Technoscientific Operations of Statehood: The Media Monopoly.

Abstract:

How is the relation of the so-called individual to the state materialized? Normally in an ID-Card or something similar. The ID-Card is the technical relay between the body and the abstract orders of addresses that define the *citoyen*. To ensure the functionality of the state ID-Cards are highly protected – as is money. ID-Cards and money are often very advanced and complex technoscientific and medial objects. They use very advanced technologies like holography, kinegrams, unreproducible color schemes, point-clouds etc. The paper describes the historical emergence of socio-technical arrangements to protect the medial form of the state. It thereby becomes visible that all modern, even the most democratic, states have a ‘media monopoly’ (of protected documents) that is co-constitutive with its monopoly on power. The ‘media monopoly’ is under constant threat by new technological and social developments and is constantly defended. And in this process, interestingly enough, new technologies are seen as the non-human actors that threaten the state.

Introduction

In their thought provoking paper “Actor-Network State” Jan-Hendrik Passoth and Nicholas J. Rowland¹ argue that it might be helpful to escape the dichotomy of theories that model the state like a person-like actor and those (rarer ones) that model the state like a network. They propose – using the recently very much discussed approach of actor-network-theory – a model of the state as ‘actor-network-state’. Seen in this light, the state is a network of human and non-human actors that are bound together by circulating mediators. It is surprising that some of the most central non-human actors (or mediators) are not mentioned or just mentioned in passing: the ID-Card, passports or money, that could be called ‘media of statehood’. When they for example quote Carroll – “The state is ‘anything but an agent.’ [...] Instead, it is ‘constituted in a highly complex matrix of ideas and representations, government and bureaucratic agencies, and land and people’”² – the media of statehood are absent (although Carroll speaks vaguely of ‘representations’, but that could also apply e.g. to maps of the territory of the state as they are shown on television). One page later, to be sure, Passoth and Rowland add that “printing passports” is one of the “concrete and interwoven ‘things’ done and said” that construct the state. I want to follow that important hint.

¹ Jan-Hendrik Passoth and Nicholas J. Rowland, “Actor-Network-State. Integrating Actor-Network-Theory and State Theory,” *International Sociology* 25, 6 (2010): 818–841.

² Ibid, 823.

In the following essay I want to analyze historically the techno-scientific construction of ‘optical document security’, which is a crucial precondition for the working of that mediators (ID-Cards, passports, banknotes etc.) that are a crucial part of the actor-network of the state. It will be shown that there is a ‘media monopoly’ of the state, which is a very precondition of its so-called power monopoly. Therefore this media monopoly is highly protected and under in constant struggle.

But to begin, I want to make some remarks on central notions: I use a certain notion of ‘statehood’: “I want to suggest that the modern state, [...] in a crucial sense is a configuration of subject-bodies and material spaces, realized within a network of heterogeneous practices, in which both government and science are integral.”³ This notion of the state as a heterogeneous assemblage, which is constantly performed, is central to my paper. I want to underline two points:

First: The subject-bodies of which Carroll speaks, are – of course – not given, but produced and constructed, as e.g. Law teaches us.⁴ Also Callon’s insistence, that “ANT was developed to analyse situations in which it is difficult to separate humans and non-humans”⁵ is helpful: Being a subject-body, a citizen or even a person always already means to be a heterogeneous assemblage of a living body and an ID-Card (or similar documents). Our name is attached to us via the ID Card, it is necessary to have such a document to establish a bank account, to enter education and so on. Being a subject body, a citizen or even a person is performed constantly in certain material spaces, e.g. when one has to show a passport at a border, meaning that one enters legitimately a certain state, or showing it in the office of a bureaucratic institution etc. That’s one of the ways how “states are performed”.⁶ The ‘individuum’ is at least dividable in its human and non-human components and a heterogeneous network from the very beginning. Of course other documents like the birth certificate play also an important role in this subject/citizen/person-becoming of the body in specific material spaces, but here I want to focus on the central examples of the “material practices of domination”⁷, namely the ID-Card and money.

³ Patrick Carroll, “Science, Power, Bodies: The Mobilization of Nature as State Formation,” *Journal of Historical Sociology* 9, 2 (1996): 139-167, here: 140.

⁴ Cf. John Law, “Notes on the Theory of the Actor-Network: Ordering, Strategy and Heterogeneity,” *Systems Practice* 5 (1992): 379–393.

⁵ Michel Callon, “Actor-Network Theory. The Market Test,” in *Actor-Network-Theory and After*, ed. John Law and John Hassard (Oxford: Blackwell Publishing 1999), 181–195, here 183.

⁶ Passoth/Rowland, “Actor-Network State,” 819. On the performative construction of the citizen-subject by showing the passport or ID-Card see Jens Schröter, “Sich ausweisen.,” in *Fotografisches Handeln*, ed. Ilka Becker, Bettina Lockemann, Astrid Köhler, Ann Kristin Krahn and Linda Sandrock (Kromsdorf: Jonas-Verlag, 2016), 226–238.

