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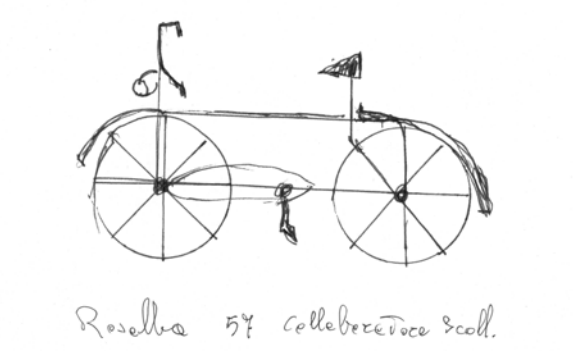
DOUBLE SPECIAL ISSUE - Part One

Digital Circulation: Media, Materiality, Infrastructures

Velocipedia by Gianluca Gimini (Italy)



There is a quite funny story behind this project. It all started in 2009 in a bar in Bologna where I was chatting with a friend. We were talking about school time memories and I recalled this very embarrassing moment: a classmate was being questioned by our technical ed. teacher. He was doing pretty bad and was on the verge of tears at a certain point, so the teacher tried to help him out by asking him to describe his bicycle. The poor kid panicked and couldn't even remember if the driving wheel was the front or the rear one. My friend laughed at this story and said that anyone who has ridden a bike must know how it's made. Then he tried drawing one on a napkin and miserably failed. That's the day I started collecting bike drawings.

I would walk up to friends, family or total strangers with a pen and a sheet of paper in my hand, asking that they immediately draw me a men's bicycle, by heart. Soon I found out that when confronted with this odd request most people have a very hard time remembering exactly how a bike is made. Some did get close, some actually nailed it perfectly, but most ended up drawing something that was pretty far off from a regular men's bicycle.

I collected hundreds of drawings. There is an incredible diversity of new typologies emerging from these crowd-sourced and technically error-driven drawings. A single designer could not invent so many new bike designs in 100 lifetimes and this is why I look at this collection in such awe.

In 2016 I eventually decided it was my turn to take part in this project. I selected those sketches that I found most interesting, genuine and diverse, then rendered them in digital form as if they were real. I became the executor of these two minute projects by people who were mainly non-designers and confirmed my suspicion: everyone, regardless his age and job, can come up with extraordinary, wild, new and at times brilliant inventions.

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A New Triennium (2016-18)

With this issue, *Tecnoscienza* celebrates the beginning of its third three-year cycle. The journal has been increasingly consolidating in the last six years and we believe this is a valuable result, especially as the journal represents an example of alternative and independent scientific publishing practices. Its release is still made possible by the commitment and energy of an emerging generation of researchers, who have invested in an independent open access peer-reviewed journal released under the Creative Commons licence.

As a spontaneous intellectual project developed outside the countries that are "usual suspects" in the STS field, we have been delighted to see the journal growing and its readers multiplying. *Tecnoscienza* is still the only Italian academic journal specifically devoted to social studies of science and technology, as well as possibly the only one coming from a southern European country. This positioning offers the journal a rather unique perspective in the international landscape and our aim for the next years is to go on developing such a distinctive standpoint within the STS international academic community.

Another characteristic of the journal we aim to foster is the hybridization and cross-fertilization of more established STS approaches with emerging perspectives and viewpoints. The current double special issue, which explores the notion of "digital circulation" by building a bridge between STS and media studies, is an example of such a kind of intersection and cross-fertilization.

In the next three years, we plan to strengthen our position as an international platform that offers a space for novel intellectual inter and cross-disciplinary thinking. We will pursue this twofold goal by promoting a number of special issues dedicated to emerging topics in contemporary STS. In the last three years, our experience with monographic issues has been extremely positive and we are pleased with the numerous international contributions we have hosted so far. The current double special issue is also an example of this success. The call received almost forty

contributions from all over the world, while about only one-quarter of them are actually being published in the two issues. For this result, we have to thank the guest editors and external anonymous reviewers, whose voluntary contributions made this and previous volumes of the journal possible.

In the perspective of a more incisive positioning of the journal both internationally and in interdisciplinary terms, we inaugurate a new section evocatively titled "Crossing Boundaries". This section is a hybrid itself, being to some extent the merger of two previous sections: "Cartography" and "Debates". In this new section, invited contributors belonging to different countries and disciplinary backgrounds will debate around common topics, questioning at the same time existing scientific categories, disciplinary boundaries, and STS geographies.

In a similar vein, we are establishing a new group of international scholars who will act as correspondents from other countries, signaling the most stimulating and thought-provoking volumes to be reviewed. The correspondents, who will be made effective from the next issue, will enhance and refresh our goal to engage with the STS debate of other countries and to offer in-depth analyses (in English) of STS books written in non-English languages. On the basis of the journal's alternation policy, this new three-year cycle also inaugurates a new Coordination Board, as well as future plans for further expansion of the Editorial and Advisory Board. Once more, this represents the journal's geographical grounding, as members of both the Coordination and the Editorial Board are based in Universities across Europe.

Six years are just gone and we are ready to engage in new challenges for the next three. In spite of all the hard work, time flies when you are having fun.

Attila Bruni, Paolo Magaudda and Manuela Perrotta

Digital Circulation: Media, Materiality, Infrastructures. An Introduction

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Abstract The concept of "digital circulation", together with the idea of 'social life of digital things', is highly evocative. Yet science and technology studies have not addressed it in depth to date. This introduction looks at the major converging dimensions examined in the papers in the first part of a special issue focusing on the notion of digital circulation. Specifically, if focuses on digital circulaton's material ontology and on the infrastructures that sustain the processes of circulation, seeing them as pivotal points in theoretical considerations aimed at bridging science and technology studies, media and communication studies and other neighboring fields. This introduction also provides an overview of the articles that make up this issue of Tecnoscienza.

Keywords: Digital circulation; media; communication; materiality; infrastructures.

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1. A Double Special Issue on 'Digital Circulation'

This issue of Tecnoscienza is the first part of a special double issue devoted to an interdisciplinary exploration of the notion of 'digital circulation'. This notion is highly evocative and frequently adopted in science and technology as well as media studies yet its development has remained largely generic. To cite a single example, Adrian McKenzie (2005) used the notion of circulation in vague terms to address the fact that the creation of meaning has not been as central as patterns of circulation through software versions, distributions and reconfigurations in the case of the Linux operating system. David Beer (2013) introduced the notion of cir-

culation in a more forthright way, as a starting point for an analysis of intersections between popular culture and new media. He suggested that our understanding of popular culture in the digital media realm should not be archived without a consideration of the ways in which media as objects and infrastructures influence this circulation. Specifically, he claimed that it is precisely "by bringing to the fore the material dimensions of everyday life, embodied in these infrastructures and data circulations" that "we are able to see how culture and media combine and fold into ordinary routine life" (Beer 2013, 2).

But digital circulation should not be confined to studies of media and cultural industries. 'Digital' and especially 'digitization' related processes have constituted critical change in almost all realms of modern everyday life enabling processes involving the circulation of content and meaning, objects and technologies, competences and embodied knowledge to be generally reconfigured. The analysis in this special double issue is not limited to the empirical sphere of media content. It attempts to develop theoretical connections between fields, concepts and approaches that have been triggered by the rise of digitization processes and the emergence of technology as an intrinsic infrastructure in modern times.

An accessible introduction to an understanding of digital circulation processes is the work of social anthropologist Arjun Appadurai (1986) who highlighted the ways in which things acquire meaning and value through a process of circulation between worlds, individuals and social contexts exactly 30 years ago. Reflecting more recently on globalization processes, Appadurai (2010) distinguished between "the circulation of forms" (meanings and contents) and the "forms of circulations", i.e. features pertaining to content circulation trajectories including speed and scale. While Appadurai is reflecting on the circulation of cultures rather than media technologies, the consequences of this distinction for digital circulation studies are clear: patterns of circulation represent a crucial dimension in media cultures, as digital things – files, standards, data and codes – have biographies and life trajectories, travel across different spaces and are governed by specific politics according to distinct forms of circulation. Far from standardizing the meanings and materialities involved in the circulation of things and objects, contemporary digital media-driven society has added new layers of complexity to it. Thus, a foundation perspective adopted in this special issue is that studying circulation in contemporary societies means focusing on the nexus of digital materialities, techniques and infrastructures that generate an accelerated, globalized, and pervasive circulation scope. Contemporary social and cultural flows are facilitated by digital technologies and these are in turn increasingly embedded in everyday life and human relationships. Yet, a more multifaceted understanding of the specificity of digital things and their biographies is still needed.

Focusing on digital circulation and the social life of digital things has several further implications. One of them is that the politics of digital cir-

culation is shaped by power struggles in the digital realm, as regulation of digital objects' trajectories takes place in the institutional and political spheres. Many of the supposed 'revolutions' generated by digital media technologies are actually a matter of some kind of circulation, as in the case of peer-to-peer networks, social networking sites or the digitization of cultural items. Social and collective practices on the Internet rely heavily on exchange and social relationship circulation metaphors. Sharing, for example, plays a center-stage role in multiple social media activities. It is through the sharing of objects such as pictures or videos that social and political relations are built and maintained and personal identities are constructed in the context of continuous and pervasive connection. In turn, this allows for shared meaning creation. Furthermore, the political economy of digital technologies is based on the circulation of digital objects such as films streamed on Netflix, financial data used by trading bots and personal social media data managed by web companies through cloud computing. In the contemporary digital economy, value is created through the circulation of bits.

2. Media, Materiality and Infrastructures

If these phenomena have being studied extensively by media studies and political economy scholars, science and technology studies approaches allow for a stronger analysis of the technological and material facets of digital circulation. Contributing to an emerging thread of STS scholarship on the subject, in this special issue we focus exactly on the study of the material technologies that allow and sustain contemporary forms of digital circulation. Thus our privileged, even if not exclusive, focus is a specific terrain of connection between contemporary media studies and STS: the material ontology of digital circulation and the infrastructures that sustain it.

The relevance of the materiality of social life can be considered a major backbone of STS, at least since the work of – quoting just two amongst many – Madaleine Akrich (1987) and Bruno Latour (1992) on topics such as "technical objects", missing masses" "non-human actors" and other definitions that account, in the very end, for the active role played by the "physical" within the social environment. In recent years, the interest in the material dimension of media technologies has prompted what has been defined "material turn" in STS, but also in other perspectives and approaches including different branches of media and communication studies (Gillespie et al. 2014), not to mention other disciplines such as anthropology, religion studies, and art history. As Leah Lievrouw has traced in detail, the focus on the materiality of media technologies has represented a contested terrain of intersection between STS and communication studies: "on the one hand, two decades of debates have encouraged STS researchers to theorize technology as simultaneous-

ly and inextricably social and material, to see both aspects as co-determining". On the other hand, communication scholars tend to assume that "the physical, material features of technology are still more likely to be explained as outcomes or *products,* of abstract social forces, cultural discourses or economic logics" (Lievrouw 2014, 24). However, this distance does not mean that media studies have not engaged seriously with the physical and material dimension of communication. For example, media historian Lisa Gitelman, who has focused in the phonograph and the internet (Gitelman 2006) and more recently on paper documents (Gitelman 2014). On the side of more philosophically-oriented media studies, the work of Jussi Parikka on media archaeology (Parikka 2012) and on the geology of media as a form of new materialism (Parikka 2015) clearly moves in the direction of a more substantial integration of the physical and technical dimensions of communication in the study of today's era of digitization.

If data are stored in identifiable physical locations, networks that carry them are so entrenched and tangible that some scholars have proposed to put them at the center of reflection on digital media (Musiani et al. 2015). For example submarine cables, which are in fact linked to the history of electric telegraphy and colonialism, host 99% of the international Internet traffic and will be extended over the next decades. With digitization, space and geography acquire a second life. Towers for the collection and distribution of rainwater have become ideal sites for mobile phone antennas. Remote regions in Finland have been transformed from places of paper processing into ideal areas to locate Google servers – enjoying low temperatures and geographically strategic regions for efficient data distribution. Natural paradises in Hawaii continue to be hubs for the flow of data, from the first telephone cables laid in the Pacific Ocean in the 1950s and 60s to the optical fibre for Internet traffic in the 21st century.

The materiality of the digital is perhaps even more evident if we consider consumption processes. Contrary to what claimed by the champions of media convergence at the beginning of the 1980s, who predicted the rise of a single technology that would include all media, our homes and pockets are full of physical objects that allow users to enjoy digital contents: portable and desktop computers, tablets, smart phones and watches, televisions, USB memory cards, to name a few examples. Through technological obsolescence, digital devices are assigned a predefined duration and replaced by new models in a consumerist recursive process. This does not mean that digital tools are built inaccurately or with substandard materials. Rather they "grow old" for fashion reasons or because of the erosion of their computing capabilities. A second aspect of digital obsolescence is, once again, the second life of objects: fallen into disuse, mobile phones or computers often travel from North America and Europe to poorer countries, where they find new users or are dismantled, recovered, and their materials recycled.

As mentioned, another crucial dimension of the study of digital circulation are technological infrastructures. In STS, the interest in the sociotechnical building and maintenance of infrastructures has being developed since the mid-'90, especially through the work of Star and Bowker (1999; Star and Ruhleder 1996). This interest has evolved into a distinctive sub-field of "information infrastructures studies", aimed at understanding the dynamic processes sustaining and surrounding technical systems for information circulation in specific contexts such as public databases, scientific and professional communities, and so on (Bowker et al. 2010). Different formulations, such as "inverse infrastructures" (Egyedi et al. 2012), focus on the understanding of infrastructures for communication that are built "from below" by users and citizens.

However, it is quite surprising that this sensibility toward the role of infrastructures in information and communication technologies has not percolated consistently in media and communication studies until quite recently. One reason could be the lack of overlapping and cross-fertilization between historical and sociological studies of telecommunications and similar studies on mass media. This is even more startling if we consider that, since the mid '90s, Internet and network infrastructures have rapidly and overwhelmingly acquired a centrality in our everyday lives and within the media system. While internet infrastructures (from cables to the cloud, from search engines to social networks and collaborative platforms) turned into basic everyday tools, media scholars have only rarely adopted an infrastructural sensibility to unpack how our lives are embedded into their technical constraints.

And yet from a media and communication studies perspective, the view becomes richer. Communication studies have developed distinctive perspectives to address the relevance of technical systems of communication, which have been historically addressed as "telecommunication networks". This infrastructural heritage rooted in communication studies includes, for example, Armand Mattelart's (1991) or Patrice Flichy's (1991) histories of communication, which begin from the building of the "optical telegraphy" between Paris and Lille in France at the end of 18th and at the beginning of the 19th century under the pressure of war and nation state conflicts. However, scholars such as Flichy, Matterlart, but also Harold Innis, James Carey or Manuel Castells, did not focus enough on the way these networks had been technically and materially designed, implemented and maintained. The "technical" here seems to be a reflection of political, cultural and economic inputs, while its material and physical constraints and opportunities are left unexplored.

Only recently a more fluid circulation between different perspectives on media and communication infrastructures and networks has started to flow across different disciplines and fields. A recent and relevant take on the intersection between STS and media and cultural studies is the work of media scholar Jonathan Sterne (2012) on the history of the mp3 music format. In his book, Sterne unfolds some of the very technical bases of

the development of this sonic technology and at the same time articulates a political and culturalist interpretation. This allows him to coordinate in a distinct way the micro dimension of the technical ground with a macro, long-term, politically-oriented trajectory of the evolution of sound recording technologies.

A more recent contribution that brought the technical dimension of infrastructures on the foreground of media studies is a volume edited by Lisa Park and Nicole Starosielski, *Signal Traffic.* The book is explicitly aimed at building bridges between STS infrastructure studies and other approaches to the media, including environmental studies, urban studies and affect theory. Moving beyond contemporary hegemonic views, in these works media networks are not seen as decentralized, flexible and adaptive structures, but rather as the output of historically sedimented, technically resistant and politically crystallized processes, which remain largely invisible within today's liquid and cloud-based rhetoric about the role of the internet in our societies.

3. The Contributions in this Issue

The articles comprised in the first portion of this double publication offer distinct takes on the issue of digital circulation and on the objects, materialities and infrastructures involved in it. Each of them identifies specific empirical terrain, exploring and expanding the circulation of ideas between STS, media and communication studies and other neighboring fields.

Sergio Minniti's *Polaroid 2.0: Photo-Objects and Analogue Instant Photography in the Digital Age* describes an exemplary kind of digital circulation occurring between digital and analogue photographic media and specifically focuses on the reconfiguration of instant photography in the digital age. The article reveals the enduring presence of material objects in emerging photographic practices thus refuting any separation between 'old' analogue and 'new' digital photographic practices. Minniti explores the mutual influence between the digitization of photography and the resurgence of analogue objects and material artefacts within photographic communities. Moreover, by working on technology and social practice co-production, the article attempts to address the theoretical relationship between STS, media studies and photographic history.

In *Plants as Digital Things: The Global Circulation of Future Breeding Options and their Storage in Gene Banks*, Suzana Alpsancar presents the results of her research into two seed banks preserving both plant material and information. The author shows that, through processes of digitization and re-materialization, plants acquire value by becoming part of different chains of circulation. The bottom-up circulation of plant material from collectors to seed banks is coupled with the top-down diffusion of plant data from the seed bank in digitized genetic information form. Yet while

the digitization of plant data abstracts seeds from their material environment while allowing a broader circulation around the globe, this does not equate to full materialization.

In *Strategies of Circulation Restriction in Whistleblowing: the Pentagon Papers, WikiLeaks and Snowden*, Philip di Salvo deals with the content circulation restriction strategies used to block the dissemination of leaked material in three famous journalistic cases: the Pentagon Papers (1971), WikiLeaks (2006) and Edward Snowden (2013). His detailed description of these strategies aims to shed new light on the topics of information circulation on the one hand and (re)materialization on the other. Whistleblowers have always fought against forces, from government or from business, attempting to silence them and restrict their circulation networks, forbidding physical access to sources in the analogue era and restricting and limiting connections to sources in the digital era. What is surprising, according to di Salvo, is the fact that even in the digital era materiality matters and reappears: the physical destruction of the hard drives on which digital documents were stored is just one example of the ways in which Snowden was limited (with scant success).

In *A Different Kind of Story: Tracing the Histories and Cultural Signs of Pirate Copied Film,* Maria Eriksson focuses on piracy in the film industry and related social anxiety concerning the circulation of 'illegal material'. The author embraces a counter-intuitive narrative: pirate copies of films help standardize technologies of circulation for digital movies and contribute to innovating aesthetics and narratives. Standardization is another traditional STS topic dealing with infrastructures: networks, objects and ideas need to be standardized in order for them to circulate and thus acquire new meanings. Whilst pirated copies are still generally viewed negatively they are actually 'ambivalent objects' which often stimulate the diffusion, sharing and popularity of specific films.

The Scenario section provides an overview of recent work in the journalism studies field at the crossroads with digital circulation studies. Christoph Raetzsch and Henrik Bødker (*Journalism and the Circulation of Communicative Objects*) argue that circulation is becoming a critical concept with which to analyze online journalism and, specifically, that digital infrastructures are increasingly shifting attention from traditional players (such as newsrooms or corporations) to journalistic practices, user perspectives, newspapers, (im)materialities and social meanings. The key concept analyzed here is the 'communicative object'. Journalism should no longer focus on texts and styles (in a word: content), but rather on how circulation sustains and creates techno-social structures.

Finally, the issue ends with a new section called Crossing Borders dealing with convergences and differences between STS and media studies in communication technologies studies. This section, entitled *STS and Media Studies: Alternative Paths in Different Countries*, includes contributions on the dialogue between STS and media studies from three European countries: Germany (by Cornelius Schubert and Estrid Sørensen),

France (by Romain Badouard, Clément Mabi and Guillaume Sire) and Italy (by Alvise Mattozzi). This section explores the opportunities and difficulties involved in the specific intellectual and institutional contexts in which this dialogue takes place.

Together with the articles to be published in the second installment of this special double issue of Tecnoscienza planned for next December, the work presented here contributes to expanding the STS's continued navigation towards different empirical lands and new theoretical harbors.

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Polaroid 2.0

Photo-Objects and Analogue Instant Photography in the Digital Age

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Abstract: The article focuses on the reconfiguration of analogue instant photography (Polaroid-like) in the digital age. Drawing on STS literature on the mutual shaping of users and technology, and on anthropology and the history of photography, it adopts the concept of "photo-object" to discuss how the digitalization of photography stimulated a change in the cultural significance of materiality in the context of aspirational amateur photography, thus showing how this triggered a redefinition of instant photography as a more authentic form of aspirational practice. The article is based on empirical data collected during a multi-sited ethnography conducted in Italy between 2014 and 2015. By focusing on Polaroid's "objectness" and its dialectical tension with the immateriality of digital photography, the paper highlights an increasingly common process of circulation between analogue and digital photographic environments and argues that this process of circulation can be conceived in terms of a "remediation" process between analogue and digital practices.

Keywords: Polaroid; photo-object; multi-sited ethnography; technological resistance; remediation.

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1. Introduction

In 2008, the financial and market difficulties faced by the Polaroid Corporation led it to cease the production of analogue instant film products. Since then, instant films for vintage Polaroid cameras have come back to the market thanks to a new company called "The Impossible Project", which acquired and adapted the former Polaroid production plant

in Enschede, Netherlands (Bonanos 2012). This has been the basis for a resurgence of instant analogue photography amongst *aspirational amateurs*[1].

The re-appropriation of Polaroid technology has been sustained by the emergence of a collective action of *technological resistance* to digital photography (Kline and Pinch 1996). At the same time, digital infrastructure and platforms have proved to be essential to the organization of communities of practice (Lave and Wenger 1991), devoted to Polaroid photography, and to the reconfiguration of the practice itself. In the practices of aspirational amateurs, the materiality of instant prints is culturally opposed to the immateriality of digital photographs; on the other hand, instant prints have to be translated into digital form in order to circulate, to affirm a resistant group identity, and to organize community activities. In the following pages I will argue that this process of *remediation* of the "old" by the "new" technology represents the process through which the cultural significance of instant photography is negotiated, and social distinctions are maintained (Henning 2007).

2. Theoretical Framework

This article has been developed with two intertwined purposes. On the one hand, it aims to contribute to the theoretical and empirical work that, in the last 20 years, has put under scrutiny the socio-material dimension of photography (Batchen 1997; Edwards and Hart 2004) and, more broadly, the intersection of visuality and materiality in contemporary visual cultures and practices (Rose and Tolia-Kelly 2012). On the other hand, by offering an empirical analysis centred on the physical production and digital circulation of film-based photographs, this article aims to shed light on some of the manifold and situated ways in which digitalization plays a role in reconfiguring photography's materiality.

To develop this analysis, I will draw upon the work of historians of photography such as Geoffery Batchen and Elizabeth Edwards, who stressed the need to "think photography beyond the visual" and to pay attention to the objectness of photographs. As Elizabeth Edwards (2009a, 335) puts it: "The photograph has always existed, not merely as an image but in relation to the human body, tactile in experienced time, objects

[1] I am grateful to an anonymous reviewer for suggesting to me that the formerly adopted term 'serious amateur', which pre-dates digital photography, and refers to those amateur photographers with darkroom skills, can not be simply transposed to analogue enthusiasts, since the 'serious amateur' has now gravitated to digital photography. Accordingly, I adopted the term 'aspirational amateur', which points to two general, key aspects of this figure, whether s/he is a digital or analogue photographer: the ethic of self-improvement, and her or his self-conscious aspiration to produce art (Pollen and Baillie 2012).

functioning within everyday practice". In order to investigate photography not solely as a visual phenomenon, but also as a set of practices producing highly charged social objects, which mediate and are entangled in human relationships, these scholars have developed the conception of the photograph as a *photo-object*, by which they address the inseparable nature of the visual and the material that characterizes the social experience of photography (Edwards and Hart 2004). The material elements of photography are of key importance here because the focus on materiality emphasizes the relational qualities of photographs in social contexts, where the relationship between people and people, and people and things, is mediated by the physical properties of photographs and by the senses involved in their production and use (Di Bello 2008; Edwards 2009b).

Thus, central to the effort to understand photography beyond the visual is the analysis of the main forms taken by photo-materiality: the plasticity of the image itself; the presentational forms with which photographs are enmeshed, such as albums, mounts and frames; and the physical traces of usage and time (Edwards 2001, 2012; Edwards and Hart 2004). Secondly, this branch of research characterizes itself for the attention paid to the circulation of photo-objects. For instance, Edwards (2012) argues that photographs are objects specifically made to have social trajectories, and draws upon the works of Appadurai (1986) and Kopytoff (1986) to illustrate how the process of mutual constitution of the visual and the material is continuously rearticulated through the social and cultural biography of photo-objects. Like any other object, photo-objects cannot be fully understood through one moment of their existence, but only as belonging in a continuing process of production, consumption, exchange, and usage, in which they are active entities, and by which they are in turn marked and shaped.

Other scholars expanded this view of the interrelation between materiality and circulation by developing theoretical models which are more photographic in their conception. Anthropologist Deborah Poole (1997) raises questions about the multiplicity of trajectories followed by photographs, and places the social shaping of photographs' meanings in the fluid relationship between their representational content, use value, and material forms. She argues that material and cultural work required for producing, consuming, and exchanging photographs occurs on the background of a *visual economy*, within which visual cultures and practices constitute, and are constituted by, dynamic assemblages of sociality, visuality, and materiality. The concept of visual economy is thus a means for "thinking about visual images as parts of a comprehensive organization of people, ideas, and objects" (1997, 8). Within this organization, the objectness of photographs matters, especially as they move across spatial, social, and cultural boundaries.

Materiality acquires an even more active and dynamic role in the conception of photography as a *complex* proposed by historian James Louis

Hevia (2009). Drawing upon Latour (1988) and Actor-network theory, Hevia argues that the social saliency of photography is activated by networks of humans and non-humans. He takes into account the materiality of photographs, technologies, and the entire set of activities related to photography. By encompassing these elements as parts of a hybrid photography complex, he attributes to photography "a novel form of agency, one understood in terms of the capacity to mobilize and deploy elements for generating new material realities. The photograph is thus neither reflection nor representation of the real, but a kind of metonymic sign of the photography complex in operation" (Hevia 2009, 81). Photographs, in this view, can be seen as objects mobilized through socio-technical networks which partake in the production and reproduction of those same networks.

Following the steps of these scholars, sometimes referred to as *photo-materialists* (Buse 2010b), I will assume in my discussion that: 1) photographic practices are *loci* of co-production of the visual, the material, and the social; 2) photo-objects are both outcomes of this process and active participants in it; 3) photo-objects are not static, but circulate and "live" in a constant tension between mutability and immutability, which is locally managed and resolved through actors' performances.

