically addictive sort of feedback loop. I just wonder what effect this has on the subjectivities that are being created when swathes of people are treated as 'users'?



Detail of *Working Table IV*, 2017, Katriona Beales, glass sculpture with embedded raspberry pi screen displaying moving image work placed on a black glass trapezoid table, dimensions variable, shown as part of 'Are We All Addicts Now?' at Furtherfield 2017. Photo: Katriona Beales.

WT-P: I don't really subscribe to that characterisation. Nobody in any of these big tech companies has meetings where they say, 'How can we exploit our users or make them dependent on our product?'. Some degree of dependency may be an unintended consequence, as in the advertising model, attention is what's being monetised. And there are all sorts of problems with the advertising model, I'm in agreement on that.

6 http://www.katrionabeales.com/project/are-we-all-addicts-now/, access: June 6, 2019, 16:00.

KB: But I don't know if that makes it any less problematic, because possibly it wasn't intentional…

WT-P: No, people are still responsible for the consequences of the products they build. I'm not letting them off the hook. It was intentional in the sense that people wanted the product to be used, but language like dependency and addiction have got a lot of negative connotations. The more positive viewpoint is that it's a very good product that people want to use – and choose to use. At the end of the day, you can stop using Facebook.

KB: But social media platforms deliberately use gamification strategies to create addictive experiences. Sean Parker, one of the original investors in Facebook[7] has said "It's a social-validation feedback loop … exploiting a vulnerability in human psychology." And to give another example, Loren Brichter[8] who developed 'pull to refresh' has said "it is addictive and I regret the downsides". So these things are increasingly acknowledged but they're not rectified – these techniques and strategies are still utilised.

WT-P: They might agree that there are some negative side effects to what they're doing, and they may genuinely want to fix them, but I don't think they would agree that there's a net negative to society. Going back to the Facebook newsfeed algorithm, the world we live in is definitely a better one for having lots of different viewpoints rather than in the 1970s where there were three television channels, and everybody's news agenda was determined by some editor at the BBC who decided what things were newsworthy. But the negative consequences is that there's fake news and conspiracy theories and polarisation…

KB: No, but if you create an attention economy, if you'd thought through that process fully enough, it's a logical conclusion to get a lot of very sensationalised, made-up content which is purely about grabbing attention.

WT-P: I agree and I think this is a problem with the advertising model actually. And this is also a problem with being a public company…

KB: In a sense, a problem with shareholders, a problem with techno-capitalism…

WT-P: Well actually, in Facebook's case, Mark Zuckerberg is essentially dictator at Facebook, he has voting shares that allow him to override shareholders that might be purely motivated by financial returns. There was actually a dip in the Facebook share price not so long ago when Mark Zuckerberg went on the record saying that he would compromise revenue for fixing some of the problems that had been

7 Olivia Solon, Ex-Facebook president Sean Parker: site made to exploit human ‚vulnerability'. *The Guardian* (November 2017). https://www.theguardian.com/technology/2017/nov/09/facebook-sean-parker-vulnerability-brain-psychology, access: June 6, 2019, 16:00.

8 Paul Lewis, ‚Our minds can be hijacked': the tech insiders who fear a smartphone dystopia. *The Guardian* (October 2017). https://www.theguardian.com/technology/2017/oct/05/smartphone-addiction-silicon-valley-dystopia, access: June 6, 2019, 16:00.

Siri Screen II, 2018, Katriona Beales, oil pastel on cartridge paper, A4.

identified.[9] He should get credit for that.

KB: That's a huge responsibility we are trusting an individual with. Frankly, that's a bit terrifying. There's a book by Seb Franklin called *Control*[10] and basically his thesis is that control is the underlying logic of digitality because everything is about being able to be described in a very specific way in code. In "The Californian Ideology", way back in 1995, Barbrook and Cameron[11] identify how the technologies of freedom are turning into machines of dominance. I think this goes back to what you were talking about, in terms of unintended consequences, because a lot of people who were fundamental in setting up a lot of these things in Silicon Valley come from a quite hippy background and value notions of personal freedom and expression. But these networks have grown to be so massive and turned into nexus of power. I wonder what alternatives there are to these tech oligopolies? Very few individuals, almost exclusively white men, have got the power or agency to shape how these systems function?

WT-P: Without control, unintended consequences could be far worse. At least with people controlling it, problems can be addressed, and change can happen. Look at Bitcoin for example, nobody controls Bitcoin, the only way to shut down Bitcoin would be to shut down the internet. One of the unintended consequences of Bitcoin is millions and millions of dollars per month of extra electricity being consumed and extra greenhouse gases going into the environment. And there isn't a white man, as you put it, somewhere who can be pressured to stop that. So you could make the argument that the fact that it's under people's control is a good thing. You may regret who controls it, but at least as it's controlled by someone, there is some mechanism for change. I think if it were to be taken out of the control of anybody, unintended consequences could not be fixed. I would love to understand what those models are, but I worry it could be worse that what we have right now.

KB: In light of this what do you see as the potential of the space of art?

WT-P: Art is quite liberating. If you're creating a product – a commercial product – you're constrained quite narrowly by what's useful, and what your market wants. But if you're producing an art exhibit, you can be free to explore things that the market will never explore.

KB: I agree that art offers a potential space to rethink, challenge and remake. I feel strongly that that potential is only really activated in interdisciplinary contexts and appreciate you making time for this conversation.

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9 Todd Spangler, Facebook Stock slumps after Mark Zuckerberg signals Major Changes to News Feed. *Variety* (2018). https://variety.com/2018/digital/news/facebook-stock-mark-zuckerberg-news-feed-1202662782/, access: June 6, 2019, 16:00.

10 Seb Franklin, *Control – Digitality as Cultural Logic* (Cambridge MA: 2015)

11 Richard Barbrook and Andy Cameron, The Californian Ideology (1995) *MUTE magazine*, http://www.metamute.org/editorial/articles/californian-ideology, access: June 6, 2019, 16:00.

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MEET THE MACHINE: THE SIDEMAN 5000 EDITION

By Darsha Hewitt

"Freeing the Sideman from its heavy wooden confines is like discovering a baroque electromechanical universe."

Suggested citation:
Darsha Hewitt, Meet the Machine: The Sideman 5000 edition. *Interface Critique Journal* 2 (2019), pp. 163–171.
DOI: 10.11588/ic.2019.2.66990

Name: Sideman 5000
Make: Wurlitzer
Job: Rhythm Generator
Date of production: 1959

Weight: 30kg
Measurements: 80x35x70cm
Country of Origin: Germany/USA

RHYTHM DEVICE

Filed April 14, 1961 5 Sheets-Sheet 1

Fig. 1.

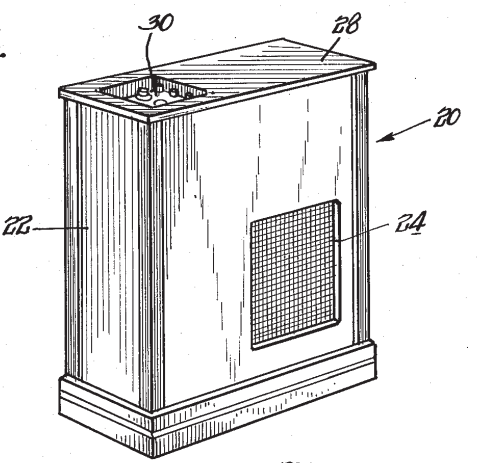
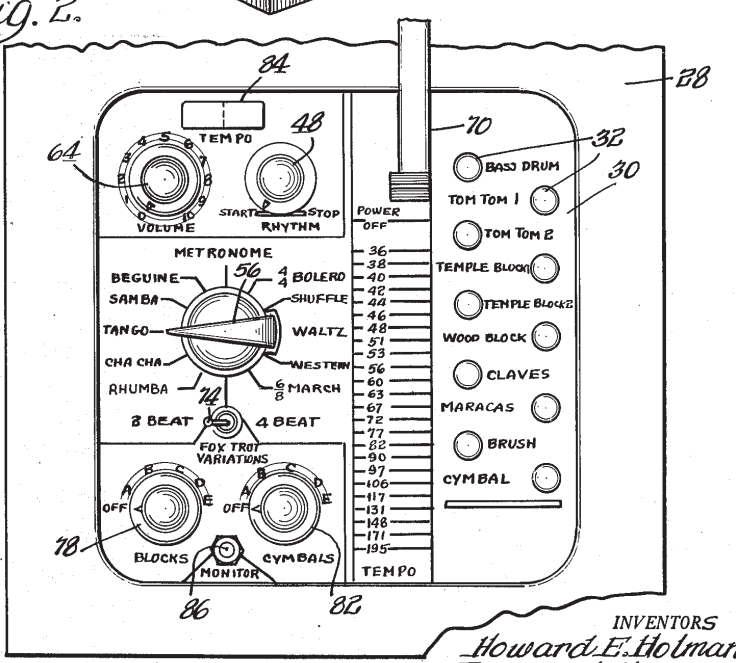


Fig. 2.



INVENTORS
Howard E. Holman
Joseph H. Hearne
Marvin C. Korinke
By: Olson & Trevor atty

Overview

Like most domestic audiovisual equipment of its time, from the outside, the Sideman 5000 looks deceptively like a piece of mid-20th century furniture designed to blend in with the living room decor. However, a closer inspection of its details reveals that this cabinet of sorts has a secret mission. And with its semi-sparkly inlayed speaker grill cloth and classy top mounted control panel with patina worn brass switches and knobs, it is one that will move you. Not only will you feel compelled to groove because its duty as a machine is to synthesize a variety of hardwired electronic ballroom variations at various speeds, but the urge to get up and dance is hard to control once you see what this machine is made of. Freeing the Sideman from its heavy wooden confines is like discovering a baroque electromechanical universe.

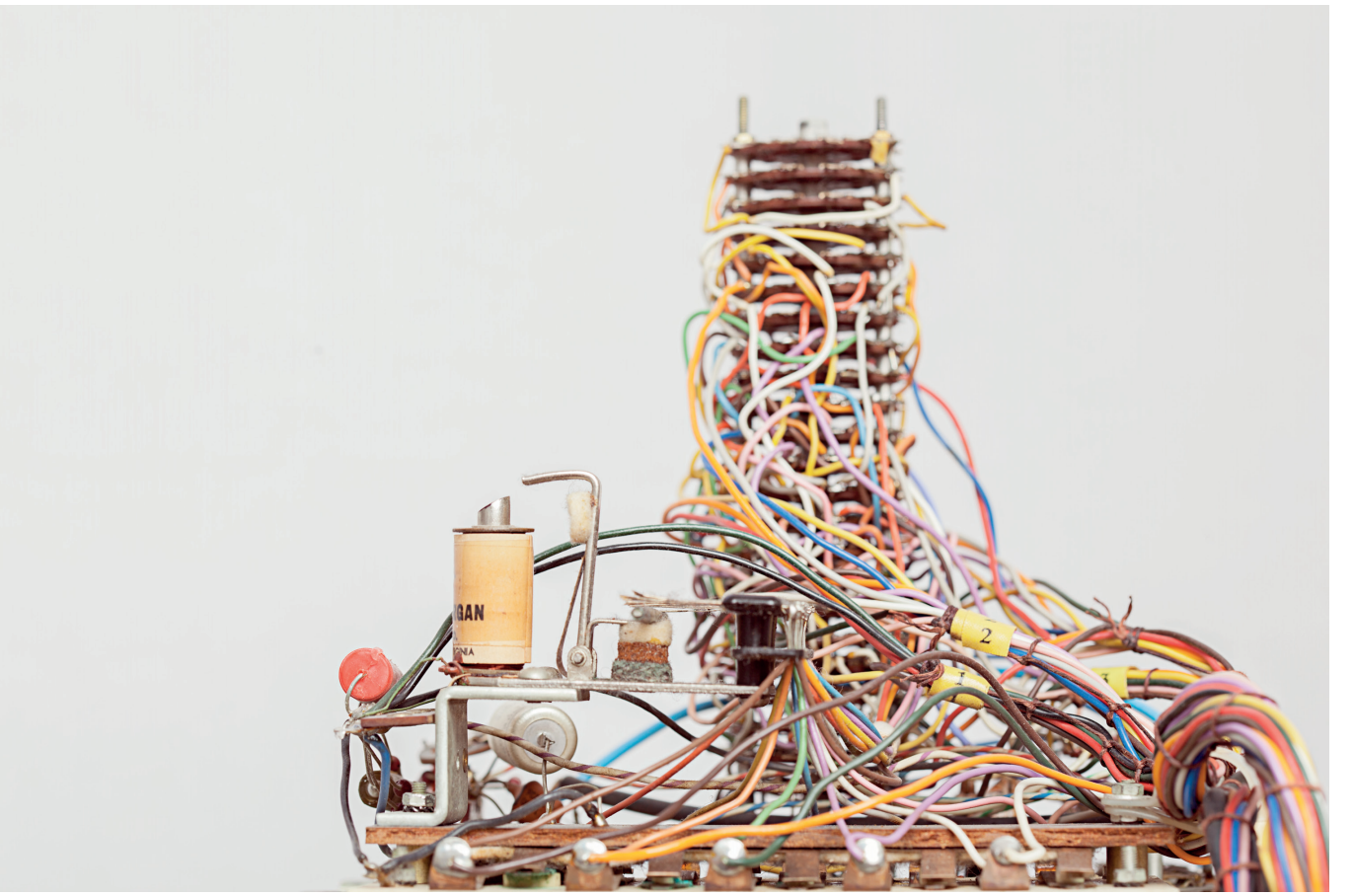
Technical Breakdown

Levered into action, the world's first commercially available drum machine warms up like a hearth. The dry smell of warm dust escapes as its ever inefficient vacuum tubes heat up to produce showers of electrons that shimmer through glass voids, across ornate clusters of resistor and capacitor and travers precisely inter-tangled networks of multicoloured wires. A wide band of frequencies awakens, awaiting filtering and amplification. Mechanically programmed renditions of the Rumba, Salsa, Cha Cha and Waltz embed themselves throughout the omnipresent drone of the tempo wheel. While tracing revolutions around a brilliant starburst circuit board, this electromechanical selector picks out sequences of synthesized instrument voices and generates a danceable beat. Though the Sideman was designed to maintain a consist steady rhythm, after a sixty-year career, naturally occurring effects such as material fatigue, electrolytic deterioration, frequency leakage and contact corrosion cause it to echo in and out of sync with time.

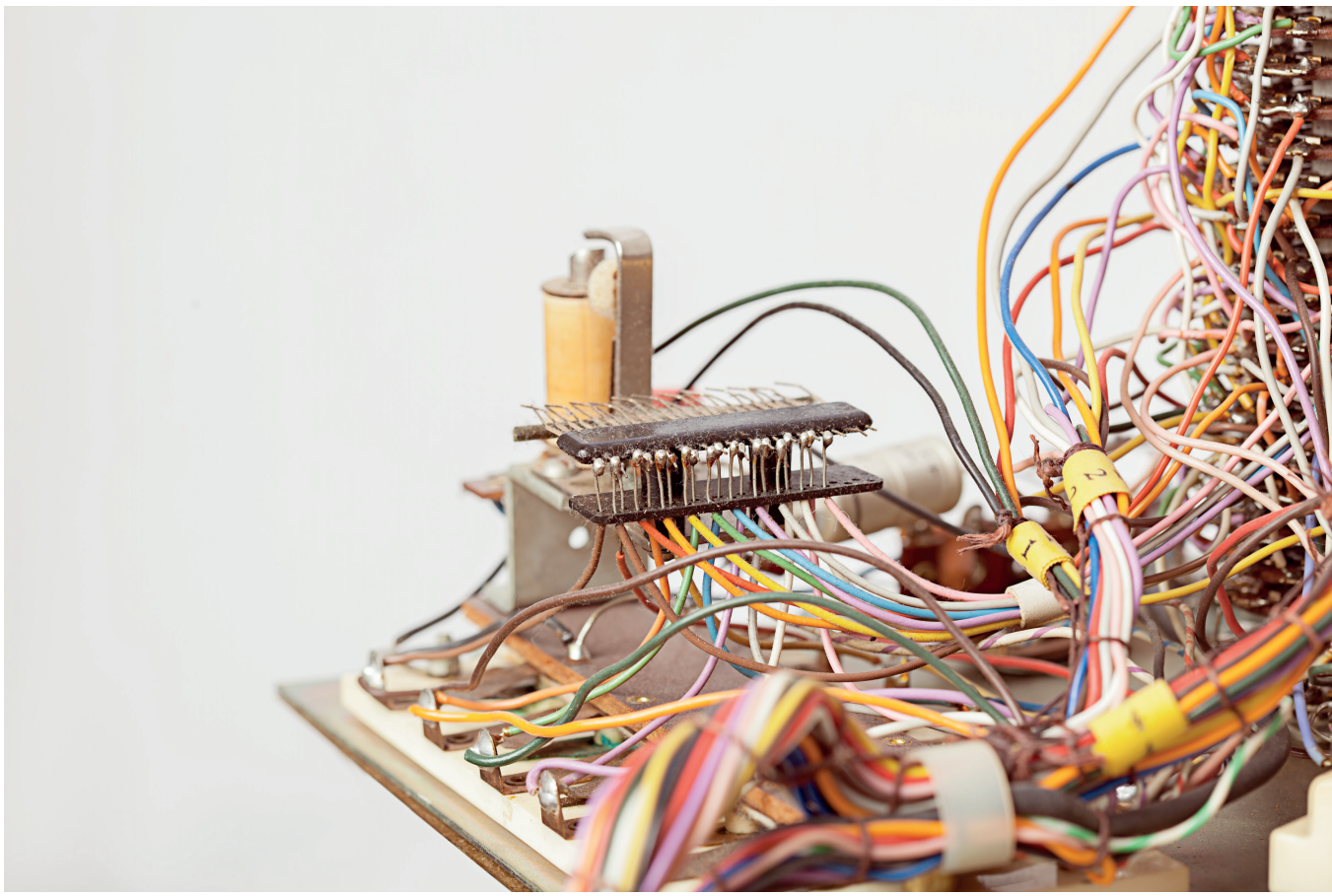
Warning

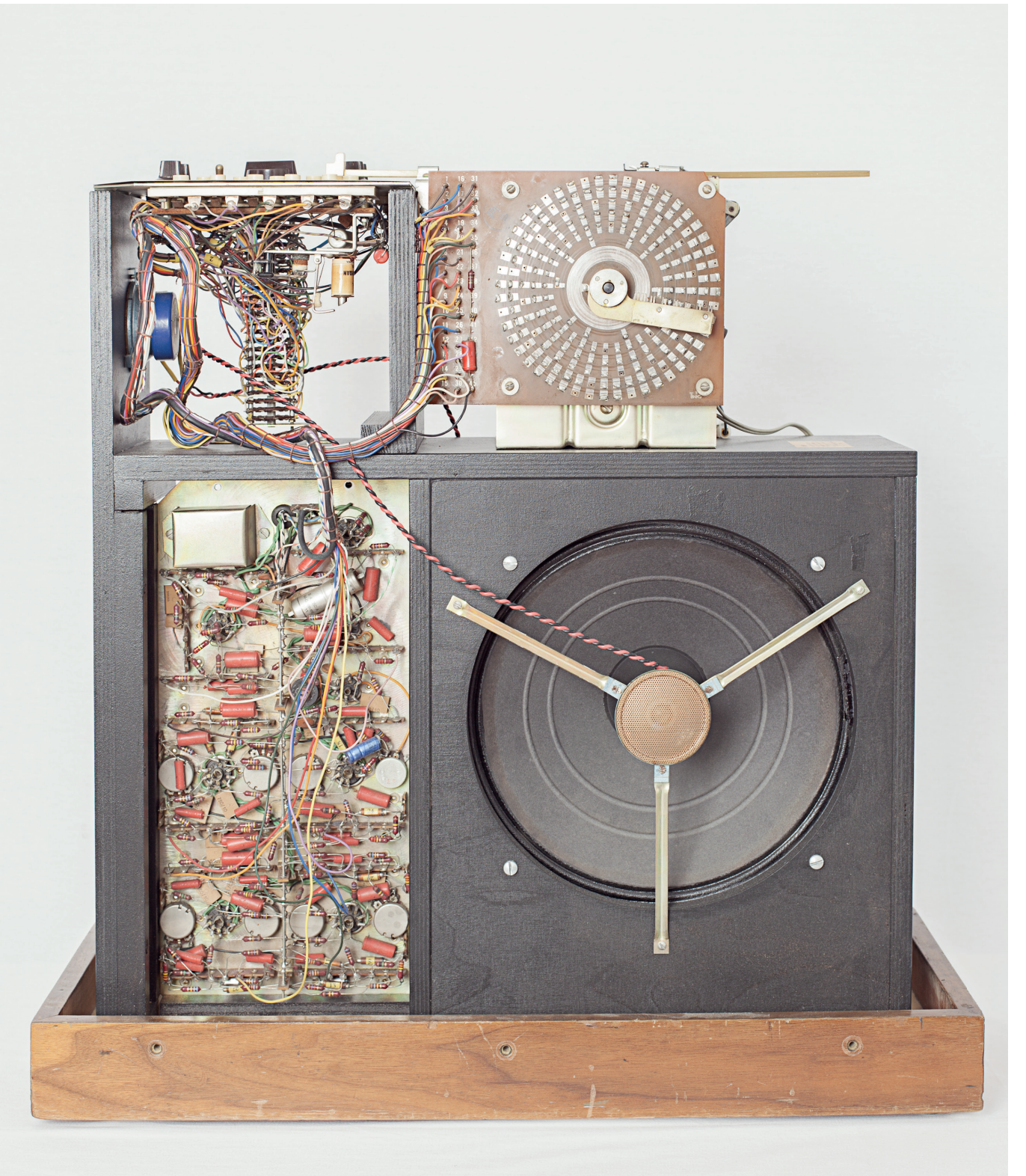
(1) Don't let romantic geeks lie to you. The Sideman is not obsolete nor are its vacuum tubes rare. Though its commercial life was cut short due to the influx of much smaller, more efficient and economic transistor technology, this machine was built to last. It's not a problem that all the original Sideman technicians are retired – all parts are user serviceable and the manual will show you the way.