⁷ See Chandra Mukerji, “Material Practices of Domination. Christian Humanism, the Built Environment, and Techniques of Western Power,” *Theory and Society* 31/1 (2002): 1-34.

But I want to focus on these central media in a certain respect: I'm not giving a detailed history how modern passports or money came into being. There is already some research on this.⁸ I want to focus on how "science and engineering are sources of social power"⁹ and on the scientific moment in the operations of ID-Cards and money, *namely in all the negotiations and struggles to make it resistant to tampering and forgery*.

Second: My focus will be on money. Money is as important for being a citizen as is the ID-Card – and the problems of stabilizing its function by avoiding forgery are even more pressing. The institutions, in which engineers and scientists constantly devise new security features in reaction to the public spreading of new technologies like photocopier machines, are often the same as those in which ID-Cards are developed. The state is the only authority that is allowed to emit money. The economy and the state are inextricably interwoven – to make business one has to have (normally) a valid ID-Card; to participate in social and political life you (normally) need money. And especially the state apparatus needs money to perform its operations. So it makes no sense to artificially separate 'political' and 'economic' media. They are in one and the same movement 'mediators' (Latour) of the economic and the political and parts of their ongoing performative construction.

Some words on method: My background is in so-called German Media Studies, which is often related to the work of Friedrich Kittler. The field is highly complex and heterogeneous.¹⁰ There has been a long tradition of dialogue and also controversy between the different strands of communication and/or media studies¹¹ and STS, as Boczkowski and Lievrouw have discussed in a concise article.¹² They discuss the differences between (what they call) communication studies and STS with a focus on three central questions: 1. prevailing notions about causality in technology-society relationships, 2. the process of technology development and 3. the social consequences of technological change. While media studies (and now I'm speaking especially of Kittlerian media studies) prefers 1. the determination of society by technology, 2. reduces the question of development to

⁸ Cf. John Torpey, *The Invention of the Passport* (Cambridge: Cambridge University Press, 2000). The literature on the history of money is enormous see only *The Cultural History of Money and Credit: a Global Perspective*, ed. Chia Yin Hsu, Thomas M. Luckett and Erika Vause (Lanham: Lexington Books 2016).

⁹ Chandra Mukerji, "Intelligent Uses of Engineering and the Legitimacy of State Power," *Technology and Culture* 44/4 (2003): 655-676, here 658, she's making this statement with regard to Bruno Latour.

¹⁰ Cf. Jens Schröter, "Disciplining Media Studies: An Expanding Field and Its (Self-)Definition.," in *Media Transatlantic: Developments in Media and Communication Studies between North America and German-speaking Europe*, ed. Norm Friesen (Kromsdorf: Jonas-Verlag, 2016), 29-48.

¹¹ In Germany communication studies and media studies are two different disciplines.

¹² Cf. Pablo Boczkowski and Leah A. Lievrouw, "Bridging STS and Communication Studies: Scholarship on Media and Information Technologies," in *The Handbook of Science and Technology Studies*, ed. Edward J. Hackett, Olga Amsterdamka, Michael Lynch and Judy Wajcman (Cambridge/MA and London: MIT Press 2008), 949-978.

epistemological questions and 3. heavily uses an language of ruptures and revolutions, STS tends – so the authors argue – to 1. discuss the determination of technology by social context, 2. analyzes very detailed the social construction of technology and 3. emphasizes continuity over discontinuity. Although there are recently more balanced approaches, emphasizing ‘co-construction’ between social and technological elements, a perspective which also informs my paper, there is one aspect of ‘technological determinism’ which remains important: Mukerji argues, as we have seen, that ‘science and engineering are sources of social power’. And although technological determinism can be criticized in several respects, it is interesting to see that the human actors in the field of the fight against forgery describe technologies as threats. *Technologies are literally seen as non-human actors that threaten the given technological setup to protect the media monopoly of the state.* The stability of money is seen as an endless process, always threatened by technological developments. In this sense the papers follows the actors as they practically behave as techno-determinists.¹³ And in the same movement, in which technology is positioned as the potential threat (and the solution) the state is construed as a seemingly homogeneous actor fighting against e.g. the photocopier.

Another point that differentiates German Media Studies from STS is, of course, the centrality of the notion of ‘medium’, which has no central place in STS. The point in media studies (especially in its ‘German’ version) is, that the notion of medium is wider than in traditional communication studies. It encompasses all technologies constructed for the “transmission, storage and processing of information”¹⁴ – and these are not only the mass media, but also e.g. ID-Cards and money. By using the notion of ‘media’ in this way firstly it becomes visible that there is a difference between traditional mass media (or the Internet) that are not controlled by the state (at least in most ‘western’ societies) and those ‘media of statehood’ which are very strictly controlled by the state and in the same movement produce the state. Secondly the difference between information and the information carrier (medium), which is central for media studies, is also central for those institutions that produce these state-controlled and state-constituting media, because the information carrier is the site on which the struggles between the state and the threatening non-human actors of technology takes place.