3. Data Collection

This article is based on empirical data collected during a multi-sited ethnography (Marcus 1995) conducted in Italy between 2014 and 2015. Fieldwork included the observation of activities organized by three different communities of photographers devoted to analogue instant photography (Polaroid-like), such as workshops, meetings, and exhibitions. It also included visits to specialized shops and private homes. Twenty-four, in-depth semi-structured interviews with members of the communities were conducted. Each interview lasted from 50 to 180 minutes. Given the field sites, interviews were conducted in Italian and translated into English by the author. The names of interviewees have been changed to ensure confidentiality. During fieldwork, over 1,000 photographs documenting practitioners' activities were also produced.

4. The Shift of Instant Photography from Mass to Niche Market: Obsolescence, Technological Resistance, and Materiality

When in 1947 the founder of the Polaroid Corporation, Edwin H. Land, announced the invention of instant photography, he dubbed it "one-step photography", because it was capable of eliminating a number

of steps between the exposure of photosensitive supports and the viewing of finished prints. In his article "A New One-Step Photographic Process," Land described his invention as basically: "...a camera and a photographic process that would produce a finished positive print, directly from the camera, immediately after exposure." (Land 1947, 61). He emphasized how many steps his invention had compressed into one by listing the conventional sequence of the photographic process: "Expose, develop the negative, rinse, fix, wash, dry, expose the positive through the negative, develop, rinse, fix, wash, dry" (1947, 62).

In this first version of instant photography, users were still responsible for pulling the film out of the camera and peeling the negative away from the positive print. After 25 more years of research, in 1972 Land eventually achieved his aim of reducing the photographic process to a single operation by developing a second generation of cameras, which mechanically ejected images that automatically developed before the eyes of the users. With the invention of this new technology, named SX-70, "absolute one-step photography" was born (Land 1972) (for a detailed account of SX-70 development see Bonanos 2012; Garud and Munir 2008). The SX-70 system was made of two parts: the automatic camera and the so-called "integral" film – where the term "integral" refers to the fact that the film itself integrates all the layers and chemicals needed to expose, develop, and fix a positive image without producing a negative. As the exposed film was automatically ejected from the camera, it was pressed between a pair of rollers that ruptured a "pod" containing chemicals. In the course of a minute, the chemical mixture developed and stabilized the positive image, producing the iconic white-bordered Polaroid print.

Two considerations are worth mentioning in order to develop my argument. They both relate to the specific distribution of competences between the photographer and the camera that is enabled by the use of Polaroid technology. In this respect, I will first illustrate how this distribution, at the time of Polaroid's mass diffusion, had been perceived as a threat to the expertise of aspirational amateurs. Secondly, I will discuss how, with Polaroid's obsolescence and the diffusion of digital photography, the emergence of a niche of aspirational amateurs devoted to instant photography brought with itself a re-articulation of the meaning of this distribution of competences. This re-articulation, developed in opposition to digital photography, made it possible for amateurs to circumvent the threat to their expertise posed by Polaroid technology. As a result, it provided a cultural basis for the resurgence of instant photography in the context of aspirational amateurism.

4.1 Polaroid Materiality Between Rejection and Experimentation

As widely acknowledged, Polaroid technology was a breakthrough innovation that reconfigured the relationship between technology and pho-

tographers by embedding most of the photographic processes into the camera itself (Hand 2012, 102-103). The reduction of picture-taking to the "one-step" of pointing and shooting had two noticeable effects on the practice of photography: first, it removed any requirement of training; second, it made darkroom work, film processing, and printing unnecessary, since these activities were now performed by technology. In this sense, Polaroid further continued the historical process of delegating actions to the camera that had started with the invention of the first Kodak camera in 1888, and that marked a change in photographic practice from the dominance of the professional to that of the amateur (Jenkins 1975a, 1975b; Latour 1991).

Yet, differently from Kodak, which had removed any requirement of competences and skills by providing professional photo-finishing services, Polaroid removed photo-processing and printing from the sphere of human activity entirely; by doing so, Polaroid reduced photography to its "degree zero" (Buse 2007). It was not by chance that newspaper writers adapted the famous Kodak slogan ("you press the button, we do the rest") to greet the invention of Polaroid technology, with which, they declared, "you press the button and the camera does the rest" (Buse 2008, 229). The key point here is that while, on the one hand, Polaroid technology was a feasible tool for lay people to practice photography, on the other hand it represented a threat to the expertise of aspirational amateurs, those spontaneous yet expert photographers whose practice was characterized by the mastering of photo-processing and printing (Griffin 1987). Since Polaroid technology replaced some key actions previously operated by experts and did not even produce printable negatives, aspirational amateurs rejected it in great numbers (Buse 2008). Given the historical exclusion of Polaroid technology from the realm of aspirational photography, how did it come to be that in the last few years, despite the cease of production caused by Polaroid's financial difficulties, instant photography has witnessed a resurgence of interest amongst aspirational practitioners?

Answering this question requires moving beyond considering the issue of the distribution of competences characterizing instant photography, and turning to the question of what kind of photographs instant photography materially produces. To overcome the gap between the exposure of film to light and the visualization of the final result, Polaroid developed a technology that instantly materializes photographs through the process previously described. As argued by Peter Buse (2010b), the outcome of this process is the production of photo-objects, which can be thought of as being a Polaroid's medium specificity. In the analogue days, the fact that Polaroid photographs developed on the spot, in the form of images that could be looked at *and* touched, gave rise to distinctive sociomaterial practices. For instance, one such practice was the use of Polaroids as party cameras: "Taking a Polaroid is an event unto itself, contained within the party atmosphere... the picture does not commemorate

the past party, but participates in the party as it occurs" (Trotman 2002, 10). Due to its capability of producing photographs that could be instantly visualized and physically exchanged, Polaroids served in festive occasions as a sort of "social catalyst" with an "ice breaking" capacity (Buse 2010b, 10-12).

Polaroid technology also played a role in the development of private forms of pornography. It made it possible for people to photograph their own sexual activity without fearing that photo-laboratories and technicians would violate their privacy. Furthermore, it made co-marital sex possible on a large scale, as it became a means by which couples who wanted to swing could establish contact with each other. Since the physical exchange of Polaroid photographs ensured the anonymity of both sides to the transaction, instant photography became an intrinsic part of swinging itself. Curiously, Polaroid's first low cost, popular model was named "The Swinger", although the double meaning of the name was originally unintended by Polaroid Corporation (Edgley and Kiser 1982).

These few examples show how the production of photo-objects, which inherently characterizes instant photography, since it enables the visualization of photographs on the spot through their instant materialization, gave rise to a range of socio-material practices in the field of amateur photography. The automated production of photo-objects and the perception of instant photography as an unmediated way of producing photographs were both fundamental in the development of such practices. Yet, in the context of aspirational amateurism, the acceptance of Polaroid technology was more problematic, as it threatened the photographer's role in controlling the whole process of photographic production. Aspirational amateurs could not follow the steps of the artist Andy Warhol, who, for instance, loved to use Polaroid cameras exactly because they "do the rest", thus enabling the re-thinking of the artist's subjectivity – in his own words: "I want to be a machine, and I feel that whatever I do and do machine-like is what I want to do" (Swenson 1963, 26).

However, although Polaroid technology did not fit aspirational amateurs' aims and established culture, during the 70s the objectness of Polaroid photographs inspired new creative practices able to circumvent the simplicity of the camera. Such practices were based on the manipulation of the print, both during and after the development of the image, and on the combination of Polaroids with each other, and with other materials, to form composite artworks (Bonanos 2012, 95-98; Buse 2010b). These practices became ways of producing works that better fitted the aesthetic criteria and conventions of aspirational amateurism. In particular, the physical interventions and manipulations accomplished by photographers resulted in pictorial photographs that resonated with the already established amateur tradition of *pictorialism* (Griffin 1987; Schwartz 1986).

Hence, in the analogue era, the reception of instant photography in the field of aspirational amateurism was characterized by a tension between the material functioning of Polaroid technology, according to

which the production of photographs is assigned to the technology itself, and the material accomplishments through which photographers could reinstate their own authorship and circumvent the problem of loss of control over the process. Thus, on the one hand, Polaroid technical artefacts were rejected by the many who considered them as "toys"; on the other hand, Polaroid photo-objects were appreciated by the few who recognized the possibility of experimenting with the inherent physicality of Polaroids. I would argue that this tension resulted in an ambivalent perception of the materiality of instant photography. From this point of view, it may be interesting to consider how this ambivalence has been recently resolved by a new group of users, who significantly define themselves as "*polaroiders*" rather than merely "photographers".

4.2 The Mutual Reconfiguration of Polaroid and its Users

Experimentations with Polaroid objectness started to diffuse in the 70s, after the introduction of the aforementioned SX-70 technology. In the context of aspirational amateurism, this practice of experimentation was less legitimate than that of traditional photography based on darkroom work, but it was nonetheless appreciated by a niche of amateurs. Significantly, researchers who conducted extensive ethnographies of amateur photo-clubs during the 80s, such as Griffin (1987) and Schwartz (1986), do not mention instant photography in their detailed accounts of aspirational amateurism. Ansel Adams, a famous photographer and consultant for Polaroid Corporation, whose influence was widespread in the world of amateurs, does not mention any creative technique based on physical intervention in the revised edition of his book on Polaroid photography (1978); he instead explains how to adapt SX-70 technology to satisfy the need for controlling the process of picture-taking. In contrast, the publication of a number of manuals dedicated to Polaroid manipulation attests an interest in this kind of practice (e.g. Sicilia 1977).

Resolving the ambivalence that had characterized the reception of instant photography in the field of aspirational amateurism required a change of both technology and its users. This change appears to have occurred after Polaroid's announcement that it was abandoning film production. As the perceived obsolescence of instant photography reached its acme, both the new group identity of *polaroiders* and a new meaning attributed to the use of Polaroid cameras have emerged. Moreover, this process of mutual redefinition has been guided by a logic of opposition to digital photography[2]. In this sense, it can be described as a phenomenon

[2] The case of polaroiders shows similarities with that of the TRS-80 users analysed by Lindsay (2003). In both cases, the obsolescence of technical artefacts (cameras and computers, respectively) stimulated a process of mutual reconfiguration of users and technology, guided by a logic of opposition to mainstream

that Kline and Pinch (1996) defined as *technological resistance* in order to address the processes of opposition to mainstream technologies through which users may become agents of technological change.

4.2.1 The Emergence of Polaroiders

When, in February 2008, the financial and market difficulties faced by Polaroid Corporation led it to announce that it would be permanently discontinuing the manufacture of instant films, a strong claim to save instant photography from obsolescence emerged from those amateurs who had already adopted Polaroid technology, notwithstanding its simplicity and illegitimate status. Several photographers turned into activists in defence of the preservation of instant photography, thus creating websites such as *savepolaroid.com* and *savethepolaroid.com*, and subscribing petitions in order to either coax Polaroid into reversing its decision or find a buyer for Polaroid's machinery (Bonanos 2012, 164-165).

Resisting the seemingly inevitable extinction of instant photography, practitioners decided to "buy films, not megapixels" – to quote what today is a well-known slogan in the world of film enthusiasts. All the interviewees who were Polaroid users at the time of Polaroid's announcement reported that their early reaction had been to buy dozens of films, either new or expired ones; some of them bought hundreds; one did buy 1,200. Others started online business to sell Polaroid equipment and films[3]. An interviewee described how he started his business by chance and then recognized the existence of a solid niche market:

> I had several vintage cameras, including some Polaroids. One day I decided to sell one of them, and put it up for auction for 1 euro. It was a Polaroid 1000, then a plastic camera, and it came to be sold for 60-70 euros. I had a fucking capital on the ground! Then I started to sell my cameras. At the time, you could find [Polaroids] at flea markets, hence I started to buy and resell them. The demand was strong, and I had to find other models abroad, in Germany, France, and mostly in America. Day-by-day... you know... it

technologies. I am grateful to an anonymous reviewer for suggesting these similarities to me.

[3] Knowing where to buy equipment has become a fundamental part of analogue photography practices. Online shopping is common, but going to flea markets is also essential, since such markets offer the advantage of a less institutionalized *regime of value* than that one shared by professional sellers (see Appadurai 1986). Another competence relates to knowing what is the appropriate price to pay; according to interviewees, vintage cameras are categorized as follows, from the lowest price to the highest: "found" cameras which are sold "as is"; cameras tested with batteries; cameras tested with film; cameras refurbished by experts; Polaroids which have never been used stand on top of the ladder, although they are intended to be collected rather then used.

> sometimes happened that cameras didn't work, thus I've learnt day-by-day how to fix the SX-70s, the most valuable ones.
>
> Then I created my own camera, using the body of a Polaroid 1000. Basically, I created a pinhole Polaroid. I also had other good ideas, like that of producing properly sized camera bags. Some artisans helped me by sewing and assembling them (Edoardo, male, 44 years old).

During my research I also met Giorgio, 56 years old, a manager who has learned by himself how to repair cameras; in his spare time, he offers repairing services to other practitioners and provides refurbished cameras to specialized shops. The announced obsolescence of instant photography thus stimulated a change in the role of users: they turned into marketers, distributors, repairers, and even producers. This change could be interpreted as a transformation of technology appropriation path, which progressively moved from the sphere of consumption towards the more active sphere of production. The *creative appropriation* of Polaroid technology (Eglash 2004), once limited to physical interventions on prints which violated producer's intentions, came to include a broader range of activities developed by the users in order to counteract the market-driven production of Polaroid's obsolescence.

Most importantly, users not only rearticulated their own role in appropriating photographic technology, but they also redefined their identity as members of a distinctive social group: a group of practitioners devoted to use and perpetuate Polaroid technology, accordingly self-defined as "*polaroiders*". By connecting with each other, Polaroid enthusiasts amplified their voice and reorganized the circulation of instant cameras and films. Networking activities, such as the organization of a collective movement for the preservation of instant photography, as well as the creation of alternative systems of distribution, quickly transformed the formerly invisible, dispersed niche of Polaroid users into a *relevant social group* (Bijker 1995). This process shaped the perception that the market for instant photography was still remunerative, although limited. Moreover, it was an empty market, since Polaroid had abandoned it. In the course of a few months, a new actor entered the market to fulfil the request of saving instant photography. The new company, called "The Impossible Project" (TIP), acquired the former Polaroid production plant in Enschede, Netherlands, and hired a dozen former Polaroid employees in order to develop new formulas for producing instant films compatible with existing Polaroid cameras (Bonanos 2012).

Photographers' activism and the entry of a new producer have reversed the process of obsolescence of instant photography, at least temporarily. In the last few years, an increasing number of aspirational amateurs have switched from using high-end digital cameras to simple, automatic Polaroid cameras. The re-appropriation of instant photography originated from the attempt of a small group of users to renegotiate and

contrast Polaroid obsolescence. Indeed, with the digitalization of photography, analogue photography "was not being outpaced or becoming obsolescent, it had to be *made* obsolete, and its obsolescence had to be presented as inevitable" (Henning 2007, 53; italics in original). That the end of instant photography was a matter of power and dominance rather than an inevitable fate became somehow clear to Polaroid enthusiasts when they started to publicly discuss the issue of obsolescence. Why should they quit practising instant photography, if they still constituted a feasible market? How could they have replaced their experimentations on photographs' objectness with a digital workflow within which photographs are visualized on screens?

4.2.2 Polaroid 2.0: Resistance and Authenticity

Since its beginning, the debate about the imminent obsolescence of instant photography was characterized by the idea that the digitalization of photography was *forcing* Polaroid users to dismiss their practice as obsolete. Polaroid photographs began to be simulated by digital apps, such as "Poladroid" (released in 2008), and this remediation of the old technology by the new revealed even more clearly the attempt of producing obsolescence by substitution (Henning 2007). As part of their effort to counteract the deliberate, market-driven production of obsolescence, instant photographers reworked the meaning of their practice in an oppositional way. They not only wanted to affirm that obsolescence was less inevitable than it was perceived; they also wanted to state that instant photography had to be preserved because it was more *authentic* than digital photography. The discourse of authenticity provided a cultural basis to their action of technological resistance, which took the form of a voluntary rejection of digital cameras in favour of the exclusive adoption of Polaroid technology – as it is convincingly expressed by the slogan "buy films, not megapixels", and reinforced by the fact that Polaroid users now define themselves as "polaroiders" and refuse to adopt the general term "photographers".

Collected data suggest that the opposition between digital and instant photography is based on three main dichotomies: immateriality vs. materiality; control vs. unpredictability; photography as an impulsive act vs. photography as a reflective experience. Materiality, unpredictability, and reflectiveness, on which Polaroid's authenticity is currently based, are linked to the two characteristics of instant photography described previously, its ingrained physicality and unbalanced distribution of competences. The meaning attributed to these characteristics, once controversial, has been culturally reworked to justify the resistance to the dominance of digital photography.

First of all, polaroiders believe that Polaroid's material essence is a fundamental dimension of photography that is completely discarded with digital technologies. In the following quotation, for instance, an amateur

described this material essence as something that digital photography has "stolen" from the practice:

> [Photography] was a 'digital' work, in the sense that you accomplished it with your fingers, with your hands. They have stolen this definition, too. That is, the 'digital' shifted from being something done with fingers to something done with pixels (Camillo, male, 42 years old).

Accordingly, polaroiders share the idea that photography should be practiced "with hands". From this idea derive both their appreciation of manipulation and the great importance they attribute to Polaroid photo-objectness:

> Above all I love manipulation… This is the reason why I love Polaroids so much. I like touching the film, boiling it, transferring the emulsion onto a canvas or cardboard. I love the fact that you do things with your hands (Alba, female, 43 years old).

Polaroiders have developed a broad range of techniques related to the physical intervention on photo-objects. These techniques partly reproduce those established at the time of Polaroid's mass production, but new kinds of manipulation are also developed to explore the potentiality of new TIP films. Such interventions include, to cite just few of them: the "lift-off", which consists in removing the emulsion layer from film and transferring it onto a different support; various techniques of surface painting; picture engraving by using heated tools such as the pyrograph; removing background layers and chemicals to obtain transparent photographs; "wounding" the film with nails and other tools. What these techniques have in common is that they presuppose the involvement of bodily sensorium. As a polaroider once told me, they make of instant photography a "photography of the senses".

Secondly, Polaroid materiality has become more salient, for it is now perceived as adding a degree of unpredictability to the supposedly automatized photographic process. Jamie Bayliss, the creator of *savethepolaroid.com*, was one of the first to sum up the difference between instant and digital photography in these terms:

> Polaroid represents what I love about art and photography. I believe experimentation, accidents, and unpredictability are important if not essential parts of the art making process. With Polaroid film you are guaranteed all three will occur at some point... It's not that you cannot be experimental with digital photography: it's just a lot more difficult. It's difficult to make a mistake. Either that, or when you do experiment your results are predictable.[4]

This quotation makes it clear that the opposition between digital and instant photography is based upon the definition of the latter as a process

[4] http://www.savethepolaroid.com/polaroids/philosophy/ (Retrieved 10/08/15).

of discovery and experimentation. In this experimentation, accidents may occur, photographers get inspired by their own mistakes and the unpredictability of the analogue process can let them find new aesthetic solutions. Different from digital photography, which is seen as "predictable", instant photography is perceived as a more authentic creative experience, since it is able to lead photographers to unexpected discoveries worthy of exploration. This opposition is also reinforced by TIP, the new producer of instant films, which emphasizes the unpredictability of the "analogue adventure" (Bonanos 2012, 168), and has adopted the innovative marketing strategy of selling defective batches of films as limited editions designed for the bravest experimenters.

It can be argued that this opposition between predictable and unpredictable photographic processes represents both a cultural shift within aspirational amateur photography, and a change of the meaning attributed to Polaroid's distribution of competences. As a matter of fact, traditional aspirational amateur culture has always been characterized by the idea that photographers play a prominent role in the photographic process. Conventionally, this culture prescribes that they have to exercise control over the whole process of production, from the mental previsualization of the image to its physical or digital post-production (Griffin 1987). In this respect, it is worth noting that the re-evaluation of Polaroid technology in the context of aspirational amateurism represents a break with amateurism's tradition. At the time of Polaroid's mass popularity, the reduction of photography to the "one step" of framing and shooting had been considered an unacceptable limitation by the majority of aspirational amateurs (Buse 2008). In recent years, as the diffusion of digital photography threatened the existence of Polaroid technology, the lack of control over the process has begun instead to be acknowledged and positively valued. Moreover, this lack of control has been interpreted as part of a new form of authenticity, upon which an opposition between digital and instant photography is created and sustained.

The shift from a traditional culture based on control and predictability to a new one grounded on unpredictability can be also understood in terms of a re-articulation of the way in which human and non-human agencies are conceived and relationally bound. On the one hand, technological artefacts are no more seen as neutral tools which photographers entirely control, but as actants exerting agency in the process of photographic production. Polaroids have come to be *machines of uncertainty*, which shape the experience of photography. This re-evaluation of technological agency seems to be a common trait of contemporary film-based practices, as it is shared by other kinds of practitioners, e.g. the "lomographers", who use simple, plastic toy cameras which also produce unpredictable effects (Mangano 2011).

Hence, the re-articulation of instant photography brought with itself awareness that practicing photography requires the balancing of technological and human agency. In this case, balance is reached by accepting

cameras that "do the rest" and by reinstating human agency through physical interventions on photo-objects, that is, by practicing photography "with hands". Polaroid photographs can thus be understood as photo-objects embodying the hybrid authorship established through polaroiders' practice. They are partly produced by the hands of photographer, partly by the technology itself. In the process of their production, both visuality and materiality are co-constituted, and put in continual dialogue, through the interaction between human and non-human actors. In fact, as non-human agency is now acknowledged and positively valued, accidents and imperfections are tolerated and sought-after:

> Few years ago, a camera with a plastic lens that vignettes the borders of the image was something to be thrown away. Yet, my first plastic camera gave me great satisfaction... plastic lens, awesome vignetting... I love out-of-focus photographs, I love photography that is *dirty* (Pippo, male, 35 years old).

Fig. 1 – An exhibition of "wrong" Polaroids. (Photo by the author).

The re-evaluation of technical imperfections appears to be widespread amongst polaroiders, as well as amongst other analogue enthusiasts such as the lomographers, although it might be reduced in the future due to the constant improvement of TIP films. Nonetheless, while conducting my research I found several evidences supporting this issue. For instance, at a workshop on Polaroid manipulations, the teacher started his lessons with an introduction to the creative use of errors ("I will firstly illustrate errors, then techniques"). Even more convincingly, in 2015 a community I studied organized a collective exhibition entitled "Spare Instants", which featured only "wrong" Polaroid photographs mounted on the wall without frames. Below the subtitle "At the edge of instant photo (and beyond)", compositions of almost unrecognizable images underlined the subject matter (Fig. 1).

Polaroiders' view of how human and non-human agencies are relationally bound within the practice of instant photography is further elaborated with the addition of a third element: the conception of photography as a reflective experience. The hybrid *dispositif* that emerged from the re-articulation of instant photography entails a form of consensual abandonment of subjects to the constraints of Polaroid materiality, which in turn stimulates the development of techniques through which polaroiders prepare themselves to "make things happen". An interviewee called this attitude the "zen of photography":

> [Polaroid] taught me the *zen of photography*. It means that you wake up in the morning, having planned that you'll be around photographing over the entire day, and then you feel... the *adrenaline*! You prepare your bag, take your bycicle and go out, far away. You arrive, and have to get there at the estimated time... I look at the map and estimate what time the sun will come... [what time] the sun will be as I like it to be. I estimate time, get there, and get *anxious*. Polaroids have parallax error, because of the viewfinder... the most difficult thing to do with Polaroid is photographing a tower and putting it at the centre of the image. In fact, I usually *shoot once*, never take more shots.
>
> The zen means widening your legs a bit, aiming, taking a breath, holding your breath, not resting your arms on the chest, because heartbeat makes them move... thus you stand that way and aim straight... frame as you wish, then do this movement, move down a bit, a bit to the left... you have to learn this movement, shoot, and then you know you've got it right. Because now you're experienced (Pippo, male, 35 years old).

These excerpts show that instant photography is perceived by the polaroiders themselves as a reflective experience: it articulates itself through a sort of meditation continuously threatened by technological constraints, such as the difficulty of framing, and by emotional states, such as excitement and anxiety; hence, instant photography is not reduced to the mere

act of pointing and shooting, but instead it is seen as an activity requiring a long preparation, as well as a learning of how to adapt the photographer's body to the camera. Experiencing photography appears to be more important to polaroiders than producing photographs. As stated above, shooting is perceived as just the reward of a long process of preparation and human and non-human interaction, to an extent that only a photograph can eventually be produced. This condensed practice is explicitly opposed to the "shooting mania" of digital photographers, that is, the impulsive production of large numbers of photographs which characterizes digital photography. An interviewee illustrated this point by reporting how he reproduced the supposedly unthoughtful digital workflow to publicly deprecate mainstream photography culture:

> I stuck my iPhone to a train window. Then, while reading a book, I kept on shooting without aiming, ta-ta-ta-ta-ta-ta-ta, over the whole trip. After returning I selected 10 photos. Then I went to a printer and asked him for the most beautiful paper. Then I went to a frame-maker for the cardboard frames. I paged the photos in a book, one metre long and forty centimetres high, entitled it "Boredom", wrote four lines of crap, and brought it to the Photoshow. And I received compliments from everyone. 'Brilliant', 'fantastic'. I said 'well, gentlemen, I haven't done anything except carrying around a phone and shooting randomly.' I selected 10 of 3,000 photos, you don't need to be a genius to do so. Thus I created a webpage, which is called 'I Shit Photo', to make people know what I think of this kind of work (Camillo, male, 42 years old).

I would argue that by linking the three elements described above – practicing photography "with hands", accepting the unpredictability of Polaroid technology, and valuing the reflective attuning of subjects to the experience of photography – polaroiders have defined a new kind of regime of authenticity, which is articulated in opposition to digital photography and which substantiates their action of technological resistance. A new distinction about what technical artefacts are appropriate for practicing aspirational amateurism has accordingly emerged. Following this distinction, analogue cameras are the "real" tools of amateurs, while digital ones can just pretend to be so by reproducing the physical structure of their predecessors, as the following excerpt from a conversation between polaroiders commenting on the latest state-of-the-art digital cameras suggests:

> A: I have to admit that I appreciate the fact that [with Fuji X-Pro] you can again set the diaphragm by rotating the aperture ring on the lens, instead of pressing buttons and turning small rings on the body.
>
> B: What about the latest craziness from Leica? That without screen... a digital camera without screen!
>
> A: *It looks like a real camera!* The Fuji X-Pro, too... it looks like an old 6x9.