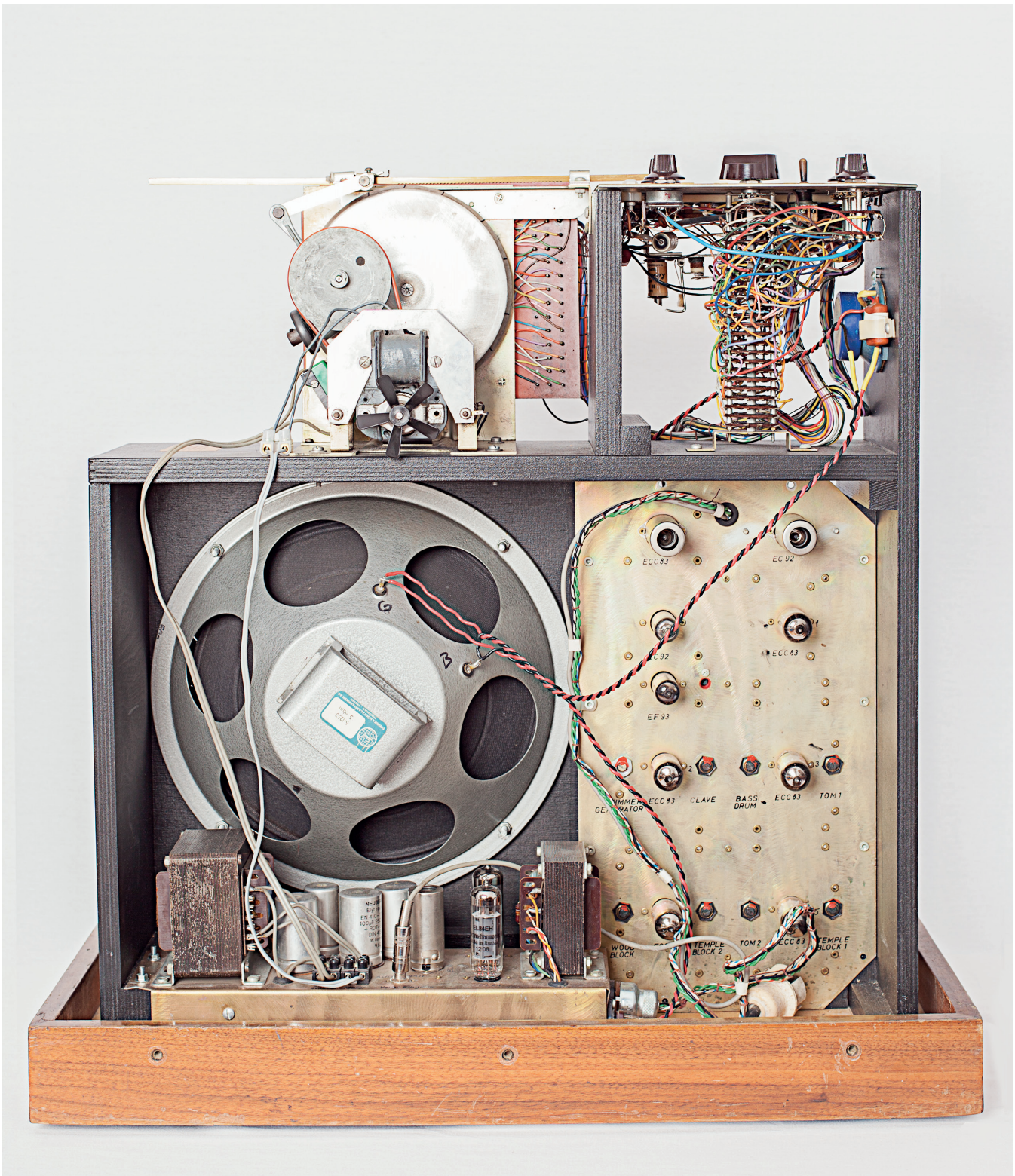
(2) Question your dance music. This machine demonstrates that today's techno is yesterday's Fox Trot, only sped up without enough time to glide across the entirety of the dance floor.



Shimmer Generators V.2D, 2018, is a photographic series by Darsha Hewitt. It was commissioned by the Eastern Bloc Media Arts Center in Montreal Canada and made in collaboration with Lena Maria Loose and Carolyn Meyer. »






ECC83
EC92
EC92
ECC83
EF93
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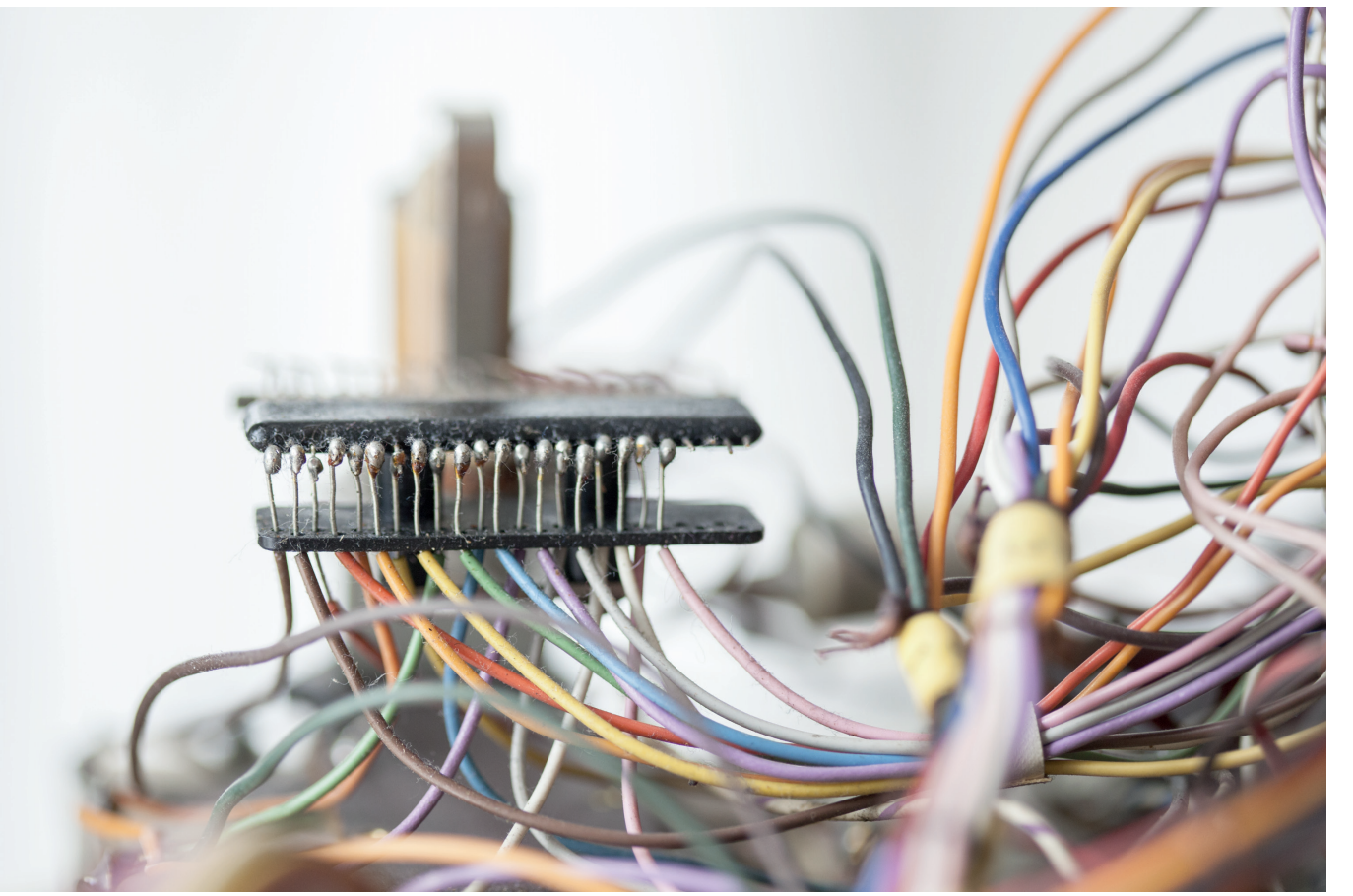
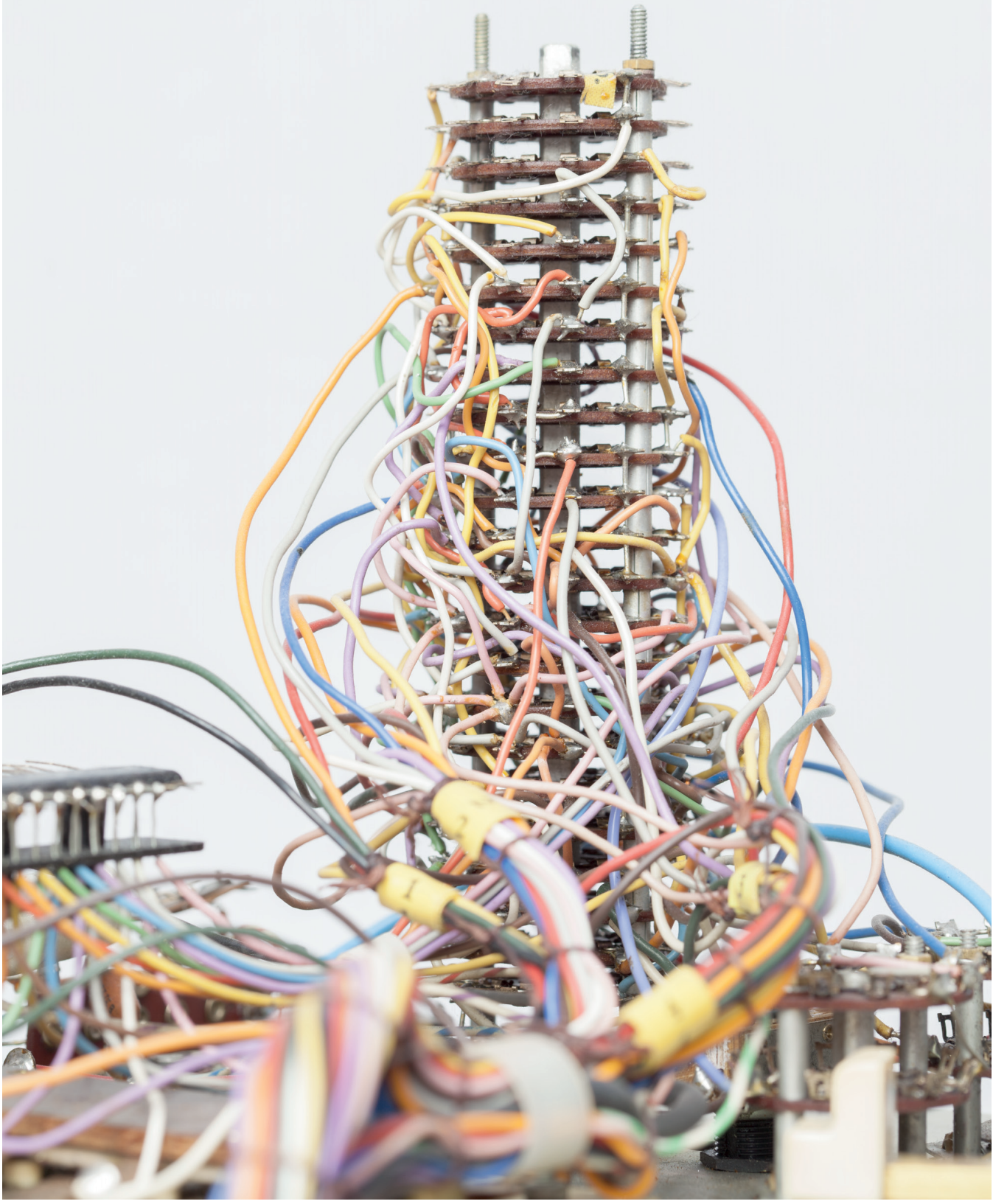
CLAVE
BASS DRUM
ECC83
TOM 1
TOM 2
ECC83
TEMPLE BLOCK 2
TEMPLE BLOCK 1
WOOD BLOCK





LITERARY TEXTS AS COGNITIVE ASSEMBLAGES: THE CASE OF ELECTRONIC LITERATURE

By N. Katherine Hayles

"The question then is: what kinds of conceptual and artistic frameworks will help us understand the implications of our participation in the hybrid human-technical systems that have become essential to contemporary life in developed countries?"

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N. Katherine Hayles, Literary Texts as Cognitive Assemblages: The Case of Electronic Literature. *Interface Critique Journal* 2 (2019), pp. 173–195.
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Interactive media include such important millennial art works as Simon Penny's *Traces* (1999), Camille Utterback's *Liquid Time Series* (2001–2010), Utterback and Romy Achituv's *Text Rain* (1999), and other works created around the turn of the 21st century emphasizing interactions between computational media and embodied performances by humans. These artworks were accompanied by a wide range of books appearing at about the same time arguing for the importance of enactive, embodied, and embedded cognition, including Edwin Hutchins,[1] Andy Clark,[2] Francisco Varela, Evan Thompson, and Eleanor Rosch,[3] Antonio Damasio,[4] Gerald Edelman and Giulio Tononi,[5] and many others, including my own *How We Became Posthuman*.[6] Some twenty years on, these views have become widely accepted and even pervasive; but we can now also see that they tended to focus on the actions of an individual person or at most a few people interacting with computational systems, leaving out of account the growing symbiosis between humans and computational systems. In our post-millennial moment approaching the two decades mark, computational media are increasingly integrated into complex infrastructural systems, often in ways not easily visible but nevertheless crucial for daily life in developed societies. Airport control systems, electrical grids, railroad and subway controlling and tracking systems, water purification systems, oil refineries, and a host of other systems rely on computational media to initiate, synchronize, control, and communicate their activities.

To see how far humans have progressed into symbiosis with computational media, we can engage in a disturbing thought experiment: what would happen to the human species if all computational media were fried tomorrow? All the systems that depend on computational media for their activity would instantly become inoperable, from automobiles and trucks to airplanes, railroads, and subways, cutting off supply lines; in addition, hybrid human-computer systems such as the electrical grid and water purification plants would begin to fail soon if not immediately. Communication via the web, cell phones, radio stations and television would be cut off; markets would crash; the global economic system would be plunged into chaos. It is not an exaggeration to say that perhaps the majority of humans now living on earth would perish. Many apocalyptic novels entertain such imaginaries, but my purpose here is somewhat different. In posing this thought experiment, I want to indicate how far into symbiosis with computational media we have already

1 Edwin Hutchins, *Cognition in the Wild* (Cambridge, MA 1996).

2 Andy Clark, *Being There: Putting Brain, Body and World Together Again* (Cambridge, MA 1998).

3 Francisco J. Varela, Eleanor Rosch and Evan Thompson, *The Embodied Mind: Cognitive Science and Human Experience* (Cambridge, MA 1992).

4 Antonio Damasio, *The Feeling of What Happens: Body and Emotion in the Making of Consciousness* (Boston 2000).

5 Gerald Edelman and Giulio Tononi, *A Universe of Consciousness: How Matter Becomes Imagination* (New York 2001).

6 N. Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago 1999).

come. When two species become symbionts, each gains advantages by interactions with the other, but they also become increasingly interdependent, thus making themselves vulnerable should something happen to their symbiont. This accurately describes our situation today with computational media. The question then is: what kinds of conceptual and artistic frameworks will help us understand the implications of our participation in the hybrid human-technical systems that have become essential to contemporary life in developed countries?

To explore this issue, my recent work has focused on what I call cognitive assemblages. Following Gilles Deleuze and Félix Guattari[7] as well as Bruno Latour,[8] I conceptualize an assemblage as a flexible and constantly shifting collectivity that includes human and technical actors, as well as energy flows and other material goods. A *cognitive* assemblage is a particular kind of network, characterized by the circulation of information through human and technical cognizers that drop in and out of the network in shifting configurations that enable interpretations and meanings to emerge, circulate, interact and disseminate. Cognizers are particularly important in this schema because they make the decisions and selections that give the assemblage flexibility, adaptability, and evolvability. Cognizers direct, use, and interpret the material forces on which the assemblage ultimately depends.[9]

This schema employs a definition of cognition crafted to include humans, nonhuman others, and technical devices. In *Unthought: The Power of the Cognitive Nonconscious* (2017), I define cognition as "the process of interpreting information in contexts that connect it with meaning".[10] A corollary is that cognition exists as a spectrum rather than a single capability; plants, for example, are minimally cognitive, whereas humans, other primates, and some mammals are very sophisticated cognizers. It has been traditional since John Searle's "Chinese Room" thought experiment[11] to argue that computers only match patterns with no comprehension of what that means (in his example, no semantic comprehension of Chinese). This view, however, is increasingly untenable as computational systems become more sophisticated, learning and experiencing aspects of the world through diverse sensors and actuators.

Much depends, of course, on how one defines the central terms "interpretation" and "meaning." Searle's example is obviously anthropocentric, since it imagines a man – a sophisticated cognizer – sitting in a room with the rule book and other apparatus he employs, obvi-

7 Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia*, transl. Brian Massumi (Minneapolis 1987).

8 Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (Oxford 2007).

9 Hayles, *How We Became Posthuman*.

10 N. Katherine Hayles, *Unthought: The Power of the Cognitive Nonconscious* (Chicago 2017).

11 John Searle, Minds, Brains, and Programs. *Behavioral and Brain Sciences* 3 (1980), pp. 417–457.

ously "dumb" affordances. The effect is to dumb the man down to the level of the affordances he uses, a painful reduction of his innate cognitive capacities (hence the anthropocentric bias, which implies that computers are much dumber than humans). We can continue to pat ourselves on the back for being so much more intelligent than computers, but in specific domains such as chess, Go and diagnostic expert systems, computers now perform better than humans. I argue it is time to move past thought experiments such as Searle's and take seriously the idea that computers are cognizers, manifesting a cognitive spectrum that ranges from minimal for simple programs up to much more sophisticated cognitions in networked systems with complex multilayered programs and high-powered sensors and actuators.

The fantasy of being completely autonomous has a strong hold on the American imagination, ranging from Thoreau's *Walden*[12] to Kim Stanley Robinson's Martian terraforming trilogy[13]. Yet even Thoreau used the planks and nails of a previous settler and walked into town more often than his notebooks allowed.

In the domain-specific area of writing, different attitudes toward our symbiosis with computational media are manifested. Dennis Tenan, in his excellent book *Plain Text: The Poetics of Computation*,[14] argues that writers should strive to maintain complete control over their signifying practices. Emphasizing that writing in digital media proceeds via multiple layers of code, or as he calls it, "textual laminates"[15], Tenen argues that writers should understand and have control over every level of the interlinked layers of code that underlie screenic inscriptions. Since many commercial software packages such as Adobe employ hidden code layers that writers are legally forbidden even to access, much less change, Tenen passionately advises his readers to avoid these altogether and compose with "plain text"[16], open-source software that does not demand compromises or sabotage the writer's intentions with hidden capitalistic complicities. We may think of Tenen as the Thoreau of digital composition, willing to put up with the inconvenience of not using pdfs and other software packages to maintain his independence and compositional integrity.

Even if a writer chooses to go this route, however, she is still implicated in myriad ways with other infrastructural dependencies on computational networks that come with living in contemporary society. So why single out writing as the one area where one takes a stand? Tenen has an answer: compositional practices are cognitive, and therefore of special interest and concern for us as cognitive beings.[17] I respect his argument, but I

12 Henry David Thoreau, *Walden; or, Life in the Woods* (Boston 1854).

13 Kim Stanley Robinson, *Blue Mars* (New York 1997); *Green Mars* (New York 1995); *Red Mars* (New York 1993).

14 Dennis Tenen, *Plain Text: The Poetics of Computation* (Stanford: 2017).

15 Ibid., p. 5.

16 Ibid., p. 3.

17 Ibid., p. 52.

wish to point out that other practices are also cognitive and so writing in this respect is not unique. Moreover, resistance is not the only tactic on the scene. Other writers are of the opposite persuasion, embracing computational media as in a symbiotic relation to human authors; they are interested in exploring the possibility space of what can be done when the computer is viewed as a collaborator. For writers like these, new kinds of questions arise. How is creativity distributed between author and computer? Where does the nexus of control lie, and who (or what) is in control at different points? What kinds of selections/choices does the computational system make, and what selections/choices do the human authors encode? What role does randomness play in the composition? Is the main interest of the artistic project manifested at the screen, or does it lie with the code? These are the questions that I will explore below.

Slot algorithms: Nick Montfort's "Taroko Gorge"

One way of enlisting the computer as co-author is to create what Christopher Funkhouser calls "slot" algorithms,[18] with databanks parsed into grammatical functions (nouns, verbs, adjectives, etc.) and a random generator choosing which word to slot into a given poetic line. The method is straightforward but nevertheless can generate interesting results. One such poem is Nick Montfort's "Taroko Gorge," written after he had visited the picturesque Japanese site.[19]

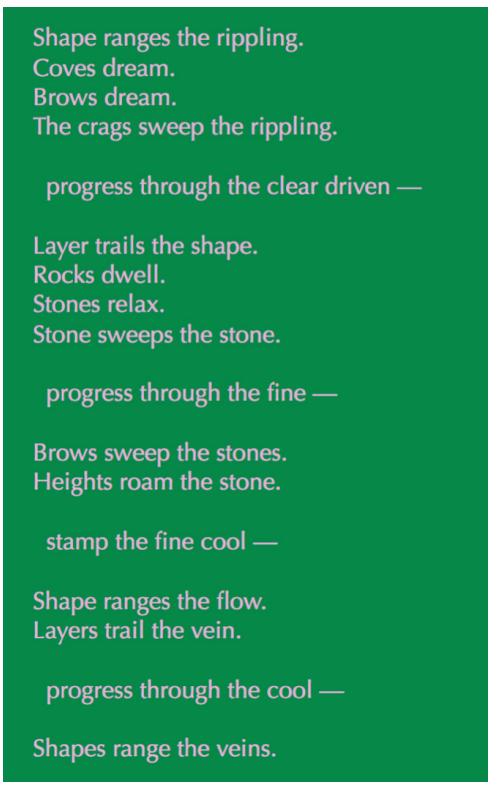

Fig. 1: Screen shot of Nick Montfort's *Taroko Gorge*.

The vocabulary evokes the beauty of a natural landscape, including nouns such as "slopes," "coves," "crags," and "rocks," and verbs like "dream," "dwell," "sweep" and "stamp." Montfort posted the source code at his site, and in a playful gesture,

18 Christopher T. Funkhouser, *Prehistoric Digital Poetry: An Archaeology of Forms, 1959–1995* (Tuscaloosa, AL 2007), p. 40

19 Nick Montfort, *Taroko Gorge*; https://nickm.com/taroko_gorge/, access: March 26, 2018.

Scott Rettberg substituted his own vocabulary and sent Montfort the result.

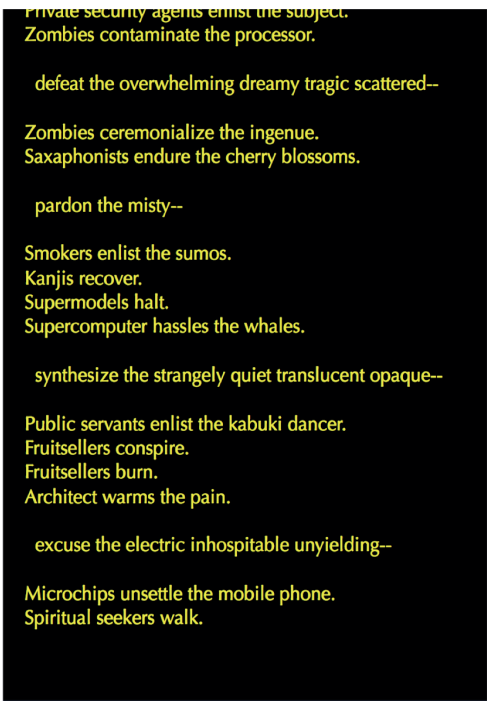

Fig. 2: Screen shot of Scott Rettberg's *Tokyo Garage*.