¹³ Cf. Sally Wyatt, “Technological Determinism is Dead; Long Live Technological Determinism,” in *The Handbook of Science and Technology Studies*, ed. Edward J. Hackett, Olga Amsterdamska, Michael Lynch and Judy Wajcman (Cambridge/MA and London: MIT Press 2008), 166-180, especially 172: “Now it is time to follow the actors in their continued commitment to technological determinism.” See also the insightful discussion in David J. Hess, “Power, Ideology, and Technological Determinism,” *Engaging Science, Technology, and Society* 1 (2015), 121-125.

¹⁴ Friedrich Kittler, *Draculas Vermächtnis. Technische Schriften* (Leipzig: Reclam 1993), 8. My translation.

The following analyses are admittedly sketchy – they do not present an already finished study but instead open a field for intense archival research. I hope they make at least clear why the field of the state-controlled and at the same time state-producing media is a field worth the research.¹⁵

The document

“A certificate is a piece of writing that gains credibility as a legally binding document through its formal layout and design.”¹⁶ Documents in the form of certificates are a key medium of the state and economic order – for example, they define claims of ownership and also specify individuals’ identity, as in the case of personal documents.¹⁷ Because of their central importance for what Christoph Engemann has aptly termed “*governementality*” (“*Gouvernementalität*”), drawing on Michel Foucault,¹⁸ it has to be possible to ensure the *authenticity* of these documents. It has to be certain that an official document really is official, that the information it contains is accurate and reliable.¹⁹ Viewed in this light, we have a media monopoly that corresponds to the state’s power monopoly. This monopoly is at the same time controlled by the state as it produces the state: Certain types of documents are only allowed to be produced by the authorities responsible and forgeries are severely punished (with fines or prison sentences of up to ten years according to Art. 267 of the German Criminal Code). However, forgeries first need to be recognized if those producing them are to be penalized, meaning law and the materiality of state-media are co-constitutive. Accordingly, the mediality of certificates and other state documents, such as bank notes, which are the media of the state and the economy, is a complex one. “Only the specific combination of the document text and the document medium constitutes the document’s validity; a mere copy of a given document’s wording on a new text vehicle has no legal validity (unless the copy is itself certified).”²⁰ Here the difference of information and information carrier is introduced.

¹⁵ A book-length study is in preparation.

¹⁶ Tilo Werner, “Urkunde,” in vol. 9 of *Historisches Wörterbuch der Rhetorik St-Z*, ed. Gert Ueding (Darmstadt: WBG, 2009), 934.

¹⁷ Cf. Edward Higgs, “From Frankpledge to Chip and Pin: Identification and Identity in England, 1475–2005,” in *The History of Information Security: A Comprehensive Handbook*, ed. Karel de Leeuw and Jan Bergstra (Amsterdam, Oxford: Elsevier, 2007), 243–262.

¹⁸ Cf. Christoph Engemann, “Write me down, make me real. Zur Gouvernentalität digitaler Identität,” in *Quoten, Kurven und Profile. Zur Vermessung der sozialen Welt*, ed. Jan-Hendrik Passoth and Josef Wehner (Wiesbaden: Springer, 2013), 205–227.

¹⁹ On the rise in “identity theft”, which constitutes a serious problem, particularly for finance, cf. Chris Jay Hoofnagle, “Identity Theft. Making the Known Unknowns Known,” *Harvard Journal of Law & Technology* 1, 21 (2007): 98–122. Cf. also Pieter Wisse, “Semiotics of Identity Management,” in de Leeuw and Bergstra, *The History of Information Security*, 167–196.

²⁰ Werner, “Urkunde,” 936.

Accordingly, the “document medium” must be designed in such a way that it cannot be easily imitated by unauthorized persons, or alternatively it must be easy to identify whether a given certificate possesses the correct mediality (otherwise it is a counterfeit). “The characteristics of certain media prompted the development of anti-forgery techniques.”²¹ This formulation is already significant, because the agency is ascribed to the ‘media’ – we will follow this trail: Against this background, the question of the “shifting media of statehood” arises²² – not only in the sense that, following the “digital revolution”, states need to produce and control new digital documents (“E-Government”)²³, but also in the sense that the spread of new media technologies potentially threatens the criteria governing the authenticity of documents and thus causes counter reactions. Media monopoly is not given once and for all, but is an “ongoing accomplishment”²⁴, densely interwoven in everyday practice. The monopoly needs to be defended constantly – and military imagery is used in doing so. In this way the heterogeneity of the state-as-network is coalesced into the state-as-actor powerfully ‘fighting’ enemies. This could be described as a form of ‘punctualization’ (John Law) of the state.²⁵ Three “lines of defense” are mentioned (in regard to the authenticity of money) in an exemplary text. The first consists of procedures that aim to make it possible for normal citizens to recognize a forgery at first glance. Here we see, how the stability of money is (at least in principle) interwoven into the fabric of everyday life, where it has to be performed constantly. However, if the forgeries are good enough this may no longer work. Here the second line of defense comes into play. It is made up of people that work with money in a professional capacity (e.g. bank clerks or traders) and use special devices (such as money counting machines). These specialized practices are an object for planned future field work. Anyway, if these ‘specialists’ are not able to detect the forgery either, then there is still the