However, although polaroiders reject digital cameras in the context of aspirational amateurism, they nonetheless admit the use of such devices for other purposes, e.g. for utilitarian and mundane photography. I found that using digital devices in different contexts is often made coherent with the practice of instant photography. The simplest way to do so is by material arrangements, for instance by inserting smartphones into cases that reproduce the design of vintage Polaroid cameras (Fig. 2). However, what is more intriguing is the way polaroiders appropriate mobile apps designed to simulate analogue photography. It is obvious that using software that mimics Polaroid photography is proscribed. What I did not expect to find is that polaroiders distinguish between apps that are commonly considered similar.

Fig. 2 – An iPhone cased in a Polaroid-like shell. (Photo by the author).

In particular, during my multi-sited ethnography I found evidence that polaroiders clearly accord preference to Hipstamatic over Instagram. They both are popular apps that digitally simulate the appearance of analogue photography. As such, they are often considered as equivalent means for practicing nostalgic "digital retro-photography" (Bartholeyns 2014; Bull 2012; Caoduro 2014). Thus, why do polaroiders accord preference to the former over the latter? An interviewee puts it in these terms:

> The concept is different, because with Instagram you shoot an ordinary photograph and then work on it, while with Hipstamatic you have a camera in your hands, and you shoot knowing that you're producing a photograph that is what it is... it's like you have a film loaded. You choose the camera, lens, and film... although

> they are all simulated. This gives you the feeling and taste of analogue photography (Fabio, male, 43 years old).

According to him, his preference is motivated by the fact that Hipstamatic – in ANT terms (Akrich 1992) – configures the user through a *script* of actions that is perceived as coherent with the practice of analogue photography. While Instagram is recognized as "digital", for it produces transient photographs that have to be post-processed, Hipstamatic has an "analogue taste", since the photographs it produces "are what they are". That is, they are seen as "real" outcomes of the interaction between photographer and technology, during which the former makes his choices and the latter "does the rest". Although it is a simulation, the doings and distribution of competences are perceived as coherent to those of instant photography.

To summarize and conclude the first part of my argument, I would argue that, with the diffusion of digital photography, Polaroid's increasing obsolescence opened up new opportunities for aspirational amateurs to reconfigure existing boundaries between mainstream and niche photographic practices. Those amateurs who, despite the cultural ambivalence of Polaroid technology (Buse 2008), had already adopted it, redefined three main elements mainly pertaining to its material dimension, in a dialectical opposition to digital photography. These elements (physical manipulation, process unpredictability, and the reflective attuning of subjects to technological constraints) have evolved together with a new form of authenticity that polaroiders feel should be preserved. In this process, former Polaroid users redefined their own identity as "polaroiders", and became a relevant social group whose aims are to resist digital photography and to contrast the production of Polaroid's obsolescence. Contemporary instant photography could thus be described as new practice. If I had to find a new label to distinguish it from its predecessor, it would be "Polaroid 2.0", since it reflects both its newness and the self-identification of practitioners with their privileged old technology[5].

5. The Double Logic of Remediation and the Digital Circulation of Polaroid Photographs

The transformation of instant photography into a niche practice that lives on the periphery of, and in opposition to, digital photography appears to be an opportunity to study the co-production of the visual and the material, since Polaroid's ingrained physicality has inspired new visual practices and has taken on a new saliency by virtue of its threatened obso-

[5] While I was writing this paper, I discovered that the label "Polaroid 2.0" had been already coined by Peter Buse in his new book on Polaroid photography, *The Camera Does the Rest* (2016).

lescence. This process of co-production has also shaped the social. In my study, this is made clear by the fact that geographically and socially dispersed individuals, by connecting to each other, and by collectively reworking the meaning of instant photography, came to constitute a relevant social group with the power of attracting a new producer of instant films (Bijker 1995).

Another way of understanding how this assemblage, or *photography complex* (Hevia 2009), works, is that of considering how a wide range of heterogeneous ingredients, relating to different dimensions (material, symbolic, and performative) are integrated into photographic practices (Hand 2012; Shove, Watson, Hand and Ingram 2007). In the case of contemporary instant photography, this process of integration can be thought of as the outcome of both the dis-integration of pre-existing practices and the re-integration of old elements, together with new ones, into a new practical entity. Out-of-production cameras, reinvented films, new forms of manipulations inspired by their old versions, an unprecedented acceptance of imperfections, online competitions and real-life "polaparties", digital and analogue technologies, all these elements are coherently integrated into a practical entity within which the old and the new are inextricably layered.

In my study, perhaps the most emblematic example of how the social, the material, and the visual are co-produced, and at the same time of how old and new ingredients are assembled-in-practice, is the digital reproduction and circulation of Polaroid photo-objects. The digital circulation of Polaroids is an essential part of instant photography practice. It lets photographers show their work and coordinate community activities, such as exhibitions and competitions, in a similar manner to that of digital amateurs (Grinter 2005). It also plays a prominent role in recruiting new practitioners, which is fundamental to the reproduction of practices (Shove, Pantzar and Hand 2007).

Digital circulation, for example, creates a pre-requisite for enrolment by making instant practice visible:

> I believed that the film era was actually over. I didn't believe that films might still exist, like millions of people I still meet who ask me 'What? Do you shoot film? Where do you find them? Do they still exist?'. That is, I believed so, believed that everything was digital. But I was wrong. Because I'd never sought information about that... so I just didn't think films were available anymore, don't know why, due to a discourse about times, about ages. Thus, at the time I'd dedicated myself only to digital photography. But then I discovered that film does still exist! (Alba, female, 43 years old).

Reaching more visibility is thus important for contrasting the dominant perception of technical innovation as a break with the past. Digital circulation has also been crucial for both the emergence of a new Polaroid culture and the transformation of Polaroid users into a relevant social

group. At the beginning of the Polaroid re-appropriation movement, early adopters connected to each other by sharing their Polaroids on websites dedicated to the preservation of instant photography. TIP recruited several of those activists as "Testers" during the experimental stage of film production. The testers' duty was to test newly produced films and ship the resulting photographs, together with a form compiled with technical data, back to TIP headquarters. However, the programme was likely intended to recruit allies (and future customers) within the networks already established by Polaroid users, rather than actually test films. An interviewee expressed his doubtfulness about both the programme and the new products:

> I shipped my first photographs and commented: 'Are you really going to sell this stuff?' About three weeks later I got an email with their response: 'Wow! Wonderful work!' And there I thought: 'Are they kidding me? That stuff has to be thrown away' (Gabriele, male, 67 years old).

This quotation also reveals that technical imperfections were not tolerated at the beginning. Although still controversial, the acceptance of imperfections has increased over time with the re-articulation of instant photography – a few years later, for instance, the polaroider quoted above took part in the organization of the already mentioned "Spare Instants" exhibition. TIP also contributed to this change by distributing defective film batches. According to two interviewees, TIP furthermore exerted some form of control by expelling from the Tester programme those who publicly criticised its products (they both reported that this happened to themselves). Notwithstanding the bewilderment of some Testers, in 2010 TIP started publishing on its website a collection of photographs shot on its newly produced films, and this created a hype around Polaroid technology, attracting new practitioners[6].

If we consider the importance polaroiders attribute to the concreteness of analogue photographs, the digital reproduction and circulation of such photographs raise questions about how practitioners maintain practical coherence between the meanings they give to Polaroid's photo-objectness and its translation into digital form. Since polaroiders, who contrast and deprecate digital photography, eventually circulate their photographs digitally, how can they discard the physical substance of Polaroids without losing coherence with their own resistant identity?

Interestingly, the conversion of Polaroids into digital data files was a fundamental part of the way in which the Polaroid Corporation imagined instant photography's unlikely future in an "image-dependent businesses" as early as in 1991 (Buse 2010a). Moreover, Polaroid's research and de-

[6] These early photographs marked the foundation of "The Impossible Collection", which explicitly refers to the famous Polaroid Collection founded by Edwin H. Land.

velopment activities during the 1980s have been guided by an equally unlikely, strong sense that customers would also want instant prints in the digital age. This "ontological truth" led the company to invest in developing digital technologies which also produce instant prints on Polaroid films, and to fail in responding quickly to the market's ongoing shift from analogue to digital imaging (Tripsas and Gavetti 2000). On the one hand, these considerations make the role of users even more significant, since it has been more effective than that of the producer in redefining the meaning of Polaroid's objectness and finding a way to keep instant photography alive. On the other hand, they make questions about how the digital conversion of analogue prints may be coherently integrated into analogue photographic practices intriguing.

Clearly, in this regard, the digital scanning of instant photographs is a crucial and delicate process, as it transforms physical objects into two-dimensional images. Polaroiders have developed two main strategies to manage scanning. The first one consists in reproducing elements that pertain to the physical form of these photographs. This is well exemplified by the reproduction of the iconic frame within which images are contained. To give some numbers, in a sample of 600 Polaroids, recently published by members of the three communities I studied, 544 are scanned with their own frames. Thus, 90.7% of the sample is composed by photographs reproduced together with their physical support. This number increases if we consider that the remaining 9.3% often show other material elements, such as traces of physical interventions and mixed materials applied on the images' surface.

It could be argued that this strategy aims to transform digital reproductions into meaningful carriers of analogue practice. As the objectness of instant photography has taken on a new saliency in opposition to digital immateriality, this oppositional meaning is preserved through visual inscriptions that remind of the socio-material production of photo-objects. In this sense, in the process of scanning, polaroiders try to not reduce photo-objects into two-dimensional images. Instead, they make visible the physical substance of the "analogue experience" by representing supports, manipulations, and imperfections, that is, the objects, doings, and meanings which constitute their practice. It could be said that, when translated by digital means, exposed instant films become even more "integral", in the sense that they integrate all the fundamental elements of polaroiders' practice.

The second strategy, which I define as "casual scanning", consists in diminishing the visibility of the mediation of digital technology, either concretely or symbolically. This is mostly accomplished by avoiding to set digital software scanning parameters. So, regarding their scanning practice, the majority of interviewees reported that they "just put the photograph into the scanner and then push the scan button". However, setting parameters is tolerated when it is limited to brightness/contrast; this is justified by the aim of ideally making what it is seen on the screen to "be

the same as the print". Digital mediation is underplayed also by discursively devaluing technologies and competences, as it is exemplified by interviewees underlining that polaroiders are "digital illiterates", and that their scanners are "poor".

> I own a very poor scanner that is also a printer. You can see that [resulting images] are askew... but it's ok. I like them as they are... as they come out from the camera, with their frame. Usually I don't correct anything. I know you can digitally correct whatever you want, but what's the point? In fact it makes no sense. I try to keep it as real and close to the original as possible. It's good as it is... a Polaroid without frame isn't a Polaroid at all, it's not itself anymore (Carla, female, 44 years old).

Besides the already addressed point about Polaroid's frame, this excerpt also reveals that polaroiders take care of reducing the transformative effect of digitization during scanning. To their eyes, digital technology "has no agency", as far as they keep the whole process of digitization "real" by reproducing Polaroids "as close as possible to how they come out from the camera". Digitization is thus a process during which practitioners express ontological assumptions on the nature of instant photography. These shared assumptions make a digitalized Polaroid an appropriate substitute for the original photo-object.[7]

From an emic perspective, the logic adopted during scanning is thus double: on the one hand, polaroiders visualize the material to materialize the visual by displaying the physical elements of their photographs; on the other hand, they deny the transformative effect of digitization, believing that this denial could preserve the original material essence of analogue photographs and thus not reducing it to the supposedly pure visuality of digital photography.

When considered together, these two strategies appear to correspond to the twin logics of *remediation*, the process by which media are multiplied, and at the same time all traces of mediation are erased (Bolter and Grusin 1999). Although digitalized Polaroids are clearly *hypermediated* contents, for they are digital versions of film-based photographs, the style of representation and the mode of production adopted by polaroiders express a desire for *immediacy*, which "dictates that the medium itself should disappear and leave us in the presence of the thing represented" (Bolter and Grusin 1999, 6). These logics, grounded on shared ontological assumptions about the status of the visual outcome, "make the viewer forget the presence of the medium" in the very act of multiplying media (Bolter and Grusin 1999, 272). The double logic of remediation can thus be used to describe how digitalized Polaroids can remain "real" photo-objects and retain their physical substance to the eyes of polaroiders.

By following the logic of remediation, polaroiders achieve practical

[7] See Sassoon (2004) for a different point of view on this issue.

coherence: to them, digitalized Polaroids are not products of digital photography; they are "real", since they are the same that photographers keep in their hands; their objectness is not discarded, instead it is reproduced in a way that expresses polaroiders' shared assumptions, knowledge, and the oppositional meaning of instant photography practice. Digitization puts photo-objects in tension between mutability and immutability, and this tension is managed through performative strategies driven by the twin logics of remediation.

The twofold goal of digitization strategies is thus to mobilize photo-objects and at the same time attain a sort of immutability. When digital Polaroids circulate, practitioners do not perceive the tension between mutability and immutability. However, this tension becomes visible when non-practitioners participate in polaroiders' communities. Since membership is usually open to participation, but new members are not yet enrolled – in the sense that they are not *carriers of the practice* (Shove, Pantzar and Hand 2007) – the status of photographs circulating online may be contested. In the following excerpt, a polaroider who manages an online community describes what happens when new members upload "fake" Polaroids created with digital software:

> It happened, especially at the beginning, that someone uploaded fake Polaroids. It was funny that after we had pointed out their fakery, they kept arguing that they are true. I didn't ever understand that. This is the reason why we've put a disclaimer in our homepage. Basically, the idea is that *you can upload only photographs that can be touched*. This is what the disclaimer says. Then, philosophical dissertations about digitization came out. It was bordering on the ridiculous... I'm very rude with *people who pass something that is not*. Our attitude is that of good faith, that is, I give you a chance to tell me if it's true or not, and to delete it in case... Yet it usually happens like this: they get angry, do their philosophical dissertation on why and how, get offended, and leave. They get angry because it's not fair, since with scanning it too becomes digital, etc. It's simply a question of ethics... of giving things a name (Beatrice, female, 35 years old).

Thus, conflicts may emerge from two contrasting ontological assumptions: practitioners distinguish between "true" Polaroids, which, although digitalized, exist somewhere in a material form, and "fake" Polaroids, which exist only in a digital form; non-practitioners, instead, do not recognize the objectness of whatever photograph circulates on the web. Notwithstanding the non-practitioners' argument that digitalized Polaroids are as transient and immaterial as digitally-produced photographs, their status of immutable photo-objects is taken for granted, produced through digitization strategies, and constantly defended by practitioners. Those who do not share this practical knowledge are excluded from the community. In this context, digitization and digital circulation are thus political acts by which social boundaries are traced and maintained.

6. Conclusions

With this article I attempted to show how the ongoing re-appropriation of analogue instant photography can be "thought beyond the visual". I drew upon both STS literature highlighting the role of material artefacts and users, and upon "photo-materialist" scholars, who stressed the need of reorienting the research on photography in order to not reduce the object of study to fixed entities constituting the practice of photography, such as images, technical artefacts, or photographers. In developing my argument, I highlighted two processes through which the visual, the material, and the social are co-produced.

The first process relates to the dynamics of socio-technical change. At this regard, I discussed how the diffusion and dominance of digital photography stimulated a counter-action of technological resistance, which successfully reversed the process of obsolescence of instant photography. This phenomenon emerged from the mutual reconfiguration of Polaroid users and technology. Previously dispersed users connected with each other and emerged as a relevant social group with the power of attracting a new producer of instant films, redefining along this process their collective identity as "polaroiders". On the other hand, the use of Polaroid technology acquired a new oppositional meaning, grounded on the definition of a new form of authenticity, based on an opposition polaroiders envision against the perceived lack of authenticity of digital photography. Contemporary instant photography could thus be described as a new practice, within which old and new elements are integrated together in a renewed configuration. If I had to find a new label to distinguish it from its predecessors, it would be "Polaroid 2.0", since this definition reflects both the newness of the practice and the self-identification of practitioners with their privileged old technology.

The second process I focused on is the process of remediation of Polaroid photo-objects that takes shape through the digital circulation of Polaroids. Here I showed how the digitization of Polaroid photographs, a passage that is fundamental to the organization and reproduction of instant photography practice, can be understood in terms of a remediation process through which digital photo-objects are made coherent with their physical counterparts. I described two digitization strategies developed by polaroiders, that they believe can preserve Polaroid's objectness into digital form. By adopting the logic of remediation polaroiders make of digitalized Polaroids appropriate substitutes for the original photo-objects. This lets them coherently integrate digitization into their analogue practice. Finally, I illustrated how the circulation of these "digital photo-objects" forces practitioners to constantly defend the boundaries and authenticity of their practice. Conflicts about the ontology of digital photographs between practitioners and non-practitioners may thus reveal how photography's material status is socially (re)produced through circulation.

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Plants as Digital Things

The Global Circulation of Future Breeding Options and their Storage in Gene Banks

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Abstract: Seeds have traditionally been collected according to their reproductive cycles, i.e. the time when they lose their potential of becoming a real plant. Therefore, the locations of botanic gardens or seed banks imply the vicinity of agricultural land. This article exemplifies the transformation of plant collections into gene and data banks by investigating the Svalbard Global Seed Vault (SGSV) in Norway and the German Genebank for Fruit Crops (DGO). It shows that international efforts to safeguard biodiversity by intertwining them with bioinformatics infrastructure transform seeds and other plant genetic material into digitalized objects. The almost virtual genetic material, now stored without the neighborhood of acres or gardens, is, at the same time, seen as "options" for new high-tech plants, which might be transplanted to a future territory. Consequently, plant varieties are circulating around the globe in form of genetic material and data. The article shows that the digitalization induces a specific distinction between the material and the digital flows of plants.

Keywords: gene bank; digital plant; digitalization; plant collections; svalbard global seed vault.

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1. Plants as Living Organisms and Mobile Biofacts

When discussing mobility, we are used to the idea of large-scale movements, and we tend not to look at the microcosm or little motions surrounding us. Furthermore, we mostly relate mobility to the capacity of changing places. A key characteristic of modern societies seems to be constant global flows of material, people, and commodities. Plants are, of course, part of these flows as they are traded around the world as scien-

tific objects, luxury articles, food and fodder. The EU, for example, estimates the import number of 17,8 million tons and the export number of 44,7 million tons of cereals for the marketing year 2014/2015 (European Commission 2016).

At first glance, 'mobile' plants are those goods flowing through global channels. People move them like all commodities. Yet, although plants are not well known to be mobile in the sense of having the capacity of changing places, they do inherit another type of mobility: As living organisms, they are constantly changing their sizes, colors, and shapes, and they are in a constant metabolic process. Aristotle (II.1) described these life processes as types of motions. According to him, things, which exist by nature, have a principle of motion and of stationary-ness within themselves. The plant's principle of moving is related to growing, withering, and constant alteration.

The principle of movement serves Aristotle as a *dynamic criterion*, which he accompanies with a *genetic criterion* to distinguish natural from artificial entities. For Aristotle, natural entities are those that generated themselves and artificial entities are those that are produced. In production, a projected form is realized by putting together input material following a certain mechanism. That process of synthesizing parts together can, in general, be undone; a ready-made automobile may be taken apart again. Plants, in contrast, reproduce themselves by transmitting a parental form into a newly emerging living being. Here, the 'outcome' is a grown one and cannot be disassembled into its singular components. However, the crucial difference between a produced object and a plant, even a modern high-tech plant, is that the plant, no matter what, still needs to grow.

In the following, I discuss how the digitalization of modern plant collections challenges our interpretation of the ontological status of plants and changes the channels through which plants are moved as mobile objects. Particularly, I want to highlight the dispersion of material and digital networks of flows due to the impact of bioinformatic infrastructures on practices of plant collecting. I am going to analyze two examples: the Svalbard Global Seed Vault (SGSV), a meta-collection of iced seeds on Norway's archipelago in the Arctic Ocean and the German Genebank for Fruit Crops (Deutsche Genbank Obst [DGO]), which is a decentralized gene bank network. Both collections aim to preserve the genetic variety within certain species for the future, and both collections are highly modern in terms of their bioinformatic infrastructure. They both explicitly operate within an international legal framework based on the political will to safeguard biodiversity. We will see that those frameworks demand and push a standardization of plant collections, including their digital data banks. By exemplary examining the rhetoric and practice of two modern plant collections by a study of literature, I will also reveal the interdependencies of the modes and objects of collecting.

2. Collecting Plants: Objects, Discourses and Politics

Currently, about 1750 plant-gene banks exist worldwide (FAO 2010). Their task is to collect samples, characterize and evaluate plants, document this knowledge, conserve the plant material, and finally make the material and the documentation available to others. Gene banks must use different conservation techniques depending on the plant's regenerating systems, e.g. storages at a very low temperature, in-vitro cultures, or field-gene banks. Over the last decades, plant collections have been undergoing tremendous changes (Engels and Visser 2003). Since the 1950s and 1960s plants have become subject to international political efforts, and thus been turned into political and juridical objects. Scientific and technological boosts, in particular molecular biology and bioinformatics, have also turned plants into biotechnological and informationalized objects. These paradigmatic shifts likewise affect the modes and practices of collecting and documenting.

2.1 The Concept of Biofacts

Since the beginning of agriculture in the Neolithic Revolution, plants are being cultivated and farmers, breeders, and scientists initiate and mediate the process of growing by using quite different tools (low-tech or high-tech). Hence, cultivated plants have never precisely grown just by themselves, but were always somehow 'made'. Because of that, the Aristotelian differentiation between the living and the artificial needs specification: We may interpret it as an analytical differentiation between two idealized types (Weber 1997, 90) of how things come into existence. It serves as a scale where objects may be located either closer to the natural or closer to the artificial vanishing points. This scale is very effective on a phenomenological level; for example, one could prefer giving real flowers – in terms of their naturalness – for Fathers day instead of plastic ones, which appear to be more artificial (Birnbacher 2006). However, on an ontological level, the contrast between natural and artificial things seems to be blurred due to the biotechnological control (Thacker 2005), the capitalization (Oliver 2000; Rajan 2006) or the prospecting of life (Hayden 2004; Schiebinger 2004). The dominant character of the ubiquitous technological-economical production paradigm seems to be pushing "naturalness" to a residual or even romantic category.

Against this background Nicole C. Karafyllis (2006) has coined the concept of *biofacts* to refer to those objects, *that grow but not by themselves*. The concept, a conjunction of 'bios' and 'artifact', distinctively relates to the field of living organisms, which are somehow being made. Here, Aristotle's dynamic criterion still serves to distinguish the *bios* from non-living things while his genetic criterion is challenged in the way that biofacts de facto come into existence with the help and under the control

of men. As things which are made they are simultaneously artifacts and facts, but as living beings they still differ from usual products. By addressing the Aristotelian scale in terms of growth, the concept of biofacts is useful to explore this ontological hybridity. Growing, in the case of plants, can be examined as a temporal process depending on certain spatial-material conditions. When collected, plants are obviously being decontextualized – temporally – from the growing-process and – spatially – from their (original) habitats. We may point out different degrees of technization in light of the temporal and spatial de-contextualizations. The crucial point is that biofacts have to be re-contextualized if they are meant to stay living beings. "With globalization, neither concepts nor seeds are fixed in time and space, and every deterritorialization provokes a reterritorialization" (Nazarea and Rhodes 2013, 11). Thus, against the idea of a collapse of the living and the artificial, the concept of biofacts animates us to discuss what we understand as more or less natural and artificial in regard of living things. In order to do so, we need to examine the (political, juridical, economical, scientific, technological) conditions under which biofacts have become what they are.

The concept of bio-facts not only recalls the technological control of life but also stresses the process of constructing scientific facts and artifacts in the domain of life. In this regard it is useful to distinguish semantic and material levels of determining how objects make sense to us. Objects – facts, artifacts, biofacts – are what they are according to those attributes, traits and relations we ascribe to them. Of course, these ascriptions are not completely arbitrary but depend on the natural properties of the objects and the historical contexts in which social practices reproduce and modify their meaning and existence. In the case of plant collections, classifying the collected objects, including identifying them as certain designated entities is especially crucial. As Geoffry Bowker and Susan Leigh Star (2000) have argued, the way things are classified leads to different semantic layers and different layers of infrastructure: political and legal frameworks, scientific knowledge and technological tools and media such as the bioinformatic information infrastructures in the life science.

2.2 The Political and Legal Framework of Collecting Plants

The Food and Agriculture Organization (FAO) of the United Nations has been propagating the threat of "genetic erosion" since the 1960s (Fowler and Mooney 1990; Flitner 1995). The need to safeguard 'biodiversity' was legally manifested through the "Convention on Biodiversity" (CBD), which came into force in 1993, and its following protocols. Territorial rights, intellectual property rights, the concept of ownership, and farmer's rights (Juma 1988; Kevles 2000; Schubert et al. 2011; Carolan 2010) have turned plants into juridical objects what may be understood as part of the broader picture of the politicization of nature (Serres 1995).

In terms of the semantics of biofacts, one of the main achievements of the CBD was to define "biodiversity" in its Article 2:

> Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (UN 1992, 3).

Each variety level (ecosystems, species, and varieties) corresponds to a preserving strategy, affecting the materiality of the biofacts. Ecosystems may only be conserved *in situ*, which means preserving plants as viable populations in their natural surroundings, or, in the case of cultivated species, "in the surroundings where they have developed their distinctive properties" (UN 1992, 4). Here, plants are preserved in the form of living, embodied organisms subject to a rather low-level of technological control (e.g. protecting the ecosystems from being transformed into building land), thus coming close to the "natural" side of our Aristotelian scale. In so-called *ex-situ* collections plants are conserved outside their "natural habitats," whereby habitat is defined as "the place or type of site where an organism or population naturally occurs" (UN 1992, Article 2). In botanical gardens, which maintain the variety of species, plants are decontextualized from their natural or cultural habitats and re-territorialized into the respective gardens. Here, plants are spatially de-coupled from their origins and their growing process might be subject to a higher degree of technological control in the sense of creating a schedule to prick them out and nurturing their growth. In so-called gene banks intended for preserving the diversity of varieties, we observe even deeper interventions: field gene banks still come close to botanic gardens whereas those plants preserved in vitro (Fig. 1) are in a way spatially decontextualized, which allows a very high degree of technological control about their reproduction-circles (which are downsized and never paused).. Stored seeds (in jars, tins or bags), in contrast, are spatially and temporally detached from their living-conditions. However, gene banks normally have to regenerate all plant material from time to time in order to secure their germability and thus their value. Therefore, all locations of ex situ collections imply the vicinity of agricultural land. Because of that context-dependency, a living plant can never fully become an "immutable mobile" as Latour (1986) described them. Immutable mobiles are easily transportable without changing their inherent characteristics, as, for example, the printed press or emails. As long as collectors want to plant out their collected plants again one day, they cannot completely detach the plant from their growing medias, which would ultimately lead to the plants death. In comparison to archives, the location issue remains crucial for living collections.