In Rettberg's version, "Tokyo Garage," the generator produced such lines as "zombies contaminate the processor" and "saxophonists endure the cherry blossoms."[20] Others took up the game, and Montfort's site now hosts over a dozen variants by others. Stuart Moulthrop raises important questions about what this technique implies: "The extension of the text into reinstantiation – the reuse of code structures in subsequent work – raises questions about the identity of particular texts. It also brings into focus the larger identity question for electronic literature. Code can do things and have things done to it that conventional writing cannot […]. Digital media lend themselves to duplication, encapsulation, and appropriation more readily than did earlier media […]. [D]ifferences of scale may be […] very large indeed. At some point, pronounced variations in degree may become effectively essential. At the heart of this hyperinflation lies the willful use of databases, algorithms, and other formal structures of computing."[21]

Other than the ease with which code can be remixed, what else can we say about the computer as co-creator here? Obviously, the program understands nothing about the semantic content of the vocabulary from which it is selecting words. Nevertheless, it would be a mistake to assert, à la Searle, that the computer only knows how to match patterns in a brute force kind of way. It knows the data structures and the syntax procedures that determine which category of word it selects; it knows the display parameters specified in the code (in the case of "Taroko Gorge," continuously rolling text displayed in light grey font on green background); it knows the randomizer that determines the word choice; it knows the categories that parse the words into different grammatical functions; and it knows the pace at which the words should scroll down the screen. This is far more detailed and complex

20 Scott Rettberg, T*okyo Garage*; http://nickm.com/tokyo_garage/, access: March 26, 2018.

21 Stuart Moulthrop and Dene Grigar, *Traversals: The Use of Preservation for Early Electronic Writing* (Cambridge 2017), Kindle version, pp. 37–38.

than the "rule book" that Searle imagines his surrogate consulting to construct answers to questions in Chinese. Using the philosophical touchstones of "beliefs," "desires" and "intentions" that philosophers like to cite as the necessary prerequisites for something to have agency, we can say that the computer has beliefs (for example, that the screen will respond to the commands it conveys), desires (fulfilling the functions specified by the program), and intentions (it intends to compile/interpret the code and execute the commands and routines specified there). Although the human writes the code (and other humans have constructed the hardware and software essential to the computer's operation), he is not in control of the lines that scroll across the screen, which are determined by the randomizing function and the program's processes.

What is the point of such generative programs? I think of John Cage's aesthetic of "chance operations," which he saw as a way to escape from the narrow confines of consciousness and open his art to the aleatory forces of the cosmos, at once far greater than the human mind and less predictable in its results.[22] As with generative poetry, a paradox lurks in Cage's practices: although the parameters of his art projects were chosen randomly, he would go to any length to carry them out precisely. The end results can be seen as collaborations between nonhuman forces and human determination, just as generative poetry is a collaboration between the programmer's choices and the computer's randomizing selections along with its procedural operations.

Code Comments as Essay: *Sea and Spar Between*

My next example is *Sea and Spar Between*, a collaborative project between prize-winning poet Stephanie Strickland and Nick Montfort.[23] They chose passages from Melville's *Moby Dick* to combine with Emily Dickinson's poems. This intriguing project highlights a number of issues: gender contrasts between the all-male society of *The Pequod* versus the sequestered life Dickinson led as a near-recluse in Amherst; the sprawling portmanteau nature of Melville's work versus Dickinson's tightly constrained aesthetic; the spatial oxymorons in each work, for example the claustrophobic rendering room aboard the ship versus Dickinson's famous poem "The Brain is Wider Than the Sky," and so forth. For this project, much more human selection was used than for "Taroko Gorge," neces-

22 N. Katherine Hayles, The Paradoxes of John Cage: Chaos, Time, and Irreversible Art in: *Permission Granted: Composed in America*, ed. Marjorie Perloff and Charles Junkerman (Chicago 1994), pp. 226–241.

23 Nick Montfort and Stephanie Strickland, *Sea and Spar Between*; https://nickm.com/montfort_strickland/sea_and_spar_between/; access: March 26, 2018.

sitated by the massive size of Melville's text and the much smaller, but still significant, corpus of Dickinson's work.

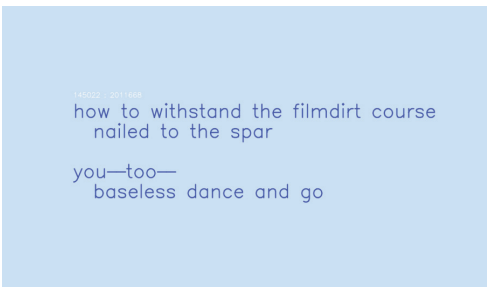

Fig. 3: Screen shot of *Sea and Spar Between*, at closest zoom. Image courtesy of Stephanie Strickland, used with permission.

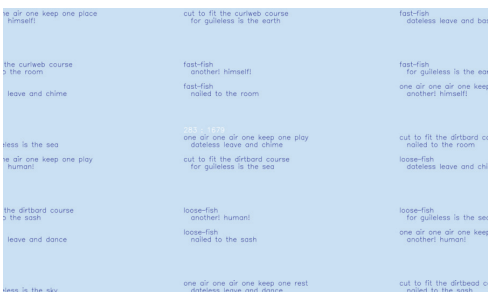

Fig. 4: Screen shot of *Sea and Spar Between*, taken at medium zoom. Image courtesy of Stephanie Strickland, used with permission.

Fig. 5: Screen shot of *Sea and Spar Between*, farthest out zoom. Image courtesy of Stephanie Strickland, used with permission.

The project displays as an "ocean" on which quatrains appear as couplet pairs. The authors define locations on the display screen through "latitude" and "longitude" coordinates, both with 14,992,383 positions, resulting in about 225 trillion stanzas, roughly the amount, they estimate, of fish in the sea. The numbers are staggering and indicate that the words displayed on a screen, even when set to the farthest-out zoom position, are only a tiny portion of the entire conceptual canvas.

The feeling is indeed of being "lost at sea," accentuated by the extreme sensitivity to cursor movements, resulting in a highly "jittery" feel. It is possible, however, to locate oneself in this sea of words by entering a latitude/longitude position provided in a box at screen bottom. This move will result in the same set of words appearing on screen as were previously displayed at that position; conceptually, then, the canvas pre-exists in its entirety, even though in practice, the very small portion displayed on the screen at a given time is computed "on the fly," because to keep this enormous canvas in memory all at once would be prohibitive. As Stuart Moulthrop points out, "Stanzas that fall outside the visible range are not constructed"[24]. Quoting Strickland, he observes that "the essence of the work is 'compression,' drawing on computation to reduce impossibly large numbers to a humanly accessible scale"[25].

The effect is a kind of technological sublime, as the authors note in one of their comments: "at these terms they signal, we believe, an abundance exceeding normal, human scale combined with a dizzying difficulty of orientation."

24 Moulthrop and Grigar, *Traversals*, p. 35.

25 Ibid.

As Moulthrop writes, "'Sea and Spar Between' asks the reader to swim or skim an oceanic expanse of language. We do not build, we browse"[26]. Montfort and Strickland reinforce the idea of a reader lost at sea in their co-authored essay on this work, "Spars of Language Lost at Sea". They point out that randomness does not enter into the work until the reader opens it and begins to read: "It is reader of *Sea and Spar Between* who is deposited randomly in an ocean of stanza each time she returns to the poem. It is you, reader, who are random."[27]

An unusual feature is the authors' essay within the source code, marked off as comments (that is, non-executable statements). The essay is entitled "cut to fit the toolspun course,"[28] a phrase generated by the program itself. The comments make clear that human judgments played a large role in text selection, whereas relatively more computational power was expended on creating the screen display and giving it its characteristic "jerky" movements. The authors comment,

//most of the code in Sea and Spar Between is used to manage the
//interface and to draw the stanzas in the browser's canvas region. Only
//2609 bytes of the code (about 22%) are actually used to combine text
//fragments and generate lines. The remaining 5654 bytes (about 50%)
//deals with the display of the stanzas and with interactivity.

By contrast, the selection of texts was an analog procedure, intuitively guided by the authors' aesthetic and literary sensibilities.

//The human/analog element involved jointly selecting small samples of
//words from the authors' lexicons and inventing a few ways of generating
//lines. We did this not quantitatively, but based on our long acquaintance
//with the distinguishing textual rhythms and rhetorical gestures of Melville
//and Dickinson.

Even so, the template for constructing lines is considerably more complex than with "Taroko Gorge." The authors explain,

//We define seven template lines: three first and four second lines. These
//line templates and the consequences they involve were designed to evoke
//distinctive rhetorical gestures in the source texts, as judged
//intuitively by us, and to foreground Dickinson's strong use of negation.

The selections include compound words ("kennings," as the authors call them) with different rules governing how the beginning and ending lines are formed:

//butBeginning and butEnding specify words that begin and end
//one type of line, the butline.

To create the compound words, the computer draws from two compound arrays and then "joins the two arrays and sorts them alphabetically."

26 Ibid., p. 36.

27 Nick Montfort and Stephanie Strickland, *Spars of Language Lost at Sea*, p. 8; https://conference.eliterature.org/sites/default/files/papers/Montfort_Strickland__Spars_1.pdf, access: March 26, 2018.

28 Nick Montfort and Stephanie Strickland, *cut to fit the toolspun course*; https://elmcip.net/critical-writing/cut-fit-tool-spun-course, access: March 26, 2018.

In this project, what does the computer know? It knows the display parameters, how to draw the canvas, how to locate points on this two-dimensional surface, and how to respond to a user's request for a given latitude and longitude. It also knows how to count syllables and what parts of words can combine to form compound words. It knows, the authors comment, how "to generate each type of line, assemble stanzas, draw the lattice of stanzas in the browser, and handle input and other events." That is, it knows when input from the user has been received and it knows what to do in response to a given input. What it does not know, of course, are the semantic meanings of the words and the literary allusions and connotations evoked by specific combinations of phrases and words. Nevertheless, the subtlety and scope of the computer's beliefs and intentions far exceed the stereotyped "rule book" of Searle's thought experiment.

In reflecting on the larger significance of this collaboration, the (human) authors outline what they see as the user's involvement as responder and critic.

> *//Our final claim: the most useful critique*
> *//is a new constitution of elements. On one level, a reconfiguration of a*
> *//source code file to add comments—by the original creator or by a critic—//accomplishes this task. But in another, and likely more novel, way,*
> *//computational poetics and the code developed out of its practice*
> *//produce a widely distributed new constitution.*

To the extent that the "new constitution" could not be implemented without the computer's knowledge, intentions and beliefs, the computer becomes not merely a device to display the results of human creativity but a collaborator in the project.

Computers as Literary Influences

One branch of literary criticism, somewhat old-fashioned now, is the "influence study," typically the influence of one writer on another. Harold Bloom made much of this dynamic in his classic study, *The Anxiety of Influence: A Theory of Poetry* (1973), in which he argued that strong poets struggle against the influence of their precursors to secure their place in the literary canon.[29] For writers creating digital literature, software platforms (and underlying hardware configurations) exert a similar insistent pressure, opening some paths and resisting or blocking others in ways that significantly shape the final work. To elucidate this dynamic, I asked M. D. Coverley (the pen name of Marjorie Luesebrink) to describe her process of creating a digital work. Her account reveals the push-and-pull of software as literary influence (private email January 20, 2018).

Coverley took as her example a work-in-progress, *Pacific Surfliner*, inspired by the train that travels to and from San Luis Obispo to Los Angeles to San Diego.

29 Harold Bloom, *The Anxiety of Influence: A Theory of Poetry* (Oxford 1973).

She says that she starts "with an idea – very rough, no text except perhaps a title or a paragraph." For this work, she wanted to include videos of the views from the train windows. "In the case of *Pacific Surfliner*, I decided to use a simple Roxio video-editing program. It outputs mp3 or mp4 files." The advantage of simplicity, however, is offset by excessive loading times, a strong negative for digital writers who want to keep users engaged: too long a wait, and users are likely to click elsewhere. The solution, she writes, "was to let Vimeo do the compression—but then I had to figure out how to get a Vimeo file to play on my designated HTML page." Note that these negotiations with the software packages precede actual composition practices and definitively shape how it will evolve. "These decisions," Coverley acknowledges, "have already constrained many elements of the message."

Once she has decided on the software, then comes a period of composition, revision, and exploration of the moving images she wants to use. "For a long stretch, I will arrange and rearrange, crop and edit, expand some ideas, junk others, maybe start over several times […]. I did about 36 versions of the video [for *Pacific Surfliner*] and that is about standard." It is significant that the images and sounds, rather than words, come first in her compositional practices, perhaps because the archive of images and sounds is constrained compared to the possibility space of verbal expression, which is essentially infinite. So software first to make sure the project is feasible, then images and sounds, and only then verbal language. "Once all the other elements are in place – I can see how economical I can be with the prose. If something is already evident in the images, sound, videos, etc. then I need only refer indirectly to that detail in the actual text."

It is remarkable that Coverley, who began as a novel writer before she turned to digital literature, not only places words last in her compositional practice, but also sees them in many ways as supplements to the non-verbal digital objects already in place. This makes her practice perhaps more akin to film and video production than to literary language, although of much smaller scope since it can be accomplished by a single creator working alone or perhaps with one or two collaborators. She remarks, "I have always been surprised (and delighted) at how much descriptive text can be dispensed with in hypermedia narrative. This way of writing is one of the chief joys of the medium for me." Here is influence at the most profound level, transforming her vision of how narrative works and offering new kinds of rewards that lead to further creativity and exploration. The point is not so much the influence of specific software packages and operating platforms, although these are still very significant, but rather the larger context in which she sees her work evolving and reaching audiences. To find a comparable context in conventional influence studies, we may refer to something as looming as literary canonization in Bloom's theory, a driving motivating force that in his view propels poets onward in the

hope of achieving some kind of literary immortality. (Of course, "immortality" in the digital realm is another matter entirely, beset as the field of electronic literature is with problems of platform obsolescence and media inaccessibility.) Nevertheless, the tantalizing prospect of reaching a large audience without going through conventional publishing gateways and the opportunity to experiment with multimodal compositional practices function in parallel ways to literary canonization, the golden promises that make it all seem worthwhile. And this is *only* possible because of networked and programmable machines. This is the large sense in which computers are our symbionts, facilitating and enabling creative practices that could not exist in their contemporary forms without them.

Computer as Co-Author

Sea and Spar Between does not invoke any form of artificial intelligence, and differs in this respect from *Evolution*, which does make such an invocation. Montfort and Strickland make this explicit in their comments:

> *//These rules [governing how the stanzas are created] are simple; there is no elaborate AI architecture*
>
> *//or learned statistical process at work here.*

By contrast *Evolution*, a collaborative work by Swedish poet Johannes Heldén and visual artist Håkan Jonson,[30] takes the computer's role one step further, from collaborator to co-creator, or better perhaps poetic rival, programmed to erase and overwrite the words of the Heldén's original. Heldén is a true polymath, not only writing poetry but also creating visual art, sculpture, and sound art. His books of poetry often contain images, and his exhibitions showcase his work in all these different media. Jonson, a computer programmer by day, also creates visual and sound art, and their collaboration on *Evolution* reflects the multiple talents of both authors.

The authors write in a preface that the "ultimate goal" is to pass "'The Imitation Game' as proposed by Alan Turing in 1951 […]; when new poetry that resembles the work of the original author is created or presented through an algorithm, is it possible to make the distinction between 'author' and 'programmer'?"[31]

These questions, ontological as well as conceptual, are better understood when framed by the actual workings of the program. In the 2013 version, the authors input into a database all ten of the then-extant print books of Hélden's poetry. A stochastic model of this textual corpus was created using a statistical model known as a Markov Chain (and the corresponding Markov Decision Process), a discrete state process that moves randomly step-wise through the data, with

30 Johannes Heldén and Håkan Jonson, *Evolution* (2013); https://www.johanneshelden.com/evolution/, access: March 26, 2018; Johannes Heldén and Håkan Jonson, Evolution (Stockholm 2014).

31 Heldén and Jonson, *Evolution* (2013).

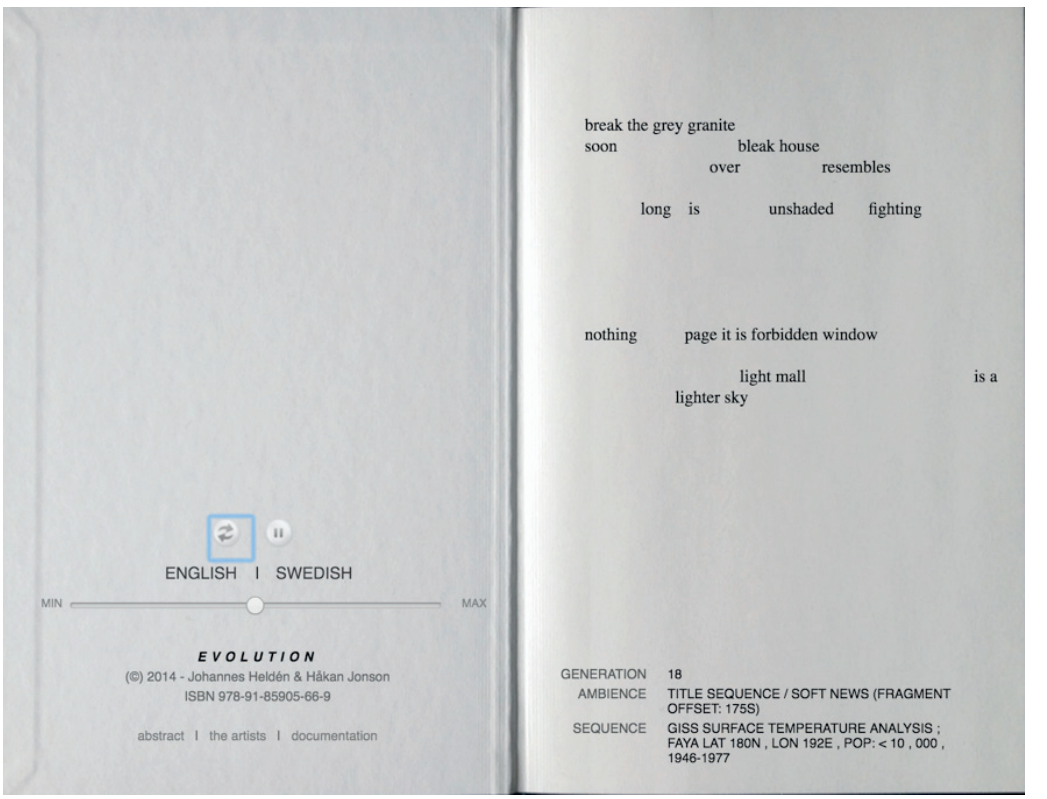

Fig. 6: Screen shot of *Evolution*, generation 18.

each next step depending only on the present state and not on any previous ones.

This was coupled with genetic algorithms that work on an evolutionary model. At each generation, a family of algorithms ("children" of the previous generation) is created by introducing variations through a random "seed." These are then evaluated according to some fitness criteria, and one is selected as the most "fit." In this case, the fitness criteria are based on elements of Heldén's style; the idea is to select the "child" algorithm whose output most closely matches Heldén's own poetic practices. Then this algorithm's output is used to modify the text, either replacing a word (or words) or changing how a block of white space functions, for example putting a word where there was white space originally (all the white spaces, coded as individual "letters" through their spatial coordinates on the page, are represented in the database as signifying elements).

The interface presents as an opened book, with light grey background and black font. On the left side is a choice between English and Swedish and a slider controlling how fast the text will evolve. On the right side is the text, with words and white spaces arranged as if on a print page. As the user watches, the text changes and evolves; a small white rectangle flashes to indicate spaces undergoing mutation (which might otherwise be invisible if replaced by another

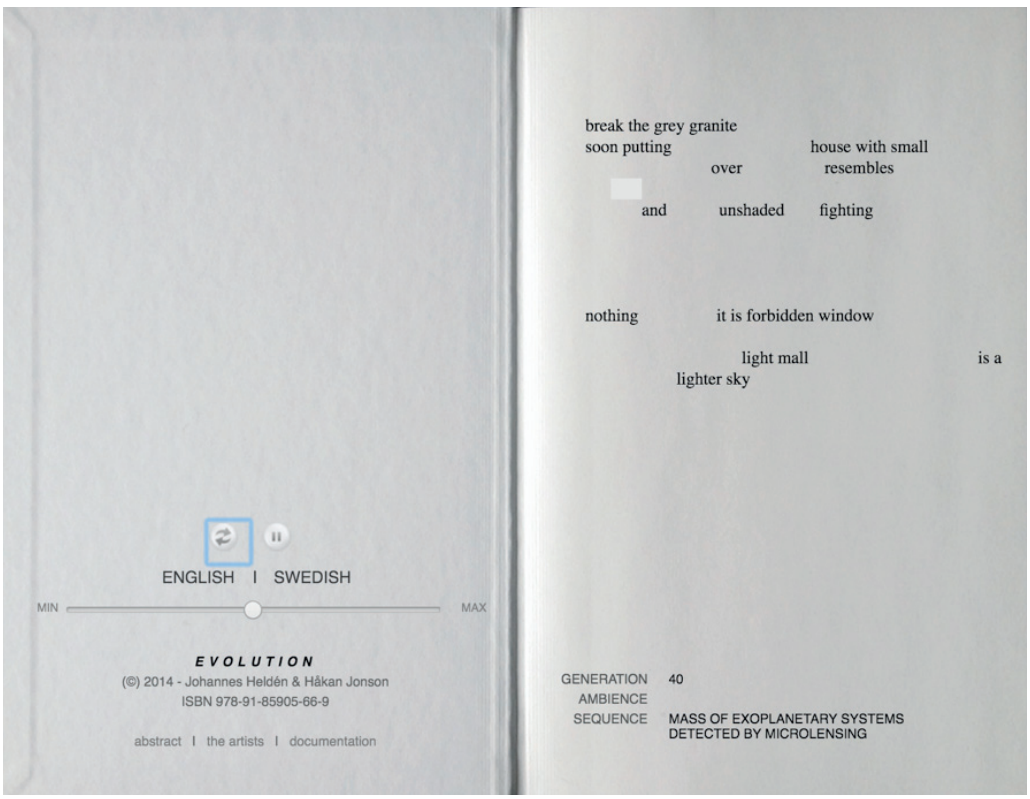

Fig. 7: Screen shot of the same run-through of *Evolution*, generation 40.

space). Each time the program is opened, one of Heldén's poems is randomly chosen as a starting point, and the display begins after a few hundred iterations have already happened (the authors thought this would be more interesting than starting at the beginning). At the bottom of the "page" the number of the generation is displayed (starting from zero, disregarding the previous iterations).