²¹ Ibid. This also includes interesting information on historical techniques for ensuring authenticity, such as tallies. Also cf. Thomas Vogtherr, “Urkunden und Akten,” in vol. 4 of *Aufriß der Historischen Wissenschaften in sieben Bänden*, ed. Michael Maurer (Stuttgart: Reclam, 2002), here 154 on the fact that the “standardisation of the appearance” of certificates was “a safeguard against the falsification of documents”. He notes on p. 157 that “modern diplomatics, the academic study of documents, emerged around 1700”; “the fundamental question both then and now is *discrimen veri ac falsi*, the distinction between what is real and what is false”.

²² Engemann, “Write me down,” 212.

²³ Cf. Christoph Engemann, “Im Namen des Staates. Der elektronische Personalausweis und die Medien der Regierungskunst,” *Zeitschrift für Medien- und Kulturforschung* 2 (2011): 211–228.

²⁴ Harold Garfinkel, *Studies in Ethnomethodology* (Englewood Cliffs/NJ: Prentice Hall, 1967), vii.

²⁵ Cf. Patrick Carroll, “Articulating Theories of States and State Formation,” *Journal of Historical Sociology* 22, 4 (2009): 553–603, here 559: “The actor-state can be recast as an institutionalized discourse, a distorted representation of the state that is nonetheless real enough in its effects [...]. In this context state theory can benefit from articulation with actor-network theory (ANT) in Science and Technology Studies (STS). For instance, John Law uses the term ‘punctualization’ to describe the process through which a complex and heterogeneous actor-network, composed of humans, nonhumans, institutions and all the rest, is simplified in the language of singular coherent actors, whether human individuals or organizations [...]. This insight is readily applicable to the notion of the state as an actor. Though in reality a heterogeneous formation assembled together over centuries, all the complexity of the modern state is suppressed and made invisible through an act of punctualization that renders it a single unified actor.”

third, last and highest line of defense of the state's media monopoly – the professional forensic analysis of the suspicious document in a laboratory. In this sense Passoth's and Rowland's idea that "states should be seen as laboratories"²⁶ applies – the media whose controlled circulation co-constitute state and economy are always already intertwined with the laboratory. The complex mediality of bank notes serves all three lines of defense; bank notes have features that are tailored specifically to the perceptions and habits of normal citizens, then professional traders and finally counterfeit specialists.²⁷

In the following, the historical development of the fight for the media monopoly of the state will be highlighted using the examples of two changes in terms of media history. The *first* of these is the spread of photocopiers and above all color copiers from the 1960s and then the 1980s onwards. These technologies made increasingly efficient techniques for creating copies available. As much as the photocopier was an instrument of increased efficiency and speed in the circulation of files in state and economic bureaucracy on the one hand, on the other hand it represented a potential threat to documents as it made copying them significantly easier. One reaction to this was the increased usage of optical document security measures, that is, markings – for example on bank notes, which cannot be copied by photocopiers, or only in such a way that users of the three lines of defense are able to recognize at least in the last instance that the copies do not have the correct "document medium".

The *second* shift, from the 1990s onwards, is the move towards personal computers and the peripheral devices associated with them, such as scanners and color printers, which also made reproduction possible on a hitherto unknown scale. The specific optical markers on documents dating from the historical defense against photocopiers still exist, but digital data processing by computers both requires and enables new, additional security features. Schell summarizes as follows:

In the last two decades of the 20th century, security printers and document issuers were confronted with color copiers combined with laser printers [...], and home reproduction units consisting of a PC linked with a scanner and an inkjet printer. The existing armoury obviously became less effective if not obsolete and at least new *firstline* features were urgently requested: The threat was tackled this time by introducing: 3D devices, optically variable

²⁶ Passoth/Rowland, "Actor-Network State," 832.

²⁷ Cf. Karel Johan Schell, "History of Document Security," de Leeuw and Bergstra, *The History of Information Security*, 219.

printed images and regarding the *second-line of defence*, printed covert images, tracers and/or taggants.²⁸

Please note Schell's interesting formulation that 'security printers and document issuers were *confronted with color copiers combined with laser printers*' – that is again the agency is attributed not to humans using this technologies but to the technologies themselves.