Fig. 1 – In Vitro Collection from the Laboratory of microclonal propagation of plants in Uman city (by Красноштан Василь Ігорович).

Another important legal document is the "International Treaty on Plant Genetic Resources" (hereafter the Treaty), which came into force in 2004 (FAO 2009a). The Treaty is officially coherent with the CBD and aims at guaranteeing "food security" (FAO 2009b) through the conservation, exchange and sustainable use of *Plant Genetic Resources for Food and Agriculture* (PGRFA). The Treaty provides a so-called "Standard Material Transfer Agreement" (SMTA), which has to be used by all contracting parties to exchange those PGR, listed in its Annex 1. Furthermore, it recommends establishing a "Global Information System on PGRFA" with standards how to document information and how to build a digital infrastructure. Hereafter, international descriptors, the Global Information Management-System (GRIN GLOBAL), and a web-based catalogue that merges the world's largest databases into one Gateway to Genetic Resources (GENESYS) were built (Nawar 2012).

As the CBD and the Treaty define nearly all related central concepts such as "genetic resource", "genetic material", "ex situ" and "in situ conservation", it is important to see that the CBD and the Treaty do not only serve as legal framework for safeguarding but also as a semantic framework defining what exactly to collect and why (Flitner 1995). This affects the material-side of the biofacts: while traditional seed banks have understood their efforts as collecting cultivars and their wild-relatives (Gäde

1998), such as the Vavilov Institute of Industrial Plants in "St. Petersburg", established in 1926, or the Leibniz Institute of Plant Genetics and Crop Plant Research (IPK) in Gatersleben (Germany), established in 1943, gene banks collect genetic material as resources[1]. A *cultivar* is understood as an achievement from a process of cultivation and therefore a past-oriented concept. A *resource*, in contrast, is a future-oriented concept, as something can only be understood as a resource in terms of its usage within a certain process of production. Plant material as a *genetic* resource evokes (at least today) the information paradigm of molecular biology. Information is known to be very flexible in terms of its materialization. Hence, the metaphor of an information carrier presumes plants to be as flexible as information goods in terms of their context-dependency.

Thus, this well-discussed political-legal framework enforces the production-paradigm and shifts our biofacts more to the artificial side on our Aristotelian-scale. Furthermore, it pushes local and regional collectors to standardize their documentation while engaging in international efforts of taking an inventory of the worldwide diversity of crops, as we will see further on.

2.3 The Bioinformatic Impact on Gene Banks

The impact of bioinformatics on plant collections is a research issue on its own. Most of the literature on the conjunction of computer technology and life science in general (Beaulieu 2004; Thacker 2004; Howe et al. 2008) or 'bio-banks' in particular (Fujurama and Fortun 1996; Gottweis and Petersen 2008) have focused on the human and on those gene banks that hold "digitalized genotypic (genetic) and phenotypic (environmental and lifestyle) information" (Ratto and Beaulieu 2007, 176) which have been turned from "well documented, local tissue-sample collections to large-scale bioinformatics resources with a national or supranational scope" (Ratto and Beaulieu 2007, 175) over the last decades. The largest and most prominent collections of that kind are the "Nucleotide Sequence Archive", produced and maintained by the European Bioinformatic Institute, established in 1980 in Heidelberg, the "GenBank" hosted by the US-National Institute of Health, opened in 1982, and the "DNA Data Bank" of Japan released in 1986. These bio-banks are understood to be repositories that store biological samples, mostly human, for research purposes, chiefly in the field of genomics or personalized medicine. Along with the establishment of those large bio-banks STS and History of Science have also gained interest in the practices of collecting and in the role that collections play within the production of scientific knowledge (Bowker 2000a; Strasser 2011). By the impact of molecular

[1] Actually, IPK-researchers seem to use both terms today, "cultivar" and "genetic resources" (Müntz and Wobus 2012).

biology and more powerful and widely used computer technology, the stored data itself, which had been nothing more than a useful annotation in the beginning, has become increasingly important. As DNA-sequencing has become faster and cheaper, data-driven research issues have emerged on the basis of open access data bases and shard hardware capacities, shifting research from *in vivo* to *in silicio* (Marx 2013). By including full clinical records of the donors or information about related research networks today's data and meta-data go far beyond the corresponding samples and reorganize the process of collecting from a sample-oriented approach toward a data-driven approach (Quinlan et al. 2015). Since research becomes less involved with organic tissue, such as blood, milk, and sperm (Swanson 2014), and is more focused on computer-based data mining, it becomes unclear if these inquiries are still investigating biofacts in the sense of men made (parts of) living things or simply artifacts. At any rate, the *bios* as the object of investigation seems to be exclusively modeled through the information paradigm.

It is important to realize that the information paradigm entered the life science in two different ways. First, the shift from population genetics (a formal statistical discipline) to molecular genetics (concerned with the physical-chemical processes and functions of genes) has re-conceptualized genes – in terms of their materiality – as genetic code, using the language of information theory (Kay 2000; Keller 2003; Müller-Wille and Rheinberger 2009). The molecular paradigm interprets growing plants as living expression of genes and *transforms the plant material into information carriers*, readable objects like books. The second entry of the information paradigm are bioinformatic infrastructures, whose impact on molecular research may be summed up as enabling the management and comparison of large amount of data, which could not be handled otherwise, and, speeding up the task of analyzing DNA structures and functions at rather low costs nowadays (Strasser 2011). While the first transformation is primary a scientific one regarding the theoretical options of modeling biological functions, the second transformation is a technological one related to practices that permit producing and sharing scientific knowledge. This shift must actually be understood as a twofold process of digitization and digitalization.

Digitization is understood as the technical process of converting an analogue stream of information or of signals into digital bits, which are of discrete and discontinued value. *Digitalization*, in contrast, is meant to be the way "in which many domains of social life are restructured around digital communication and media infrastructures" (Brennen and Kreis 2014); in particular, the change of scientific practices.

However, plant collections differ from the above mentioned bio-banks in several ways. Their primary duty has not been storing genetic information, but maintaining species or varieties by storing and reproducing plant material and documenting the information necessary for doing so. Still, just like bio-banks, they provide two kinds of resources for both

fundamental and applied research: *maintained (plant) material and documented (plant) data*. Yet, bio-banks do not serve the study of biodiversity or pre-breeding processes (Bhatti et al. 2015). Also, empirical investigation must show if there is a comparable shift from 'wet' to 'dry' research in plant collecting (Beaman and Cellinese 2012). I would suppose that the material side of plants plays a larger role here, because unlike the life of the human donors the whole existence of the plants lays in the hands of the collector – especially in the case of endangered species or varieties. Accordingly, plant collections do not only have to maintain bio-samples as possible medical substitutions or sources of knowledge, but also have to manage whole life-forms and control the status of 'being' itself. Therefore, I suppose that plant collections ultimately have to stay sample oriented. Another crucial difference lays in the epistemological status of the samples: in the case of plant collections, the sample refers not to an individual being but to a species or a variety which is being instantiated by the singular sample. We are talking about the digitalization of those abstract entities.

Fig. 2 – Typical herbaria: Geranium (by Sergio Fabris).

Now, the digitization of plant collections concerns the corresponding information, which has been documented systematically for hundreds of years and is now converted into digital data. Using a distinction by Vilém Flusser (2002), the modes in which the information is stored and circulated can be called their *media* and the modes in which the symbolic meaning of the information is organized can be called their *codes*. While media are the channels and materials through which information is exchanged and displayed, the codes are the "symbolic systems" putting the content in order (Bowker 2000a, 647). The digitization of plant collections leads to a media alteration that affects the code in which the information is stored: it becomes more abstract and shifts from more qualitative codes to quantitative ones along the transfer from herbaria (Fig. 2) to books and then to digital sheets. Compared to dried plants, books do not represent the information corporally but symbolically through written language. Through this shift, the information becomes more precise and distinct but also less detailed and rich. The implementation of standardized descriptors used for digital data banks results in an even higher degree of abstraction, again replacing richness with precision. A fruit's color, to give an example, is one of the main traits used to characterize a variety. In books, the color can easily be described in a qualitative way giving credit to graduation and nuances. In his classical directory of apple and pear varities Willi Votteler describes the fruit husk of "Gravensteiner von Saebygard" as "glatt, fettig, grünlichgelb bis gelb, später lebhaft gelb [smooth, greasy, greenish yellow to yellow – later vividly yellow, my translation]" (quoted from Höfer 2015). In contrast to describing a range of color, UPOV (International Union for the Protection of New Varieties of Plants) descriptors for fruit color list fixed tones, such as "yellow" or "green". Even more interestingly, standardized data sheets might not leave space to describe the change of certain traits over time in regard of the plants growing-process. Standardized data sheets detach the plant from its natural existence in terms of freezing its essential time reference into a given set of pull-down-lists that do not leave space for designating constant alterations.

While the digitization of plant collections affects the semantics of the documentations, the process of digitalization builds a bioinformatic infrastructure that creates particular networks and practices. This impact might also be summed up as enabling and speeding up the datification of the documentations and its circulation through new-built networks, as in the case of the above mentioned bio-banks. However, digitalization leads to a specific distinction between the material world and the discursive world (Abbate 1999), consequently generating two different collecting practices, two different collections and two different networks of flows: one of plant material and one of digital plants.

3. Two Modern Gene Banks

Traditional plant collections are national institutions. At present, single seed banks head for trans-nationalization, which import and combine existing collections. They recollect and transform what has been collected before. By doing so, different practices of collecting and different networks of exchanging plants – as material or as data – are invented. Hereby, the material becomes decoupled from the data in terms of their flowing-channels. This happens in quite different ways: while the DGO builds a network of collections only on the digital level the SGSV recollects plant as material *and* as data.

3.1 The Svalbard Global Seed Vault (SGSV)

The SGSV has been built with the help of Norway's government being juridically responsible for the Vault, the Nordic Genetic Research Center (NordGen) providing the scientific basis, and the Global Crop Diversity Trust (Global Trust) paying the running costs. The SGSV consists of nothing more than locked and cooled high shelves accompanied by a systematic digital documentation and managing system. Whereas most traditional gene banks have been research institutions, the SGSV is simply a big storage-room (Fig. 3). When the currently largest plant collection of the world was opened in 2008, it was presented to the public as a "Noah's Ark" and as the "final backup" to protect seeds from natural and human-made catastrophes. The SGSV has been ascribed with religious, eschatological loaded images and metaphors from IT. As a backup copy, the Vault stores duplicates of existing collections. The benefit is not only double safety, but also long-term storage. For example, the gene bank in Aleppo, run by the International Center for Agricultural Research in Dry Areas (ICARDA), had a collection of 135,000 varieties of wheat, fava bean, lentil, chickpea, and barley crops and had sent duplicates to Norway when the war broke out in Syria. Today, ICARDA's scientists, who have left the country as well, plan to regenerate their collections at ICARDA facilities in Morocco and Lebanon, and so they withdrew their duplicates from Svalbard (Conlon 2015).

Let us first take a look at the way Svalbard is recollecting plants. The SGSV explicitly takes the mandate to safeguard biodiversity and presents itself as a global player fighting for food security (Global Trust sd). However, there are different mechanisms at work, selecting which seeds within the general diversity of crops are actually stored there. There is a capacity limit to store 4.5 million varieties of crops (approximately 2.5 billion seeds) at total. Furthermore, the Global Trust covers the shipment costs of those plants listed in the above-mentioned Annex 1 of the Treaty. Finally, the donating banks, which stay owners of the seeds according to

the CBD and the Treaty, ultimately decide what they want to send to Svalbard.

Fig. 3 – Inside the Vault (by Dag Endresen).

What happens to the collected seeds by being re-collected (Fig. 4)? First, as Svalbard understands itself as a backup-facility serving other gene banks the re-collected seeds are *duplicates*. Remarkably, the relation between Svalbard and the regular gene banks introduces a differentiation between those seeds stored in Svalbard and those seeds stored at the regular seed banks, which does not correspond to their natural properties but only to Svalbard's mandate to backup other gene banks: the recollected seeds become *copies*, the primary collected seeds become *originals*. Whenever a gene bank needs to reinstall their original collections, as in the case of Syria, Svalbard provides the backup-copy. Here, it is crucial to understand that this differentiation only corresponds to the localization of the seeds and the way they are interchanged. Talking of origins and copies would not make sense otherwise because all collected seeds are equal to one another in terms of being preserved as instantiations of particular species or varieties. Along with becoming a copy, the re-collected seeds in Svalbard also change their purpose. While regular seeds are maintained in order to be planted out one day, Svalbard-seeds are stored

in order to re-install collections – that is become original collected seeds again.

Second, the recollected seeds are even more detached from their growing-context because: (a) Svalbard has no soils to plant them out; (b) they are not meant to be planted out but to become original seeds by demand. Accordingly, their reproductive status must be well documented (month and year), and samples should be stored together in accordance to their expected life span, in order to substitute them easily with fresh ones once their time is up. As the process of replacing duplicates to maintain the duplication is not very transparent, this is only speculation: regular gene banks use their own 'originals' to regenerate their collections and to produce new duplicates to send to Svalbard. Thus, the spatial replacement first transforms the re-collected seeds into copies and ultimately into waste – at least in terms of their singular materiality. The Svalbard-seeds might therefore represent the highest degree of technization compared to biofacts stored at regular gene banks. They are spatially further away from corresponding soils and temporally constantly postponed to be planted out – if ever.

Fig. 4 – Storage box for the Nordic Gene Bank's Svalbard Global Seed Bank, (by NordGen/Dag Terje Filip Endresen).

Third, another notable aspect of this initiative is that it does not only hold a meta-collection of what has already been collected by other gene banks, but it also centralizes these collections by merging them all into one single iceberg. That happens *o*n the material level as well as on the data level. Yet, in contrast to the genetic material, which must be decentralized in order to fulfil its purpose (recovering an original collection), this is not true for the recollected data.

In the light of today's international standards, the documentation of plant collections consists of three data sets. FAO and Bioversity International provide standards for *passport data*, which serves to exchange material between gene banks easily (accession's origin, holding institute, storage number). *Characterization data* serves to identify plants and the corresponding international standardized variety-specific descriptors regarding the distinctiveness, uniformity, and stability of a variety are provided by UPOV. These characteristics are traits of high heredity, which means that they are normally passed on from one generation to the next regardless of their growing-contexts (e.g. the colour of a fruit, the growth-form of a tree). *Evaluation data*, in contrast, refers to those traits depending highly on growing conditions. That information does not serve to identify a variety but to assess its agricultural performance (yield). In terms of their economic value as breeding options, seeds therefore intrinsically depend on context-performance.

Accordingly, Svalbard is also semantically re-collecting what has been collected before. In other words, it hosts two different kinds of collections: While the material duplicates are stored in the vault, NordGen (sd) manages the recollected data through a distinct online-catalogue called the "Seed Portal". In line with the Treaty's demands, its data will be merged into the GENESYS-project. The Seed Portal serves two interests: to educate the public about the project and to let the depositors know what is already there and what not. Whenever a gene bank wishes to send duplicates to Svalbard, they are asked to send the corresponding information first. For this, NordGen provides a template on the Seed Portal's website, through which the depositors are asked to hand in an inventory of their donation via email. It hast to comprise the following information (NordGen 2013):

— Institute Code
— Deposit box number
— Collection name
— Accession number
— Full scientific name
— Country of collection or source
— Number of seeds
— Regeneration month and year

Most entries are standardized by international agreements, such as the "institute code" which is part of the FAO's and Bioversity's (2012) "International Multicrop Descriptor" standard. That standard defines the most common descriptors for basic plant characterization and passport data. The full scientific names of plants consist of genus, species, subspecies, authority, and year of description, according to the International Code of Nomenclature for algae, fungi, and plants. The country of origin is supposed to be described in accordance with the ISO-3166 standard defining an alpha-3-code for countries.

This example confirms Bowker and Star's (2000, 34) observation that each classification inherits its history and consists of different layers: "Systems of classification (and of standardization) form a juncture of social organization, moral order, and layers of technical integration. Each subsystem inherits, increasingly as it scales up, the inertia of the installed base of systems that have come before". It also demonstrates that meta-collections enforce international standards: if you want to use the back-up-service you have to adapt your documentation to these standards. There even might be cases, where adjusting the data means a change of media as some gene banks, e.g. in the so-called third world, might not use digital documentations themselves. However, as a consequence, Svalbard holds a rich digital data bank covering – at best – an inventory of the world's gene banks.

3.2 The German Genebank for Fruit Crops (DGO)

As mentioned above, all contracting countries of the Treaty obliged themselves to support a Global Information System regarding the characterization, evaluation, conservation and accessibility of PGRFA. In comparison to the SGSV as a centralized plant storage facility, many other international initiatives are building decentralized networks. One example is the "European Cooperative Program for Plant Genetic Resources" (ECPGR) aiming to build a "safety network for our crops" (ECPGR sd). The ECPGR initiated "The European Genetic Resources Search Catalogue" (EURISCO), a web-based search catalogue providing information about ex situ plant collections maintained in Europe. EURISCO, in contrast to the SGSV's Seed Portal, is based on a European network of ex situ collections and retrieves its data from National Inventories (NIs) from member countries (IPK sd).

The SGSV is run on donations. In practical terms that means that the donating institutes have to ship the material and to submit the data manually. The decentralized networks work quite differently. First of all, the genetic *material* is not being centralized and re-collected but remains within the partner gene-banks of the network. Second, the data flow is technically automatized. And it always flows bottom up.

In Germany, the Federal Ministry for Food and Agriculture (Bundesministerium für Ernährung und Landwirtschaft) is responsible for its

implementation. As it hosts Germany's NI, it serves as a data interface between EURISCO and Germany's national, regional and local collections (BMELV 2012). The NI gathers data from six different gene banks; the DGO hosted by the Julius-Kühn-Institute (JKI) in Dresden is one of them. The DGO brings together governmental and non-governmental partners as well as private persons. Here, it becomes obvious how much taking an inventory – especially of fruit crops, which cannot be preserved as seeds due to their reproduction biology (Fig. 5) – relies on the engagement of local and regional collectors, run by farmers, breeders, nature conservation associations or individual aficionados. Those smaller collections may apply different standards regarding the storage of material and the characterization and evaluation of the collected objects. Hence, unifying the documentation often includes research on literature to fill documentation gasps or verify given information (particularly regarding a plant's origin). Each partner is obliged to maintain its collection and to provide the data. So, in the beginning, only data is exchanged and centralized – no plant material. While the gene banks stay decentralized, the documentation becomes centralized and monitored by the coordination office at the JKI. Once, the network and its primary digital connections are established, these channels might as well be used to exchange duplicates upon request from breeders, researchers and private persons, which might then also be coordinated centrally.

Fig. 5 – Strawberry Field Gene Bank at the JKI Dresden/Pilnity, (by Bärbel Göring).

The network providing the data for the Global Information System is an interlaced and hierarchical structured system. The higher levels are structured in analogy to political units at international, inter-state (e.g. European), and national levels, while the nationally gathered information depends on local actors. Local partners provide their input. Then, the donated data is collected at the next higher level, in this case, Germany's NI. Then EURISCO imports it. While the data originates from growing contexts and travels 'bottom up' into the World Wide Web crossing different systematical units, the international standards are implemented and concretized top down.

The main goal of the DGO is to take an inventory of all fruit collections with German origin, to rationalize this inventory and to secure its preservation. However, not all fruit varieties are to be preserved. Here, the coordinators ultimately decide which fruit to include and which not (Hanke et al. 2012, 127). The argument of world hunger plays the most important role in most preservation initiatives, but fruit is an exception. It is interesting to see that other reasons become predominant, such as the reason to preserve cultivars with a "socio-cultural, local and historical relation to Germany" (BMEL 2012, 27). Here, the term cultivar is echoed and provided with a second meaning. Cultivars are not only outcomes of agriculture, but they also pass on cultural history. While the "world hunger argument" is mainly future-driven and focuses on basic needs, this argument relies on the past and on tradition. The line of this argumentation, therefore, puts these initiatives somehow close to the cultural work of museums, which strive to maintain history by making material testimonies accessible for a general public. However, the DGO's collection is also based on the argument of changing consumption habits, a future- and profit-oriented reason. While the SGSV serves to back up existing collections, the DGO primarily serves to rationalize Germany's fruit collections and to establish them as a common scientific standard. However, both ultimately serve to take an inventory of the world's PGRFA on the data level. But, what material is actually documented lies in the hands of local actors.

4. Plants as Digital Objects

My article has focused on how the digitalization affects the ontological status of collected plants. By re-collecting what has been collected before, meta-collections produce new types of biofacts and install new networks of flows. Although meta-collections have been technically possible before, it was the digital infrastructure that made them practicable, especially for operating on a supra-national level, if not ultimately on a global scale. In the case of the Svalbard Seed Vault, this process of re-collecting first transforms the re-collected biofacts into copies and the donating collec-

tions into originals. Once the re-collected seeds need to be substituted with new duplicates they are, second, most likely to be turned into waste; or – but only in the case of damage – they may be turned into originals again. Only then, the recollected seeds at Svalbard have a real chance to live on. As *copies* and pre-waste biofacts they are shifted closer to the artificial side of the Aristotelian scale. As long as they stay copies, their materiality is only virtually effective as an insurance policy for the originals. Their bios, therefore, becomes secondary in comparison to the seeds in the 'original' collection. Yet, to fulfill their function of being backup-copies they must inherit the capacity to grow and (virtually) stay living things. The German Genebank for Fruit Crops, in contrast, does not directly affect the materiality of the biofacts, which themselves stay with the partners of the 'decentralized' network, although it makes them more visible for potential customers or researchers through its web catalogue.

By re-collecting information, the SGSV and the DGO produce digitized, centralized and standardized data. Semantically, the information becomes more abstract, distinctive and precise but also less rich and vivid. However, what happens on the material-side of the information is more substantial: the digital infrastructure, hand in hand with international political efforts, induces the specific distinction between the world of material and the world of digital plants which travel through different channels and networks. Three questions arise and need further investigation: (1) how does the digitalization alter the relationship between the material and the digital plant? (2) how does it transform the study of plants and biodiversity? (3) do we need a new information policy?

Information about plants has always had an ambiguous status. Epistemologically, it has always been independent of singular material plants in the sense that the knowledge which it offers is not limited to those singular material plants it has inductively been gathered from but refers to varieties or species. As general knowledge, the plant documentation – regardless of its codes and media – has always been an independent object. Conversely, the information, not as knowledge but as documentation, has always been ontologically linked to a specific collection and has not existed, traveled or being stored as an independent object until now: digital plants are being shared and exchanged without the corresponding material transforming the linkage between the documentation and the corresponding material into a virtual one. Furthermore, as in the case of biobanks, distinctive data-driven research issues might emerge on the basis of these newly created global plant data banks using the possibilities of linking large amounts of data, e.g. for mapping biodiversity (Bowker 2000b). Through this process the information is transformed into a global documentation discarding its characteristic of being documentations of specific collections. Maybe, the information stored in the Seed Portal of the SGSV will once be considered a primary source for research, thereby turning the historically original documentations into their 'backup copies'.

Because of the dominance of digital plants, it seems that meta-collections are not primarily collecting bio-facts anymore but data. Remarkably, this specific distinction of material and digital flows in the plant community has not been subject to a lot of debates until now. Whilst there is a legal framework for the flow of plant material and while there have been many arguments about authorship and credit as well as ownership and inventions in case of the data of the bio-banks (Strasser 2011), there has been little debate on the question of the flow of digital plants. Here, the crucial question would be, what kind of values the new data banks create and whom they can and will serve. Nonetheless, bioinformatic infrastructures already build technological momentum (Hughes 1994): once the documentation is digitized this media shift seems irreversible (Bowker and Star 2000). Once large networks keep digital plants flowing it might be hard to control the flow of information or even implement traffic rules.

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Strategies of Circulation Restriction in Whistleblowing

The Pentagon Papers, WikiLeaks and Snowden Cases

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Abstract: The Pentagon Papers, WikiLeaks and Edward Snowden are among the most topical whistleblowing cases where journalists got involved to publish articles based on leaked information. On occasion of these major leaks, strategies of circulation restrictions were activated in order to stop the dissemination of the leaked material. In the Pentagon Papers case, *The New York Times* first published the material and received a restraining order to stop the publication (Diamond 1993); WikiLeaks was targeted with digital DDoS attacks aimed at putting it offline. In the case of Edward Snowden, *The Guardian* was instead forced to physically destroy hard drives where leaked documents were allegedly stored (Greenwald 2014a). This paper analyses the evolution of content circulation restriction strategies and their effectiveness in whistleblowing cases by means of the three aforementioned case studies, focusing on the material nature of the leaked documents. The analysis focuses on issues of digital materialization, content circulation and journalism, contributing to the debate on these topics in STS.

Keywords: Whistleblowing; censorship; journalism; WikiLeaks; surveillance; materiality.

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1. Introduction: Analog and Digital Whistleblowing and Content Restriction Strategies

Whistleblowing is a process of information circulation set to bypass veils of secrecy in order to inspire change by using transparency and impact on public opinion as strategies (Callahan and Dworkin 1994). The history of journalism is full of topical whistleblowers who inspired impactful scoops and publications, for instance the Watergate scandal "Deep Throat" has been widely historicized, even in pop culture, as one

of the most famous instances of whistleblowing (Schudson 1992). In more recent times, different cases of whistleblowing in digital environments have gained global attention, such as the WikiLeaks "Megaleaks" in 2010 or the NSA surveillance scandal in the summer of 2013. Whistleblowing cases at different levels, not only those involving national interests or high-ranking institutions, are among those instances where journalism can act as evidence-supported effective watchdogs (Curran 2005) and as independent monitors of power (Strömbäck 2010, 185-187). They provide a public service for accountability and act in a more adversarial way towards those in power. As a form of dissent, whistleblowing may not be welcome from organizations that suffer an information leak. This could lead organizations to respond with strategies of information circulation restrictions in order to maintain control and prevent information from getting out. Retaliation against the whistleblower within the organizations is common (Johnson 2003, 91-114), but when the press and governmental or public bodies are involved, authorities may also engage in active censorship practices to stop the exchange of information from the whistleblower to the recipients or to prevent publication and circulation of the leaked information. Frequently used tactics include evoking the need for secrecy in matters of national security, legal actions and, in most extreme cases, active censorship (Carpenter 1995, 7-10).