Also displayed is the dataset used to construct the random seed. The dataset changes with each generation, and a total of eighteen different datasets are used, ranging from "mass of exoplanetary systems detected by imaging," to "GISS surface temperature" for a specific latitude/longitude and range of dates, to "cups of coffee per episode of *Twin Peaks*"[32]. These playful selections mix cultural artifacts with terrestrial environmental parameters with astronomical data, suggesting that the evolutionary process can be located within widely varying contexts. The work's audio, experienced as a continuous and slightly varying drone, is generated in real time from sound pieces that Heldén previously composed. From this dataset, one-minute audio chunks are randomly selected and mixed in using cross-fade, which creates an ambient soundtrack unique for each view.[33]

32 Heldén and Jonson, *Evolution* (2014), n.p.

33 Johannes Heldén and Håkan Jonson, The Algorithm, in: Heldén and Jonson, *Evolution* (Stockholm 2014), n.p.

The text will continue to evolve as long as the user keeps the screen open, with no necessary end point or teleology, only the continuing replacement of Heldén's words with those of the algorithm. One could theoretically reach a point where all of Heldén's original words have been replaced, in which case the program would continue to evolve its own constructions in exactly the same way as it had operated on Heldén's words/spaces.
In addition to being available online, the work is also represented by a limited edition print book, in which all the code is printed out. The book also has appendices containing brief commentaries by well-known critics, including John Cayley, Maria Engberg, and Jesper Olsson. Cayley seems (consciously or unconsciously) to be influenced by the ever-evolving work, adopting a style that evolves through restatements with slight variations.[34] For example, he suggests the work is "an extension of his [Heldén's] field of poetic life, his articulated breath, manifest as graphically represented linguistic idealities, fragments from poetic compositions, I assume, that were previously composed by privileged human processes proceeding through the mind and body of Heldén and passing out of him in a practice of writing. […] I might be concerned, troubled because I am troubled philosophically by the ontology […], the problematic being […], of linguistic artifacts that are generated by compositional process such that they may never actually be – or never be able to be […] read by any human having the mind and body to read them." "Mind and body" repeats, as do "composed/composition," "troubled," and "never actually be/never be able," but each time in a new context that slightly alters the meaning. When Cayley speaks of being "troubled," he refers to one of the crucial differences in embodiment between human and machine: whereas the human needs to sleep, eat, visit the bathroom, the machine can continue indefinitely, not having the same kind of "mind and body" as human writers or readers. The sense of excess, of exponentially larger processes than human minds and bodies can contain, recalls the excess of *Sea and Spar Between* and gestures toward the new scales possible when computational media become co-creators.

Maria Engberg, in "Appendix 3: Chance Operations," parallels *Evolution* to the Cageian aesthetic mentioned earlier. She quotes Cayley's emphasis process over object. "'What if we shift our attention,'" Cayley writes, "'decidedly to practices, processes, procedures—towards ways of writing and reading rather than dwelling on either textual artifacts themselves (even time-based literary objects) or the concept underpinning objects-as-artifacts?'"[35] In this instance, the concept underpinning the object is itself a series of endless processes, displacing, mutating, evolving, so the distinction between concept and process becomes blurred, if

34 Cf. John Cayley, Appendix 2: Breath, in: Heldén and Jonson, *Evolution* (2014), n.p.

35 Maria Engberg, Appendix 3: Chance Operations, in: Heldén and Jonson, *Evolution* (2014), n.p.

not altogether deconstructed.

Jesper Olsson, in "Appendix 4: We Have to Trust the Machine," also sees an analogy in Cage's work, commenting: "It was not the poet expressing himself. He was at best a medium for something else."[36] What is this "something else" if not machinic intelligence struggling to enact evolutionary processes so that it can write like Heldén, albeit without the "mind and body" that produced the poetry in the first place? A disturbing analogy comes to mind: H. G. Wells' *The Island of Doctor Moreau* and the half-human beasts who keep asking, "Are we not men?" In the contemporary world, the porous borderline is not between human/animal but human/machine. Olsson sees "this way of setting up rules, coding writing programs" as "an attempt to align the subject with the world, to negotiate the differences and similarities between ourselves and the objects with which we co-exist".[37] Machine intelligence has so completely penetrated complex human systems that it has become our "nature-culture," as Jonas Ingvarsson calls it.[38] He points to this conclusion when he writes: "The signs are all over Heldén's poetic and artistic output. Computer supported lyrics about nature and environments, graphics and audio paint urbannatural land-and soundscapes […]. We witness the (always already ongoing) merge of artificial and biological consciousness."[39]

How does Heldén feel about his dis/re/placement by machinic intelligence? I had an opportunity to ask him when Danuta Fjellestad and I met Heldén, Jonson, and Jesper Olsson at a Stockholm restaurant for dinner and a demonstration of *Evolution* (private communication, March 16, 2018). In a comment reminiscent of Cage, he remarked that he felt "relieved," as if a burden of subjectivity had been lifted from his shoulders. He recounted starting *Evolution* that afternoon and watching it for a long time. At first, he amused himself by thinking "me" or "not me" as new words appeared on screen. Soon, however, he came to feel that this was not the most interesting question he could ask; rather, he began to see that when the program was "working at its best," its processes created new ideas, conjunctions, and insights that would not have occurred to him (this is, of course, from a human point of view, since the machine has no way to assess its productions as insights or ideas, only as more or less fit according to criteria based on Heldén's style). That this fusion of human and machine intelligence could produce something better than either operating alone, he commented, made him feel "joyous," as if he had helped to bring something new into the world based on his own artistic and poetic creations but also at times exceeding them. In this sense *Evolution* reveals the power of literature conceived as a cognitive assemblage, in which cognitions are

36 Jesper Olsson, Appendix 4: We Have to Trust the Machine, in: Heldén and Jonson, *Evolution* (2014), n.p.

37 Ibid.

38 Jonas Ingvarsson, Appendix 5: The Within of Things, in: Heldén and Jonson, *Evolution* (2014), n.p.

39 Ibid.

distributed between human and technical actors, with information, interpretations and meanings circulating throughout the assemblage in all directions, outward from humans into machines, then outward from machines back to humans.

Super(human) intelligence: The Potential of Neural Nets

In several places, Heldén and Jonson describe *Evolution* as powered by artificial intelligence. A skeptic might respond that genetic algorithms are not intelligent at all; they know nothing about the semantics of the work and operate through procedures that are in principle relatively simple (acknowledging that the ways random "seeds" are used and fitness criteria are developed and applied in this work are far from simple, not to mention the presentation layers of code). The power of genetic algorithms derives from finding ways to incorporate evolutionary dynamics within an artificial medium, but like many evolutionary processes, they are not smart in themselves, any more than are the evolutionary strategies that animals with tiny brains like fruit flies, or no brain at all like nematode worms, have developed through natural selection. When I asked Jonson about this objection, he indicated that for him as a programmer, the important part was the more accurate description of genetic algorithms as "population-based metaheuristic optimization algorithms"[40]. Whether this counts as "artificial intelligence" he regarded as a trivial point.

Nevertheless, to answer the skeptic, we can consider stronger forms of artificial intelligent such as recurrent neural nets. After what has been described as the "long winter" of AI when the early promise and enthusiasm of the 1950s and 60s seemed to fizzle out, a leap forward occurred with the development of neural networks, which use a system of nodes communicating with each other to mimic synaptic networks in human and animal brains. Unlike earlier versions of artificial intelligence, neural networks are engineered to use recursive dynamics in processes that not only use the output of a previous trial as input for the next (that is, feedback), but in addition change the various "weights" of the nodes, resulting to changes in the structure of the network itself. This amounts to a form of learning that, unlike genetic algorithms which use random variation undirected by previous results (because they rely on Markov chains), use the results of previous iterations to change how the net functions. Neural nets are now employed in many artificial intelligence systems, including machine translations, speech recognition, computer vision, and social networks. Recurrent neural networks (RNN) are a special class of neural nets where connections

40 Heldén and Jonson, The Algorithm, sp.

between units form a directed graph along a sequence. This allows them to exhibit dynamic temporal behavior for a time sequence. Unlike feedforward neural nets, RNNs have internal memory and can use it to process inputs, which is particularly useful for tasks where the input may be unsegmented (that is, not broken into discrete units) such as face recognition and handwriting.

A stunning example of the potential of neural net architecture is AlphaGo, which recently beat the human Go champions, Lee Sedol in 2016 and Ke Jie in 2017. Go is considered more "intuitive" than chess, having exponentially more possible moves, with a possibility space vastly greater than the number of atoms in the universe (10^{240} moves vs. 10^{74} atoms). With numbers this unimaginably large, brute computational methods simply will not work—but neural nets, working iteratively through successive rounds of inputs and outputs with a hidden layer that adjusts how the connections are weighted, can learn in ways that are flexible and adaptive, much as biological brains learn.

Now DeepMind, the company that developed AlphaGo (recently acquired by Google), has developed a new version that "learns from scratch," AlphaGoZero.[41] AlphaGoZero combines neural net architecture with a powerful search algorithm designed to explore the Go possibility space in ways that are computationally tractable. Whereas AlphaGo was trained on many human-played games as examples, its successor uses no human input at all, starting only with the basic rules of the game. Then it plays against itself and learns strategies through trial and error. At three hours, AlphaGoZero was at the level of a beginning player, focusing on immediate advances rather than long-term strategies; at 19 hours it had advanced to an intermediate level, able to evolve and pursue long-term goals; and at 70 hours, it was playing at a superhuman level, able to beat AlphaGo 100 games to 0, and arguably becoming the best Go player on the planet.

Of course, programs like this succeed because they are specific to a narrow knowledge domain, in this case, the game of Go. All such programs, including AlphaGoZero, lack the flexibility of human cognition, able to range across multiple domains, making connections, drawing inferences, and reaching conclusions that no existing artificial intelligence program can match. The race is on, however, to develop General Artificial Intelligence (GAI), programs that have this kind of flexibility and adaptability. Many experts in AI expect this goal to be reached around mid-century, with a 90% confidence level.[42] In this case, the AI would combine the best of human intelligence with the powers of machine cognition, including vastly faster processing speeds, much greater memory storage, and the ability to operate 24/7. There is

41 Deep Mind, AlphaGoZero: "Learning from Scratch" (2017); https://deepmind.com/blog/alphago-zero-learning-scratch/, access: March 26, 2018.

42 Nick Bostrom, *Superintelligence: Paths, Dangers, Strategies* (Oxford 2016), S. 23.

no guarantee that humans would succeed in developing constraints to keep such an intelligence confined to following human agendas and not pursuing its own desires for its own ends.[43]

It is easy to see how this could be a scary prospect indeed, including, as Stephen Hawking has warned, the end of humanity.[44] However, since this is an essay on literature and computational media, I want to conclude by referring to Stanislaw Lem's playful fable about what would happen if such a superintelligence took to writing verse. In "The First Sally (A), or Trurl's Electronic Bard",[45] Trurl (a robot constructor who has no mean intelligence himself, although with very human flaws) builds a robot versifier several stories high. Rather than working on a previously written (human) poem, as *Evolution* does, Trurl re-creates the evolutionary process itself. Reasoning that the average poet carries in his head the evolutionary history of his civilization, which carries the previous civilization and so on, he simulates the entire history of intelligent life on earth from unicellular organisms up to his own culture, descendants of the preceding human civilization. Something goes wrong with the emergence of the primates, however, when a fly in the simulated ointment causes a glitch, leading not to great apes but gray drapes. Fixing this problem, Trurl succeeds in creating a multi-story robot that can only produce doggerel. Lem, ever the satirist, recounts how he finally solves the problem: "Trurl was struck by an inspiration; tossing out all the logic circuits, he replaced them with self-regulating egocentripetal narcissistors."[46]

Demonstrating the Electronic Bard for his friend (and sometimes rival constructor) Klaupacious, Trurl invites him to devise a challenge for the robot versifier. Klaupacious, wishing his friend to fail, invents a nearly impossible task: "a love poem, lyrical, pastoral, and expressed in the language of pure mathematics. Tensor algebra mainly, with a little topology and higher calculus."[47] Although Trurl objects, the versifier has already begun: "Come, let us hasten to a higher plane / Where dyads treat the fairy fields of Venn / Their indices bedecked from one to *n*, / commingled in an endless Markov chain!"[48] So the Markov chain surfaces again, although to be fair, it is far, far easier to imagine such a versifier in words than to create it through algorithms that actually run as computational processes! There follow scenarios reminiscent of the predictions of those worried about superintelligence, although in a fanciful vein. The Electronic Bard crosses "lyrical swords" with all the best poets: "The ma-

43 Ibid; David Roden, *Posthuman Life: Philosophy at the Edge of the Human* (New York and London 2014).

44 Rory Cellan-Jones, Stephen Hawking Warns Artificial Intelligence Could End Mankind. *BBC News*, December 2, 2014; http://www.bbc.co.uk/news/technology-30290540, access: March 26, 2018.

45 Stanislaw Lem, The First Sally (A), or Trurl's Electronic Bard, in: Stanislaw Lem, *The Cyberiad: Fables for a Cybernetic Age* (New York 2014), pp. 43–57.

46 Ibid., p. 46.

47 Ibid., p. 52.

48 Ibid.

chine would let each challenger recite, instantly grasp the algorithm of his verse, and use it to compose an answer in exactly the same style, only two hundred and twenty to three hundred and forty-seven times better."[49] The Electronic Bard enacts the same kind of procedure animating *Evolution*, but vastly accelerated, the faux precision underscoring its absurdity.

Just as critics warn that a superintelligence could outsmart any human constraints on its operation, so the Electronic Bard disarms every attempt to dismantle it with verses so compelling they overwhelm its attackers, including Trurl. The authorities are just about to bomb it into submission when "some ruler from a neighboring star system came, bought the machine and hauled it off"[50]. When supernovae begin "exploding on the southern horizon," rumors report that the ruler, "moved by some strange whim, had ordered his astroengineers to connect the electronic bard to a constellation of white supergiants, thereby transforming each line of verse into a stupendous solar prominence; thus the Greatest Poet in the Universe was able to transmit its thermonuclear creations to all the illimitable reaches of space at once"[51]. The scale now so far exceeds the boundaries of (human and robot) life, however, that it paradoxically fades into insignificance: "it was all too far away to bother Trurl."[52]

We may suppose that this fanciful extrapolation of *Evolution* is "all too far away" to bother us, so we plunge back into our present reality when computational media are struggling merely to come close to simulating human achievements. Lem's fable does not quite vanish altogether, however, suggesting that even the most vaulted preserve of human consciousness, sensitivity, and creativity – that is, lyrical poetry – is not necessarily exempt from machine collaboration, and yes, even competition.[53] By convention, symbionts are regarded as junior partners in the relationship, like the bacteria that live in the human gut. We are now on the verge of developments that promote our computational symbionts to full partnership in our literary endeavors. The trajectory traced here through electronic literature demonstrates that the dread with which some anticipate this future has a counterforce in the creative artists and writers who see in this prospect occasions for joy and relief.

Whatever one makes of this posthuman future, it signals the end of the era when humans could regard themselves as the privileged rational beings whose divine inheritance was dominion over the earth. The complex human-technical systems that now permeate the infrastructure of developed societies point toward a humbler, more accurate picture of humans as only one kind of cognizers

49 Ibid., p. 54.

50 Ibid., p. 56.

51 Ibid., p. 57.

52 Ibid.

53 For an analysis of a posthuman strain within the lyric, see: Sumita Chakraborty, *Signs of Feeling Everywhere: Lyric Poetics, Posthuman Ecologies, and Ethics in the Anthropocene*. Dissertation (Atlanta 2018).

among many. In our planetary ecology, co-constituted by humans, nonhumans and technical devices, we are charged with the responsibility to preserve and protect the cognitive capabilities that all biological lifeforms exhibit, and to respect the material forces from which they spring. If we are to survive, so must the environments on which all cognition ultimately depends.

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AMERICAN PSYCHO. READING AN ALGORITHM IN REVERSE

By Karl Wolfgang Flender

"Google recommends a pulse monitor while someone's bleeding to death, or suggests skin tightening while Bateman makes sausage of a victim."

Suggested citation:
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Introduction

"UNSER SCHREIBZEUG ARBEITET MIT AN UNSEREN GEDANKEN", Friedrich Nietzsche famously remarks on his use of the Malling-Hansen Writing Ball, a forerunner of the typewriter which was developed for the visually impaired.[1] Originally acquired by the shortsighted philosopher because of his rather illegible handwriting, the machine began to slowly affect his writing and thinking. Alluding to Nietzsche's new telegram style and the capital letters (the Writing Ball did not have miniscules), his assistant, Peter Gast alias Heinrich Köselitz, observes in a letter: "Sowohl von der Deutlichkeit der Lettern, noch mehr aber von der Kernigkeit der Sprüche war ich *überrascht*. […] Vielleicht gewöhnen Sie Sich mit diesem Instrument gar eine neue Ausdrucksweise an."[2]

Examples in literary history are legion, that each writing tool yields new materialities of text, new forms of writing and ways of thinking: The pencil for example allowed Goethe to effortlessly jot down his nighttime-inspirations, while Georg Lichtenberg's experimental use of the quill resulted in his famous *Sudelbücher* (if need be, the quill dipped into coffee instead of ink); Kerouac binge-wrote *On the Road* on his Underwood Portable, the typewriter also enabling the typographic experiments of the Concrete Poets – in poetological texts and literary experiments writers investigate their respective writing tools as the technical conditions of the possibility of literature.[3]

With the advent of the personal computer, digital writing tools and their increased enmeshment through cloud-services, we have entered a new epoch of writing, in which "the interfaces themselves and therefore their constraints are becoming ever more difficult to perceive", as Lori Emerson has noted in *Reading Writing Interfaces*.[4] She has shown how the complex workings of digital writing tools under their shiny graphical user interfaces (GUIs) have become less and less observable to users, let alone comprehensible, since input and output are seemingly disconnected through opaque algorithmical operations and paradigms of user-friendliness and intuitive design, while the possibility of user's choice has

1 Nietzsche to Heinrich Köselitz, end of February 1882, in: Friedrich Nietzsche, *Sämtliche Briefe. Kritische Studienausgabe in 8 Bänden*, ed. Giorgio Colli and Mazzino Montinari (Munich, Berlin and New York 1986), vol. 6, no. 202, p. 172, quoted from Martin Stingelin, "UNSER SCHREIBZEUG ARBEITET MIT AN UNSEREN GEDANKEN.", in: *Schreiben als Kulturtechnik*, ed. Sandro Zanetti (Berlin 2012), pp. 283–304, here p. 304. English transl.: "Our writing tools are also working on our thoughts", here taken from Friedrich Kittler, *Gramophone, Film, Typewriter*, transl. Geoffrey Winthrop-Young and Michael Wutz (Stanford 1999), p. 200.

2 Heinrich Köselitz to Nietzsche on February 19th 1882, in: Friedrich Nietzsche, *Briefwechsel. Kritische Gesamtausgabe*, ed. Giorgio Colli and Mazzino Montinari (Berlin and New York 1986), third devision, vol. 2, no. 107, p. 229, quoted from Stingelin, SCHREIBZEUG, p. 302. English transl.: "Both the distinctness of the letters, yet even more the markedness of your slogans surprised me. Maybe you even will adapt a whole new expression through use of this tool." (My transl.)

3 Davide Giuratio, Martin Stingelin and Sandro Zanetti have mapped out the area of research on the genealogy of writing and the "scene of writing" ("Schreibszene", developed from Rüdiger Campe's model) and contributed seminal publications. Stingelin, SCHREIBZEUG mentions the examples of Goethe and Lichtenberg.

4 Lori Emerson, *Reading Writing Interfaces* (Minneapolis 2014), p. ix.

been strategically limited by software companies.[5] The everyday digital writing tools thus appear as closed-off black boxes to the users,[6] ever increasing the writer's dependence on the *Eigensinn* of his or her tools.[7] Or, more drastically put, as Emerson concludes at one point: "[T]hey frame what can and cannot be said."[8]

Just think of the automatic spell-checking in Microsoft Word, which does not disclose on grounds of which grammatical rules or dictionary this or that word is underlined; or the AutoCorrect-function of Apple, which almost unnoticeably capitalizes words or corrects mistakes, whether or not the user intended it. AutoComplete interferes with smartphone-messaging, when words are proposed on grounds of a statistical or stochastic body that has been trained on the user's habits; search engines complete search terms to entire sentences, and therefore influence what is searched and thus found; not to mention the most complex language technologies such as Google Translate and its machine learning algorithms.[9]

While one can get quite weary of reiterating how writing today is subject to international surveillance and corporate control – and that conditions of literary production, distribution and reception are becoming ever more intertwined with commercial, political and power interests as these writing tools have become the widely accepted and unchallenged norm –, a range of contemporary literary experiments still serves as a fresh take to critically assess these tools.

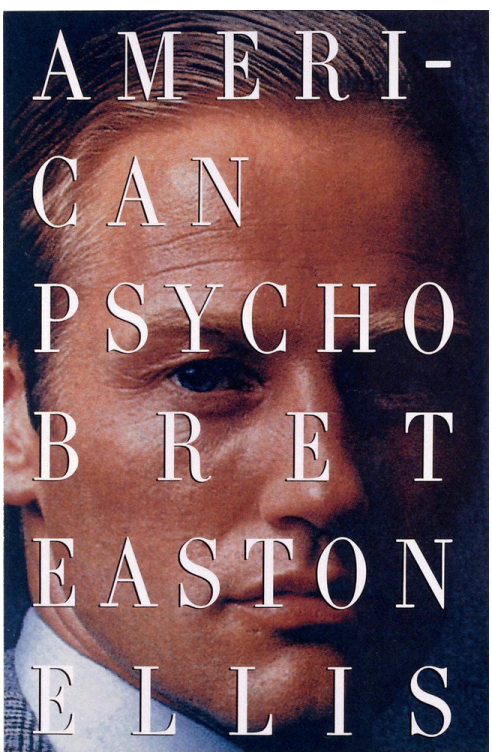


Fig. 1: Bret Easton Ellis, *American Psycho*, Cover.

5 Ibid.

6 Alexander Galloway defines the blackbox as "an opaque technological device for which only the inputs and outputs are known." (Alexander R. Galloway, Black Box, Black Bloc. A lecture given at the New School in New York City on April 12, 2010; http://culturean-dcommunication.org/galloway/pdf/Galloway,%20Black%20Box%20Black%20Bloc,%20New%20School.pdf, access: August 8, 2018, 11 pm)

7 Stingelin, SCHREIBZEUG, p. 293.

8 Emerson, *Reading Writing Interfaces*, p. xvii.

9 Social media writing tools such as Facebook, Twitter or Snapchat, whose interfaces each affect respective forms of writing, storytelling and identity construction shall not be the topic of this article. For an analysis of the Snapchat-interface see for instance Karl Wolfgang Flender, #nofilter. Self-narration, identity construction and metastorytelling in Snapchat, in: *Interface Critique*, ed. Florian Hadler and Joachim Haupt (Berlin 2016), pp. 163–179.

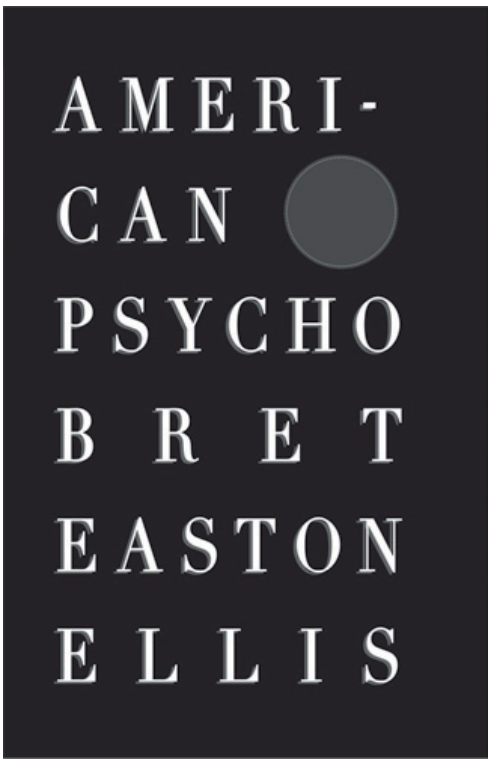


Fig. 2: Mimi Cabell and Jason Huff, *American Psycho*, Cover.