Xerography and optical lines of defense

The struggle between counterfeiters and specialists goes back a long way; early authenticity features such a watermarks were used as early as the 14th century.²⁹ However, the 20th century, in the words of Walter Benjamin, is the age of technical reproducibility. Benjamin himself already highlighted that technical reproducibility by no means affects art alone.³⁰ However, Benjamin firstly did not focus on the reproducibility of money and other documents, and secondly – naturally – did not consider the rise of xerography. Although the first successful experiments with this technique were carried out by Chester Carlson as early as 1938, it only developed slowly (and after Benjamin's death) due to a range of technical and financial problems. From the beginning of the 1960s onwards this technology became increasingly common in offices, which now cannot be imagined without it.³¹ One of Carlson's main motivations for devoting himself to automatic copying techniques, if not the most important, was easing the tedious and laborious process involved in reproducing written files in bureaucratic practices.³² Indeed, speeding up paper-based administrative processes was of key interest. Companies that owned photocopiers were able to accelerate their work processes and hoped that this would give them an advantage over their competitors in the market. This situation acted as a kind of catalyst, a "supervening social necessity",³³ leading to the acceptance of the photocopier – and soon Xerox had become a major corporation.³⁴

²⁸ Ibid. 220.

²⁹ Cf. ibid. 198–204. Also cf. Gerhard F. Strasser, "The Rise of Cryptology in the European Renaissance," de Leeuw and Bergstra, *The History of Information Security*, 277–325.

³⁰ Cf. Walter Benjamin, "The Work of Art in the Age of Its Technological Reproducibility," (Third Version) vol. 4 of *Selected Writings: 1938-1940* (Cambridge, MA: Harvard University Press), 251–283.

³¹ On the details of this development, cf. Joseph Mort, *The Anatomy of Xerography. Its Invention and Evolution* (Jefferson, NC et al.: MacFarland, 1989). On the founding of Xerox and the growing acceptance of photocopiers, cf. part. 59 and 62–69. Cf. also Joseph Mort, "Xerography: A Study in Innovation and Economic Competitiveness," *Physics Today* 47 (1994): 32–38.

³² Ibid. 49. Cf. David Owen, *Copies in Seconds. Chester Carlson and the Birth of the Xerox Machine* (New York: Simon & Schuster, 2004), 70, 82.

³³ Cf. Brian Winston, *Media Technology and Society. A History from the Telegraph to the Internet* (London, New York: Routledge, 1998), 6.

³⁴ Cf. Owen, *Copies in Seconds*, 180–181, 192, 222–225 and 239–243.

However, this often-celebrated myth of the visionary inventor, whose ideas are initially thought to be crazy but then earn him a fortune and change the world – it goes without saying into a better place, suffers from the flaw of all linear histories of media: It ignores the fact that new technologies not only can be described in terms of success, but also create entirely new problems. For xerography cast the shadow of a threat to the media monopoly of the state. The first copiers were complicated devices that were prone to errors, able only to make black and white copies, and thus did not pose any danger. This changed, however: “From the 1960s until the late 1970s, the copiers reproduced in black and white and were neither threatening graphic arts and printers nor its *niche* of security printers. That threat changed when colour copying and laser printing arrived”.³⁵ One of the defense measures is that the color copiers’ color gamut is limited. Figure 1 shows that the color space that copiers are able to depict (the irregular hexagon with the words “W Color Copier”) only represents a section of the possible color spectrum: “So in order to optimise the effectiveness of the use of colour against colour reproduction, a person has to choose a colour outside of the RGB gamut and outside the colour copier hexagon, which is why the US dollar is green, the Euro ten is stone red, while the Euro twenty is blue violet, etcetera”.³⁶ Their colorfulness was and is a line of defense of the media monopoly of the state. The color constitutes a barrier in and of itself, although the precise details of how the technological makeup of the copiers and the regulation of banknote-printing were co-constituted needs further research. It has to asked if the ‘colour copier hexagon’ is given by technological constraints or – what is more likely – is itself a social and political construction in the sense that wider possibilities of the copying machines were willfully restricted in order to defend the media monopoly.

³⁵ Schell, “History of Document Security,” 217.

³⁶ Ibid.

Figure 1.11 The CIE 1931, 2° observer chromaticity diagram showing the color gamut of a color copier, standard RGB and the gamut of the combination of a HeNe laser (633 nm), an Argon laser (514 nm), and a HeCd laser (442 nm).

Figure 1 CIE 1931 color diagram, taken from: Renesse, *Optical Document Security*, 18.