This paper provides a comparison of content circulation restriction strategies in the context of whistleblowing in both analog and digital conditions, dealing with external whistleblowing cases involving journalists and media as recipients of leaks. Analysis of the evolution of applied circulation limitations strategies from an offline to an online context focuses on three different case studies: the Pentagon Papers (1971), WikiLeaks (2010) and Snowden's revelations about the NSA surveillance (2013). Thus, the paper is structured as follows: section 2 focuses on information circulation restriction strategies applied during the Pentagon Papers case; section 3 deals with the different strategies deployed in the digital context of WikiLeaks; and section 4 analyzes the technological implications of the restrictions applied in the Snowden case. We will be looking at whistleblowing cases mainly from one points of view: the content circulation restriction strategies put in action to stop the leaks. Particular attention will be given to how authorities tried to stop the diffusion of information. The theoretical analysis is drawn on a discussion from media materiality, crossed with philosophy of technology and journalism studies. The notion of whistleblowing has been common in communication and journalism jargon since the early 70s, when the term came to express a particular form of dissent in bureaucratic systems (Johnson 2003) based on information circulation. Whistleblowing scholars Marcia P. Miceli and Janet P. Near (1992, 15) have described the practice as the "disclosure of illegal, immoral or illegitimate practices under the control of their employers to persons of organizations that may be able to effect action". The definition clearly poses whistleblowing as an

information exchange between an individual holding information and recipients able to possibly make this information actionable in different ways. In connection with journalism, whistleblowers represent a unique resource in terms of information gathering and sourcing. Especially when it comes to secretarial organizations or closed environments, insights coming from insiders turned whistleblowers may work as leads or inspirations for possible journalistic investigations or can provide evidence for an investigative hypothesis. In contexts where excessive secrecy is applied (Fenster 2014) or Freedom of Information (FOI) laws are absent or inadequate, whistleblowers are an indispensable resource for accessing data or information for reporting. Where legal limitations are at stage, whistleblowers aid in circumventing legal limitations in situations warranted by public interest and journalists provide a conduit to reach the public. Both in offline and online instances, whistleblowers act as the vehicles of dissent to a specific authority.

In Hirschmann's terms (1970), whistleblowing happens when individuals facing wrongdoings are asked to decide among different response strategies: Exit, Loyalty or Voice. By opting for Voice, whistleblowers decide to operate "in opposition" – breaking a bond of loyalty in favor of pressing ethical demands. Danah Boyd (2013) has defined whistleblowing as a form of civil disobedience. This is particularly the case with "external whistleblowing" (Kaptein 2011): cases where the recipient of complaints and leaks are entities based outside of the involved organizations. Among all of the major changes imposed by digitalization to the media environment, there is also the reconstruction of the environment architecture on a "distributed structure", mutated from the Internet network structure (Arvidsson and Delfanti 2013, 76-77) and the dematerialization of communication means in favour of its strong and growing digitalization. This wider phenomenon also brought to a growing availability of digitalized information. In 2007, over 300 exabytes of stored digital data existed globally (Hilbert and Lopez 2011). As a vast majority of communication exchanges moved online, content circulation restriction strategies also turned to the web (Byfield 2011; Deibert 2009). This built up a growing approach to censorship and content filtering that Rebecca MacKinnon (2012, 31-50) effectively calls "Networked Authoritarianism".

The spectrum of censorship on the Internet interests both authoritarian regimes and democratic countries. Despite some utopian and deterministic perspectives that view the Internet as an eminently libertarian and emancipatory tool, the ubiquity of digital censorship is on the rise. The Chinese case is a commonly analyzed example of Internet control and censorship (Negro 2013), but instances are visible in other countries as well. Additional instances include but are not limited to India (MacKinnon 2012, 91-94), Turkey (Akgül and Kırlıdoğ 2015) and Russia (Simon 2015, 54-62). A global perspective on the widespread control over

digital communications and publications is annually tracked in the "Enemies of The Internet" report[1] published by Reporters Without Borders (2014). According to Zubair Nabi (2014), around 60 countries in the world somehow actively censor the Internet.

2. Analog Restrictions: The Ellsberg Case and the Pentagon Papers

When it comes to content circulation restrictions in the context of whistleblowing and journalism, few cases are more representative than the publication of the Pentagon Papers[2] in 1971. The Papers, officially titled "History of United States Decision Making Process on Vietnam Policy, 1945-1967," was a "7000-page top secret study of U.S. decision making in Vietnam" (Ellsberg 2002, xi). They were released to the press by Daniel Ellsberg, a former analyst for the U.S. intelligence community turned whistleblower. The corpus of leaked classified documents outlined an insider perspective on the Vietnam War. Since the Papers were classified, the U.S. authorities intervened to prevent the publication of the material by the American Press. *The New York Times* published on June 13th 1971 and this was followed by an immediate reaction from the Nixon administration to obtain an order of prior restraint (Diamond 1993, 117-118) and they subsequently filed for an injunction on June 15th with the federal district court in New York. The injunction was granted and *The New York Times* received a temporary restraining order that completely stopped the publication of the newspaper for five days (Lewis 2012). The legal case eventually reached the Supreme Court, where the government alleged that the publication of the material by *The New York Times* was harmful to national security. However, the Supreme Court ruled that the allegations were insufficient to give the restraint order legitimacy (Rudenstine 1998, 301-320).

By underlining the power of the First Amendment, the Pentagon Papers case ended up strengthening the constitutional freedom of the press in the United States (Diamond 1993, 118; Lewis 2012) and is now considered a milestone for press freedom. Retrospectively, the U.S. government's attempt to restrict and censor information with an order of prior restraint on matters of national security was a direct attempt to legally stop the publications pursued within the borders of democracy. It was a circulation restriction strategy targeting the physical distribution of the information and the medium, namely, the 1971 print editions of newspapers featuring the material. The analog nature of the leak of the Pentagon

[1] Available here: http://12mars.rsf.org/2014-en/.

[2] The Pentagon Papers were fully declassified in 2011 and put online. They are available here: http://www.archives.gov/research/pentagon-papers/.

Papers forced Ellsberg to rely on legacy media for the publication of the revelations. At the time, legacy media was the only institution able to perform the gatekeeping function and provide the reach necessary for the information to become news (White 1950; Gans 1979).

As argued by Joel Simon (2015, 13), the legal comprehensive censorship against powerful institutions such as national newspapers implies a hierarchical approach, intrinsic of the analog media environment in which they were perpetuated. This hierarchical approach was also strengthened by the climate of excessive secrecy within the Nixon administration during the Vietnam War. This later culminated in the explosion of the Watergate scandal in 1972, which contributed to increasing the pressure over Nixon until his resignation in 1974 (Carpenter 1995, 80-81). Thus, the Pentagon Papers case falls under Christopher Woolmar's (1990) definition of censorship: the information released is controlled through distribution channels, rather than controlling the information itself. Moreover, from the perspective of the authorities, restricting the reach of the leak by blocking the publication of newspapers holding the documents was the only available strategy to restrain the information circulation.

This element is also tightly connected with the analog print nature of the Pentagon Papers corpus. The Papers originally existed only in physical form and were shared exclusively within a very small and elite community, mainly staff members granted access to the offices where the Papers were stored. The Papers were available in only fifteen original duplicates and Ellsberg had access to one of them (Gitelman 2011). The actual act of whistleblowing was also influenced by the analog nature of the print documents. Ellsberg himself explained (2002) the mechanic and painful difficulties he and his colleague Anthony Russo had to face in manually copying all the seven thousand pages of the books with a Xerox 914 machine. The physical and technological limitations of the copying and carrying of the documents influenced the number of copies that Ellsberg and Russo could create. In his memoir of the events, Ellsberg (2002, 372-375) recalls how crucial it was to have more than one single copy of the corpus, in order to avoid possible seizures. When the injunction reached *The New York Times*, it was the pressure of sharing the Papers with another 15 newsrooms willing to publish, including *The Washington Post* and the *Boston Globe*, that made injunctions useless and let the Pentagon Papers reach the public. If only one newspaper would have been in possession of a single copy of the Papers, an injunction against that particular publication would have caused a complete blackout against the leak. When other newspapers started publishing, thanks to the other copies of the Papers available, it was literally impossible to stop all the publications at the same time.

The backfire of a censorship attempt that leads to wider circulation of content has been defined as the "Streisand Effect", a notion accepted by the academic community to define censorship attempts that end up being counterproductive (Jansen and Martin 2015; Nabi 2014). The effect is

named after singer Barbra Streisand, who attempted to restrict circulation of a picture of her home from a public website, which led to a much wider viral circulation. Although this term was coined in the context of digital censorship, the Streisand Effect is also illustrated by the publication of the Pentagon Papers and the backfire of the governments censorship attempt. As noted by Jansen and Martin (2015), other instances of the Streisand Effect have appeared in non-digital times and, according to Evgeny Morozov (2011, 121), date back to Ancient Greek times. In the next section, the focus will shift to content circulation restriction strategies in a digital context, demonstrating how strategies in this context have led to a similar backfire reaction on a much larger scale.

When it comes to the Pentagon Papers case, it is possible to argue that the fully material circulation restriction strategy put in action against the first US newspapers publishing the material has been quite insufficient, as other publications picked up the source material in order to get it out and it would have been simply impossible to imagine a legal blockage against all the involved media. As discussed earlier, this was possible mainly because of the existence of several copies of the original Papers. Otherwise, with the eventual seizure of the content, the circulation of the leaked information would have been completely blocked. When it comes to the practice of whistleblowing, instead, the analog nature of the Papers was also the possible limitation to its own efficiency: to create copies of the original content was technologically complicated and very difficult to scale. In the next two sections we will dig into two digital cases, in order to analyze whether digitalization reinforced whistleblowing practices and the consequent circulation restriction strategies.

3. Digital Restrictions: The WikiLeaks Case

WikiLeaks, launched in 2006, proposed a different approach to whistleblowing, relying on the affordances of digital technologies. WikiLeaks provided on its own website an encrypted dropbox where whistleblowers could submit documents and tips in a safer and anonymous way. In the first 10 years of operation, WikiLeaks has been publishing several leaks, with a spike in terms of impact and interest in 2010. Thanks to a massive leak of digital materials, provided by Chelsea Manning, WikiLeaks had access to more than 600'000 classified files coming from the US intelligence and army archives. The publication of that information was done working closely with some major news outlets, such as *The New York Times*, *The Guardian* and *Der Spiegel*. With its own approach, WikiLeaks has become one of the most powerful voices in the field of whistleblowing in the digital era.

In the previous section, we discussed how the Pentagon Papers leak happened in an analog context where legacy media and newspapers were strong gatekeepers of news. That situation and process underwent a

complex and radical disruption with the rise of the web. As Axel Bruns puts it (2005, 13): "digital media like the World Wide Web function according to different models than print or even the electronic broadcasting media, and as a result, gates kept by news organizations can now be bypassed". The result of this switch of power facilitated by digitalization pushed the role of traditional media towards a new function of "gatewatchers," shaping a new networked relationship status between traditional media and new irregular news providers (Beckett 2012, 147-160). Although gatekeeping has changed its status and role, it is definitely still "alive and kicking" (Heinderyckx 2015); however, the power legacy media and newspapers have to shape the flow of news has diminished.

Whistleblowers in the digital age profit from having more tools and strategies than their analog counterparts. WikiLeaks, in particular, exemplifies the power of digital encryption tools in anonymizing and circulating the accomplishments of a whistleblowing act online (Bruns 2014). WikiLeaks established a new "e-tactic" for whistleblowing in the digital age. In the context of online activism, an e-tactic is defined as an opportunity to complete a given task - profiting from the web's distinct affordances, without the need for physical copresence (Earl and Kimport 2011, 7-8). WikiLeaks, thanks to its own online anonymous leak submission system, gave whistleblowers an easier and faster tool to leak information by proving the opportunity to deliver vast amount of digital content in an easier and faster way. Major cases such as the "Afghan War Logs", the "Iraq War Logs" and "Cablegate", resulted in 600,000 digital files in total being leaked by whistleblower Chelsea Manning in 2010. The material was published in cooperation with major international news outlets and illustrates how powerful the WikiLeaks e-tactic has been.

Distributed Denials of Service (DDoS) are hacking attacks that are an "increasingly common Internet phenomenon capable of silencing Internet speech, usually for a brief interval but occasionally for longer" (Zuckerman et al. 2010). They are realized by harnessing a large number of remotely controlled computers and by address an overwhelming numbers of requests to an Internet domain, until it goes offline (Zuckerman et al. 2010). WikiLeaks itself had to cope with content circulation restriction strategies, mainly digital. As Rebecca MacKinnon recalls (2012, 82-83), in 2010 when WikiLeaks started publishing the Cablegate documents, a corpus of more than 250 thousand U.S. diplomatic cables on a dedicated site, the site domain was targeted with untracked DDoS attacks that put it offline for some hours and made its content unavailable (Schonfeld 2010). Similar attacks happened again in 2012 (Kerr 2012). DDoS attacks can be used as content circulation restrictions to silence websites, as illustrated with WikiLeaks. Their use has been documented in Russia, where newspaper *Novaya Gazeta* was a censorship target (Zuckermann et al. 2010) and also in Saudi Arabia and Belarus, among other instances (Morozov 2011, 108). But DDoS attacks are ambivalent strategies and, besides being possible tools of censorship, are being increasingly used as a hacktivist

e-tactic for protests (Earl and Kimport 2011, 7-8). As anthropologist Gabriella Coleman notes (2014, 136-142), use of DDoS extends a long tradition of disruptive activism by transferring analog tactics such as sit-ins or occupations online. The hacker collective Anonymous brought DDoS to a higher level of efficiency during its operations against WikiLeaks' adversaries, when companies involved in the banking blockade against WikiLeaks saw their flagship websites targeted and put offline by DDoS attacks although without suffering any damage or data losses.

Beside DDoS, there are additional forms of digital circulation restriction strategies when it comes to whistleblowing: online filtering, for instance, is one of the most common strategies. Online filtering involves making websites unavailable to selected users or from selected locations, both at the TCP/IP (Transmission Control Protocol/Internet Protocol) and DNS (Domain Name System) level (Murdoch and Anderson 2008). The practice is a daily routine under the Chinese Great Firewall (Powers and Jablonski 2015, 168-172), in Bahrain (OpenNet Initiative 2005), Pakistan (Nabi 2014) and also in countries such as Burma, Syria, Thailand and Tunisia, among others (Deibert 2009). Filtering also plays a part when it comes to restricting access to content originating from whistleblowing acts. Regarding WikiLeaks, federal workers in the United States were unable to access the website on the Internet because of a ban imposed on the site domain on computers hosted in federal offices – including the Library of Congress.

Despite putting such strategies in place, leaked documents were nevertheless easily accessible through major news outlets that collaborated with WikiLeaks, such as *The Guardian* (MacAskill, 2010). At the same time, the U.S. authorities pressured Internet Service Providers to prevent access to WikiLeaks (Jansen and Martin 2015), with a public-private partnership in censorship (Cannon 2013). These attempts sparked the Streisand Effect, thereby causing a chain reaction with the formation of "mirror sites" for WikiLeaks. The mirror sites were replications of the contents of WikiLeaks, however they were hosted under different domains worldwide. According to journalistic reports (Warrick and Pegoraro 2010), when WikiLeaks was under attack in 2010 the number of mirror sites grew from 200 to more than 1000 in few days, making a complete restriction against WikiLeaks almost impossible.

The organizational nature of WikiLeaks is also based on the potential of its own peculiar organizational structure, such as not having a newsroom, a national affiliation or an identifiable organization chart. The technological structure of WikiLeaks followed the same pattern: spread throughout different legislative contexts with servers located in several different countries (Bruns 2014). This technological structure created very complicated circumstances to restrict access to what WikiLeaks puts online. The combination of the organizational and technical structure of WikiLeaks, the support obtained through the proliferation of mirror sites and the backlash of the DDoS attack perpetrated by Anonymous made

content restriction strategies against WikiLeaks almost useless (Cannon 2013). When DDoS attacks against WikiLeaks peaked, there was an escalation in launching mirror sites: 355 websites were available in December 2010 (Schroeder 2010). Nabi's (2014) definition of the Streisand Effect as "unintentional virality of any information, online or otherwise, as a consequence of any attempt to censor, suppress and/or conceal it" is illustrated through the backlash when authorities tried to silence WikiLeaks and mirror sites appeared in hundreds. The power of WikiLeaks stays definitely in the "networked" environment in which it operates and the rise of the Networked Society had a lasting effect on whistleblowing (Benkler 2011; McCurdy 2013).

The near impossibility of silencing WikiLeaks is also due to the technological changes to the kinds of documents and information whistleblowers are able to carry and leak to external recipients. As Gina Neff notes (2014), "the change of a medium, say from paper documents to digital documents, can have an enormous impact on how these roles play out" and this applies to all the players involved in a whistleblowing act. If we consider the Pentagon Papers and WikiLeaks as the embodiment of two different phases in the evolution of external whistleblowing, differences emerge by analyzing the kinds of documents they were able to deliver to the press. The Pentagon Papers consisted of hard copies of a classified leaked report, whereas the WikiLeaks publications took place in a highly digitalized environment where impressive quantities of classified information is routinely stored in digital archives and networks. In the time between 2001 and 2011, the U.S. federal government digitized 475 million pages of federal records (The White House 2011). Taking a closer look at these numbers, it is possible to frame them within the wider phenomenon of "datafication" (Mayer-Schönberger and Cukier 2013). This concept involves in a constantly less-physical way every aspect of the contemporary age in which information is being shared among individuals and institution, toward a massive and pervasive extension of digitalization of information in form of digital files.

In the shift from an offline to a data ecosystem, it is important to focus on the nature of documents that whistleblowers can now access and leak. In order to download the documents which were later leaked to WikiLeaks, Chelsea Manning, the whistleblower behind the major WikiLeaks' revelations, accessed a top secret network from her workstation in Iraq. This involved searching through classified digital documents on five different archives, including the New Centric Diplomacy database (Zetter 2011). U.S. diplomatic cables, such as those included in the Cablegate leak, are usually transferred in PDF form via email using a State Department classified network called ClassNet. They are later stored in PST form, the format used by Microsoft Outlook to compress and store data, in order to be searchable. Manning downloaded a massive amount of files from the SNAP computer and saved them on CD-RWs (Ambinder 2010). For instance, the 250 thousand files that comprised the Cablegate corpus

was 1.6 GB in size. It could later be delivered by Julian Assange to *The Guardian* using a USB flash device, as journalist David Leigh recalls (2010).

The details above fit perfectly in Floridi's (2010) theorization of how digitalization and "datafication" were able to completely change the concepts of *objects* and *processes*. Following this path, growing digitalization caused the loss of "physical connotation" of objects which, in digital form, can easily be considered independent from their origin. In this sense, in comparison to the original Pentagon Papers stored in the RAND offices in Washington, it is intrinsically more difficult to individuate the *original* copies of the diplomatic cables Manning was able to copy and download. Following Floridi's proposed framework (2010), digital objects are "typified in the sense that an instance of an object […] is as good as its type". In this sense, digital objects are perfectly clonable and all copies are interchangeable with one another. Consequently, to create copies is considerably easier than it used to be in the offline environment in which Daniel Ellsberg was operating. Is has been calculated that it would take approximately 41.8 hours of straight printing at a rate of 100 pages a minute to print out the entire Cablegate leak (McCurdy 2013). Chelsea Manning's leak to WikiLeaks, instead, was only one click away and despite its vastness could be downloaded, copied and shared with relatively low computing skills and agility (Zetter 2011).

When discussing the nature of digital artifacts, it is also important to consider their distributed nature (Kallinikos, Aaltonen, Marton 2010). Digital artifacts are essentially "borderless" entities that cannot be identified within clear physical borders, in contrast to physical entities such as books or paper documents. This distributed nature of digital artifacts evolves into the substantial impossibility to control the spread of leaked documents once they are extracted from archives and disseminated. This is also at the core of the likelihood of the Streisand Effect in situations where a circulation restriction strategy is applied to digital whistleblowing cases in order to prevent the spread of information. This Effect is further illustrated by WikiLeaks: despite the aforementioned attempts, WikiLeaks has never been completely silenced and is still online and operational. Moreover, since the explosion of the WikiLeaks revelations, also the scale of journalistic leaks has escalated. For instance, the Panama Papers, published in spring 2016, consisted of 2,6 TB of digital files (11,5 m documents), a size which is almost twenty-six times bigger than the original WikiLeaks Cablegate dataset (Obermaier et al. 2016). The growth in terms of size of the leaks is interesting in at least two different directions. First, it shows how affordances involved in digital storage and carrying of files can really facilitate the practice of whistleblowing, particularly when large amounts of documents are involved. Secondly, it shows also how, despite the content circulation restriction strategies analyzed in this paper and the attempts, both technological and political, to stop the spreading

of leaks, the practice of whistleblowing in the digital era seems to get more and more relevance in terms of effectiveness and scale.

4. Re-materialized Restriction: The Snowden Case

In the summer of 2013, the disclosure of a vast amount of classified information from the NSA and its own allied agencies by whistleblower Edward Snowden sparked an unprecedented debate about digital freedom and rights and the role of journalism as a fourth estate. When it comes to journalistic practices, the case represents one of the most peculiar examples of whistleblowing in the digital era. Although not realized through a whistleblowing platform such as WikiLeaks, it proved how crucial encryption and digital security tools are in securing journalists' online communication with their sources (Greenwald 2014a; Ziccardi 2015, 193-198; Schneier 2015, 143-145). The number of digital files that Edward Snowden was able to download and hand over to journalists is still unclear (Greenwald 2014b) but the revelations have had a global impact. The reach has extended far beyond the newspapers that were first given access to the leaked material (*The Guardian* in the UK and *The Washington Post* in the US), amenable to different levels of media attention and engagement (Di Salvo and Negro 2015).

Consequences for the publication of this sensitive classified material have been harsh: Edward Snowden himself has been charged with different felonies, including some under the U.S. 1917 Espionage Act. His American passport was invalided and he is currently living in Russia, where he was granted temporary asylum after having spent 4 months in the international area of the Moscow airport seeking to reach South America from Hong Kong. Journalists who worked on the analysis of the original classified material were put under police investigation in the UK (Gallagher 2015) and *The Guardian*'s David Miranda was detained at the Heathrow airport for nine hours under anti-terrorism laws while allegedly travelling with documents from the Snowden cache (McGrath Goodman 2015; Paterson 2014, 34).

As with the Pentagon Papers and WikiLeaks cases, the Snowden case also exemplifies the application of circulation restriction strategies against news outlets covering the leak in order to prevent information distribution. One day after *The Guardian* published the first article related to the PRISM NSA surveillance program, the Minister of Defence in London issued confidential D-Notices to several media outlets asking not to publish content related to the Snowden leak, in order to protect national security interests (Halliday 2013). D-Notices are only advisory, different from the injunctions against the U.S. press seen in the Pentagon Papers case, however they are nonetheless a legal form of circulation restriction.

Digital censorship has been documented on other occasions on a smaller scale. For instance, U.S. troops in the Middle East, South Asia and Afghanistan can't access *The Guardian* site, as it is blocked to prevent

access to the Snowden material and related journalistic analysis (Ackerman 2013). Concerning the Snowden disclosures, the most evident and emblematic case of content circulation restriction strategy was when UK authorities and the GCHQ, the British equivalent of the NSA, asked *The Guardian* to hand back classified digital documents obtained from Edward Snowden. The former editor-in-chief, Alan Rusbridger (2013) recalls that the formal requests followed other previous attempts to restrict the publications, including the threat of a proper prior restraint against the newspaper. In July 2013, tensions reached the top and in order to resist governmental requests, *The Guardian* decided to destroy the digital archives of Snowden leaked files in London, under the supervision and instructions of two GCHQ agents (Borger 2013). Files were stored with high-level digital security standards in encrypted and airgapped machines in a secure room in the London newsroom under constant human surveillance, as security researchers and hackers Al-Bassam and Tynan recall (2015). As indicated by national security agents, *The Guardian* staffers had to physically destroy computers and hard-drives where the documents were stored by using angle-grinders and revolving drills. A "degasseur" was also used, an appliance that destroys magnetic fields and erases data from computer drives in order to eliminate any possible trace of the leaked material (Harding 2014; McLaughlin 2015). Despite the digital nature of the material and the fully digitalized environment where files were processed and published, the circulation restriction strategy targeted the physical support where documents were eventually stored. This strategy was able to circumvent the limitations imposed by adopting digital-only circulation restriction strategies, as seen in WikiLeaks case.

The adoption of such an approach to content restriction may have different motives, including being another attempt of intimidation, as noted by scholar Chris Paterson (2014, 35). If in the Pentagon Papers case the destruction of the original print leaked document would have caused the loss of the original material, in the case of digitalized files such as those leaked by Snowden, copies of the original cache could have been created and shared much more easily. In order to avoid the consequences of a possible legal injunction, *The Guardian* proactively moved the files outside of UK legislation. This provided its New York headquarters and journalist Glenn Greenwald (based in Brazil) with access, who was also in possession of the files (Rusbridger 2013). Despite the intervention to destroy the physical supports for the digital materials, the distributed nature of the digital files (Kallinikos et al. 2010) once again played a major part in dismantling the circulation restriction strategy. Hence, *The Guardian* was able to keep publishing from its U.S. newsroom. Moreover, they also provided *ProPublica* and *The New York Times* with access to the files in order to broaden the publication spectrum of the Snowden cache with more journalists and news outlets in the United States (Beaujon 2013).

This case once again illustrates how content circulation restrictions in whistleblowing cases can actually lead to a wider extension of the reach

and yet another exemplification of the Streisand Effect in the journalism context. When it comes to restrictions themselves, instead, the Snowden case and the way authorities tried to block the work of *The Guardian* bring in another interesting aspect of circulation restrictions in the digital era. The physical destruction of the hard drives, including its own intrinsic symbolic nature, could be associated with the notion of "re-materialization", a trend that has been analyzed in different field of technology studies and consumer cultures as a trend when describing the still persistent analog characterizations of the current digital environment. In the context of this paper, it could be possible to extend this notion into the analysis of physical content circulation restriction strategies within the Snowden case seen as a way to prevent digital information to spread.