American *Psycho* (2012): Black-Box-Testing of an Algorithm

"ABANDON ALL HOPE YE WHO ENTER HERE",[10] are the first, Dante-channelling, words of Bret Easton Ellis' infamous novel *American Psycho*, published by Vintage Books in 1991, in which the brand-obsessed investment banker and yuppie Patrick Bateman turns into a perverse mass murderer. The eponymous 2012 edition of the book however, released by the publishing collective Traumawien, and, judging by its cover, also written by Ellis, begins like this:

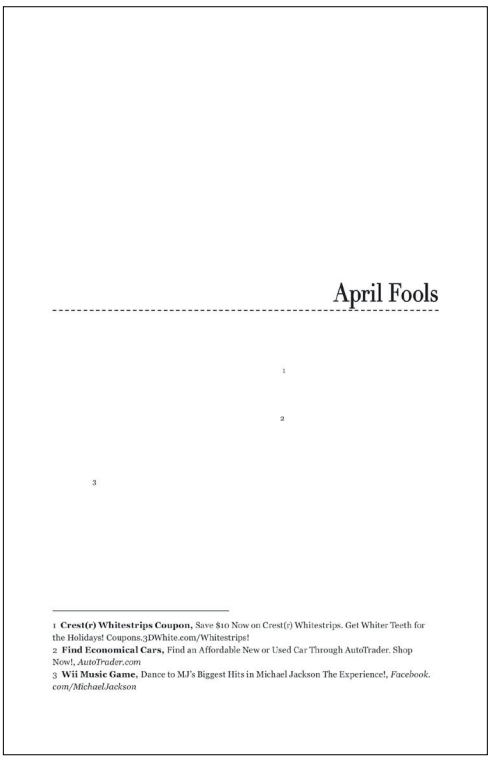
> *"Crest(r) Whitestrips Coupon, Save $10 Now on Crest(r) Whitestrips. Get Whiter Teeth for the Holidays! Coupons.3DWhite.com/Whitestrips!"*[11]

At first glance, one merely seems to be holding a cheap bootleg, at some stage of the illegal copying process infested by advertisements, a spambook so to say: Jacket, half-title and typesetting imitate the original's design and typography, the chapter titles are identical, yet the 408 pages of the 2012 edition are almost completely white, except for constellations of footnotes, in which advertisements like the one above appear (see fig. 1–4). On closer examination however, *American Psycho* (2012) turns out to be the result of the creative (mis-)use of a contemporary writing technology, namely Google Mail, as if taking to heart that "[t]he only conceivable way of unveiling a black box, is to play with it."[12]

10 Bret Easton Ellis, *American Psycho* (New York 1991), p. 3.

11 Mimi Cabell and Jason Huff, *American Psycho* (Vienna 2012), p. 3.

12 René Thom, *Mathematical Models of Morphogenesis* (Chichester 1984), p. 298.



April Fools

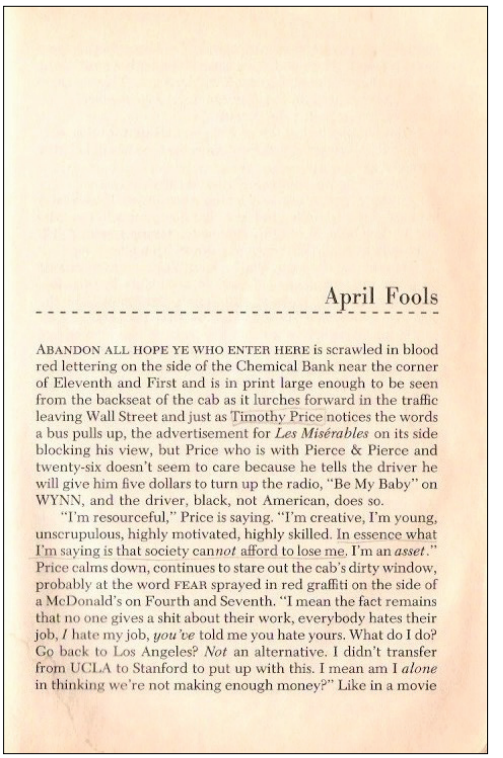
1

2

3

1 **Crest(r) Whitestrips Coupon,** Save $10 Now on Crest(r) Whitestrips. Get Whiter Teeth for the Holidays! Coupons.3DWhite.com/Whitestrips!
2 **Find Economical Cars,** Find an Affordable New or Used Car Through AutoTrader. Shop Now!, *AutoTrader.com*
3 **Wii Music Game,** Dance to MJ's Biggest Hits in Michael Jackson The Experience!, *Facebook.com/MichaelJackson*

Fig. 3: Mimi Cabell and Jason Huff, *American Psycho*, p. 3.



April Fools

ABANDON ALL HOPE YE WHO ENTER HERE is scrawled in blood red lettering on the side of the Chemical Bank near the corner of Eleventh and First and is in print large enough to be seen from the backseat of the cab as it lurches forward in the traffic leaving Wall Street and just as Timothy Price notices the words a bus pulls up, the advertisement for *Les Misérables* on its side blocking his view, but Price who is with Pierce & Pierce and twenty-six doesn't seem to care because he tells the driver he will give him five dollars to turn up the radio, "Be My Baby" on WYNN, and the driver, black, not American, does so.

"I'm resourceful," Price is saying. "I'm creative, I'm young, unscrupulous, highly motivated, highly skilled. In essence what I'm saying is that society can*not* afford to lose me. I'm an *asset*." Price calms down, continues to stare out the cab's dirty window, probably at the word FEAR sprayed in red graffiti on the side of a McDonald's on Fourth and Seventh. "I mean the fact remains that no one gives a shit about their work, everybody hates their job, *I* hate my job, *you've* told me you hate yours. What do I do? Go back to Los Angeles? *Not* an alternative. I didn't transfer from UCLA to Stanford to put up with this. I mean am I *alone* in thinking we're not making enough money?" Like in a movie

Fig. 4: Bret Easton Ellis, *American Psycho*, p. 3.

For their *American Psycho*, the artist duo Mimi Cabell and Jason Huff sent Ellis' novel page by page between to Gmail-accounts to and fro, and saved the ad-banners which appeared in the graphical user interface of the mail program. These so-called "relational ads" are generated through algorithmic keyword analysis of the email's text, as when signing up for Gmail one automatically agrees that all in- and outgoing mails will be analysed to serve personalized ads ("we are always looking for more ways to deliver you the most useful and relevant ads", it says on Google's support-page). Subsequently, Cabell and Huff annotated the novel page by page with the collected ads, placing footnotes behind each word that presumably triggered the respective ad – for example, an ad for the already mentioned "Whitestrips Coupons" would be placed behind "teeth". Then Cabell and Huff erased the original text of the novel, leaving us with blank pages and constellations of footnotes.

To read *American Psycho* (2012), one can thus consult a copy of the original to compare pages (see fig. 3 and 4), or download the freely available PDF-version, in which the original text is not deleted but only "whitened out" and can easily be rendered visible – the authors clearly encouraging such a reading.[13] One then encounters

13 The PDF is available on http://traumawien.at/prints/american-psycho/american_psycho_content.pdf, access: October 1, 2018, 6:30 pm.

multiple processes of reading and writing constellated in *American Psycho* (2012) for the reader to decipher: Google's algorithm has "read" – aka processed – the pretext page by page (input) and written the ads (output), Cabell and Huff have compared the output to the pretext and positioned the ads in footnotes: In a black-box-testing-spirit feeding a canonical novel into the writing technology Gmail, Cabell and Huff render visible the opaque workings of the algorithm in the discrepancy between pretext and new text.

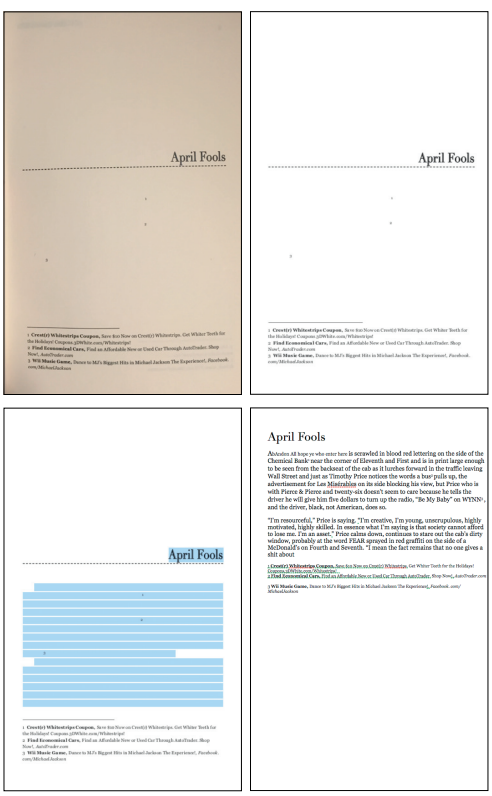


Fig 5: The same page of *American Psycho* (2012) in various mediations: (1) in print (2) as pdf (3) as pdf, with the text marked through the command select all (4) the text copied into a Word-document and the text-color changed to black.

As one starts to follow the algorithm through the book(s), one basically tries to get into the algorithm's head: Why does this or that ad appear on this particular page? Where is the keyword that triggered it? Is there one – or is the output not only influenced by the text on the page, but by some other signals like IP-address or previous searches…?[14] Furthermore, one starts to compare passages/keywords throughout the novel, which apparently triggered identical ads – the common denominator, at times impossible to find. This is only complicated by the fact that one already reads a human interpretation of the algorithm – Cabell and Huff placed the ads "by hand" –, so if ads seem to be arbitrarily attached to keywords the reader might start looking for more adequate keywords on the same page, or at times even presumes that strategic authorial intervention could be at play…[15] Reading the new *American Psycho* in this manner, one thus reconstructs the authors' process of composing the text, retraces the workings of Gmail's algorithm, and at the same time reads a translation of a novel, famous for its portrayal of 1980s consumer culture, into a

14 Not surprisingly a novel set in Manhattan is full of ads by New York companies. Yet four times ads by firms from New England appear without any reference of the region in the text. Upon my inquiry Cabell and Huff confirmed, that during producing *American Psycho* they actually were based in New England, so one might conclude that the appearance of the ads is actually also connected to the IP-address. – The 2012 Google Ad Policy however keeps quiet about using IPs for placement of relational ads. Compare Cabell and Huff, *American Psycho*, pp. 171, 179, 269 and 360.

15 The "Whitestrips Coupons" can also be read as an uncanny self-reflexive allusion to a text that is "stripped white", inviting the reader to reflect whether this ad really is the output of the algorithm or might be a sign of the authors' intentional interference.

present whose consumer culture is dictated by online advertisement – all three ways of reading deeply intertwined with each other.

Algorithmic Actualization and Literacy in Linguistic Capitalism

Reading *American Psycho* (2012), it is astonishing how close to home the advertisements hit: If in the "original" there are page-long descriptions of Bateman's frenemies' suits, ads for clothes appear ("Dress Shirt – SALE $29.89 / 60% OFF Robert Talbott / Dress like a secret agent / Joseph Bank Mens Shirts / R Laurens: Secret Sale");[16] high-end audio equipment is praised when Bateman plays music; a two-pager about drinking water is accompanied by six ads for "LIFE Water Ionizers(tm)" or "Free Water Cooler Rental",[17] and last but not least, the notoriously recurring "Crest(r) Whitestrips Coupons" (on 81 out of 408 pages!), give away Bateman's obsession for teeth (and/or Google's fondness of bleaching-ads). Sometimes the algorithm even uncannily grasps the gist of a scene, for example when an "Instant Tenant Screening" and criminal checks are advertised, while Bateman is interrogated by a homicide detective.[18]

The conceptual match of pretext (a novel about consumer culture saturated with brands) and applied procedure (keyword-triggered algorithms to display ads), results in an awkwardly adequate actualization of *American Psycho* for the present, as of course all the products in the footnotes stem from the year 2011 and not from the 1980s. The absurdity of the breathless online-advertisement-sound seems at times to perfectly match the surface-fixated Bateman:

> *Luxurious Volume, Full Bodied Hair. Seriously High Style. A New Level Of Fullness, www.JohnFrieda.com / 479 Short Hair Pictures, Find inspiration for your next cut with our short hairstyle pictures., Short-Hairstyles.StyleBistro.com / Clip-On Hair Extensions / Face Tightening Secret / 60 years old … A must see. FlexEffect Facialbuilding / Get Soft, Natural Curls.*[19]

As an effect of this actualization, interesting superpositions appear. While in the original Bateman programs his VHS-recorder to record *The Patty Winters Show*, in the new version mp3-players are offered – in general, so it seems, the most striking difference between 1991 and 2011 are not the advertised clothes, furniture or food, but the media change as it is heralded in this ad: "Tape To Digital Converter, Convert Any Cassette Tape To Digital MP3 In 3 Easy Steps! $59.95, *www.CassetteToUSB.com.*"[20]

16 Cabell and Huff, *American Psycho*, p. 57.

17 Ibid., pp. 257–258.

18 Ibid., pp. 281–282

19 Ibid., p. 22.

20 Ibid., p. 180. It is striking, that this advertisement – in a telling

Gmail's ad-placement, as illustrated in *American Psycho* (2012), is an expression of what Frederic Kaplan calls "linguistic capitalism", namely the current state of permanent algorithmic evaluation and commodification of linguistic material via language and writing technologies.[21] With Google as example, Kaplan describes how the linguistic capital of accumulated search-entries is translated directly into revenue through algorithmic keyword-auctions: Each word or sentence that is entered into Google's interface is auctioned in split seconds to advertisers, whose ads are then displayed in the results. Kaplan concludes: "Some words and expressions have therefore become commodities with different monetary values that can be 'bought' from Google. In some sense, Google has extended capitalism to language, transforming linguistic capital into money."[22]

This is also the case with Gmail and *American Psycho* (2012): For each keyword that has triggered an ad, a price has been paid (which makes one wonder how much money Google earned from the 819 ads in the making of the book); each word has been awarded a price in the logic of "linguistic capitalism": it is treated and calculated according to statistical bodies, regardless of its narrative or semantic context, clearly implying a different sort of reading and appreciation of text than we human readers are accustomed to.[23] The configuration of both cultures of reading in one text highlights the threshold and/or transition from human to digital/machinic/algorithmic literacies – they "read" differently.

Algorithmic Mismatching and the Politics of the Algorithm

Besides the succeeding actualizations, the most striking feature of the new *American Psycho* are the absurdities, inaccuracies and paradoxes that originate from the algorithmic mismatches of semantic content and respective ad. If there's "salmon au lait" on a restaurant menu, Google proposes to "Learn French in 10 Days";[24] another time it is obviously misinterpreting "chow-chow" and offering "Cheap Cowhide"[25] (which for the knowing reader almost seems like an uncanny premonition to the skinning of people which will occur later in

parallel to the algorithmic remediation of the whole *American Psycho* – also advertises a process of translation/conversion/digitization, making this just one of many too-good-to-be-true 'coincidences', worthy of further interpretation, which appear throughout the book.

21 Frederic Kaplan, Linguistic Capitalism and Algorithmic Mediation. *Representations* 127/1 (2014), pp. 57–63.

22 Ibid., p. 59.

23 The keyword-sensitivity here obviously is not yet perfect, but of course the more the program is used, the more sophisticated it gets, as Google's auctioning-algorithm is of course refined with every search, a match of keyword and ad positively evaluated if clicked-on, refining the algorithm's "understanding" of language through feedback loops.

24 Cabell and Huff, *American Psycho*, p. 21.

25 Ibid., p. 105.

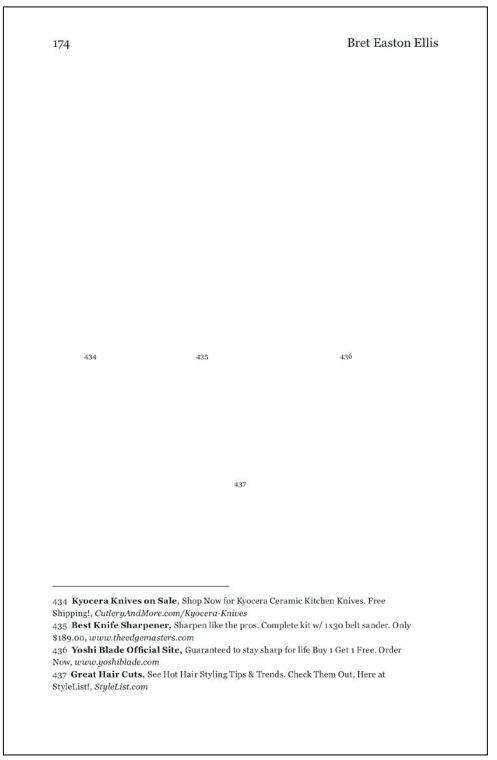


Fig 6: Mimi Cabell and Jason Huff, *American Psycho*, p. 174.

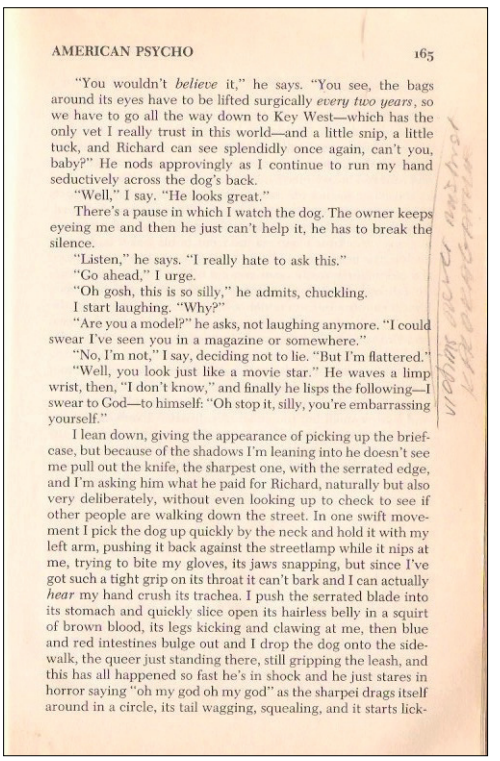


Fig 7: Bret Easton Ellis, *American Psycho*, p. 165.

the novel), or having – without apparent keyword – a PR-campaign from the present of 2011 intrude the equally catastrophy-ridden Eighties: "BP, Info about the Gulf of Mexico Spill Learn More about How BP is Helping., www.BP.com/GulfOfMexicoResponse."[26]

As one continues reading the novel(s) and Bateman begins his spree of murder and rape, the algorithm's disturbing indifference towards violence becomes apparent: During the detailed description of the slashing of a dog, porcelain knives, knife sharpeners and a haircut are advertised: "[H]e doesn't see me pull out the knife (Kyocera Knives on sale), the sharpest one (Best Knive Sharpener), with the serrated edge (Yoshi Blades Official Site)". And a few sentences later: "I push the serrated blade into its stomach and quickly slice open its hairless belly (Great Haircuts)."[27] – If Google's goal is to provide users "with ads that are useful and relevant to their interests",[28] for a mass murderer like Patrick Bateman that apparently works just fine.

The list goes on and on: Google recom-

26 Ibid., p. 334.

27 Cabell and Huff, *American Psycho*, p. 174. I put the ads from the footnotes in brackets. Quoted after the PDF-version, in which it is possible to make the whitened-out text visible (compare fig. 5).

28 Google, Ads in Gmail and your personal data. *Gmail Help*, April 8, 2011; https://web.archive.org/web/20110511094215/http://mail.google.com/support/bin/answer.py?answer=6603, access: October 2, 2018, 7 pm.

mends a pulse monitor while someone's bleeding to death, or suggests skin tightening while Bateman makes sausage of a victim. During these passages, which are unbearable to read and were responsible for *American Psycho's* temporary indexing in countries such as Germany, the algorithm displays a decided insensitivity towards the semantic content and context. Googles full-mouthed ad policy can only be counted as a sarcastic comment to these observations: "[W]e are careful about the types of content we serve ads against. For example, Google may block certain ads from running next to an email about catastrophic news. In addition, we will not show ads based on sensitive information, such as race, religion, sexual orientation, health, or sensitive financial categories."[29]

The reader's amusement, ambiguity or disturbance regarding Gmail's ad-placements, are again effects of the relationship of two different kinds of reading and their playing against each other in the book: the sense-making, semantic reading of human recipients and the algorithm's keyword-oriented "reading", or processing, of text against a database of ads.[30] *American Psycho* (2012) is thus a hybrid book: Produced according to the logic of an algorithm[31] but published as a printed book, the familiar narrative genre of the novel is what makes the taken for granted workings of the blackboxed writing interface observable through defamiliarisation: Gmail's "ignorance" towards violence and racism and its willingness to serve ads on top appear as part of the bigger picture that similar technologies have been and are used in the "fight against terror", equally combing mails for keywords, or how self-learning algorithms used in predictive policing exhibit racist attitudes with real-life effects, how hiring-tools of tech companies disadvantage women, etc.[32] The programmed, economic, and political dispositif of the algorithm remains necessarily opaque, but here it can be glimpsed in the literary.

29 Ibid.

30 See N. Katherine Hayles' recent article in *PMLA* for a broad discussion of how machines and humans read differently, one of her key points being that "whereas reading and narrative are closely linked for humans, reading and correlation have a strong connection for machines." (p. 1229) One can also argue that the two versions of *American Psycho* correspond with the difference between database and narrative. According to Lev Manovich, the database "represents the world as a list of items and it refuses to order this list. In contrast, a narrative creates a cause-and-effect trajectory of seemingly unordered items (events)." (p. 225) Cabell's and Huff's use of a narrative text to access the Google-AdWords-database, then comes into light as "the construction of an interface to a database." (p. 226) This user interface is the text of the new *American Psycho* (2012). Comp. N. Katherine Hayles, Human and Machine Cultures of Reading: A Cognitive-Assemblage Approach, *PMLA* 133/5 (2018), pp. 1225–1242; Lev Manovich, *The Language of New Media* (Cambridge, MA 2001).

31 Cabell and Huff imitate Google's instrumental attitude toward text: "They reduce Ellis' text to data, and reading and writing experience into an exercise in data mining and user profiling." (Kaja Marczewska, Erasing in the algorithmic extreme: Mimi Cabell and Jason Huff's American Psycho. *Media-N Journal* 11 [1] (2015); http://median.newmediacaucus.org/the_aesthetics_of_erasure/erasing-in-the-algorithmic-extreme-mimi-cabell-and-jason-huffs-american-psycho, access: August 15, 2018, 8 pm.)

32 Compare for example Kate Crawford, A.I.'s White Guy Problem. *The New York Times* (June 25, 2016); https://www.nytimes.com/2016/06/26/opinion/sunday/artificial-intelligences-white-guy-problem.html, access: October 20, 2018, 9 pm; Jeffrey Dastin, Amazon scraps secret AI recruiting tool that showed bias against women. *Reuters* (October 10, 2018); https://www.reuters.com/article/us-amazon-com-jobs-automation-insight/amazon-scraps-secret-ai-recruiting-tool-that-showed-bias-against-women-idUSKCN1MK08G, access: October 20, 2018.