However, this was soon to change: On the one hand, the quality of color copiers improved; thus Schell³⁷ cites 1980 as the time that color laser copiers began to spread. On the other hand, another much more serious factor is that normal users (that is, the “first line of defense”) possibly *failed* to notice discoloration (as one needs to know the color space depicted in Image 1 to do this) – and thus it seemed wise not to rely on color alone. The danger existed that the money-using ‘subject bodies’ couldn’t be constructed in the appropriate way and so some functions had to be delegated to non-human actors. As early as the 1970s, there were nervous reactions to the new technologies and international working groups were formed.³⁸ New techniques able to offer new, increased resistance to the copiers were needed. Since then, the repertoire of optical document security has grown drastically.³⁹

The dramatic shifts in reproduction technology since the 1970s [...] brought issuers and producers of security documents to the point of strengthening their potential. They expanded in-house research and development groups; outsourced dedicated research assignments; and

³⁷ Cf. *ibid.*

³⁸ Cf. *ibid.* 200.

³⁹ For the best, most comprehensive overview currently available, cf. Rudolf L. van Renesse, *Optical Document Security* (Boston, London: Artech House, 2005).

united to share efforts. The history of the development of holography runs more or less parallel with this growing awareness.⁴⁰

This is where holography comes into play; document security needs played a key role in the development and spread of this technology. Of course the history of holography is more complex than this⁴¹, but it remains undisputed that one of its most important fields of application since the 1980s has been document security: “In 1983 MasterCard International, Inc. launched the first credit cards carrying embossed holograms that were produced by the American Bank Note Company in New York. The MC holograms were the widest distribution of holography in the world at that time”.⁴² Today just about every bank note⁴³, credit card⁴⁴ or identity card⁴⁵ contains a hologram or at least uses techniques similar to holography.⁴⁶ Holography is not an exotic special technology; rather, there is a veritable everyday holographic culture that exists to defend the state’s media monopoly. Again, Passoth’s and Rowlands’ idea that a state could be described as a kind of laboratory is pertinent here.⁴⁷ Holography was a quite experimental technology, just developed in the 1960s. But one of its relevant features was that it only could be produced and moreover reproduced in special laboratories (or factories that adopted technological setups close to the labs). By introducing this lab-technology into the public sphere a technology was introduced that by definition could not be produced or reproduced by normal citizens. Holography was transformed into a widely diffused technology by its use in state-media and at the same time helped to stabilize the state. Holographic images – such as the three-dimensional representation of a small white sculpture of a dove on a VISA card – cannot be reproduced by photocopiers, as holography is based on wave optics and the information it conveys cannot be

⁴⁰ Schell, “History of Document Security,” 231.

⁴¹ Cf. Sean Johnston, *Holographic Visions. A History of New Science* (Oxford: Oxford University Press, 2006).

⁴² Schell, “History of Document Security,” 231.

⁴³ Cf. Ian M. Lancaster and Astrid Mitchell, “The Growth of Optically Variable Features on Banknotes,” *SPIE Proceedings* 5310 (2004): 34–45.

⁴⁴ Cf. Don Tomkins, “Application of Holograms to Credit Cards,” *ICMA. The Voice of the Plastic Card Industry* (May/Jun. 1998): 8–17.

⁴⁵ German identity cards, for example, use the so-called “identigram” technique, cf. https://www.bundesdruckerei.de/sites/default/files/identigramr_flyer.pdf, accessed June 9, 2016.

⁴⁶ Such as “kinegrams” or security holograms (cf. <http://de.wikipedia.org/wiki/Kinegramme>, accessed June 9, 2016). Often these techniques are collectively referred to using the umbrella term “holography” or “holograms”, although strictly speaking this is not correct. Thus “dot matrix holography”, which is often used in security appliances (cf. Johnston, *Holographic Visions*, 220) does not record interference patterns between object waves and reference waves; instead, an interference between two beams is used to draw pixels that constitute diffraction gratings, thus digitally assembling an image. Cf. Mindaugas Andrulevičius, Tomas Tamulevičius, and Sigitas Tamulevičius, “Formation and Analysis of Dot-Matrix Holograms,” *Materials Science (Medžiagotyra)* 13, 4 (2007): 278–281.

⁴⁷ Cf. Passoth/Rowland, “Actor-Network State,” 832.

transferred using the geometric, optical system of a photocopier.⁴⁸ In everyday life – the first line of defense – normal citizens can see this in the fact that holographic markers’ shimmering, angle-dependent and often three-dimensional appearance disappears when photocopied – if they are correctly trained as good citizen-subjects to recognize these differences. This kind of optical marker guarantees the authenticity of the document medium – and defends it even against the best color copiers (or scanners).⁴⁹ At least that was the hope of those institutions working on the media monopoly.