Vincent Mosco (2014) and Tung-Hui Hu (2015) have focused on cloud computing as a physical industry, contradicting the commonly accepted notion of the "cloud" as a completely ephemeral digital entity with borderless connotation. Cloud computing companies, Mosco argues, rely on extensive physical facilities and gigantic data centers in order to work, an aspect which is commonly neglected in public and journalistic discourse. On a similar note, Evgeny Morozov referred as well to the frequently neglected technological connotations of cloud storage (2013, 72-75). Conversely, Paolo Magaudda (2011; 2012) analyzed how materiality regained an important role for digital music consumption, namely with the introduction of material objects such as the iPod. The hard disk and the vinyl disc, even in times of strong digitalization, have gained a crucial role in shaping consumption practices. As Magaudda (2012) puts it, re-materialization brings together a complexity of phenomena, practices and technologies, which are once again providing digital artifacts with a strong emphasis on materiality. This happens because material objects such as the destroyed *The Guardian*'s hard disks and laptops[3], pure physical entities, are re-gaining importance in the storage of media content, even in a highly digitalized environment.

Whistleblowing has encountered fundamental changes due to digitalization and the intrinsic nature of digital artifacts that are more and more frequently leaked by whistleblowers over the Internet. As digital security researcher Bruce Schneier recalls (2015, 159-161): "technology is making secrets harder to keep, and the nature of the Internet makes secrets much harder to keep long-term. The push of a "send" button can deliver gigabytes across the Internet in a trice. A single thumb drive can hold more data every year. Both governments and organizations need to assume that their secrets are more likely to be exposed, and sooner, than ever before".

[3] In 2015, the Victoria and Albert Museum in London hosted an exhibition named "All These Things Belongs to You", where objects of public interest were included in the museum collection. Among them was one of *The Guardian*'s smashed computers (http://thecreatorsproject.vice.com/blog/smashed-snowden-laptop-slated-for-london-museum-show).

When it comes to the restriction of circulation of digital content, despite the basic impossibility to stop a digital leak, it comes as no surprise that the attention of authorities remains focused on the physical supports that contains the material. It is interesting to see how materiality arises again when a leak needs to be stopped and all of the digital methods to prevent the information from spreading have proved to be almost powerless.

5. Conclusion

This paper provided a comparison of content circulation restriction strategies in the context of whistleblowing in both analog and digital conditions. The Pentagon Papers, WikiLeaks and the Snowden cases are examples of how whistleblowing acts have caused reactions from authorities aiming to prevent leaks from reaching the public. As discussed, in the case of the 1971 Pentagon Papers, the U.S. government acted with legal prior restraints against the press in order to completely stop the publication of newspapers for some days. Content published online by WikiLeaks capitalized on the networked and digital nature of Julian Assange's website and instead was restricted through digital censorship and filtering tactics on several occasions. On the other side, during the publication of the Snowden leak, restricting the circulation of the leaked content happened in a re-materialized way, through physical destruction of the hard drives where digital documents were stored.

Despite the vast digitalization reached over the course of time in the cases analyzed, it is possible to see how content circulation restriction strategies often still rely on materiality. This demonstrates that the need for an approach focused on materiality still matters when it comes to whistleblowing. Instances of circulation restrictions strategies in the context of whistleblowing seem to confirm how specific trends of continuity between the analog and digital contexts can be identified, rather than a clear separation (Balbi and Magaudda 2014: 13-16). As discussed, re-materialization is also strictly connected with the efficiency of the restriction strategies. Both analog and digitalized cases illustrated instances of the Streisand Effect as a backfire to the censorship attempts. Further, it is possible to argue that in the Snowden case, the physical connotation of the restriction strategy put in place was meant to be a stronger level of censorship to be applied to an otherwise uncontrollable leak. Its efficiency, as discussed, remains disputable. This paper contributes to the analysis of whistleblowing in the digital era and to the related content circulation restriction strategies that could arise.

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A Different Kind of Story

Tracing the Histories and Cultural Marks of Pirate Copied Film

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Abstract: Pirate copied objects are fiery artifacts that have caused much anxiety and debate. This article explores the cultural biographies of one particular type of such objects; digital pirate copied films. More specifically, it traces two neglected aspects of such object's life histories: their entanglement in systems of standardization and quality control, and the ways in which new types of aesthetics and narratives are inscribed (or added to) pirated audiovisual content. Paying close attention to the layered and multifaceted dimensions of digital pirate copied film, the paper approaches the act of pirate copying as a form of transfiguration, and suggests that pirated objects are much more than plain replications. By housing a multiplicity of material identities and by carrying (and being surrounded by) alternative narratives of production, the article argues that these objects intervene, disorient, and disrupt the power dynamics of cinematic circulation and ultimately serve to queer commodity spheres.

Keywords: piracy; queer theory; transfiguration; copying; inscription.

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1. Introduction

Digital pirate copied films present themselves as artifacts that contain a dizzying array of matter, politics, and meaning. Equally despised, celebrated, and ubiquitous, such objects have been placed in the middle of crossfires between consumers, activists, politicians, and corporations during much of the twenty-first century. From a market perspective, illicitly copied objects are essentially "matter out of place" (Douglas 1986); they are artifacts having been removed from their planned trajectory paths within the market economy, and later re-inserted into alternative (or par-

allel) routes of artifact circulation. Through this process of dislocation, pirate copies testify to the disruption of orders of commodity circulation (Dent 2012), and appear as objects that stretch, challenge and reinforce the boundaries of markets and authenticity.

This article ventures into the different layers of meaning that are inscribed into pirate copied digital films, and explores attempts to create systems of quality control around them. It aims to move beyond discussions regarding piracy's virtues and flaws, and instead explore piracy's internal aesthetics and relations to "new textual or paratextual subjects, new political sensibilities, and different standpoints taken with respect to cultural reproduction" (Burkart and Andersson Schwarz 2015; see also Larkin 2004). This is therefore not a text that focuses on digital piracy and issues of law and copyright (Coombe 1998; Gillespie 2007), piracy's relation to economics and market profitability (Barker and Maloney 2015), or piracy's links to nation politics, democracy, or notions of the commons (Coombe and Herman 2004; Burkart 2014; High 2015). Neither is it a text that focuses on the reception and consumption of pirate copied film, nor its statistical frequency within the contemporary media landscape (Cardoso et al. 2012; Cardoso and Castells 2012). Instead, I use pirate copied film as a lens through which to explore how marks of use and circulation may be inscribed into digital objects.

As a starting point, I take copies and reproductions seriously as cultural artifacts, and build on classic anthropological accounts of the fruitfulness of tracing the life histories, and biographies of things (Kopytoff 1986; Appadurai 1986; Marcus 1995). The pirated incarnations of one randomly selected film, *Captain America: The Winters Soldier*, will be used as a gateway to explore the material transformations and alterations that result in pirated films[1]. What goes into the making of digital pirate copied films, so that they take form as pirated content? How are films transfigured in order to arrive as pirated material? And what can a closer scrutiny of the materialities and histories of illicit digital things tell us about the ways in which the status and value of divergent artifacts is renegotiated?

In order to explore these questions I draw from queer and feminist theory (Ahmed 2006; Philip 2005), scholars that have explored humanity's broader relationships with copies (Schwartz 2014), and research that traces the aesthetic and political affordances of forgeries and fakes (Benzon 2013; Larkin 2004; Bubandt 2009). Furthermore, I lean on the work of scholars who stress that different kinds of "remix practices" (Lessig 2008; Manovich 2005, 2007) and "participatory cultures" (Jenkins 1993) are fundamental to the use of new media, and effectively blur the bound-

[1] This implies that explorations of the fictional character of Captain America are left to the side in this text (readers who are interested in such scholarly work, can for example look up Mcdonald and Mcdonald 1976; Jewett and Lawrence 2003; Dittmer 2012).

aries between production/consumption, and original/copy.

Importantly, I understand efforts to standardize and add new messages to digital pirate copied films as interventions in the cultural biographies and social lives of things. The result of such interventions, I argue, are a special type of digital objects that carry both disorienting and normatively reinforcing aesthetic qualities. Such qualities, implies that digital pirate copied films do not just interrupt commodity spheres; they queer them. By twisting, bending, and subverting notions of authenticity and originality, pirate copied films bring in (and encourage) a multiplicity of material identities, and thus carry a cultural energy that reaches well beyond their audiovisual content.

2. Following the Copy

In the 1980's, Arjun Appadurai's edited volume *The Social Life of Things* (1986) gave nourishment to the anthropological study of material culture, and inspired a wide range of investigations into the politics, histories, and social lives of things (see for example Knorr Cetina 1997; Suchman 2005; Marcus 1995)[2]. In the introduction, Appadurai stressed that things, much like human beings, have a "social life" which is realized when things "circulate in different *regimes of value* in space and time" (1986, 4). Following similar trails of thought, Igor Kopytoff (1986) argued for the need to trace the "cultural biography of things", and to explore how objects follow – or diverge from – their planned career paths and life trajectories. Such tracings, Kopytoff (1986, 67) suggested, have the potential of revealing "a tangled mass of aesthetic, historical, and even political judgments," and may serve as a starting point for capturing broader cultural tendencies.

In their call for more intimate engagements with objects, Appadurai and Kopytoff encouraged the study of mundane and ordinary things, but they also directed special attention towards objects that have wandered off the grid of legitimacy and order; they pointed towards divergent matter. Such a focus also resounds in the work of Sara Ahmed (2006), who shares Appadurai's and Kopytoff's fascination with the histories of things, and embeds their outlooks into her queer phenomenology. For Ahmed (2006, 45), objects are "properties of assemblage"; they are things that come together through a mixture of labor, materials, and thought. Much like Appadurai, she suggests that we should study such assembled objects on their own, and she encourages us to begin with the non-normative;

[2] It should also be noted, however, that anthropology has a much longer tradition of mapping out and tracing the circulation of things. Classical anthropological works such as Bronislaw Malinowski's writing on the Kula exchange (1920), and Marcel Mauss investigations into the practices of gift giving (1966), all take objects as their starting points for the exploration of what it means to be human.

that is, with queer matter.

A queer object, according to Ahmed, is a thing that appears as crooked or out of line, and instead of trying to straighten and re-align such a thing, she suggests we should "inhabit the intensity of its moment" (2006, 66). For Ahmed, the queer is fascinating and worthy of attention in its own right; it is indeed something that carries its own politics. In what follows, I draw from Appadurai, Kopytoff, and Ahmed's work in order to trace the initial histories and materialities of pirate copied films. While Appadurai and Kopytoff's work will guide my opening questions (where does pirate copies come from? How are they expected to look and function?), Ahmed's thoughts on queerness[3] will assist in trying to understand the implications of the material messiness of such objects; their untidy identity play, and their disarrayed affiliations.

Importantly, I suggest that such a material messiness needs to be understood as the result of *transfiguration*; the process by which objects are altered when they move between different hands (Gaonkar and Povinelli 2003). As a critique against scholarly outlooks that assume that objects have stable and fixed meanings, Gaonkar and Povinelli encourage us to pay attention to conditions of becoming when tracing and studying things. This includes following the ways in which materials are repurposed and transformed when they circulate through different contexts (Gaonkar and Povinelli 2003; see also Lee and LiPuma 2002). Circulation is never a neutral or non-interruptive practice, argues Gaonkar and Povinelli. On the contrary, it is something that alters, adjusts and changes the thing being transported.

Recognizing that transfiguration – or metamorphosis – is a central part of what happens when objects move is especially important with regards to pirate copied materials, since it allows us to investigate how the act of copying involves something more than the sole mimicry of original forms. As Ravi Sundaram (2010) has put it, the kinds of copying that take place as a result of piracy are more a matter of "recycling" than replication. The concept of transfiguration permits us to understand piracy as a production form that carries its own norms, and not least aesthetics (Larkin 2004; Benzon 2013). As Hillel Shwartz (2014, 214), has describes it, "we perpetually transfigure what and when we copy. By heart, by hand, by art, by ROM or RAM." What follows is thereby an exploration of how such digital transformations take place. I am interested in the ways in

[3] Ahmed does, however, use the term "queer" in two senses; first to describe objects that diverge or appear as slightly "off" track, and second to describe non-normative sexual practices. When I henceforward draw from her work and describe pirate copied films "queer," I am primarily doing so in the first sense of Ahmed's usage of the term (although others, like Jonathan Sterne, have indeed suggested that digital objects – and in particular MP3 files – could be described as having promiscuous, and thus non-normative, sexual drives built into them. See Sterne 2006).

which pirate copies take on forms that both revive and divert from their originals, and will argue that it is partly in the mixture of these two components – the play between intimate resemblance and defiant originality – that pirate copies find their place as provocative and inflammatory objects.

3. Matter Displaced

Piracy has now become an everyday feature of the Hollywood industry and its prevalence would hardly surprise anyone working with film; indeed, both filmmakers and researchers have testified to its mundanity (Andersson Schwarts 2012). However, upholding a narrative in which films are described as passing through carefully designed and monitored paths of commodity circulation is still a fundamental part of Hollywood-discourse. While movies reoccuringly escape from their planned circuits, an insistence on their association to particular distributive paths is central to legal prosecutions around copyright violation. In effect, certain future life stories and expectations continue to be crafted around films, and such was also the case with the movie *Captain America: The Winter Soldier* that first had its Hollywood premier on the 13th of March 2014. The film appeared as the second release in a trilogy about the comic figure Captain America and his alter ego Steve Rogers; a young man who receives super powers after being part of a medical experiment, and later sets out to aid the US government's efforts during World War II. Originally founded in 1941 as a critical response to growing German Nazi powers, the comic series has remained in print up until this day, and was the first series from the legendary publisher Marvel Comics that was transported into another media format than comic books.

Like most of its commercial movie siblings, *Captain America: The Winter Soldier* was described as intended to move through a series of "windows of display" after its first Hollywood premier. These display venues initially included a pattern of carefully scheduled cinema premiers at different points in time across various global regions, including (classic) regionally scheduled airline/hotel releases, home video releases (DVD, Blu-ray), pay-per-view releases (VOD, PPV), pay TV broadcastings (Cable TV), and broadcastings on free TV-channels (Nelson 2014). Like other systems of artifact circulation, this means that the movie *Captain America: The Winter Soldier* had a clear ideal destiny staked out for it on its journey from producer to consumer (at least from its creators point of view); the film was supposed to pass through specific and pre-approved chains of actors, who were each expected to treat, value and present the film in particular ways.

Captain America's carefully scheduled life journey (and other similar circulatory patterns for film) – began to be carved out and implemented on a wide scale during the 20th century, but it didn't take long until the

boundaries of such routes of display began to be transgressed. Films (much like other types of intellectual and cultural artifacts) have always been stolen, hijacked, smuggled, kidnapped and turned into copies (Lobato 2012; Johns 2009), and so was *Captain America*. Only days after its first Hollywood premier, pirated camera shootings from within cinema halls where widely available online, and since then the film has been transformed into copies from virtually every legal form it has taken.

At the time of this article's writing (October 2015) a search for "Captain America: The Winter Soldier" generated 586 unique hits on the website KickassTorrents (or www.kat.cr) – a site which was currently considered to be the largest bit torrent site in the world (TorrentFreak 2015). These torrent files where of at least 14 different formats including portable camera recordings, copies made from exclusive industry previews (or so-called "screeners"), and copies originating from retail DVD discs, Blu-ray discs, and TV transmissions. What is the history behind these files? Who – or what – governed the forms they took? And out of which assemblages where they put together?

4. The Standardization of the Copy

One crucial aspect of understanding the arrival of the various pirated versions of *Captain America: The Winter Soldier* (and from a broader perspective, the onset of pirated digital films in general) is to understand the practices of the networks of people who make such objects come alive. Such networks generally consist of so-called "release groups"; units of people who assemble under the umbrella grid of the "scene"; a highly diverse underground sphere from which most pirate copies originate.

Digital pirate scenes first developed around the illicit copying of software, TV games, and computer games during the 1970's, and perpetually grew to become a "global, virtual network of people copying, cracking, and distributing copyrighted digital material, such as movies, games and software" (Huizing and van der Wal 2014)[4]. The motivations for participating in such networks has been described in terms of anti-conformism, pleasure, sociality, and sharing (Wittel 2011; Rehn 2004), but also along the lines of competition, since the cultural organization of "scenes" have often centered around hierarchical rewards for rapid and "proper" pirate production and rivalry between release groups (Huizing and van der Wal 2014).

A central element in such competitive arrangements has been the establishment of rules for quality assessment, or so-called "release standards"; a type of guidelines that underlie battles between different release

[4] The page numbers of the article are not available as this is an online publication. The citation is from the introduction.

groups. Apart from being understood as competitive yardsticks, these rules can be seen as broader attempts to professionalize and regulate piracy. Release standards give fascinating insights to the histories of digital pirate copies, and reveal how most objects – pirate copied or not – are surrounded by rules, norms, and regulation that guide their use and production (Dent 2012). Far from existing in a lawless limbo, practices of pirate copying have been subjected to far-reaching organization processes (Lobato 2012), and a closer look at release standards give insights into the ways in which digital pirate copied films are "brought forth" as cultural artifacts.

Jumping back in history, evidence of some of the first and most organized attempts to regulate the production of digital pirate-copied objects appeared around the year of 2000[5]. In the history of the circulation of digital pirate copied materials, this period marks a significant point in time, since it was during the late 1990's that large-scale file sharing first started to flourish and become a widespread practice. With sites like Napster and Kazaa expanding their territories, pirate copies where no longer only shared within intimate networks, but also reached mainstream users on a global scale. In such a situation, not only "authentic" fakes, but also "fake" fakes were widely circulating online; that is, pirate copies that were wrongly labeled, carried viruses, or were of an unwatchable quality. Relatedly, the act of pirate copying had become a practice that was performed by greater numbers of people and groups; something which undermined former hierarchies of piracy production.

One of the first piracy release standards that was produced for film specifically addressed such circulatory disorder, and consisted of a set of rules and guidelines produced by a group of people who called themselves Team Div/X, or TDX. After engaging in a series of conversations about how to sharpen the ways in which pirated movies come about, TDX published a document online that suggested the enforcement of a series of piracy rules and regulations[6]. This document was signed and ratified by five different release groups who all motivated their engagement in questions regarding the order of pirate production by referring to the "sloppiness" that was said to prevail in many pirate circles. In order to correct such perceived orderly negligence, the TDX regulations included a series of demands that every network and competition-approved pirate copy was urged to submit to.

[5] For other media formats, however, traces of standards date even further back in time. Such is the case with release standards for MP3-files which have origins in the mid 1990's (see https://scenerules.org/t.html?id=1996_DACMP3 .nfo, retrieved October 7, 2015), and standards for TV-games that most likely also originate from sometime during the 1990's (see https://scenerules.org/p.html?id=vcd.nfo, retrieved October 7, 2015).

[6] See https://scenerules.org/p.html?id=2000_XViD.nfo (retrieved November 28, 2015).

In tandem with the technological affordances of the time, the release standards suggested a minimum resolution and bitrate, a maximum file size, and specific guidelines regarding the efficient packaging of films. TDX also presented rules for how recently released, and older types of film materials should be treated, and revealed instructions regarding the practice of adding so-called .nfo-files to pirate copied films; a type of text files that are attached to digital pirate copies, and offer additional information about them (I will discuss this further in one of the following sections).

The TDX release standards further introduced thorough instructions for how pirate-copied files should be named. According to the instructions, the title of each movie was not allowed to exceed 64 characters, and it was prohibited to add any detailed information about the movie in question in its title. Only a certain set of characters were allowed to enter the title of a film[7], and it was disclosed that the naming of files should always follow a specific pattern: first, the full title of the movie was to be revealed. Second, the origins/type of the copy should be disclosed, and last, TDX insisted that every release group who produced a copy should inscribe their name into the title of the film. Following this logic, the titles of movies were supposed to sustain the following pattern: Movie.Title.File.Type.-Group.

In part, the standardizing efforts of TDX can be understood as an attempt to straighten, professionalize and re-align a messy field of artifact circulation, where cultural objects were shuffled around on the web with little quality control. However, the DivX standards soon faced competition, and it did not take long until a wide range of other groups were developing similar documents. Rather than serving as a finite outline for the production and acceptance of pirated contents, the TDX standards only marked the beginning of a wide proliferation of comparable ordering devices.

Today, there exists a multiplicity of rules that resemble the standards that originated from the TDX group, and the protocols are often contested and revised on a continuous basis.[8] More or less every type of media format is now accompanied by release standards of various forms, and within each media format, such as film, there commonly exists a long row of subcategory rules containing specific instructions for specific file formats or geographical regions. In relation to the multiple pirated versions of *Captain America: The Winter Soldier* that was found on KickassTorrentz's website, it was possible to find traces of compliance with release standards in a majority of the copies, and perhaps the most obvious example of standard obedience relates to the titles given to the pirate copied

[7] In particular, the approved characters where: "ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789.-_".

[8] For an example of an overview of both current and historical release standards visit https://scenerules.org/ (retrieved October 10, 2015).

films. Most titles followed a pattern similar to the one that was stated by TDX, and through these titles, it is possible to discern parts of the history of the copies. For example, a heading like "*Captain America The Winter Soldier 2014 BRRip XviD AC3-REKD*" reveals that the copy was most likely made from a BluRay source that was pre-released before the film's official cinema premier (BRRip), that it was produced according to the latest accepted XviD ruleset (XviD)[9], and that the file has an audio stream encoded according to a compression technology developed by Dolby Digital in the early 1990s (AC3). The title also reveals that the release group who produced the copy call themselves "REKD".

Similarly, a title such as "*Captain.America.The.Winter.Soldier.2014.1080p.3D.BluRay.Half-OU.x264.DTS-HD.MA.7.1-RARBG*" reveals that the copy has origins in a BluRay source (BluRay) that was encoded in a 3D format (3D), using a special technology that places the video for the left eye slightly above the video for the right eye on the screen (Half-OU). Furthermore, the title tells us that the film has a comparatively high resolution (1080p), that it was compressed using the ITU-T H.254 standard which is typical for BluRay discs (x264), and that it carries a surround sound format called DTS-HD Master Audio and was developed by the American company Digital Theatre Sound (DTS-HD.MA.7.1). Last, the title also discloses that its producers call themselves RARBG – a group which happens to have their own webpage where new copies are regularly uploaded, and hosts elements such as a facts and questions-section and contact information[10].

The phrases and acronyms used in the two examples above illustrate how the language around pirated content is highly multifaceted and quite tricky to interpret for non-initiated readers (there is, in fact, an entire wiki-page that explains and translates piracy terminologies[11]). For this reason, release standards that systematize certain types of language use reveal something important about the senders and expected receivers of pirate copied films. Far from being tailored to mainly attract mainstream film fans, the discursive sphere around these copies is aimed at a tech-savvy audience that is familiar with technical terminologies, and appreciates detailed accounts of the materialities and qualities of digital objects. Release standards encourage the creation of cinematic paratexts that demand special types of knowledges and skills; thanks to their adherence to certain codes, jargon, and literary styles, the copies end up addressing certain readers, while excluding others. Here, the standards reveal a significant power struggle in play; by encouraging highlighting technologically oriented information and knowledge around cinema, the status and

[9] See https://scenerules.org/p.html?id=2013_SDX264.nfo (retrieved October 9, 2015).

[10] See https://rarbg.to/index8.php (retrieved February 24, 2016).

[11] See https://en.wikipedia.org/wiki/Pirated_movie_release_types (retrieved February 24, 2016).

authority of commercial and more non-technical/mainstream ways of describing film is countered and undermined.

Apart from assisting in making copies recognizable by virtue of their names and aiding in creating a 'techy' discursive framework around pirated films, release standards also function as a broader set of criteria against which pirate copies can be valued, assessed, and judged. For example, bit torrent sites frequently use release standards to decide which materials are accepted or rejected on their websites. In that sense, these rule sets have a significant impact on how digital pirate copies are shaped, formed, and packaged – and also how they later come to circulate in the world. Much like quality ensuring mechanisms within the market economy, they help to separate grain from husk and thus exert power over the future movements of digital pirate copied objects.

However, the existing multiplicity of release standards also speaks of an untidy bureaucratic framework for the production of digital pirate copies. Paradoxically, the establishment of TDX's rules (and other early release standards) could be said to have initiated a system of regulatory disorder, rather than plain and simple tidiness. Release standards exist in confusingly multiple forms and are often adopted according to national and personal preferences (for example in terms of language and subtitle settings). As we will see, they also make room for the production of ambivalent and highly individualized objects. To borrow from Ravi Sundaram, release standards reveal how "replication is not more of the same, but a giant difference engine, experimenting with possible openings… and becoming[s]" (Sundaram 2010, 12). Instead of closing the doors for identity play among digital pirate copied artifacts, release standards allow a multitude of material identities to flourish within their boundaries.

5. .nfo:s, Copies, Narration and Inscription

As briefly mentioned before, one common rule stated in release standards declares that each pirate copied object should be accompanied by a so-called ".nfo"-file. An .nfo (shorthand for the word "information") is a text document – sometimes also containing images or videos – that is attached to pirate copied objects and follow each file as it begins to travel across the web. These small and discrete files often go unnoticed, but significantly reveal a type of "stickiness" that mark digital pirate copies; they uncover where and how these objects have travelled, and who they have come in contact with during their journeys (Ahmed 2006).

Importantly, the phenomenon of adding .nfo-files to pirate copies builds on longer traditions of complementing digital copies with artistic and self-descriptive messages. For example, artsy computerized audiovisual presentations was the main output the so-called demo scene of the

1980's (Carlsson 2009; Polgár 2005), and was later transported into the production of graphic presentation texts, or so-called "crack screens" and "crack intros," within the software piracy scene of the 1980's and 1990's (Reunanen et.al. 2015). Contemporary .nfo:s borrow their aesthetics and rhetoric from these early types of pirated paratexts, and help to present, introduce, and frame digital pirate copies.

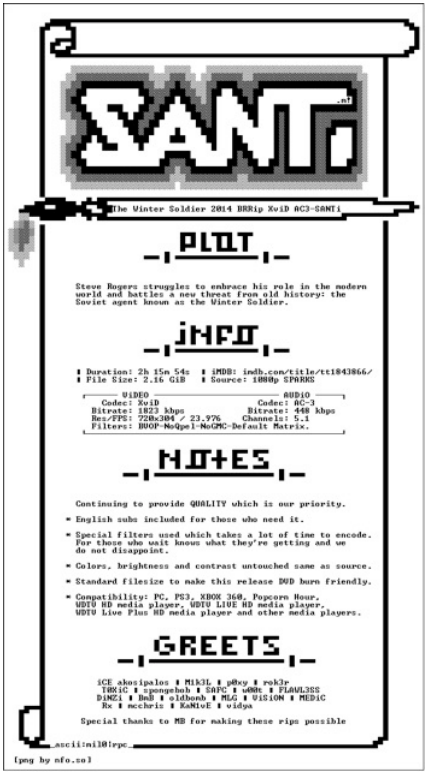

Fig. 1 – Example of .nfo from the release group "SANTi" containing ASCII artwork[12].