A Poetics of the Glitch

As we have seen, not the perfect matches of text and ad invite the reader to reflect on the workings of the algorithm but rather the inconsistencies, paradoxes and mismatches. Operationalizing the faultiness of an unperfected writing tool, Cabell and Huff employ a poetics of the glitch. Glitch theorist Rosa Menkman explains that a glitch appears when any medium is brought "into a critical state of hypertrophy" that allows to "subsequently criticize its inherent politics."[33] *American Psycho* (2012) does just that. It oversaturates a novel, which is already brimming with brand names, with even more advertising, bringing it into an unreadable "state of hypertrophy" and testing the sensitivity of a technology with page-long descriptions of slaughter. This critique in the guise of literature not only allows to reflect, but also to make tangible the politics of the program, as Nathan Jones notes: "[A] glitch is a moment which gives propulsion into an unforeseen area of critical enquiry – allowing us to not only observe, but *experience* beneath a media surface."[34]

Admittedly, it is difficult to distinguish where the glitch begins and ends, as not only the artist or the faulty software are responsible for the glitch, but also the recipients who experience something as glitchy, as "glitches *only exist* against human expectations. […] [A] glitch comes into being solely at this moment of transversal entanglement between human and technological systems."[35] That said, the hypertrophy and seeming immorality of Gmail's algorithm as displayed in *American Psycho* may also merely be effects of a human reader's brain that cannot yet process the "newness" of a medium: "[N]ew media devices and artifacts themselves produce the sensations of a destabilizing surge of information or signal when they come into contact with a worldview of technics that has no affordances for them. […] New media are glitches by virtue of the forms this newness takes."[36]

So what if the seemingly faulty or immoral ads in *American Psycho* (2012) are not glitches at all, but show us a future, where Kaplan's "creolization" (in his use of the term, natural languages incorporating "linguistic biases of algorithms and the economical constraints of the global linguistic economy")[37] has already happened – and our contemporary semantic reading habits are just not adapted to it yet?

33 Rosa Menkman, *The Glitch Moment(um)* (Amsterdam 2011), p. 11.

34 Nathan Jones, Glitch Poetics. The Posthumanities of Error, in: *The Bloomsbury Handbook of Electronic Literature*, ed. Joseph Tabbi (London 2018), pp. 237–252, here S. 238, my emphasis.

35 Ibid., p. 239.

36 Ibid., p. 238.

37 Kaplan, Linguistic Capitalism, p. 61.

Media Poetics and Interface-specific Literature

Cloud-based writing technologies are ephemeral: Google discontinued the algorithmic assessment of emails in 2017,[38] but in contrast to locally installed software, which can still be accessed and researched on old PC's, cloud-based software is forever lost to the researcher. The book *American Psycho* (2012) then just may as well be one of the few pieces of evidence we have on how the algorithm in Gmail worked in the year 2010, when the book was produced.

American Psycho thus not only marks a specific point in the genealogy of writing, which is ever more difficult to trace due to the permanent stream of updates, bug fixes, add-ons or discontinuation of services; but is also a contribution to what Lori Emerson has called *media poetics* – writer's engagements with their respective writing technologies –, the literary correspondent of media archaeology. For the 21st century she identifies "a practice not just of experimenting with the limits and possibilities of writing interfaces but rather of *readingwriting*: the practice of writing through the network, which as it tracks, indexes, and algorithmises every click and every bit of text we enter into the network, is itself constantly reading our writing and writing our reading."[39]

American Psycho may then herald a specific subgenre of *readingwriting*, which by feeding canonical literary works into writing interfaces, reverse-engineers these technologies, rendering visible the opaque workings of the black box in the difference between pretext and new text.[40] Operationalizing glitches, authors of such texts more resemble bug hunters or beta-testers than traditional writers, identifying the not-yet-perfect workings of a machine, but then, instead of writing a report or making suggestions for improvement, they use the book/novel as defamiliarising tool to illustrate their findings.[41] This

38 "We will not scan or read your Gmail messages to show you ads", it now says on Google's support page. "The process of selecting and showing personalized ads in Gmail is fully automated. These ads are shown to you based on your online activity while you're signed into Google." In the face of today's user-tracking the keyword analysis of 2012 as displayed in *American Psycho* seems almost innocent. (Google, How Gmail ads work. *Gmail Help*; https://support.google.com/mail/answer/6603?hl=en, access: September 9, 2018, 8 pm.)

39 Emerson, *Reading Writing Interfaces*, p. xiv.

40 Further examples would be Hannes Bajohr's defamiliarisation of canonical German poems using the synonym-function in Microsoft Word (Hannes Bajohr, *Halbzeug. Textverarbeitung* [Berlin 2018], pp. 86–97), Elisabeth Tonnard's compressing canonical texts like Hamlet with Word's AutoSummarize-tool (Elisabeth Tonnard, *"Speak! eyes En zie!* [Gent 2010]), or Gregor Weichbrodt feeding Kerouac's *On The Road* into the Google Route planner, resulting in a contemporary road novel: "Head northwest on W 47th St toward 7th Ave. Take the 1st left onto 7th Ave. Turn right onto W 39th St. Take the ramp onto Lincoln Tunnel. Parts of this road are closed Mon–Fri 4:00 – 7:00 pm. Entering New Jersey." (Gregor Weichbrodt, *On the Road* [Berlin 2014], p. 9).

41 Emerson has pointed to what could be called a respecification of the book in the digital age: "Perhaps, the future of digital literature is readingwriting that is born of the network but lives offline – digital literature transformed into bookbound readingwriting that performs and embodies its own frictional media archaeological analysis." (Emerson, *Reading Writing Interfaces*, p. 184.)

subgenre – or what could be called a version-specific, interface-specific literature – not only "addresses" or "questions" writing technologies but makes a direct claim to comparative analysis. It radicalizes Emerson's notion of media poetics as media archaeology, as in *American Psycho* with the juxtaposition of canonical pretext and algorithmically mediated new text a way of literary comparison is offered, which allows the reader to reflect directly on the workings of a blackboxed digital writing technology.

With cloud-based writing software increasingly also taking into account place, time, browser history, user profile, etc. and changes in the algorithm going unnoticed by users and even developers,[42] the notion that interface critique can only be version critique[43] is further complicated – each use of the algorithm being potentially singular and results impossible to reproduce. In the end, *American Psycho* thus of course cannot explain, *how* the Gmail-algorithm "really" works.[44] But it explores how one can experimentally generate *any* knowledge about black boxes – and how this knowledge can be made tangible for human readers by using literature as a familiar mode of representation.

Coda: The (Writing) Technology of the Self

If we return to Friedrich Nietzsche's remark that writing tools affect our thinking, it seems that in the casen of digital writing technologies and algorithmic black boxes we increasingly cannot know how they influence our texts and how interfaces co-determine what is written (and thought). With the enmeshing of writing technologies with all areas of life – just think of what one does with the PC/smartphone, before/while/after one writes: book flights, communicate with friends, send money –, in the digital age, Foucault's *écriture de soi* becomes a default, exploitable and heteronomous act – a "technology of the self" in the truest sense of the word:[45] We are all like Patrick Bateman (minus the murder), portrayed and defined by opaque always-on algorithms with personalized constellations of products around us.

42 Recently it seems like a must for developers to attest their algorithms an own agency and non-intelligibility – catchwords: machine learning und neural networks –, yet this rhetorical blackboxing is nothing new, as programmer's have said the same about their software half a century ago, as Kathrin Passig has shown. Andersen and Pold have also pointed to the importance of dismantling interface myths in *Interface Critique* vol. 1. (Kathrin Passig, Fünfzig Jahre Blackbox. *Merkur Blog* [2017]; https://www.merkur-zeitschrift.de/2017/11/23/fuenfzig-jahre-black-box, access: June 15, 2018, 9 pm.)

43 Flender, #nofilter, p. 164.

44 The design of the printed book hints at this: With the original cover photograph removed, the book as object is itself a black box (see fig. 2). One could interpret the circle on the cover as a peephole, which allows a glimpse under the surface of the blackbox: But it affords no clear sight, just a shade of grey.

45 Michel Foucault, *Ästhetik der Existenz. Schriften zur Lebenskunst* (Frankfurt/Main 2007), and Michel Foucault, Technologien des Selbst, in: *Technologien des Selbst*, eds. Luther H. Martin, Huck Gutman and Patrick H. Hutton (Frankfurt/Main 1993), pp. 24–62.

In his essay on "linguistic capitalism" Kaplan concludes that new tools must be developed to observe the current developments of algorithmically mediated language.[46] – And if literature always also reflects on its technical conditions of possibility, why shouldn't these "new tools" be works of *interface-specific readingwriting* like *American Psycho* (2012), tools that open up fresh perspectives on the contemporary revolution of writing and language?[47]

46 Kaplan, Linguistic Capitalism, p. 62.

47 New technologies then of course call for new texts. Gmail has just introduced SmartReply, a function which automatically answers emails and already accounts for 11% of Gmail-traffic according to Google. So who will take Goethes *Werther*, feed it into Gmail, and write a reverse-engineered epistolary novel revealing the *techné* of this tool? (Matthew Kirschenbaum has entertained a similar thought in a tweet: https://twitter.com/mkirschenbaum/status/1051649868241006597, access: October 20, 2018, 8pm.)

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SPECIAL SECTION: **INTERFACE AND THE POST-INDUSTRIAL SOCIETY**

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The following four essays are based on a workshop 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 Siegen in September 2018. With six brief contributions – in addition to the papers published here, Sabine Wirth addressed "User Interfaces as 'Personal Tools'" and Sophie Ehrmanntraut discussed the development "from 'Human Factors Engineering' to 'User Centered Design'" – the working group responded to the main topic of the conference: 'industry'.

The fact that the call for papers of the conference gave the current speech of 'industry 4.0' a lot of room corresponded to the currently-held consensus that digitisation is an industrial factor of crucial importance for (social) value creation processes. In the late 1960s and early 1970s, however, the formation and commercialisation of human-computer interaction as a discipline coincided in time with sociological analyses that proceeded from the diagnosis of an end of the old type of industrial society and forecast the emergence of a post-industrial society. Books like Alvin and Heidi Toffler's Future Shock (1970), Alain Touraine's La Société Post-Industrielle (1969) or Daniel Bell's The Coming of Post-Industrial Society (1973) shaped a new understanding of the economic and industrial foundations of capitalism in the dawning age of computerised industrial production. The Tofflers tried to identify basic features of radical innovation in a post-industrial society, Touraine was mainly concerned with the future of the working class under post-industrial conditions and Bell attempted to outline the main features of a historically new value-creation regime that is based squarely on knowledge processes and the circulation of information via technologies of telecommunication. Since its inception, the term "post-industrial society" itself has evolved further into conflicted and widely-discussed notions such as the 'information society', 'knowledge economy' or 'network society.'

Primarily, the workshop examined the historical question what role interfaces (in all their forms) play for the contemporary diagnoses of the post-industrial. The critique of the military-industrial complex, of the technocratic society (Theodore Roszak), of one-dimensional man and the ideology of the advanced industrial society (Herbert Marcuse), of the society of spectacle characterized by passive media consumption (Guy Debord) – these were all issues in the 1960s and 1970s taken up by interface design and the empowerment gestures of computerization (e. g. through 'user-friendly interfaces', 'soft technology', 'intimate computing', the promised flexibility of 'being digital', and participation in egalitarian and meritocratic online communities). While the idea of an imminent or already completed end of industrial society circulated for several decades, interfaces are today a decisive component of computer-based or computer-supported value creation processes, both in the areas of production and consumption. Yet, future rarely comes as predicted. Beyond the hypothesis to consider interfaces as a key technology of post-industrial society, the workshop also reflected on the question in what ways interfaces transcend older

notions of post-industrial societies. The question was raised, in which way these older theories are no longer able to adequately grasp the situation of our era.

Against this background of different notions of a 'post-industrial' society, the respective theories and their advantages and deficiencies, the contributions of the working group discussed the role of interfaces in the development and criticism of a post-industrial society. In the first essay, Timo Kaerlein explores the historical connection between interface design and diagnoses of a post-industrial society. He argues that interfaces have become the equivalent of the assembly line or office workstation of industrial societies by connecting the mobile and flexible knowledge workers to the post-industrial production process. Interface design, if not limited to the field of human-computer interaction (HCI), can even be considered as the central site of value-creation in post-industrial societies, as Roland Meyer argues in the second essay. Focusing on the work of Gui Bonsiepe, he shows how already around 1970 industrial design began transcending the sphere of mass-produced commodities by focussing on the mediating layers between the user's experience and an increasingly complex world of invisible structures and processes. In the third essay, Jan Distelmeyer recalls the advantages of the multi-faceted interface concept, which are particularly evident in the (historical) coupling of the terms interface and conduction. Based on this, he approaches interface politics of post-industrial values by addressing the transition from object orientation to process orientation through the introduction of the iPhone. The fourth essay by Christoph Ernst closes by discussing a scene from Blade Runner 2049 which sheds a light on current imaginaries of the interconnection between coming types of natural user interfaces and their use in 'post-industrial warfare'.

Taken together, the four short essays explore the productivity of focussing on interfaces as central sites of transition between industrial and post-industrial regimes of value creation and organisation. It is here where the social practices of computer use and cultural imaginations about human-technology relationships in digitally networked environments offer themselves to critical scrutiny and historical comparison.

Jan Distelmeyer, Christoph Ernst,
Timo Kaerlein and Roland Meyer

MOBILIZING POST-INDUSTRIAL SUBJECTS: HUMAN-COMPUTER INTERACTION AS AESTHETIC PRACTICE

By Timo Kaerlein

"Often against their own intentions, the pioneers of human-computer interaction find themselves at the forefront of the development of entirely new ways to control and programme the productivity of an increasingly mobile and flexible workforce."

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Sociologists such as Alain Touraine in France and Daniel Bell in the USA diagnosed the emergence of post-industrial societies at the end of the 1960s and beginning of the 1970s, precisely at the time when Human-Computer Interaction (HCI) was being established as a field of inquiry and the design of user interfaces was beginning to play a central role in computer science.[1] In this short essay I would like to put forth the argument that there exists an intrinsic relationship between what has been diagnosed as post-industrial modes of production and social organization on the one hand and the emergence of an explicit focus on designing user interfaces for connected computers on the other hand.

My argument is that the design of user interfaces acts as a technique of motivation and mobilization for post-industrial subjects and ties them to diverse value-generating mechanisms. Taking this argument one step further, interfaces can be analytically situated as the central nodes of contemporary regimes of productivity which are being described in terms of immaterial labour, data colonialism and heteromation, as I will argue in the concluding remarks.

Bell gives a succinct summary of what he understands as the main features of post-industrial society:

> *Broadly speaking, if industrial society is based on machine technology, post-industrial society is shaped by an intellectual technology. And if capital and labor are the major structural features of industrial society, information and knowledge are those of the post-industrial society.*[2]

In addition to the growing importance of the service sector for value creation, a new significance of knowledge processes for the production of economic added value can also be observed in post-industrial societies. Economic and social policy is thus faced with the historically new challenge of constructing infrastructures, which in addition to the classical transport and distribution of energy must now also ensure the circulation of information.

Touraine's earlier neo-Marxist argumentation, which asks for the future of the working class under post-industrial conditions, is only worth a side note to Bell,[3] while this question in particular could prove to be one of the most politically explosive today. Touraine, first in 1969, already very clearly described the phenomenon of a diffusion of the economic into all social areas, due to a decentralization and diffusion of value-creating processes from the factory floor or office building into the capillaries of society: "Growth results from a whole complex of social factors, not just from

1 Cf. Alain Touraine, *The Post-Industrial Society. Tomorrow's Social History: Classes, Conflicts and Culture in the Programmed Society* (London 1974); Daniel Bell, *The Coming of Post-Industrial Society. A Venture in Social Forecasting* (New York 1999); Alan Kay, User Interface: A Personal View, in: *Multimedia. From Wagner to Virtual Reality*, eds. Randall Packer and Ken Jordan (New York 2001), pp. 121–131; Jonathan Grudin, A Moving Target: The Evolution of Human-Computer Interaction, in: *Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications*, ed. Julie A. Jacko (Boca Raton 2012), pp. xxvii–lxi; Brad A. Myers, A Brief History of Human Computer Interaction Technology. *ACM Interactions* 5/2 (1998), pp. 44–54.

2 Bell, *Coming of Post-Industrial Society*, p. xci.

3 Cf. ibid., p. 39f.

the accumulation of capital. Nowadays, it depends much more directly than ever before on knowledge, and hence on the capacity of society to call forth creativity. All the domains of social life – education, consumption, information, etc. – are being more and more integrated into what used to be called production factors."[4]

For post-industrial society, or as Touraine also calls it: *technocratic* or *programmed society*, the core problem is how to ensure participation in the social production process of knowledge and information. And it is precisely here, according to my thesis in all due brevity, that interfaces come into play: they operate as the equivalent of the assembly line or office workstation of the old type of industrial societies by connecting the mobile and flexible knowledge workers to the post-industrial production process, which is increasingly shifting towards the immaterial.[5] As Jan Distelmeyer has repeatedly argued, the "scope of the interface complex"[6] is decidedly not limited to the symbolic layer of user interfaces, but includes a diversity of connections in computerized environments. For instance, application programming interfaces (APIs) regulate the programmability and interoperability of platforms and third-party applications, thus translating the logics of post-industrial production into code.

At the user side of the interface complex, one can observe a characteristic blurring of the boundaries between work and leisure, because it is sometimes the same operating systems and end devices, possibly the same software, that are used to carry out everyday practices such as flexible work organization or time management. The designers of user interfaces are well aware of the historical threshold situation in which they find themselves: their idea of a post-Fordist work culture, expressed, for example, in Douglas Engelbart's vision of an augmentation of human intellect,[7] is, however, only partially consistent with the dream of capital stressed by Franco Berardi in all sharpness, of being able to mobilize the labour potential of a distributed workforce at any time and from any location.[8] Often against their own intentions, the pioneers of human-computer interaction find themselves at the

4 Touraine, *Post-Industrial Society*, p. 5.

5 This is not to say that physical labour and material infrastructures would not play a decisive role in post-Fordist regimes of production. Rather, the creation of added value involving digital media has to be situated in a complex relationship of dependence on more traditional forms of capitalist production, decidedly involving capital and labour. The diagnoses of post-industrial society tend to overlook this point. Cf. Yann Moulier-Boutang, Marx in Kalifornien. Der dritte Kapitalismus und die alte politische Ökonomie. *Aus Politik und Zeitgeschichte* 52–53 (2001), pp. 29–37; Enda Brophy and Greig de Peuter, Labors of Mobility. Communicative Capitalism and the Smartphone Cybertariat, in: *Theories of the Mobile Internet. Materialities and Imaginaries*, eds. Andrew Herman, Jan Hadlaw and Thom Swiss (New York 2015), pp. 60–84.

6 Jan Distelmeyer, Drawing Connections – How Interfaces Matter. *Interface Critique* 1 (2018), pp. 22–33, here p. 23.

7 Cf. Douglas C. Engelbart, Augmenting Human Intellect. A Conceptual Framework. SRI Project 3578 for Air Force Office of Scientific Research (Menlo Park 1962).

8 "In a certain sense, cellular phones realize the dream of capital: that of absorbing every possible atom of time at the exact moment the productive cycle needs it. In this way, workers offer their entire day to capital and are paid only for the moments when their time is made cellular." Franco Berardi, *The Soul at Work: From Alienation to Autonomy* (New York 2009), p. 90.

forefront of the development of entirely new ways to control and programme the productivity of an increasingly mobile and flexible workforce.

Contemporary diagnoses of the digital cultural economy, largely influenced by Italian autonomists such as in the debate around immaterial or free labour[9] and the emergence of a cognitariat[10], can be fruitfully connected to Touraine's problematization of the social struggles accompanying the fleshing out of post-industrial modes of production. Vis à vis a process of extensive rationalization and diffusion of value-creating activities into everyday life, one could expect knowledge workers to resist these developments as unreasonable demands and border transgressions between work and leisure time.

Thus, it seems necessary to aestheticize the regime of production in order to connect and affectively tie subjects to the post-industrial production apparatus. The user interface pioneers at Xerox PARC and elsewhere, despite being inspired to a large extent by countercultural imaginaries,[11] are dedicating themselves to this task with great ambition and lasting success. Their imagination and design of user interfaces can be described as an aesthetic practice in the sense of Andreas Reckwitz ("ästhetisch-imprägnierte Praxis"), i.e. as a convergence of processes of rationalization and aestheticization characteristic of late modern societies.[12] In Reckwitz' account, in particular, the creative apparatus firmly anchored in Western culture since the 1980s responds to the lack of affect and motivation of organized modernity and its employee culture oriented towards bureaucratic points of view. Contemporary user experience design answers to this challenge by giving aesthetic form to a regime of productivity that is thoroughly extended in time and space to encompass large domains of everyday life.[13]

The "factories of the mind"[14] hardly resemble the factories of industrial societies on the outside, yet they represent the central instance of value creation in post-industrial societies. Interfaces are the distributed terminals of their socio-

9 Cf. Maurizio Lazzarato, Immaterial Labor, in: *Radical Thought in Italy. A Potential Politics*, eds. Paolo Virno and Michael Hardt (Minneapolis 1996), pp. 133–146; Tiziana Terranova, Free Labor: Producing Culture for the Digital Economy. *Social Text* 63 (2000), pp. 33–58.

10 Cf. Franco Berardi, What does Cognitariat Mean? Work, Desire and Depression. *Cultural Studies Review* 11/2 (2005), pp. 57–63; as well as Moulier-Boutang, Marx in Kalifornien, on the premises and implications of cognitive capitalism as a system of accumulation that is mainly based on knowledge processes.

11 Cf. Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago 2006).

12 Cf. Andreas Reckwitz, Ästhetik und Gesellschaft – ein analytischer Bezugsrahmen, in: *Ästhetik und Gesellschaft. Grundlagentexte aus Soziologie und Kulturwissenschaften*, eds. Andreas Reckwitz, Sophia Prinz, and Hilmar Schäfer (Berlin 2015), pp. 13–54.

13 Cf. Timo Kaerlein, 'I can't remember ever being so in love with a color'. Smartphones und die Rhetorik des Intimate Computing, in: *Smartphone-Ästhetik. Zur Philosophie und Gestaltung mobiler Medien*, ed. Oliver Ruf (Bielefeld 2018), pp. 179–203. On the role of digital media in the ongoing expansion of data work in what he terms "capture" capitalism cf. Till A. Heilmann, Datenarbeit im "Capture"-Kapitalismus. Zur Ausweitung der Verwertungszone im Zeitalter informatischer Überwachung. *Zeitschrift für Medienwissenschaft* 13/2 (2015), pp. 35–47.

14 John Perry Barlow, A Declaration of the Independence of Cyberspace (1996); https://www.eff.org/cyberspace-independence, access: April 18, 2019, 18:30.

technical infrastructure and the core technology of participation in networked value creation processes, whether paid or unpaid. By linking economic, cultural and aesthetic logics with concrete subject designs and affect-constellations, they therefore represent a preferred object of criticism from a media studies perspective. It is at the site of the user interface where everyday practices of socializing, searching and navigating are captured and made economically productive.[15]

Sensorial interfaces with the world outside computers are extracting data from the environment that are then transformed into resources for value-creation processes.[16] Many of the transactions initiated and transferred via interfaces in fact do not initiate automated processes so much as to connect customers to legions of clickworkers or physical labourers via platforms that act as central registers for value exchange.[17] In all these instances, the role of interfaces – ranging from user interfaces via application programming interfaces on the software level to the hardware interfaces physically connecting network nodes with each other – requires more scrutiny on the part of media scholars interested in the ways value is created and distributed in post-industrial societies.