Computers and the algorithmic line of defense

The mention of “scanners” brings us to the next media shift, which once again triggered nervous reactions and so gave rise to changes in security techniques. While holographic security features cannot be reproduced by scanners (and the computers they are attached to, e.g. using Adobe Photoshop), as described above the function of optical security features – at least in the first line of defense – relies on the ability of average users of documents such as passports and money to recognize that the security markings on the document medium do not look the way they ought. Thus intensive education aims to provide users with this knowledge, such as the “Euro forgeries trainer” on www.polizei-beratung.de, which teaches users how to recognize whether a document is authentic step by step.⁵⁰ However, this construction of the appropriate subject-bodies can of course fail, as users may not make use of the available resources and not even know what markings are supposed to look like; they may not be able to see well in a given situation due to poor light, or may be distracted for other reasons. Thus it stands to reason to try and eliminate the human factor from at least the first line of defense⁵¹ and to delegate protection to technical devices to a greater extent, which is possible at least in principle using digital technology. Schell summarizes this succinctly: “Instead of adding features that are difficult to reproduce, codes are embedded that thwart reproduction.”⁵² In a discourse that constructs technological non-human actors as the enemies, it makes completely

⁴⁸ Cf. Jens Schröter, “Das holographische Wissen und die Nicht-Reproduzierbarkeit,” in *Das holographische Wissen*, ed. Stefan Rieger and Jens Schröter (Berlin: diaphanes, 2009), 77–86.

⁴⁹ Of course there has been no shortage of attempts to forge holograms, but the results were seldom convincing; cf. David Pizzanelli, “Counterfeit Holograms and Simulations,” *SPIE Proceedings* 3314 (1998): 86–96.

⁵⁰ Cf. http://www.bluetentrainer.polizei-beratung.de/blueten_euro/trainer_d.html, accessed March 17, 2014.

Unfortunately this highly interested is now longer existing.

⁵¹ This does not pose a problem for the second and third line of defense, as the second line consists of persons working professionally with money, who are likely more aware of forgeries and also have devices at their disposal able to recognize forgeries (e.g. the counterfeit detectors produced by the company Safescan, cf. <https://www.safescan.com/de/products/30/automatische-geldscheinpruefer/>, accessed June 9, 2016). The third line of defense are already specialists in counterfeit detection.

⁵² Schell, “History of Document Security,” 224.

sense to construct the defense also in technological terms. That is: “Another idea might be to incorporate features that locate copier type and serial number or that hamper the copier mechanism itself.”⁵³ One of the first ideas thus were so-called “tracers”, which refer to the fact that modern photocopiers include a code made up of dots invisible to the human eye in their copies, which makes it possible to identify exactly which copier at which location made the copy in question.⁵⁴ Rosengart specifies that these dots are able to secretly write up to 512 bits, that is 64 bytes, onto a color copy. “This even makes it possible to mark each copy individually or at least note the current time/date on the copy”.⁵⁵ While this may seem reasonable from the point of view of those tracking down counterfeiters, there are however alarming side effects: “Would anyone still dare to uncover bribe scandals and pass on the pertinent evidence, for example to the press, if they knew that the anonymity of a photocopy is no longer guaranteed, but that, for example their employer as the machine’s owner is able to trace a document back to a specific department, a specific office?”⁵⁶ The reproduction of unwelcome political writings could also be traced, an option that would probably be of interest in authoritarian and totalitarian states.⁵⁷

The website www.polizei-beratung.de notes that “many criminals react surprisingly flexibly to the developments of the technology market. By now, most color copiers are equipped with coding systems that enable color copies to be matched exactly to the copier in question. Thus an increasing number of perpetrators use computer scanners when producing their forged banknotes.”⁵⁸ The fight for the media monopoly continues – and the use of home computers and their peripheral devices was also a response to the technical delegation used by copiers to make their copies locatable. However, the spread of ‘threatening’⁵⁹ digital technology to the domestic sphere means that the frontline of the fight has advanced there, too: “According to some producers of printers, in the near future every inkjet printer and every color laser printer for domestic use will leave an individual marking on the paper”.⁶⁰ It is tried to ban the threat

⁵³ Ibid., 222.

⁵⁴ Cf. ibid., 223.

⁵⁵ Frank Rosengart, “Datenspur Papier,” *Die Datenschleuder* 86 (2005): 21.

⁵⁶ Big-Brother-Award-Jury, cit. in: ibid.

⁵⁷ The governments of authoritarian states were not overly fond of photocopiers, as they made the uncontrolled reproduction of information possible (such as the USSR, cf. Jakob Steinschaden, *Digitaler Frühling. Wer das Netz hat, hat die Macht?* (Vienna: Ueberreuter, 2012), 112). However, the new options for marking copies make them interesting for dictatorships again. See on this also Hans Magnus Enzensberger, “Constituents of a Theory of the Media,” in *The New Media Reader*, ed. Noah Wardrip-Fruin and Nick Montfort (Cambridge/MA, London: MIT Press, 2003), 259-276, here 263.

⁵⁸ <http://www.polizei-beratung.de/themen-und-tipps/betrug/falschgeld.html>, accessed June 9, 2016.

Unfortunately, to conduct a field study in the criminal milieu of forgers is quite difficult to do (and moreover dangerous).

⁵⁹ Cf. Renesse, *Optical Document Security*, xiv.