In most cases .nfo:s begin with presenting some ASCII artworks that often take the shape of logotypes for release groups, or illustrative frames that surrounds its textual contents. In short, ASCII is a graphic design technique that involves the production of images and patterns by way of using letters, symbols, and numbers. Several dynamic styles and types mark this art form which has its origins in the late 19th century when the

[12] See https://kat.cr/captain-america-the-winter-soldier-2014-brrip-xvid-ac3-santi-t9402616.html (retrieved November 10, 2015).

first typewriters were introduced. Developed as a curious play with art, symbols, letters, and technology, ASCII images have served a practical "need for pictures when there wasn't bandwidth to transmit them" and have further been described as a kind of prequel to contemporary emoticons (Madrigal 2014)[13].

Fig. 2 – Example of .nfo from the release group "KAGA" containing ASCII artwork[14].

The images above are all taken from .nfo files for pirated versions of the movie *Captain America: The Winter Soldier* and reveal a creative flora of cinematic paratextuality. Due to technical advancements, these ASCII artworks might perhaps be best approached as nostalgic artifacts that connect contemporary forms of pirate production back to subcultural

[13] The page numbers of the article are not available as this is an online publication.

[14] See https://kat.cr/captain-america-the-winter-soldier-2014-1080p-bluray-dts-x264-kaga-t9413691.html (retrieved November 10, 2015).

and aesthetic digital practices in the pre-www era. Appreciated more for their aesthetical appeal than their functional affordances, there today exists several webpages that are completely dedicated to the collection and exposure of artsy .nfo-files[15].

After some introductory art, .nfo-files generally contain three types of textual contents that adds to the re-packaging of pirate copied films and embeds them in layered types of description. First, .nfo:s commonly present information about the actual movie in question. This information is often copied straight from movie producers themselves, or public movie websites such as IMDb. Often, such film information includes classic data about who directed the movie, when it first premiered, who starred in it, and which genre it can be said to belong to. Occasionally, snapshots from chosen scenes of a film, or images of movie posters are also included in .nfo:s, and it is also common to include a summary of the plot of the film. Such a summary is revealed below, where a text written by the movie enthusiast Kenneth Chisholm (active on Imdb.com) got transported into a Captain America .nfo:

> "Release Notes:
> Plot:
>
> For Steve Rogers, awakening after decades of suspended animation involves more than catching up on pop culture; it also means that this old school idealist must face a world of subtler threats and difficult moral complexities. That comes clear when Director Nick Fury is killed by the mysterious assassin, the Winter Soldier, but not before warning Rogers that SHIELD has been subverted by its enemies. When Rogers acts on Fury's warning to trust no one there, he is branded as a traitor by the organization. Now a fugitive, Captain America must get to the bottom of this deadly mystery with the help of the Black Widow and his new friend, The Falcon. However, the battle will be costly for the Sentinel of Liberty, with Rogers finding enemies where he least expects them while learning that the Winter Soldier looks disturbingly familiar.
>
> Cast:
> Chris Evans ... Steve Rogers / Captain America
> Samuel L. Jackson ... Nick Fury
> Scarlett Johansson ... Natasha Romanoff / Black Widow"[16]

[15] See for example http://artscene.textfiles.com/asciiart/NFOS/ (retrieved November 25, 2015).

[16] This quote was taken from the .nfo file of the torrent available at https://kat.cr/captain-america-the-winter-soldier-2014-hdts-xvid-crys-t9328825.html (retrieved November 7, 2015), but can also be found in its original form at the Imdb website, where Kenneth Chisholm gets credit for his summary:

To a certain extent, such mimicry of classic Hollywood packaging's reveal how our relationships with objects are often shaped by already existing ideas and elements of recognition (Kirshenblatt-Gimblett 1998). It also suggests how the status of diverging pirate objects are negotiated alongside their legal predecessors. As Hillel Schwartz (2014, 268) has noted, the skill of performing as a "good" model, or copy, is about learning the ability of "posing, as it were, *au naturel*"; an art which requires the careful mastery of effortless consistency. Mimicking the presentation mechanisms of the film industry is a practice which helps to construct a natural and authentic pirate copy; a trustworthy duplicate that poses as an original in a relaxed fashion. As copies "muddies the waters of authenticity" (Schwartz 2014, 311), re-dressing them in recognizable clothes, is something which importantly raises the status and familiarity of digital things that would otherwise be little more than anonymous clusters of data.

However, the attachment of market-oriented information about films is not the only material found in nfo:s. Secondly, .nfo:s commonly reveal details about a film's transformation into a copy. This may include information about which software that assisted the act of copying, or specifications regarding the copy's compression, formatting, and visual qualities. In some cases, these technical descriptions are kept short and concise, but other times they are paired with detailed stories of how a particular production process took place. As an example, one producer of a CAM rip (or hand filmed copy from cinema halls) of *Captain America: The Winter Soldier* described his or her work as follows in an .nfo:

> "I asked my guy in chinatown which i got need for speed from, if he can get me the source, and he came through, so thx m8. Had the pleasure to get the original cam! so this one had NO Subs, nothing is cropped or chopped off and it was untouched in brightness etc. well that was some work, took me 3 days/nights to finally get it done…//… the cam itself was ok, had it faults, some scenes are very bright, some ok-ish and some darker (eg. runtime 4mins to 14mins) the colouring was varying a lot, from reddish to colourless and some purple and hardly colour at all. There was no way i could make one setting for the whole movie, i had to split up the movie into parts as needed. Categorized parts in daylight scenes, mid-scenes and darker-scenes. Noticed i had to split them up more cause of the different colouring parts. so each part got it as needed - adjusted brightness, contrast, rgb, saturation, sharpness, blackbase, whitebase etc. the final result looks great in relation to what is out and no damned subs, dont think there will be any new further cam, so it wont get better than this till retail. For the

http://www.imdb.com/title/tt1843866/plotsummary (retrieved November 7, 2015).

> Audio i used Millenium/Echo Line, cleaned it and raised vocals, and synced it back to my video. all in all it looks very nice and watchable and will do me till retail. attached 3 samples, daylight, mid-scene and action scene. enjoy"[17]

These types of alternative – and piracy rooted – tales of production are form of political inscriptions that inserts new historical dimensions to the life histories of films. In particular, stories like the one above bring forth practices of labor that are oftentimes disowned, and instead lays bare the time and effort that goes into the production of pirate copied things.

Lucy Suchman (1995) has shed light on the power dimensions in representing work, arguing that there lies a particular power in "making work visible." Suchman (1995, 58) suggests that "bringing (…) work forward and rendering it visible may call into question the grounds on which different forms of work are differentially rewarded, both symbolically and materially". She further talks of the existence of "representational artifacts" that intervene in the sphere of ideas that exists around practices of labor, and I would suggest that .nfo:s could partly be understood precisely as that. By adding new types of technical details and descriptions of labor to the histories of film, .nfo:s are artifacts that make an alternative kind of labor visible to the audience that reads them. Doing so, turns .nfo:s into representational agents; into snippets of texts that bring forward the voices of alternative co-authors of film. In relation to Foucault's (1984 [1969]) classic notion of the author function, .nfo:s thus usher in the principle of abundance (rather than thrift) with regards to the proliferation of meaning relating to a particular type of work. Through .nfo:s, films are given new and multiple authors.

Last, .nfo:s commonly also carry personal messages from such authors (or producers). Oftentimes these messages are directed towards potential collaborators, and sometimes they are designed as pure recruitment ads:

> "LOOKING FOR ANYTHING YOU WANT TO LOOK AND SOUND BETTER COME FIND US AND HANGOUT WITH US DRUNKARDS CM8@hushmail.me"[18]

Other times, they may simply encourage people to join the producer's networks on social media:

> "=!JOIN OUR COMMUNITY IN FACE BOOK

[17] See .nfo attached to the torrent: https://kat.cr/usearch/Captain.America.The.Winter.Soldier.2014.SUBFREE.HD-TS.XVID.AC3.HQ.Hive-CM8/ (retrieved November 10, 2015).