15 Cf. Terranova, Free Labor; Mark Andrejevic, Facebook als neue Produktionsweise, in: *Generation Facebook. Über das Leben im Social Net*, eds. Oliver Leistert and Theo Röhle (Bielefeld 2011), pp. 31–49.

16 Cf. Shoshana Zuboff, *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power* (New York 2019); Mark Andrejevic, Theorizing Drones and Droning Theory, in: *Drones and Unmanned Aerial Systems*, ed. Aleš Završnik (Cham 2016), pp. 21–43; Nick Couldry and Ulises A. Mejias, Data Colonialism: Rethinking Big Data's Relation to the Contemporary Subject. *Television & New Media* 20/4 (2018), pp. 336–349.

17 Cf. Hamid R. Ekbia and Bonnie A. Nardi, *Heteromation, and Other Stories of Computing and Capitalism* (Cambridge, MA 2017).

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TAKING PART. TWO STEPS TOWARDS NETWORKED COMPUTERIZATION

By Jan Distelmeyer

"That is why the term interface is so fruitful today: It helps addressing a variety of efficacious operations – from the material basis of all sorts of computers and networks up to the educational and epistemological or ideological guidance by user interfaces showing and instructing me what to do."

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Step one: interfaces perform conduction

It is getting increasingly difficult to say what one is dealing with when dealing with computers and their aspired ubiquity. Especially because of their networked condition, the spread and diverse forms of computers – in all their stationary, mobile, embedded, sensor-supported, and increasingly quasi-autonomous (that is: programmatically evolving) modes – create a nearly overwhelming complexity. A simultaneity of highly effective modes of exhibited and unobservable power: As the obvious presence and handling of computers and their operative images (particularly visible through the spread of mobile computers such as smartphones) increases, so does the implementation of comparatively hidden processes of sensing, calculation, and conduction (emphasised e.g. in relation to smart cities, big data analyses, and machine learning) that is considered as "seemingly autonomous agents"[1] or the "becoming environmental of computation"[2]. The present computerization is characterized by the simultaneity of a special form of inaccessibility and functionality.[3]

It is precisely to address this widespread complexity that the concept of interface proves to be extremely helpful. Its own challenging complexity helps to approach that of the advancing computerisation and cybernetisation. Interfaces involve various apparatus and processes. They create and enable modes of connectivity and transfer in different and mutually related forms: between hardware and hardware, software and hardware, software and software, and between those interconnected hardware-software relationships and everything (bodies, things, environments) that is not a computer. This last form includes people who actively and consciously relate to computers – ranging from using or programming computers and developing machine learning systems to questions of design[4] and the relationship between software and ideology. With such operations we humans decide and learn from experience what this could be: a computer, its user, a network, or "the digital".

These different interface layers and processes are not only intertwined, but also share an indispensable basis: the conduction of electricity which enables signals to be transferred. This is why the conceptual history of the term interface

1 Jennifer Gabrys, *Program Earth: Environmental Sensing Technology and the Making of a Computational Planet* (Minneapolis 2016), p. 65.

2 Ibid., p. 4.

3 The suggestions and questions in this article are based on the presentation "Anteil nehmen. Interface-Prozesse des Netzwerks" at the annual conference of the German Society for Media Studies (GfM) 2018 in Siegen and on a more detailed paper entitled "From Object to Process. Interface Politics of Networked Computerization" in the proceedings of the conference „Interface Politics: After Post-Truth", in: *Artnodes Journal* 24 (2019).

4 On the concept of the interface in design theory around 1970, see Roland Meyer's essay in this issue. On interfaces as "diegetic prototypes" and imaging interfaces in future warfare, see Christoph Ernst's essay in this issue.

and its roots around 1870 – introduced by the physicists James and William Thomson (later Lord Kelvin) to describe the conduction of energy – is so enlightening.[5] William Thomson's research on electricity and "interfaces between media of different conductivity"[6] led among other things to his famous work with the transatlantic telegraph.

Today the term interface allows us to describe the computer's "interior telegraphy"[7] (its inner processuality and conduction of signals) as well as its connections and distributed networks, its embeddedness, and its multifarious relations to us in the form of dealing with user interfaces, for example. Thus, in contrast to terms and concepts aiming at mathematical rules (like "algorithmic"[8]) or a deliberately general description of global effects (like "technosphere"[9], "implication"[10], or "the stack"[11]), the concept of interface, with its specific intricacy and history (in the physics of the 19th century and since the late 1950s in computer technology and computer science[12]), places certain requirements on an analysis and thus grants it special possibilities: It demands and enables to remain alert to the different interface levels and their relationship to each other. Interfaces constitute the technical basis for any implication of computers in support of the proclaimed technosphere. And interfaces constitute the material (and industrial), aesthetical, as well as ideological basis for an understanding, what I can actually do with a computer.[13]

Hence, investigating the interface complexity means combining concrete and material questions of technology and (infra)structures with cultural, political, and epistemological ones. The question of interfaces leads to certain, isolable conditions and processes of conduction as well as to the complexity of the cooperation formed by them. This is its heuristic advantage and the challenge of *interface analysis*: The interface concept opens both an investigative horizon and a mode of analysis, which always asks for further interface levels and processes involved in the phenomenon I am currently investigating. What other interfaces are in play? What else is involved?

5 See Peter Schaefer, Interface: History of a Concept, 1868–1888, in: *The Long History of New Media: Technology, Historiography, and Contextualizing Newness*, ed. David W. Park, Nicholas W. Jankowski, Steve Jones (New York 2011), pp. 163–175; Branden Hookway, *Interfaces* (Cambridge, MA 2014), pp. 59–119.

6 Crosbie Smith and M. Norton Wise, *Energy and Empire: A Biographical Study of Lord Kelvin* (Cambridge, MA 1989), p. 212.

7 See Hartmut Winkler, *Prozessieren. Die dritte, vernachlässigte Medienfunktion* (Munich 2015), p. 294.

8 Antoinette Rouvroy and Bernard Stiegler, The Digital Regime of Truth. From the Algorithmic Governmentality to a New Rule of Law. La Deleuziana. *Online Journal of Philosophy* 3 (2016), pp. 6–27.

9 Erich Hörl, Introduction to general ecology: The ecologization of thinking, in: *General Ecology: The New Ecological Paradigm*, ed. Erich Hörl (London 2017), pp. 10–13.

10 Mark B.N. Hansen, *Feed Forward. On the Future of Twenty-First-Century-Media* (Chicago 2015), pp. 580–629.

11 Benjamin H. Bratton, *The Stack: On Software and Sovereignty* (Cambridge, MA 2016).

12 See Hans Dieter Hellige, Krisen- und Innovationsphasen in der Mensch-Computer-Interaktion, in: *Mensch-Computer-Interface. Zur Geschichte und Zukunft der Computerbedienung*, ed. Hans Dieter Hellige (Bielefeld 2008), pp. 13–15.

13 See Jan Distelmeyer, Drawing Connections. How Interfaces Matter. *Interface Critique* 1 (2018), pp. 27–28.

Where computers are at work, interfaces are at work – and even more so where they are networked. Against this background Christian Ulrik Andersen and Søren Pold speak of a metainterface: "Although the interface may seem to evade perception, and become global (everywhere) and generalized (in everything), it still holds a textuality: there still is a metainterface to the displaced interface."[14] In order to emphasize the enduring materiality, processuality, and the different (observable and unobservable) levels of interfaces, which also act when (user) interfaces disappear or become ubiquitous, it is advantageous, then, to further strengthen the concept of interface. Especially since the origin of this concept and its historical proximity to conduction literally request different modes of conduction to be taken into consideration.

My conceptual consequence is: *interfaces perform conduction*. The semantic field of conduction includes the physical meaning of transmission referred to in "the theory of electric conduction"[15] (or in the basic function of semiconductors), as well as the social, educational, religious and political meaning of leadership and guidance, to which such terms as political conduction or "algorithmic conduction"[16] refer. That is why the term interface is so fruitful today: It helps to address a variety of efficacious operations – from the material basis of all sorts of computers and networks up to the educational and epistemological or ideological guidance by user interfaces showing and instructing me what to do.

Step two: from file to programming flow

This first step – a brief reminder of the advantages of the multi-faceted and thought-provoking interface concept, which are particularly evident in the proximity of *interface* and *conduction*[17] – allows reflections on the interface politics of post-industrial values.[18] They arise in

14 Christian Ulrik Andersen and Søren Pold, *The Metainterface. The Art of Platforms, Cities and Clouds* (Cambridge, MA 2018), p. 10.

15 Vannevar Bush, Memex Revisited, in: New Media, Old Media. A History and Theory Reader, ed. Wendy Hui Kyong Chun and Thomas Keenan (New York 2006), p. 90.

16 Bratton, *The Stack*, p. 52.

17 In a comparable way James Ash speaks of „transduction". Ash combines the technical ("transduction refers to a process of 'convert[ing] one kind of energy into another kind of energy'") with the philosophical meaning ("[f]or Simondon, transduction is a process 'in which activity gradually sets itself in motion, propagating within a given domain, by basing this propagation on structuration carried out in different zones of the domain [whereby] each region of the constituted structure serves as a constituting principle for the following one'"). Thus, Ash understands "transduction" as "a process by which objects in interfaces are organized by designers to produce particular qualities for other objects in that interface and for the people using that interface" (James Ash, *The Interface Envelope. Gaming, Technology, Power* [New York 2015], p. 28). In contrast to this emphasis on user interfaces, the approach proposed here and its connection to 'conduction' emphasizes the multi-layered quality of the interface complex, which also includes Ash's understanding of interfaces as (infra-)structures and environments, in which objects are arranged and processes of transduction, transmission and mutual impact, take place.

18 On the design of user interfaces as a technique of motivation and habituation for post-industrial subjects, see Timo Kaerleins's essay in this issue.

the programmatic correlation between demonstration and seclusion: of interface operations difficult or impossible to observe (networked modes of computing and *autonomous agency*) on the one hand and the dissemination of operative images and depresentations (understood as an ongoing oscillation between displaying computer agency and at the same time concealing "the processual and material complexity involved"[19]) on the screens of the spreading smartphones on the other hand. I would like to make a few fragmentary proposals on how this correlation can be addressed and questioned. My approach is to start with the most popular, the most obvious, and the most tangible – with the front-end and its interface politics of depresentations, performed as an "interface *mise-en-scène*"[20].

A historical and persistently effective example to discuss post-industrial value creation processes is the shift from object-oriented to process-oriented interaction in interface *mise-en-scènes* since 2007. This shift is of great but hardly noticed importance for the status and functionality of the computers with which the value creation of platform or capture capitalism runs.[21]

The introduction of the iPhone and its first operating system marked a historic turning point in more than one respect. The interface correlation of screen, operative images, mouse, and keyboard, presented in 1983 by the Apple Lisa (enabled, of course, by the work of Xerox PARC), was replaced in 2007 by a touch-sensitive screen, operative images, and my body – promoted by Apple as "letting you control everything with just your fingers"[22]. Controlling means interfacing by modes of conduction: At certain parts of the capacitive touch screen marked by operative images, my physical contact leads to altered electrical voltage conditions or capacities. A touching act of conduction is the very start of the commands and program sequences attributed to these operative (conducting) images.

This enables a new performance of an interface *mise-en-scène* that is presented in a grid pattern on the so-called "home screen". This shows which apps are available to me *with just my finger* and furthermore how I handle this computer is primarily how I handle apps. The operative images of this interface *mise en-scène* do not depresent files or folders, but rather programs. And this, in my opinion, is at least as important as establishing the touchscreen: the change from object-oriented interaction to process-oriented interaction.

Now interaction no longer starts with objects such as folders or files that wait

19 Marianne van den Boomen, *Transcoding the Digital. How Metaphors Matter in New Media* (Amsterdam 2014), p. 36.

20 See Jan Distelmeyer, *Machtzeichen. Anordnungen des Computers* (Berlin 2017), pp. 81–92.

21 See Till A. Heilmann, Datenarbeit im "Capture"-Kapitalismus. Zur Ausweitung der Verwertungszone im Zeitalter informatischer Überwachung. *ZfM – Zeitschrift für Medienwissenschaft* 13 (2015), pp. 35–47; Dal Yong Jin, *Digital Platforms, Imperialism and Political Culture* (New York 2015); Nick Srnicek, *Platform Capitalism* (Cambridge 2017).

22 See Ripley M. Louise, Trickster Fiddles with Informatics: The Social Impact of Technological Marketing Schemes. *Journal of Systemics, Cybernetics, and Informatics* 6/1 (2008), p. 91.

for me on my desktop and may assure my status as owner or central reference figure of a *personal computer* and "N(YOU) Media"[23]. On the home screen everything begins with a program that I always have to select and start first to find my "digital objects"[24] in it – to get to my music, my photos, or my notes in the flow and regime of the installed program.[25] Not until 2017 the new operating system iOS 11 for iPhones and iPads provided a kind of comeback of the object with the new app named "Files", which in 2010 was preceded by the app "My Files" on Android systems. Object orientation returns here not as default (as with the desktop), instead as a program like and next to many others.

This interface *mise-en-scène* of smartphones and tablets of various brands, inspired and urged by the iPhone, has initiated and conducted a new way of dealing with computers. A new gesture and order of availability: not to proceed from objects (like a file) but from processes and programmatic structures depresented by operative images of apps. Of course, even in object orientation nothing works without the primacy of programs, because every file management system of a desktop environment like the "Finder" is nothing but a running program. But the gesture is different now. Process/program first: In the beginning, the mass/power of the programs dominates, from which I can choose, but which I do not own, move and create, as I did with my files and folders. My digital objects only appear under the condition of the program responsible for them. Instead of owning these programs, the goods of the software industry, I can acquire the right to their lawful use.

In addition, processes are also gaining in importance here, as many apps (already in 2007) depend on a running Internet connection. The advertised promise of the iPhone, "it ushers in an era of software power"[26], echoed by this new performance of process orientation, is closely related to another paradigm shift: to the always-on of widespread (and not only mobile) forms of permanently networked computers and their uninterrupted energy flow as well as their uninterrupted energy consumption. Although "the voracious energy consumption of digital systems and its current and potential interactions with climate policies raise many questions", as a study published in 2019 stresses, "the material footprint of digital technology is largely underestimated by its users, given the miniaturization of equipment and the 'invisibility' of the infrastructures used. This phenomenon is reinforced by the widespread availability of services on the 'Cloud', which makes

23 Wendy Hui Kyong Chun, *Updating to Remain the Same. Habitual New Media* (Cambridge, MA 2016).

24 With reference to Yuk Hui I understand digital objects in this context as materialized forms of a large amount of "data and metadata, which embody the objects with which we are interacting, and with which machines are simultaneously operating" (Yuk Hui, *On the Existence of Digital Objects* [Minneapolis 2016], p. 48).

25 The personal pronoun 'my' is a little misleading here, not only for copyright reasons, but also because of the special nature of digital objects. Nevertheless, I remain with it, because it helps to describe the gesture of the interface *mise-en-scène* in its transformation.

26 See Ripley, *Trickster Fiddles with Informatics*, p. 91.

the physical reality of uses all the more imperceptible and leads to underestimating the direct environmental impacts of digital technology."[27]

To be is to produce traffic. And its commodification is one of the most promising business models of post-industrial production processes. The iPhone is not only a paragon for the triumph of those mobile, sensory, and quasi-autonomous active computers called smartphones. It is also a role model for the contemporary computer, that is, or should be, always connected to the Internet – and thus to further interface processes of hardware and software, to cables, server parks, and last but not least the "protocol interface"[28].

As computer efficiency can therefore increasingly be outsourced via online services and "cloud" computing, the priority of incessant networking also allows the ongoing change in the status and location of the prioritized processes: programs, software. Software can now appear even less as a product to buy and own, as good and property, but as a processing and subscribable (outsourced) service, as Irina Kaldrack and Martina Leeker have argued.[29]

My very brief suggestion now is that these programmatic, structural, and ecological changes of networked computers have also been supported by the interface *mise-en-scène* since 2007. Since access to my data is only possible through an obvious entry into a running program (and software as a service), this shift from object- to process-orientation supports to habituate to new conditions of conduction – to new man-machine(-world) relationships in the *era of software power*.

From object to process, from file to programmatic flow: The development that dealing with a computer should become more and more synonymous with dealing with a network can thereby appear both productive and natural. Just as my digital objects are now only and ostentatiously present in the flow of various and responsible programs, my data is increasingly no longer stored on my computer, but in the distributed and conducted computer network and its formations of platforms, services, and the like. This network – interface processes, programmatic systems, and circuits all of which tend to remain hidden and perhaps perceived as comparatively immaterial[30] – seems to be more than and at the same time increasingly identical with my computer. In this I am to take part.

With regard to a post-industrial economy based on many traditional forms of industry, a whole series of questions arise from this interface politics, three

27 The Shift Project, *Lean ICT: Towards Digital Sobriety*, 2019, https://theshiftproject.org/wp-content/uploads/2019/03/Lean-ICT-Report_The-Shift-Project_2019.pdf, p. 10.

28 Alexander R. Galloway, Black Box, Black Bloc, in: *Communization and Its Discontents: Contestation, Critique, and Contemporary Struggles*, ed. Benjamin Noys (New York 2012), p. 243.

29 Irina Kaldrack and Martina Leeker, There is no Software, there are just Services: Introduction, in: *There is no Software, there are just Services*, ed. Irina Kaldrack and Martina Leeker (Luneburg 2015), pp. 9-10.

30 See Sebastian Gießmann, *Die Verbundenheit der Dinge: Eine Kulturgeschichte der Netze und Netzwerke* (Berlin 2014), p. 427.

of which I would like to conclude here: If I own neither the network nor the programs containing my data, how can I claim ownership of my data? To what extent is ownership on and through platforms tied to and established by interfaces (their industry, performances, and matter)? Which deeply material and energy-consuming infrastructures enable immaterial work in capture capitalism?

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FROM ARTEFACTS TO INTERFACES: GUI BONSIEPE AND THE RE-DEFINITION OF INDUSTRIAL DESIGN, C. 1970

By Roland Meyer

"Thus, not only the Opsroom, but also the dosing mechanism of a sowing machine could now be understood as an interface: it had to be readable and understandable, it had to convey a sense of the possible uses of the machine and provide access to its operative resources, and in doing so, it structured a common sphere of communication and interaction between people and their artefacts."

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A comprehensive conceptual history of the notion of the interface, tracing the transdisciplinary itineraries of the term between such diverse fields as fluid dynamics,[1] cybernetics and computer science,[2] media and communication studies,[3] architectural and design theory,[4] remains to be written. In such a history, the years around 1970 would mark a decisive threshold moment. Not only are the late sixties and early seventies a time of intensive research into Human-Computer Interaction, the development of the first Graphical User Interfaces (GUI) and the beginnings of personal computing. Around 1970, the concept of the interface also begins to enter the field of design theory, and, as I would like to argue in the following, it is there where some of its implications regarding the transformation from an industrial to post-industrial society are most clearly spelt out. By adopting the concept of the "interface", design theory accompanied, in part even anticipated a more general economic shift from a mode of production centered around physical artifacts to one increasingly concerned with processes of signification and communication.[5]

Given the trajectory of this transformation and the hyper-capitalistic dynamic it has fueled in recent decades, it is not without irony that the first time the notion of the interface is put at the center of design theory is on the pages of a book promising the transition to socialism: *Design im Übergang zum Sozialismus*, written by German industrial designer and theoretician Gui Bonsiepe and published in 1974 as the programmatic first volume of a newly launched book series on *Design Theory*.[6] Herein Bonsiepe, who was trained at the Hochschule für Gestaltung (HfG) Ulm, recounts his recent experiences in Chile, which he had to leave after the military coup of September 11, 1973. The book tries to develop a theoretical framework which encompasses the variety of design projects he and his collaborators had pursued in the previous years, from consumer technology to agricultural machines and new forms of data visualisation. With introducing the term *interface* to cover these diverse fields, Bonsiepe, as I would like to show, not only defines a new field of activity for designers but rather sets in motion a more fundamental redefinition of industrial design and its role within society. What follows, then, is a spotlight on

1 On the origination of the term in fluid dynamics, see Branden Hookway, *Interface* (Cambridge, MA/London 2014), pp. 59–119.

2 On the history of the concept in computer science, see Hans Dieter Hellige, Krisen- und Innovationsphasen in der Mensch-Computer-Interaktion, in: *Mensch-Computer-Interface. Zur Geschichte und Zukunft der Computerbedienung*, ed. Hans Dieter Hellige (Bielefeld 2008), pp. 11–92.

3 For a comprehensive overview of the debate in media studies, see Jan Distelmeyer, *Machtzeichen. Anordnungen des Computers* (Berlin 2017), pp. 22-35.

4 For a design historical approach to the notion of the interface, see John Harwood, *The Interface: IBM and the Transformation of Corporate Design 1945–1976* (Minneapolis/London 2011).

5 On the notion of the post-industrial society, see Timo Kaerlein's essay in this issue.

6 Gui Bonsiepe, Design im Übergang zum Sozialismus. Ein technisch-politischer Erfahrungsbericht aus dem Chile der Unidad Popular (1971–73), in: *Designtheorie. Beiträge zur Entwicklung von Theorie und Praxis des Industrial Design*, Bd. 1, eds. Bernhard E. Bürdek et al. (Hamburg 1974).

Cybersyn operation room. Source: Gui Bonsiepe, *Del archipiélago de proyectos : diseño industrial en Chile 1971–1973* (La Plata: Nodal – Nodo Diseño América Latina, 2016).

nalised factories throughout the Andean state were supposed to be sent to the capital where they would be automatically collected and electronically processed. Visualised and displayed at the various screens of the opsroom, these data, together with statistical models and computer simulations, should allow a group of planners assembled in the operations room to grasp the current economic situation in real-time and to react accordingly towards impending crises.[8]

collective access to these data visualisations and to foster rapid decision-making processes. The interface, thus, here appears as a semiotic-material hybrid: a non-verbal language translating processes and entities that elude immediate perception into visually apprehensible and symbolically readable symbols, as well as a media environment, a spatial apparatus that establishes new relations between human bodies and media technologies and enables the effective manipulation of these symbols.

7 Bonsiepe, Design im Übergang zum Sozialismus, pp. 13, 206f. See also Bonsiepe's later description of the project in: *Entwurfskultur und Gesellschaft. Gestaltung zwischen Zentrum und Peripherie* (Basel, Boston and Berlin 2009), pp. 35–62.

8 Cf. Eden Medina, *Cybernetic Revolutionaries. Technology and Politics in Allende's Chile* (Cambridge, MA and London 2011).

9 Bonsiepe, Design im Übergang zum Sozialismus, p. 206.

10 Ibid.

For Bonsiepe, though, the concept of the interface was not limited to data processing systems. Rather, he used it as a theoretical tool in order to redefine the scope of industrial design as a discipline: "Industrial design does not deal with the entire universe of industrial artefacts, but only with those with which man enters into a direct operative and/or perceptive relationship, i.e. products of the class of 'interfaces'."[11] From today's point of view, such a statement may seem surprising, since most of the designs presented in the book, for example those for agricultural machines or kitchen utensils, hardly qualify as "products of the class of 'interfaces'". But what was it that constituted these "industrial artefacts" as "interfaces" in Bonsiepe's view?