⁶⁰ Rosengart, “Datenspur Papier,” 21.

that is posed by the non-humans actors by willfully transforming them – interestingly enough, by individualizing them, so that every non-human actor becomes an identifiable subject too. And moreover the home is transformed into a war zone, in which the threatening technologies have to be fought too.

Another approach is to prevent the copying process completely. This cannot be done using analogue technology, but it is possible with digital technology. Certain patterns are built into the templates, so-called *taggants*⁶¹, that can be recognized both by the data-processing systems of photocopiers as well as programs such as *Photoshop* (Version 8 onwards). If this kind of pattern appears, there are a range of reactions: Only black pages are printed, the note “Copy” is added to the document – or the machine (e.g. a photocopier) or software (e.g. *Photoshop*) refuses to carry out the command altogether, displaying a corresponding warning – as the author was able to see in a personal experiment (Figure 2).

Figure 2 Warning displayed by *Photoshop* following an attempt to scan a 50 Euro note.
Author's image.

Conclusion

The state has a media monopoly: In democratic states, this does not refer to control of the traditional mass media, but even the most democratic states exercise strict control of similarly everyday mass media that are usually paid much less attention – the documentary media of

⁶¹ Schell, “History of Document Security,” 223–224. One of the best-known examples of such a taggant is the so-called EURion constellation, a cloud of dots found on Euro banknotes that can be recognized by copiers and the like. The algorithm CDS (Counterfeit Deterrence System) developed by the Central Banks Counterfeit Deterrence Group (<http://www.rulesforuse.org>, accessed June 9, 2016), a working group of 27 central banks and other institutions that produce bank notes, is implemented in software such as *Photoshop*. For obvious reasons, the exact mechanisms used are secret. Steven J. Murdoch of Cambridge University has been researching this for some time: “Software Detection of Currency,” last modified October 12, 2009, <https://www.cl.cam.ac.uk/~sjm217/projects/currency/>, accessed June 9, 2016.

bank notes, identity documents and other important documentation; there are also security markings that aim to prevent product piracy.⁶² One might be tempted to argue, in the sense of “governementality”, that media lines of defense are a condition of state monopoly of power insofar as the documents circulating in political, police and military lines of command need to be safeguarded. Only if their authenticity is stable are they able to communicate commands. A policeman entering your house has to show his ID-Card – and you should be able, at least in principle, to check if this is a valid document. However, “authenticity” can only exist if the difference between “authentic” and “false” is legally defined and forgeries can actually be sanctioned. For example, in principle it is possible to make lossless copies of music or film files – but that is prohibited by law, essentially to protect the form of commodity, that is, the capitalist economy.⁶³ However, this legally protected difference can only become effective if markings on the document medium⁶⁴ make it possible for illegal copies⁶⁵ to be recognized or completely prevented and the culprits localized. Here we can see the mutual irreducibility of legal and media factors – not least in that the various copy protection techniques are themselves legally protected.⁶⁶ The “certificate” or the “document” as such is only able to exist thanks to this link between the law and special media techniques (such as holograms, for example), which is impossible to unravel in causal terms – for an original can only exist if the difference between original and copy firstly is a difference that actually makes a difference, and secondly, if this difference can be identified in some way. One could say, that medial and legal actors co-constitute and thereby stabilize each other. “Both forces of cultural construction, science (or knowledge/expertise), and government (or governmentality) [...] co-produce” the state.⁶⁷ This mutual construction as manifested in optical security features of official documents is a very concrete example of how the state is techno-scientifically “performed”.⁶⁸ And in this process, interestingly enough, new technologies are seen as the non-human actors that threaten the state.

⁶² Cf. Holger Paul. (January 19, 2010). “Hologramme auf die Maschinen. German engineers rely mainly on their technological lead to protect themselves from plagiarism. Their union thinks this is not enough,” *Frankfurter Allgemeine Zeitung* 15: 20.

⁶³ Cf. Winston, *Media Technology and Society*, 11f. on the “law of the suppression of radical potential” and Stefan Meretz, “Der Kampf um die Warenform. Wie Knappheit bei Universalgütern hergestellt wird,” *Krisis* 31 (2007): 52–89.

⁶⁴ Where digital technologies are concerned, it is probably more apt to speak of markings “in” the media, e.g. digital watermarks and the like.

⁶⁵ There can be legitimate copies, as evident in the phenomenon of “certified copies”, cf. <http://de.wikipedia.org/wiki/Beglaubigung>, accessed June 9, 2016.

⁶⁶ Cf. Martin Senftleben, “The Answer to the Machine Revisited. Kopierschutz aus juristischer Sicht,” in *Kulturen des Kopierschutzes I*, ed. Jens Schröter et al. (Siegen: universi, 2010) = *Navigationen. Zeitschrift für Medien- und Kulturwissenschaften* 10, 1 (2010): 81–94.

⁶⁷ Carroll, “Articulating Theories of States and State Formation,” 563.

⁶⁸ Passoth/Rowland, “Actor-Network State,” 819.