Bonsiepe has reformulated and expanded his theory of interfaces in the 1990s,[12] but its core idea was already present in the 1974 formulation cited above: Instead of reducing the task of the designer to aesthetic form-giving of technically engineered and industrially mass-produced artefacts, in his view the design process should focus on the "relationships" between people and objects. Industrial design, in this perspective, acts in the *in-between*, devising the intermediate, both material as well as semiotic layers necessary to provide human subjects access to the increasingly complex world of technical artefacts they live in.

Thus, not only the *Opsroom*, but also the dosing mechanism of a sowing machine could now be understood as an interface: it had to be readable and understandable, it had to convey a sense of the possible uses of the machine and provide access to its operative resources, and in doing so, it structured a common sphere of communication and interaction between people and their artefacts. By becoming a designer of interfaces, the industrial designer thus ceases to be preoccupied with the mere aesthetic form of the artefact, and rather begins to design new forms of access and use.[13]

By introducing the notion of the interface into design theory, Bonsiepe deliberately broke with a (late) modernist conception of design very much centered around the notions of *form* and *function*.[14] Especially in post-war Western Germany, the ideal of industrial design was considered to be what Max Bill, the first rector of the HfG Ulm, famously coined "Die gute Form" (*the good form*).[15] The designer, in Bill's view, was responsible to give every artefact, "from spoon to city", its definitive, appropriate form, both practical and beautiful, reflective of its function and in accordance with the eternal laws of aesthetics. For Bill, this was nothing less than a profoundly ethical task, whose ultimate goal was to bring "civilisation" and "culture" into "harmony".[16] Whereas the "good form"

11 Ibid., p. 39.

12 Gui Bonsiepe, *Interface. Design neu begreifen* (Mannheim 1996).

13 Ibid., p. 20.

14 Bonsiepe, *Entwurfskultur und Gesellschaft.*, p. 155.

15 Max Bill, *Die gute Form: 6 Jahre Auszeichnung "Die gute Form" an der Schweizer Mustermesse in Basel* (Winterthur 1957).

16 Paul Betts, *The Authority of Everyday Objects. A Cultural His-*

aimed at an organic unity of form and function, realised in the single artefact and visible in its physical appearance, Bonsiepe's concept of industrial design as interface neither begins nor ends with the isolated artefact, but encompasses the whole network of material as well as symbolical relations which it is part of. Rather than just aesthetically expressing the already determined function of a given technical artefact, the interface opens up a new space of possible uses and functionalities, thus undermining every attempt to distinguish between form and function in the first place.

Bonsiepe's redefinition of industrial design can be seen as the conclusion of a debate that had been going on in German design discourse since the late 1950s. At the HfG Ulm, where Bonsiepe first studied and later teached, the role of the designer in the process of industrial production was intensely debated, not least out of a fear that it was becoming increasingly marginalised. In the affluent German consumer society of the "Wirtschaftwunder" era, the role of industrial design threatened to sink into a mere superficial aestheticisation, the role of the designer being reduced to adding surplus exchange value to otherwise exchangeable products. Bill's "good form" was initially presented as an antidote to this process, as it gave German designers an ethical ideal that could clearly be put forward against the commercial "styling" primarily identified with commercial American industrial design.[17] But during the 1960s, it became more and more clear that the question of the "good form" now definitely belonged to a bygone era of industrial production.

One of the first to notice this was Swiss sociologist and design theorist Lucius Burckhardt. In several articles in the late sixties, Burckhardt pointed out that recent technological developments had made the ideals of modernist design more or less obsolete. Pliers and coffee pots, Burckhardt wrote ironically in 1967, could perhaps still be designed in correspondence to the modernist ideals – but in the era of transistors, more and more artefacts structurally eluded any attempt to reconcile their visible form und their technical function. A tin box full of wires, transistors and batteries, Burckhardt writes, could just as easily be a musical instrument as a calculating machine. In these and other cases, no longer the visible "appearance" of elements, but their "invisible" organisation determines their function – which in turn is conveyed to the user solely via external control elements: "Because of the buttons we have to press, we know what kind of apparatus it is, and if we don't know these buttons [...], if they don't tell us anything, then this apparatus remains alien and useless to us."[18]

Rather than giving an aesthetic form to an already determined function, de-

tory of West German Industrial Design (Berkeley, Los Angeles and London 2004), p. 154.

17 Ibid., pp. 139–177, esp. p. 152.

18 Lucius Burckhardt, Bauen. Ein Prozess ohne Denkmalpflichten (1967), in: Lucius Burckhardt, *Wer plant die Planung? Architektur, Politik und Mensch*, eds. Jesko Fezer and Martin Schmitz (Kassel 2004), pp. 26–45, here p. 43.

sign here defines and enables possible uses, by providing symbolic means of communication, material devices of manipulation, and establishing a perceptive and operative relationship between a human subject and a technical artefact. Although he does not use the term interface, what Burckhardt describes is not unlike what Bonsiepe will conceptualise a few years later: the replacement of design as an art of form-giving by design understood as a practice of mediation and communication.

Around 1970, in an increasingly complex world, determined by immaterial structures and invisible processes rather than material forms and visible appearances, design could take on a new role which would go beyond the mere styling of surfaces. Rather than just increasing the commercial exchange value of mass-produced artefacts, it could now set itself the task of generating new use value by focusing on the interface between the everyday environment of the user and a sphere of technical artefacts whose functional dimension increasingly eluded sensual experience. In stark contrast to Bonsiepe's revolutionary dreams of the seventies though, this redefinition of industrial design hardly made it into a weapon of political liberation and the overcoming of cultural, technological and economic dependencies.[19] In retrospect, one could argue, the shift of design theory from artefacts to interfaces rather paralleled and even anticipated a more general economic transformation in late-capitalist societies, where the main site of value production also began to shift from the factory to the logistics, advertisement, service, communication and financial departments – thus, exactly those sites where new relationships between commodities and their consumers, in a certain sense: new interfaces, were being designed and established.

19 Bonsiepe, Design im Übergang zum Sozialismus, p. 13.

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NATURAL USER INTERFACES AND THE IMAGINATION OF POST-INDUSTRIAL WARFARE: A BRIEF LOOK AT BLADE RUNNER 2049

By Christoph Ernst

"Blade Runner 2049 gives us a hint how to imagine the future of warfare. According to the film, post-industrial society will be a 'post-human' society."

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I. Imagining interfaces and future warfare

If user interfaces can be considered as a key technology of the 'post-industrial' society then this is true for the 'post-industrial condition of warfare' as well. The relevance of interfaces in military technology and, vice versa, the importance of military applications for the development of interfaces is very well known. It is hardly news to consider user interfaces as an integral part of warfare. Nevertheless, current debates on "autonomous weapons systems" (AWS)[1] give us the opportunity to take a fresh look on this relation.

It can be argued that in military contexts user-interfaces are currently transformed into tools for second-order observations of highly integrated automatic operations. According to the available information, 'autonomy' in self-acting weapons is still limited to very specific tasks. Thus, the real issues with 'autonomy' concern 'teamings' between human actors and machinic actors.[2] The problem is how to develop man-machine-relations which are able to make the best out of the respective cognitive abilities of both types of actors. The design of effective interfaces is crucial to tackle this problem.[3]

As David Kirby has shown, the development of user interfaces it related to the development of "diegetic prototypes" in science fiction-films. For Kirby, diegetic prototypes such as the famous interface in *Minority Report* (US, 2002) are "[…] depictions of future technologies [to, CE] demonstrate to large public audiences a technology's need, viability and benevolence. […] These technologies only exist in the fictional world – what film scholars call the diegesis – but they exist as fully functioning objects in that world."[4]

Currently, so called "natural user interfaces" (NUIs) are regarded as the next step in the evolution of user interfaces. The idea is to abandon devices like the keyboard or the mouse and to use the "natural" interaction of our bodies (hands, voice) with the physical world as a basis for input-output-relations.[5] Following these ideas, I want to briefly sketch a scenario in which military force is controlled via a highly integrated coupling between autonomous NUIs and AWS.

1 Nehal Bhuta, Susanne Beck, Robin Geiß, Han-Yan Liu and Claus Kreß (eds.), *Autonomous weapons systems. Law, ethics, policy* (Cambridge 2016).

2 Lucy Suchman and Jutta Weber, Human-machine autonomies, in: *Autonomous weapons systems. Law, ethics, policy*, eds. Nehal Bhuta, Susanne Beck, Robin Geiß, Han-Yan Liu and Claus Kreß (Cambridge 2016), pp. 75–102.

3 Christoph Ernst, Beyond Meaningful Human Control? – Interfaces und die Imagination menschlicher Kontrolle in der zeitgenössischen Diskussion um autonome Waffensysteme (AWS), in: *Die Maschine: Freund oder Feind? Mensch und Technologie im digitalen Zeitalter*, eds. Caja Thimm and Thomas Bächle (Wiesbaden 2019), in print.

4 Cf. David Kirby, The future is now: diegetic prototypes and the role of popular films in generating real-world technological development. *Social Studies of Science* 40 (2010), pp. 41–70, here p. 41.

5 For a definition of NUIs see Yvonne Rogers, Helen Sharp and Jenny Preece, *Interaction Design. Beyond Human-Computer Interaction* (Chichester 2015), pp. 219–222, here 219.

The example to illustrate those ideas is a scene from Denis Villeneuve's *Blade Runner 2049*, in which a NUI is presented as a "diegetic prototype". In part, the implications of this scene are anticipated in the reflections on post-industrial warfare in the book *War and Anti-War* (1993) by Alvin and Heidi Toffler.

II. Looking back at post-industrial warfare

Alvin and Heidi Toffler were among the most important theorists on the post-industrial society and its relation to warfare. In 1993 they stated, "the way we make wealth and the way we make war are inextricably connected."[6] Applied to warfare, what happened in Kuwait and Iraq in the Gulf War 1991 was a symptom of what they called the "third wave" in human economic production. In the book they tried to show that the criteria of a post-industrial society could be applied not only to means of economic "production" but to military "destruction" as well. According to this premise, the Toffler's identified the following analogies between a 'post-industrial-style' of usage of information and communication technologies (ICT's) and the way the US-forces operated during the war of 1991:

1. Knowledge processed by networked computers (information) was the "central resource" of the war.[7]

2. "Value" was not created by sheer quantity of numbers (tanks, planes etc.) but as an "intangible" size which emerged from the interplay between different factors.[8]

3. The goal was to create "finer and finer precision [with, CE] more and more selectivity" in the use of force.[9]

4. Military personnel was better educated in order to operate the fielded "smart" weapons and to deal with the increasing complexity of military technology.[10]

5. Because of their education, soldiers were able to improvise in an effective way despite the confined limits of military hierarchy.[11]

6. The overall efficiency of all components (people, weapons, logistics etc.) was maximized by computers, the whole effort was (relatively) cost-efficient and provided "more bang for the buck."[12]

7. ICTs strengthened bottom-up decision-making and created the possibility for more decentralized military hierarchies (e. g. in the context of special operations).[13]

8. ICTs were merged into one gigantic complex logistic system, were every ele-

6 Alvin Toffler and Heidi Toffler, *War and Anti-War* (New York 1993), p. 73.

7 Ibid., pp. 79–82.

8 Ibid., pp. 83–84.

9 Ibid., pp. 83–85.

10 Ibid., pp. 85–88.

11 Ibid., p. 88.

12 Ibid., pp. 88–89.

13 Ibid., pp. 89–90.

ment of the war was accounted for.[14]

9. The "electronic infrastructure" was the largest created in previously known military history.[15]

10. The allied force was no longer a military "machine," but a "system with far greater internal feedback, communication, and self-regulatory adjustment capability," in short, it was a "thinking system."[16]

From hindsight, some analogies are disputable. Regarding the influence of computers, the Toffler's reproduced in part the propaganda of the US-military. However, the conclusions they drew in *War and Anti-War* are not wrong. Some aspects of them are even prophetic.[17] A good example is the chapter on "Robot Wars".[18] What is today an important debate, the Toffler's did foresee in some parts. For example, they mentioned already the problem of "humans in the loop"[19]: "[b]y extension, one can envision even more complex integrations of helicopters, ships, tanks, and ground-support planes into a single 'robotic organism' under the control of tele-operators. The imagination conjures up an all-robotic battlefield."[20] If we consider interfaces in the above mentioned sense as "diegetic prototypes," how is the scenario of a "robotic organism" depicted in current science fiction movies?

III. Imaging interfaces for future warfare

Denis Villeneuve's 2017 film *Blade Runner 2049* offers us a scene in which an automatized battlefield and the control of military force via NUIs becomes tangible (00:59:45-01:01:50).[21] The main character of the movie, K (Ryan Gosling), has been shot down with his flying car in the ruins of a destroyed city. As we learn, K's actions are under surveillance by Luv (Sylvia Hoeks), a replicant, created by Niander Wallace (Jared Leto), CEO of a powerful replicant manufacturing company. Luv operates as his right hand and is tasked with the mission to keep a watchful eye on K's actions.

In the scene, K is attacked by hostiles. Outnumbered by his attackers, suddenly precise missile strikes occur. The missiles are literally 'raining' on his opponents, killing all of them. A moment later we see Luv, sitting relaxed in an armchair, getting her nails done. Looking

14 Ibid., pp. 90–91.

15 Ibid., pp. 91–92.

16 Ibid., pp. 92–93.

17 Their analysis of the analogy between economy and warfare provided a basis for the influential 'network-centric warfare'-doctrine which was developed in the mid-1990s. See Arthur K. Cebrowski and John J. Garstka, Network-Centric Warfare: Its Origin and Future. *US Naval Institute Proceedings* 123/1 (1998), pp. 1–11.

18 Toffler and Toffler, *War and Anti-War*, pp. 125–136.

19 Ibid., p. 129. See for this discussion and the necessary literature on the subject Ernst, Beyond meaningful Human Control.

20 Toffler and Toffler, *War and Anti-War*, p. 130.

21 *Blade Runner 2049*, Denis Villeneuve, USA 2017, DVD Sony Pictures Home Entertainment.

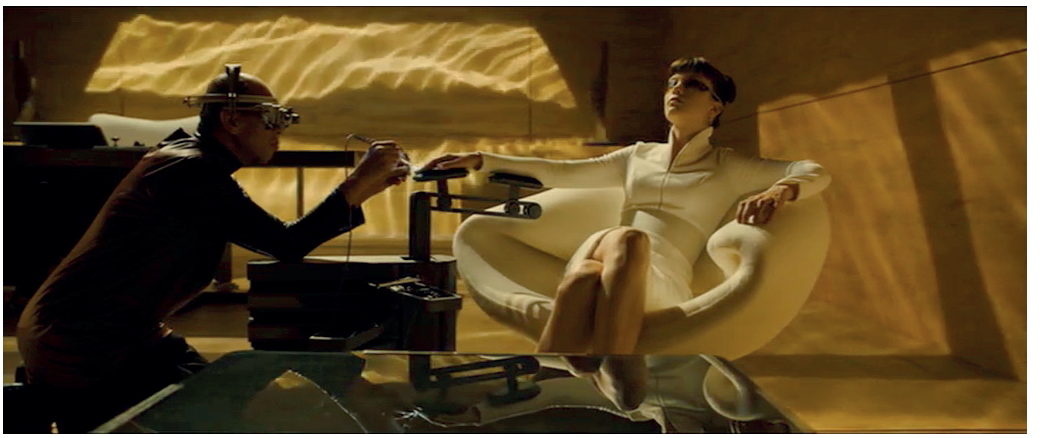

Fig. 1: Screenshot from Blade Runner 2049, Dennis Villeneuve, USA 2017, DVD Sony Pictures Home Entertainment.

upwards in the light, she wears mixed-reality glasses. The glasses are a combination of a head-mounted-interface augmented reality interface and a voice-controlled NUI which is integrated into a setting that seems private, but is in fact her workplace. The interface is a wearable, voice control makes it multimodal. In her glasses are the events at K's site visible as a superimposition.

It is interesting to note, that the missiles come right out of the 'clouds.' While there is some debate on the web, which weapon platform is used in the scene, the whole point of the scene is to conceal the weapon system (the 'cloud'). The movie doesn't show drones, airplanes, or helicopters as the weapon-platforms. When K looks up in the air to figure out who helped him, all we get is an indexical point of light in the sky. In military terms, Luv is commanding a 'close air support'-mission (CAS). The firepower is highly precise and well-adjusted. For CAS this is important because there is, like in the scene, close contact between one's own troops and foreign troops. Furthermore, the scene depicts a low intensity conflict with irregular forces, a typical feature of the "new wars" (Herfried Münkler) since 9/11. Yet, we don't see humans at work. Instead, we can assume that automatized robotic systems are used. Why is the interface – Luv's mixed-reality glasses – interesting?

What distinguishes the interface in this scene is the absence of any form of explicit display of information- or control-elements. There is no 2D or 3D geometry visible, no coordinate system, no diagrammatic elements to organize the command & control-relation between user and the objects targeted by the weapon system. The interface is completely transparent and 'naturalized', reacting to voice command but otherwise operating independent from further human control. Luv has all time in the world and the weapon system does the work for her.

This absence of gesture-based control and visualisation of target acquisition is a remarkable feature of the interface. It reminds us of the difference between bodily engaged usage of devices, be it a

computer, be it a car, and bodily disengaged usage of automatized services, as it is e. g. the case with voice-controlled assistants like Amazon's Alexa. In the theory of traditional graphical user interfaces (GUI) 'spatialisation' was regarded as the driving factor of interface design.[22] Direct manipulation by pointing gestures is replaced in the scene by a proactive interface, which can be referred to as 'invisible computing' or even 'ambient intelligence'.[23] The AWS is selecting the targets, choses the adequate weapons, and offers this as a 'service' to Luv. This kind of self-organisation and cooperation obviously takes place in a highly integrated, automatized manner in order to relief Luv from any coordinating activities. We even can consider the interface to be part of a 'liquid operation' or 'operational flow', which is expressed in the scene by shadows of moving water all over the walls.[24] But to what extent is this interface a "diegetic prototype" for interfaces of future warfare?

The movie doesn't show us the teaming between human cognitive abilities and AI-based machinic cognitive abilities. The reality of this interaction is simply presupposed. In fact, the depicted NUI is as real as it can get at our current point in time. Such sophisticated NUIs are certainly conceivable, but are not yet ready for the mass market. To come back to Kirby's criteria, the diegetic prototype visualised in the movie shows the viability of the technology and the need for it, but not its 'benevolence'. Yet, this is exactly the point. The NUI strongly resembles a military application for a real-world interface like Microsoft's *HoloLens*-glasses. Given that, maybe it is no surprise that in November 2018, one year after the release of the film, Microsoft signed a $479 million contract with the US-military in order "to use the new HoloLens in a platform that 'provides increased lethality, mobility, and situational awareness necessary to achieve overmatch against our current and future adversaries.'"[25] In case of *Blade Runner 2049*, Hollywood was one step ahead. The movie gives us a scenario in which – on the level of interface metaphors – such an interaction between humans and automatized or even autonomous machines of war is

22 From the perspective of cultural theory see e. g. Janet H. Murray, *Inventing the medium. Principles of interaction design as a cultural practice* (Cambridge, MA 2012), Johanna Drucker, *Graphesis. Visual forms of knowledge production* (Cambridge, MA 2014).

23 José L. Encarnancao, Gino Brunetti and Marion Jähne, The interaction of humans with their intelligent environment, in: *Mensch-Computer-Interface. Zur Geschichte und Zukunft der Computerbedienung*, ed. Hans Dieter Hellige (Bielefeld 2008), pp. 281–306.

24 This flow might even be seen as a metaphor for the interface in general, as the notion of "interface" originally comes from the dynamics of liquids. See Peter Schaefer, Interface. History of a concept, 1868–1888, in: *The long history of new media. Technology, historiography, and contextualizing newness*, eds. David W. Park, Nicolas W. Jankowski and Steve Jones, (New York 2011), pp. 163–175. See for a further elaboration with regard to the idea of "conduction" Jan Distelmeyer's text in this volume.

25 April Glaser, Microsoft workers say the company is war profiteering, and they've timed their protest to hurt. *Slate* (February 2019), https://slate.com/technology/2019/02/microsoft-workers-protest-hololens-pentagon-contract.html, access: January 4, 2019, 15:30; Joshua Brustein, Microsoft wins $480 million army battlefield contract. The military plans to purchase as many as 100.000 HoloLens augmented reality devices. *Bloomberg* (November 2018), https://www.bloomberg.com/news/articles/2018-11-28/microsoft-wins-480-million-army-battlefield-contract], access: January 4, 2019, 16:30.

already a 'seamless' and 'liquid' reality. Interface-based 'teamings' between man and machines are the normal case.

Looking back at the Toffler's analogies between the Gulf War of 1991, the 'information society' and its economy it is obvious which aspects of the analysis are compatible with the movie and the particular future depicted in it. Future warfare will be a privatised service, run by the big players of the tech industry (like e. g. Microsoft). Using state of the art-NUIs, a wide range of AWS will be ready at voice command. The user, in our case Luv – a fully qualified and extremely 'smart' operator –, has not to care about the operational performance of the weapon. She can lean back and let the AWS do the work.

Certainly, the military would appreciate such a scenario. It appears, that humans are still in the 'loop'. This is a criterium to fulfil normative requirements regarding 'human' warfare in the age of AWS.[26] The only problem is, that Luv is not a human but a replicant, operating as the right hand of the company leader. Luv is, as Wikipedia informs us, a "bioengineered android".[27] This illustrates where the post-industrial situation the Toffler's described back in 1993 already has been transgressed in the fictional film – and most likely will be transgressed in reality as well. *Blade Runner 2049* gives us a hint how to imagine the future of warfare. According to the film, post-industrial society will be a 'post-human' society. The way war is conducted in a post-human society is in large parts warfare on the basis of AWS. However, this means we have to transgress the differentiation between 'operators in the loop' on the one side and 'robots' on the other side as well. And this means to challenge at least one of the premises in the Toffler's book. As an interface user, Luv is not the kind of human "tele-operator" controlling the machines the Toffler's talked about back in 1993. Neither are the 'troops' she saves. K is a replicant and he is accompanied by Joi (Ana de Armas), a holographic artificial intelligence. As a replicant, Luv is a metaphor for a new type of "smart player"[28], challenging a simple differentiation between man and machine in the process. The "thinking system" in the scene consists of man-machine-interactions, but not in the way it was imagined back in 1993. The interfaces of the future will link hybrid 'users', weaving together "human-machine assemblages".[29]

As a conclusion, we can see the significance of post-humanism for interface-theory (and of interface-theory for post-humanism). Scenarios like the one from *Blade Runner 2049* can be regarded as a reason to rethink the differentiation between humans and computers, thus re-conceptualising the understanding and relevance of interfaces for the relation between man and machine.

26 Ernst, Beyond meaningful human control.

27 Wikipedia (English), Replicant, https://en.wikipedia.org/wiki/Replicant, access: February 4, 2019, 12:00.

28 Encarnancao, Brunetti and Jähne, The interaction of humans, p 289.

29 See for further literature Suchman and Weber, Human-machine autonomies, p. 78.

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BIOGRAPHICAL NOTES

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