[18] See .nfo attached to the torrent: https://kat.cr/captain-america-the-winter-soldier-2014-subfree-hd-ts-xvid-ac3-hq-hive-cm8-t9090523.html (retrieved November 14, 2015).

```
HD          Desi          Rockers          -          HDDR
https://www.facebook.com/hddr1

HD DESI ROCKER RELEAESEES
https://www.facebook.com/groups/hddesirockers/

DJ Group HD Movie Releases
https://www.facebook.com/groups/inam70/

Rocking Shop
https://www.facebook.com/inam77

TQMovies
https://www.facebook.com/groups/TQTorrent/

Invincible Movie Zone
https://www.facebook.com/groups/229482163842928/

Invincible Audio Zone
https://www.facebook.com/groups/630571410308171/"[19]
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These types of advertisements and announcements are commonly placed under headlines such as "group news"; which reveals how .nfo:s – much like other earlier types of "crack intros" – are used as continuous channels of communication (Reunanen et al. 2015).

On an even more personal note, .nfo:s may also contain lyric quotes, proverbs, literary fragments, or long descriptions of the histories of release groups. In other cases, they might make moralistic proclamations that encourage people to buy, rather than download content, or celebrate artists, moviemakers or authors. Other times, they might contain movie clips that present the release group, or home-made posters like the one on the next page, displaying a copy-pasted image of Captain America (Fig. 3).

Through these kinds of messages and contextual elements, .nfo files reveal an entangled mix of textual and descriptive materials that add to the social life of pirate copied films; they contain art, labor descriptions, personal messages, movie industry contextualizations, and tales of material transformation. These discreet (yet politically-laden) attachments tell alternative origin stories of films. .nfo:s intervene in classic cinematic biographical writings, and carries diverse patchworks of cinematic paratextuality that all contribute to the metamorphosis, or transfiguration, of digital pirate copied film. In essence, .nfo:s reveal that pirate copying is not just about sole replication, but the staging of narrative revisions and contextual re-births of film. Through the contents of .nfo:s (and through the

[19] See .nfo attached to the torrent: https://kat.cr/captain-america-the-winter-soldier-2014-720p-bdrip-dual-audio-english-hindi-x264-ac3-dd5-1-inam-t9441401.html (retrieved November 14, 2015).

standards that surround their production), movies are transfigured into recognizable, and fiery pirate copied things.

Fig. 3 – Example of .nfo from the release group "Wolverdonfilms"[20].

5. Conclusion

In contrast to the discourses of freedom that often seem to surround piracy, digital pirate copied films are artifacts which are surrounded by detailed and fascinatingly varied structures of production. Piracy standardization efforts are central to the ways in which digital pirate copies are brought forth as cultural artifacts; they do not only help to adjust these object's production methods, but also assist in organizing their future lives by serving as a background for quality assessment. Doing so, release

[20] Published under Fair Use Policy. See .nfo attached to the torrent: https://kat.press/captain-america-the-winter-soldier-2014-bluray-720plegendado-t9402984.html (retrieved May 15, 2016).

standards reveal how the production methods of the market economy may get transported into informal market sectors and provide legitimacy and authority to illicitly copied things. These standards further speak of the historical development of digital pirate copying; its transformation into a wide-spread and ubiquitous practice, and consequently the perceived need to police its customs – not only from the outside perspective of law, but also from within piracy circles.

Through .nfo-files, films such as *Captain America: The Winter Soldier* are given new and cumulative identities that challenge film narratives told from the perspective of movie industries. nfo:s allow multiple fantasies and tales of origin to enter the histories of film. By injecting new forms of authorship, and new material contextualizations to film content, they rewrite cultural biographies of film and insert new dimensions to their social life. Such contextualizations speak to a very specific and tech-savvy audience, which adds another power dimension to pirated content. Rather than adhering to mainstream discourses around film, the texts that surround these copies privileges the attention of small and technologically competent communities. Thus, they also go against the grain of classic film contextualizations and narratives. Together, both release standards and .nfo files are elements that expose how meaning and value is constantly negotiated and re-negotiated at different points in time along the history lines of objects; they testify to the cumulative and layered ways in which artifacts (both digital and non digital) are given value, meaning, and identity.

Discussing female artist's use of photocopying machines in the late 20th century, Hillel Schwartz (2014) has noted that, for them, copying has not been an act of disembodiment through photographic reproduction, but the opposite; it has been used as a way to explore new kinds of embodiments. "Women have used the photocopier's capacity for appropriation less to lay claim to uniqueness than to celebrate multiple identities," writes Schwartz (2014, 201). Perhaps these notions could be extended to the case of digital pirate copying as well. Pirate copied objects tease out the existence of a multiplicity of material identities; they are things that play with, and explore, the parallel existence of diversified cultural matter, and diversified forms of authorship. In doing so, these objects are also things that queer artifact spheres and challenge dominant orders of film circulation, presentation, and authorship. Pirated films are queer in the sense that they – much like those who transgress gender, sexual, or normative boundaries – destabilize categorizations, and occupies spaces who's edges are fluid and porous. They embody diversity rather than singularity, movement rather than fixidity, hybridity rather than purity.

As Kavita Philip (2005, 208) has described it, digital pirate copies are at once "enthusiastic mimics and relentless betrayals"; their identities and affiliations are only marginally coherent. Unlike carefully produced art forgeries, these copies do not give their originals the honor and respect of

being made in their complete resemblance. Instead, pirated films are "ambivalent objects" (Suchman 2005, 390) that partially (and selectively) borrow from their predecessors, while simultaneously transporting new and interventionist messages. Such double edged notes and materialities are political scripts and marks of circulation and transfiguration (Gaonkar and Povinelli 2003). They are evidence of the co-presence of textual and cultural forms, and the ways in which contestations and transfigurations are an inevitable part of the circulation of things.

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STS and Media Studies

Alternative Paths in Different Countries

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Abstract: This section presents three perspectives on the trajectories of interaction between science & technology studies and media studies in three different national contexts: Germany, France and Italy. Each of the contributions focuses on a specific country and adopts a distinctive standpoint to unfold how STS and media studies have interacted or have maintained boundaries and differences. The first contribution about Germany moves from the outcomes of two workshops on these topics and highlights how STS and media studies seem to tap into each other in a highly selective manner, filling some of their conceptual and empirical gaps, but not engaging in an actual mutual discussion. The second text assumes as fulcrum the concepts of "mediation" and "dispositif" in order to argue that, in France, these ideas has played the role of "boundary objects", enabling a dialogue between the two different fields. Finally, the third and last input to this section reconstructs some of the trajectories that led specific groups or individuals working in communication studies and semiotics in Italy to connect with the STS framework, arguing that the concept of "mediation" emerges as a productive common ground for both communication and STS scholars.

Keywords: STS; media studies; Germany; France; Italy.

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Encounters, Lone Travellers or Productive Differences: media studies and STS in Germany

Cornelius Schubert and Estrid Sørensen

The following pages sketch out conceptual encounters as well as evasions between STS and media studies against the backdrop of meeting at and organising shared STS/media studies workshops and conferences. Both authors have a background in STS and have been collaborating with scholars in media studies over the last years. We report our experiences as personal perspectives of how STS and media studies meet, overlap and diverge in Germany as well as in broader international context.

Our mutual interest in engaging with media studies from an STS perspective began at the 2013 conference of the German media studies Association (GfM) in Lüneburg, where both authors happened to run into each other. We found that we both had recently taken up jobs associated with media studies: Estrid in Bochum and Cornelius in Siegen. We took our meeting in Lüneburg and our new jobs as circumstantial evidence, that the two fields of STS and media studies were somehow converging and we were immediately interested in what this supposed convergence might look like. Already, a convergence could be seen in several publications where German media scholars were engaging with concepts from STS and especially with ANT (Hepp et al. 2006; Schroer 2008; Thielmann et al. 2013).

From our experiences of working with media scholars, we felt that we were often talking about similar phenomena, albeit in different terms. Of course, there was an interest in issues of mediation, a central term in both fields. However, the empirical cases tend to differ: not surprisingly media studies focus primarily on media such as books, newspapers, radio, television and the internet, technology studies focus primarily on tools and machines, and science studies on scientific instruments and theories. Out of this heterogeneous mix, the internet in its broadest sense seemed to be the most promising field of conversion (see Gillespie et al. 2014). Following our brief encounter in Lüneburg, we decided to look for current research at the intersections of STS and media studies.

Our next step led us from Germany to Poland, where we organised a session titled "STS and media studies: Empirical and conceptual encounters?" at the 2014 EASST (European Association of the Study of Science and Technology) conference in Torun. The session called for presentations that would spell out the similarities and differences of between media, science and technology studies. However, we found that most presentations were concerned with enhancing media studies through various STS perspectives. This much was to be expected at a STS conference, but we both had the feeling that the connections between STS and media studies were generally not very well balanced. Most importantly,

we felt that we did not gain a deeper insight into how STS might benefit from media studies instead of the other way round.

The session in Torun, the existing literature, and the frequent exchanges with our media studies colleagues left us with the impression that there is a curious division of labour at work in the convergence of STS and media studies. In many cases, we found that when media scholars engage with STS, they tend draw on the concepts and ideas of STS, especially the notions of mediation, flows and networks found in ANT. Yet in the other direction, STS scholars rarely seem to draw conceptually on media studies – with some notable exceptions (Latour 1986). When STS scholars engage with media studies, it usually concerns the common empirical cases of information infrastructures such as the internet (Boczkowski and Lievrouw 2008), yet they keep on using the conceptual apparatus developed in STS. Put differently, STS scholars seem rather to engage with studies of media than with media studies.

All in all, we became suspicious, that there might actually not be a conversion between STS and media studies after all. Rather, the two fields seem to tap into each other in a highly selective manner, filling some of their conceptual and empirical gaps, but not engaging in a mutual discussion. Only few STS scholars talk about aesthetics or affects, mass media or media with a more playful or creative character such as movies, computer games, and art products (see however Sørensen 2016). On the other hand, less attention is paid by media studies scholars to issues of production and industrial machines or legal regulation of technological innovation.

The experience that both fields have a strong tendency to engage with the other in highly selective ways brought us to organise a workshop in which we wanted to explicitly trace more unusual connections between STS and media studies – e.g. STS scholars importing concepts from media studies and media scholars interested in laboratories and workplaces. Based on an open call for papers, we organised a workshop in Siegen early 2015 with the title "Roads less travelled: Exploring new connections between Media Research and STS". Many of the presenters at the session in Torun reacted to the call, just as several scholars who had not yet been involved in our discussion joined the workshop in Siegen. What intrigued us over the course of this workshop was that even though we aimed at finding more connections, the presentations and discussions instead revealed significant differences between (and within) the two fields. Rather than finding hidden connections, the presentations explored how concepts, methods, perspectives and interests differed between STS and media studies. We felt that these presentations provided a very good insight into the current state of the relations (and lack thereof) of STS and media studies, and for this reason those presentations will be in the focus of the rest of our discussion.

The heterogeneity of the cases and approaches presented at the workshop highlighted the fact that media studies seem to encompass an even

more diverse field than STS. Trying to bridge the two fields is thus a difficult, if not impossible task to undertake. It would force singular identities onto polyphonic fields. Instead, the workshop revealed that STS and media research overlap in certain areas of interest, both conceptually and empirically, such as in studies of infrastructures and media technologies.

Paolo Magaudda (Padova) elegantly showed how user studies in STS and media research share a common ancestor in domestication theory (Silverstone and Hirsch 1992) and the idea that the shaping of media and technology is hardly finished after they enter the user household (e.g. Oudshoorn and Pinch 2003). Yet both sides tend to obscure this shared history in favour of purifying their respective approaches.

Somewhat unexpected by the organisers, the workshop gave in many presentations rise to discussions of relevant differences between STS and media studies. By comparing approaches of the German media theorist Friedrich Kittler with that of Bruno Latour, Judith Willkomm (Siegen) elaborated how Kittler was primarily concerned with the "logic" of media, whereas Latour is preoccupied with their "logistics". Despite their common interest in media, processes of mediation, and inscriptions, they undertake different analyses and ask different questions.

Sergio Minniti (Milan) argued that media archaeology focuses on subaltern and artistic practices of media use rather than re-tracing the development of a successful technical or scientific innovation in STS. In a similar vein, the classic studies in STS of innovation failures, like that of Aramis (Latour 1996), usually do not take the subaltern position as a starting point, but argue from the perspective of (forestalled and unsuccessful) powerful actors.

One theme that followed from this was that STS is often seen as only following dominant actors while at the same time not taking clear political sides in favour of suppressed minorities. This critique has been levelled at STS from media studies in the tradition of Cultural Studies. STS scholars usually find such accusations tiresome feeling this critique is utterly misplaced. This is particularly the case when taking more recent studies into account (i.e. de Laet and Mol 2000) along with feminist studies in technoscience (i.e. Haraway 1991). However, the exchanges at the workshop revealed that the discussion more than anything is about what counts as political, and in what contexts STS and media studies scholars can be granted political relevancy. STS scholars mainly argue with respect to the (sometimes invisible) levels of "doing politics", and ontological politics (Mol 1999). These are embedded in the ways in which technologies, media and scientific categories influence the ways in which we think, act and assess practices, social (and material) relations, discourses and even impact what comes to count as the political. Media studies scholars, on the other hand, tend to understand the political in a more distanced and diagnostic sense – pointing out power differences in media technological arrangements from a (media studies) scholarly informed perspective. It became clear in the course of the workshop, that if we force both

tendencies to their extremes, we risk creating the "essential" differences between STS and media studies we sought to overcome, and which are hardly warranted given the internal diversity of both fields. Yet different perspectives remain and we should be sensitive to their boundaries.

Another striking difference between STS and media studies is the engagement with issues of war. In the evening keynote Erhard Schüttpelz (Siegen) articulated two divergent positions: On the one hand media studies were primarily born out of Communication Studies occupied with propaganda related to warfare. Kittler and McLuhan shared a common interest in military media technology. In STS on the other hand we find very few empirical studies on war and on military technologies (except for some prominent cases such as MacKenzie 1993; Law 2002), but indeed military metaphors proliferate along with a strong political rhetoric in order to draw attention to the conflictual nature of science and technology. The most obvious example of this is the "science wars" rhetoric.

The preference for asymmetries in media studies and symmetries in STS was mirrored in the presentations of Adam Fish (Lancaster) and Diletta Luna Calibeo and Richard Hindmarsh (Brisbane). From a Cultural Studies background both engaged with visibilities in social media. Adam Fish analysed how *Anonymous* video producers see themselves in a war with *Scientology* and government agencies and how they are at the same time inextricably linked to commercial video platforms. Diletta Luna Calibeo elaborated how environmental activists may be framed as eco-terrorists in their struggle to create visibility for corporations' environmentally damaging activities. These presentations also hinted at another difference between STS and media studies: the latter prefer situating their cases in a "bigger picture" of capitalism, whereas the former tend to look more closely at individual cases, and draw more modest conclusions.

That our attempt at exploring new connections between STS and media studies also brought their differences to the fore was one of the most insightful and unexpected results of the workshop. It showed that the search for novel links in many cases occasioned a re-tracing of boundaries between and homogeneity within STS and media studies. No simple equation can be made between STS and media studies. Yet, the distinction between perspectives is productive in focusing and specifying our discussions of science, technology, and media. If we look beyond the beaten tracks of collaborations between STS and media studies a plethora of new questions arise concerning media, technologies, and science, along with variations of more or less disciplinary ways of answering them. Despite the differences, common themes and ancestors of STS and media studies came to the fore. They warrant their continued engagement, among others with issues of power and subversion, materiality and meaning, mediation and cooperation, design and use.

STS and media studies undoubtedly (have to) share empirical fields and conceptual perspectives and both benefit from manifold cross-fertilisations. Mapping out our similarities and differences, we need to

simultaneously engage in the work of purification and hybridisation (cf. Latour 1993): looking for homogeneities as well as heterogeneities within and across their boundaries (some of which may be fluid), and from there to identify productive ways of collaborating and ways of productive fighting.

* * *

Mediation as a Boundary-Object, *Dispositif* as a Boundary-Concept

Romain Badouard, Clément Mabi and Guillaume Sire

STS and media studies have made a pragmatic turn over the last two decades, by deciding to study what they both call "mediations". Media studies stopped describing societal phenomena like just a problem of mass communication or an interpersonal one. They have, so to speak, given back its complexity to the social, thanks to this term, "mediation", which "usefully highlights the artefacts and practices used to communicate" and allows to study "social and organizational arrangements through which mediation is instituted" (Livingston 2009, 10).

For their part, STS gave to the technical artefacts the status of "mediators", i.e. that artefacts can change, alter, enhance or lower the performativity of social actions (Hennion and Latour 1993). In doing so, STS have analysed the innovation process by describing it as an encounter of different program of actions, which is achieved by the mediation of technical artefacts (Latour et al. 1991; Akrich 1993). They moved away from a classic epistemology which opposes the world of speeches and the world of things to a conception of the world where speeches and things are co-constructed; because speeches are not outside things: they circulate within these things, with and trough them (Callon 2006, 269).

This shared preoccupation about the materiality of mediation has created an opportunity for dialogue between these two research fields within a same program. This is particularly encouraged by the development of a digital ecosystem that has given a central position to technical artefacts in our societies. This similar turn occured within the two fields —for which the use of the term "mediation" is a result, not a cause— so STS and media studies have begun to share common issues. In studying information and communication technologies, the two fields need to avoid the pitfall of both social and technological determinisms, in order to take into account the socially constructed dimension of technology and the question of the effects that technical artefacts can have on social practices. It will

allow them to analyse the way technology, which results of actors' will and actions, can regulate actions and normalize social practices. Therefore, technical artefacts are not immovable and unreachable entities but results of sociotechnical processes. That's why, in the *Handbook of Science and Technology Studies*, Pablo Boczkowski and Leah A. Lievrouw (2008) advocate for bridging the gap between media studies and STS in order to analyse the materiality of medias and mediations. This concept of materiality is also at the heart of Gillespie et al.'s book that aims at openig up new ways of federating scholars, at the crossroads between STS and media studies, to question what kind of boundary-objects[1] are the mediations (Gillespie et al. 2014).

For this to be possible, it is necessary to define and operationalize key notions that will serve as boundary-concepts to these boundary-objects. These concepts would allow to mix the two approaches in a coherent and operational theoretical framework, rather than just referring to the fields of one another. This is what has been initiated during the last years in France thanks to the French concept of "dispositive"[2], which has been used to study mediations within the digital ecosystem. We will briefly introduce this boundary-concept, originated from Michel Foucault's work, and explain how its operationalization has allowed to mix approaches of STS and media studies to analytically deploy mediations as boundary-objects.

Philosophical Origins

The first time the word *dispositif* was used as a social concept was during an interview of Michel Foucault published in 1977 in the journal "Ornicar?". In a crucial contribution, the philosopher presented it as a

> thoroughly heterogeneous ensemble consisting of discourses, institutions, architectural forms, regulatory decisions, laws, administrative measures, scientific statements, philosophical, moral and philanthropic propositions–in short, the said as much as the unsaid. Such are the elements of the *dispositif*. The *dispositif* itself is the system of relations that can be established between these elements. (…) On the one hand, there is a process of *functional overdetermination*, because each effect —positive or negative, intentional or unintentional— enters into resonance or contradiction with the others and thereby calls for a readjustment or a re-working of the *heterogeneous elements that surface at various points. On the other hand, there is a perpetual process of* strategic elaboration. (Foucault 1994, 299) [our emphasis]

Several linguists and philosophers, such as Jäger, Raffnsøe, Agamben,

[1] About boundary objects, see Star and Griesemer (1989).

[2] In English, some scholars say "social apparatus" or "device" but we prefer to keep that word in french, because its meaning is extremely subtle and looses some of its essence in both translations.

Pasquinelli, have then given their own definition of this concept. In France, the philosopher Gilles Deleuze detailed and completed the foucaldian approach, considering *dispositifs* as machines that make one see and talk: "The two first dimensions of a *dispositif* —or those to which Foucault draws our attention in the first instance— are curves of visibility and curves of enunciation" (Deleuze 1989, 185). From this point of view, a dispositif produces some speeches and acts as a "truth-telling regime". Deleuze does not forget the fundamental dimension of Foucault's concept: the *dispositif* is a space where power relations are visible. He stresses the importance of the idea that power results from a strategy more than a status or a property; it is exercised more than it is possessed; it comes from a way of being linked to one another (relationship) rather than of having something that the other has not (ownership) (Badouard 2012, 54). We will explain later why this reading of Foucault's work by Deleuze is particularly interesting for the dialogue between STS and media studies.

An often Misemployed Concept that Can Make Sense through the STS Lense

For the past twenty years, the concept of dispositif has colonized the French social sciences (Beuscart and Peerbaye 2006) and in particular media studies (Appel et al. 2010). However, as Laurence Monnoyer-Smith has said, its use reflects the existence of an unavoidable reference from scholars who have not really thought about what it involves theoretically and methodologically (Monnoyer-Smith 2013, 172). Indeed, it seems that the porous, versatile and elastic nature of this concept has contributed to its success (Peeters and Charlier 1999, 15) but has also made it as easy to quote yet as difficult to employ properly. This has resulted in seductive but questionable uses:

> Like other social sciences, media studies have overused the concept of dispositif and drained it of its heuristic basis. Its reinterpretations and uses have led it far from Foucault's original thought whose purpose was to associate it to the notions of "intentionality" and "strategy" in order to make a more instrumental use of it, which will allow to understand and conceptualize the mediations and the way the *dispositif* underlies them (Gavillet 2010, 20).

Such a movement has also been noticed by Peeters and Charlier (1999, 18): "[The dispositif] becomes fewer and fewer panoptic, and increasingly pragmatic and interactionistic".

STS have less suffered from these pitfalls, mainly because of the sociology of translation (Akrich et al. 2006) and because the definition of the *dispositif* was close to what Bruno Latour calls an actor-network. Indeed, the two notions refer to the same idea of sociotechnical artefacts, power relations, hypothetical subjectifications, and, more generally, to the idea

of mediation (Beuscart and Peerbaye 2006). Dispositifs make *materially possible* the phenomena of translation, through a mix of human and non-human actors where the skills and the capacities are distributed and where the different actions can bee *mediated* and *coordinated*. The geography of power relationships depends on the distribution of skills and capacities. "[Dispositifs] make things. They articulate actions; they act and make other actors to take actions" (Muniesa et al. 2007). Scholars have to measure the strength of associations, to identify what can weaken or strengthen them and to figure out for each involved actor how and to what extent he can inflect or alter others' actions and to influence their effective results.

However, even if they have used the concept of *dispositif* in order to designate the instrumental dimension of mediation more than mediation itself, STS have somehow neglected the power. According with Yochai Benkler (2016, 16) we consider the notion of power as "the capacity of an entity to alter the behaviors, beliefs, outcomes, or configurations of some other entity". Thi is the reason why they could benefit from media studies, i.e. by considering all of the mediation's purpose and not just its materiality and its social causes and involvements.

Dispositif, the Dialogue between STS and media studies and the Study of Communicational Mediations

In order to remedy the "instrumental temptation", it seems essential to shift the focus back on the foucaldian meaning, to understand the dispositif as a tool of power. It would then be a matter of building a theoretical framework, which could allow analysing mediations with their sociotechnical complexity by unfolding the "making-say" and the "making-see" of the *dispositif*. It could also help identifying the power relations within the mediations, keeping in mind that a mediation between two parts cannot be perfectly symmetrical.

Several scholars in France have done exactly that for the past six years. They used the concept of dispositif as a *fulcrum* thanks to which they could make STS and media studies dialogue and study mediations typical of digital technologies of information and communication. This approach has been developed in particular by a research team of Université Technologique de Compiègne: in their academic work Julia Bonaccorsi and Virginie Julliard (2010) and then Laurence Monnoyer-Smith (2013) have proposed to operationalize the *dispositif* to understand the way communicational practices could structure power relationships through the mediation of technical artefacts. Romain Badouard (2012) Jean-Christophe Plantin (2012) and then Clément Mabi (2014) have extended this reflexion in their PhD thesis by using the same approach in order to study participatory devices and digital navigable maps. And Guillaume Sire (2015) has used the same notion in order to show how the actions of Google and news publishers can exercise a mutual influence,

and therefore influence the way news are told, the way they circulate and the way they are ranked within the search engine's results.

In order to avoid determinism, these scholars consider that the *dispositif* is not totally crystallised into hypothetical power relations but let the possibility for individuals to express themselves as subjects. Actors can implement strategies in order to contest existing divisions of power. By using their imagination, some of them can set up a space within the *dispositif* where they are free from the pressures that otherwise could be exerted on them. Some can also "siphon" the power of other actors. Moreover, these scholars take into account actors' creativity and consider that the *dispositif* is always moving, so that they do not lock *a priori* the social actors they study into insurmountable lines of a strategic idea of power (Monnoyer-Smith 2013). Such an approach advocates for a subtle consideration of power, which aims to help scholars to describe how mediation is operated and how the *dispositif* that allows it can rebalance or counterbalance sociotechnical relationships.

Conclusion

A dialogue between different disciplinary fields is always difficult and often disappointing. But for some social phenomena there is not other way than to look at them from various angles because they can't be understood by using just one disciplinary framework. These types of phenomenon are called "boundary-objects". Mediation is a perfect example of it, and it could benefit in particular from a crossed perspective that would be based on both STS and media studies. In order to succeed in this dialogue, we have introduced here how the boundary-concept "dispositif" and explained why and how it is used in France by scholars interested in digital mediations.

More generally, we think that the boundary-object "mediation" is at the crossroads of human and social sciences as a whole: history, law, economics, psychology, sociology, aesthetics, and so on. And we think that the boundary-concept "dispositif" could be a good way to articulate these different approaches in a pragmatical framework, in order to study — theoretically and practically— what power relations are, do, could be and could do.

* * *

"Decentering": Connections between media studies and STS in Italy

Alvise Mattozzi

"Communicaton", much more than "media", has been the word and the domain around which researchers working in Italy gathered, in order to carry out researches ascribable to "media studies" (Ms). These researchers came from different disciplines like film studies, semiotics and sociology of communication, that pertain to different institutional scientific-disciplinary sectors into which Italian academia is officially partitioned. Since the '90s, this gathering has been also possible, thanks to the institution of graduate and undergraduate teaching programmes in "Communication sciences", where all these disciplines, together with other ones, were taught.

"Television" is another word that has characterized Italian research into and around Ms. "Television" has of course characterized Ms more or less everywhere. However, television has remained the centre of Italian Ms for long time, even when it started to be decentered by the presence of other information and communication technologies (Ict). Such "fixation" on television –which is somewhat understandable in a country like Italy where television has had a well-known direct political relevance– has had its consequences for the establishment of connections between Ms and STS.

Nevertheless, they have been established. And, although later than in other countries, it is possible to find connections even before STS started to have an organizational structure (i.e. STS Italia – The Italian Society for Social Studies of Science and Technology) and a certain visibility in Italy. With this contribution, I want to reconstruct some of the trajectories that led specific groups, disciplines or individuals working in the field of communication in Italy to connect with STS. Thus, this article largely privileges a historical account of the emerging connections between Ms and STS and also it prevalently focuses on the way already established Italian media studies have approached STS perspectives, rather than on the way Italian STS practitioners have increasingly adopted media as their object. For this same reason, my focus here is generally on long term vectors of influences, rather than on the present situation characterised by an increasing number of STS researchers who do studies of media technologies combining from the start Ms and STS – an area that is widely represented by this double special issue of *Tecnoscienza*. As a consequence of this choice, I will not review here today Italian STS researches centred on (new) media in Italy, taking as a departure point that many of their protagonists are participating to this issue of *Tecnoscienza* as editors as well as authors and book reviews writers.

In other countries –notoriously Great Britain, but also Norway– it is through a "decentering" of television –started already at the end of the '80s thanks to researches on "domestication" (Silverstone and Hirsch 1992; Lie and Sorensen 1996; Berker et al. 2006)– that an overcoming of the taken-for-grantedness of the tangible, artefactual and technical features of television has been possible and, with it, also the establishment of connections with STS – especially with the Social Shaping of Technology (Sst) approach. Looked at from the viewpoint of the Vcr or of the home computer, television started to show not only what was on the screen (programmes) and in front of it (audiences), but also what was around, behind and in between them: shells, frames, interfaces, devices, other artefacts, as well as values and negotiations, not just over interpretations of what was shown on television, but also over Ict intended as goods and household appliances. All these *things*, in a way or another, *mediated* the relation between the screen and its audiences and needed to be accounted for.

Only much later, such shift has taken place in Italy. It happened when, thanks to diffuse digitalization, television has started to be "technically" decentered. Given the often taken-for-grantedness of the technical and artefactual aspects of television (Ortoleva 1995)[3], its centrality for Italian studies of communication has also meant that those technical and artefactual aspects of media have tended to be disregarded[4], thus mining the possibility of a dialogue with STS. Italian studies of communication have indeed developed within the trails of the encoding/decoding paradigm they inaugurated –as indicated by Stuart Hall, who, in his famous essay "Encoding and Decoding in the Television Discourse", cites indirectly Eco and collegues (1965) as ground for his proposal. They have thus tended to focus on the tension between the emission and the reception of "symbolic content" –as the preference for the word "communication" over "media" underlines.

For instance, the debate around "neotelevision" – i.e., the configuration of television shows that emerged in the '80s in Italy, through which television became much more self-referential and in tune with everyday domestic life – was tackled mainly in enunciational terms, looking at how Tv shows would address and engage audiences differently. As Peppino Ortoleva, historian of media who has always taken STS into consideration, has noticed, that debate has taken very little into account that such new way of doing television was based on colour transmission, a relevant

[3] These aspects not only were taken for granted, but also – I would say – as a sort of doom – a framework within which it is very difficult to introduce Sts, Sts have, indeed, usually to do with possible alternative paths. Against the view of media and technological systems as forever stabilized landscapes, Italian leftist movements tried often to propose and practice alternatives (Berardi et al. 2003; Collettivo A/Traverso 1976; Faenza 1973).

[4] For a way to consider technologies and materiality within Italian Ms, which differs from that of Sts, see Attimonelli et al. (2011).

technological change – with an explicit socio-political relevance for Italy (Ortoleva 1995)[5].

Decentering Television: Attempted Connections

As already mentioned, a decentering of the television took place thanks to the general process of digitalization, first with the diffusion of mobile phones, then with the penetration into the everyday life of people of computer mediated communication and, finally, through the digitalization of television thanks to digital terrestrial transmissions.

On all these topics, the OssCom (Osservatorio sulla Comunicazione – Observatory on Communication) of the Catholic University of Milan has conducted researches by using "domestication" (Silverstone and Hirsch 1992) as main interpretative and methodological framework (among others, Pasquali and Scifo 2004; Scifo 2005; Pasquali et al. 2010). As it happened ten years before in Great Britain, through domestication a connection with the Sst approach has been attempted. Since these researches were mainly focused on audiences and users, what the OssCom researchers found interesting in Sst was the development of user-oriented perspective on technology that, at the time, was being developed.

What we see in these researches is, however, just a general reference to Sst, without a direct and systematic inquiry into how actually artifacts were shaped. This happened also because most of these researches were based on interviews or on narrations and discourses (intending them in verbal or visual terms), so that not much is said about how actual interactions and mediations took place not just through, but also on and around the researched artefacts – an exception being Aroldi et al. (2008, § 2.3). Thus, whereas domestication was analyzed often in a very detailed way, taking into account all the phases through which artifacts become parts of households' routines, Sst did not get developed in a thorough and systematic way. Not surprisingly, the references to Sst have tended to fade through time.

The category of "innovation" is another way through which STS got connected with Italian Ms, still in relation to the decentering of television operated by digitalization. Framing media technologies as innovation has been possible especially thanks to the comparison proposed by Leah Lievrouw (in Lievrouw and Livingstone 2002) between the diffusionist theory of innovation and the Sst approach. For instance, a reflection on digital divide in terms of innovation has been developed by Maria Francesca Murru's essay in Colombo (2007), by using Lievrouw's comparison. However, also in this case a systematic use of the Sst approach has not followed – and actually within the same research project (Colombo 2007)

[5] For a reconsideration of the debate around neotelevision that takes into account the relevance of media, however still without acknowledging the issue of colour transmission, see Colombo (2007, 16).

certain innovations have been tackled only through the diffusionist approach. Lievrouw's article is present in Lievrouw and Livingstone (2002), a book grounded in the dialogue between Ms and STS, which has been also translated in Italian in 2007, thus allowing STS to enter in Ms students' handbooks in Italy (see, for example, Sorice 2012).

Decentering Ict: a Connection in Progress

It is through a further decentering of Ict in relation to the urban space (Tarantino and Tosoni 2013a), that a move toward a more systematic and promising connection between Ms and STS is at present in progress. In order to account for the presence and role of media distributed and interacting with the urban environment, Simone Tosoni –who had already taken part to the mentioned OssCom's researches– and Marco Tarantino, are developing an approach, called the "Rpm model, an STS–informed inquiry of socio–spatial production" (among other essays, Tarantino and Tosoni 2013b) –where RPM stands for Representation/Practices/Materiality. They propose to read the social space as the outcome of the interaction among various "sociospatial production patterns", considered as "networks of representation of space", "spatial practices" and "spatial morphology" in a relationship of continuous translation and co-shaping. In order to reconstruct the various chain of translations between media and spaces they use categories taken from Actor-Network Theory (Ant), in order to account for non-human actors, but also taken from the Social Construction of Technology (Scot) approach, in order to take into account relevant social human actors, through which understand which are the relevant non-human actors.

Decentering Signs and Enunciation: a Dedicated Connection

It is very likely that, if we would take into consideration only quantitative data – number of citations – the domain of Italian Ms connecting the most with STS would result to be semiotics. However, looking more closely, we would see that most of the citations would refer to Bruno Latour's works. This is the result of the close relation Bruno Latour has had with semiotics and especially with Greimasian semiotics – which is largely diffused and practiced in Italy –, since the beginning of its inquiry on sciences. Latour was introduced to semiotics by Paolo Fabbri – one of the co-authors of Eco et al. (1965) – with whom Latour also signed one of his first STS articles in 1977.

However, the present relation between Latour and Italian semiotics, though grounded on that heritage, started much later on two other grounds, related to the decentering of two basic semiotic concepts: signs and enunciation. Greimassian semiotics, and especially the way it has been practiced in Italy, has tended to overcome the concept of sign – and with it also of representation – in order to develop a semiotics of texts,

intended as complex configurations of meaning-bearing relations. Thus, texts can be the traditional objects of Ms like movies, television shows, advertisements, but also more tangible artifacts like tools, interfaces, technical objects.

Therefore, a systematic relation with Latour has been resorted within the attempt to analyze tangible artifacts as complex configurations of relations (see, among others, Deni 2002; Mangano 2009), similarly to what Akrich and Latour (1992; see also Latour 1992) did, by using semiotics too. The results of these researches, thanks also to a broader reflection on the Latourian concept of interobjectivity – intended, though, in a restricted way, only as relations among objects – have been used to analyze more traditional texts as paintings, movies or advertisements (Landowski and Marrone 2004) as well as new media (Marrone et al. 2004). Within, this framework the entire reflection around the concept of script (Akrich and Latour 1992) has been connected to Eco's concept of "model reader", with which Eco intended a "system of instructions aiming at producing a possible reader whose role is designed by and within the text" which "can be extrapolated from it and described" (Eco 1994, 52) – a definition very similar to that of script. This relation between script and model reader has proven productive in order to analyze interfaces (see, for a general overview, Cosenza 2004).

Enunciation has been a very relevant concept for Italian Ms –as I said, neotelevision has been analyzed mainly in enunciational terms. Enunciation is also a concept often used by Latour, who has proposed a radical extension of it (Latour 1999), providing the basis for the subsequent reflection on the "modes of existence". As for now, such further decentering has been the ground for a reconsideration of the concept by Italian semioticians, however it has not yet given way to a more radical rethinking that Latour's proposal probably requires.

Decentering Signification and Information: a Possible Connection

Tiziana Terranova's contribution to Cultural Studies and to Internet Studies – especially through the influential essay on "Free Labour" (now part of Terranova 2004) – intersects in various ways STS, representing a possible connection between Italian Ms and STS.

"Free Labour", for instance, is the result of a Bristish research project connecting cultural studies and STS (Wyatt et al. 2001), which is explicitly grounded on the Italian autonomists reflection, especially on its concept of "social factory". Another example can be found in her reflections on the Gramscian concept of "hegemony" (Terranova 2007) – notoriously very relevant for Cultural Studies as well as for Ms. Trying to ground such concept in a more materialist framework, she introduced issues which are shared with STS, such as ontological politics, the concept of publics (Marres 2012) and the rediscovery of Gabriel Tarde. A further example is related to her more recent reflection on the use social move-

ments do and are able to do of corporate social media (like Facebook and Twitter), which she sees as new mass media. One of the steps of this reflection (Terranova and Donovan 2013) has been the result of an encounter that has taken pace at a STS Italia's conference.

However, beside these intersections, I would like to highlight what I consider a more relevant connection between her work, Ms and STS. Such connection could emerge in relation to decenterings she proposed of the concepts of signification and information. In the first chapter of *Network Culture* (Terranova 2004), she addresses information as a more productive concept than signification – a first decentering within Ms. She operates this decentering by reconsidering information within a more materialistic framework, allowing to free that concept from the tension between sender and receiver. By considering the relation between information and noise (and by giving relevance to noise), she decenters information, too, and reconceives it not as a passage between two already established positions, but as a constitutive event that contributes to create also the positions between which such event takes places. Thus, information is thought in transformative and instaurative terms. This way of thinking information is very similar to the one in which Antoine Hennion and Latour have conceived mediation, always in relation to artifacts, to translation and to enunciation.

Conclusions

At the end of this reconstruction of some of the trajectories that led specific groups, disciplines or individuals working in the field of communication in Italy to connect with STS, the concept of mediation appears to emerge as a productive common ground that could, in turn, connect the various decenterings here introduced. Mediation, however, as conceived by Ant, thus, not so much in relation to media, but within a broader framework – which encompasses also media. And mediation, for Ant, always presupposes decenterings – deviations, delegations, otherness.

Thus, recovering Hennion and Cecile Medael's (1986, 30) words – stated exactly thirties years ago in one of the few explicit Ant study of media –, I can conclude by saying: "we should rely rather on our ability to define another unit of analysis; to no longer speak of media, but of mediation" (Hennion and Meadel 1986, 301).

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Journalism and the Circulation of Communicative Objects

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Abstract Digital infrastructures are increasingly altering the ways in which journalistic content acquires social value. Our key argument here is that processes of digital circulation are merging with the construction of social meaning in new kinds of news flows. Based on recent work in journalism studies, this paper outlines a theoretical perspective on circulation through the concept of "communicative object". Through this concept we account for the dual technological and cultural constitution of circulation and the processes of meaning-making that it sustains. We argue that the duality of the communicative object as both a digital and an epistemic object allows for a productive conceptualization of journalistic communication as well as for a methodological innovation in journalism studies.

Keywords: circulation; journalism; digital objects; communicative objects; digital methods.

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1. Introduction

Circulation is emerging as a critical concept for analysing online communication. This is prompted by an increasing awareness among scholars from various disciplinary backgrounds of the growing embeddedness of digital content in forms of online interaction, especially through social networking sites. Circulation seems to be hard-wired into the digital systems that structure, aggregate and prioritise communications at the individual level – for millions of users at the same time. Web search and social networking sites in particular enhance the circulation of *more* information in *less* time among *larger* networks of users across *different* (geographical and cultural) spaces, which, however, does not nec-

essarily result in more heterogeneous networks. In light of the emergence of such sites, increasing circulation could count as a plausible but simplified rationale of media development in general. It would be fairly easy to establish a genealogical connection between the now dominant social networking sites and early efforts of Dutch publishers to enhance the distribution of stock and goods prices across Europe in what was called *corantos* in the 16th century – the ancestors of modern day newspapers (Hart 1970; Steinberg 1959).

Methodologically, it is easier to retrace circulation to a source of origin than to understand in what ways and dynamics circulation contributes to the constitution of social and individual practices of meaning-making. With digital and networked media gaining central importance in the maintenance of social relations, we are, however, urged to acknowledge the need for a methodological reversal, asked to "explore the intersections of content and materiality in the use of media technologies" (Siles and Boczkowski 2012, 242). In this article, we bring together previous arguments on the practice of journalism and its connection to cultures of circulation (Raetzsch 2015; Bødker 2015) in order to develop the notion of the circulation of communicative objects as a theoretical and methodological innovation for the study of journalism.

Taking circulation seriously as a critical concept in journalism studies means to shift our attention away from traditional actors (e.g. institutions) to acknowledge the co-constitution of materiality, users and meaning. Just as journalists developed specific cultural forms and practices which, over time, gave shape to the institution of journalism, so have users engaged in practices of *commonplacing* in their function as readers and audiences. Already in the 16th century, users were copying and curating information to "construct a trail of references, often shared with other people, as a way of showing off their taste and their circle of friends" (Hoem and Schwebs 2015). This sharing of information, commentary and content with others has enhanced under conditions of digital and networked technologies, becoming a new form of "self-communication" (to borrow half a phrase from Castells 2007, 248). By circulating references, symbolic content and relations in social networks, users are "equipping copied information fragments with tags and with links to the online sources" (Hoem and Schwebs 2015). The practice of circulating information is not and has not been exclusive to the domain of journalism.

The potential of circulation as an analytical concept lies in the possibility to overcome dichotomies of creators and consumers, of producers and users, to focus on the social processes that emerge from the enhanced referentiality of very different types of content in digital media. As audiences come to be regarded as actors in these processes, the domain of journalism studies needs to critically interrogate its key analytic categories and models of public communication. In this article, we want to propose that circulation is akin to processes of "co-creation" (Banks and Deuze 2009), not simply in the sense that audiences and journalists together cre-

ate new forms of journalism, but that circulation can help to understand the negotiation over boundaries, cultural meanings and heterogeneous group affiliations in digital media. Invoking circulation in relation to journalism and networked media means foregrounding processes of interaction in which cultural forms develop, are contested and appropriated – among journalists and their audiences, between users and observers, between actors and their networks. Circulation implies more than "[bridging] a source and a destination" but foregrounds a constant "realignment of forms in relationship to each other" (Straw 2010, 26).

In this article, we delineate in what ways our understanding of journalism can be reconfigured through the concept of the circulation of communicative objects. In the first part, we will retrace the prevalent concept of circulation in relation to journalism to show how the strong association with distribution has side-lined processes of meaning-making that arise from the negotiation over journalistic content and that now become all the more relevant (and apparent) in regard to social media. We will especially focus on how news in its varied forms contributes to the creation of social value through circulation. In the second part, we will develop the concept of the communicative object based on two core arguments. First, we posit that digital circulation is distinguished by a uniform layer of referencing (i.e. digital encoding and metadata description), which creates the condition for the transmutation and remediation of any kind of content. Second, we argue that this referential layer is not adjacent or secondary to content but is now integral to the constitution of processes of communication. By defining the communicative object in relation to its digital materiality and its epistemic function in social interaction, we propose that the study of journalism needs to methodologically and theoretically focus on how circulation sustains and creates technosocial structures rather than just focusing on specific types of content.

2. Journalism and Circulation: from Newspapers to News Flows

The concept of circulation has often been associated with objects moving – either in circles or through networks of different kinds. Jörg Heiser has retraced the etymology of the term to the "metabolic distribution and redistribution of fluids and matter, implying qualitative and quantitative transformation via movement." From this original meaning, the term circulation in the 19th century became "linked to urbanization, the flow of populace and traffic in the city" before being applied to the circuits of money, labour and news (Heiser 2005, n.p.). Circulation thus stood for basically two forms of circular movement. In the original sense, an object or substance was seen to repetitively move through a point of origin or was propelled by a centrifugal force around a centre. During the

passage, the circulated object or substance changed, acquired new properties or transformed into something else. In the latter sense, circulation came to describe an endless and cyclical transmutation of forms (symbolic, artistic, commodities, labour) while the notion of an actual or assumed centre of force driving circulation receded gradually to the background.

In journalism, circulation traditionally refers to the physical distribution of newspapers, i.e. how many copies are printed and disseminated. The history of modern journalism is often associated with the gradual increase in the circulation of particular cultural artefacts, especially newspapers, across geographical space. But most newspapers were at the same time intimately linked to a specific urban setting and market. Through their close associations with urban communities, most journalists and editors were keenly aware that the distribution of newspapers had a social significance for the exchange and constitution of public opinions. The movements of the artefact were thus intimately tied to the circulation and the construction of meaning within the community of which journalists and editors were both members and outside observers. In many locations, the newspaper became the main object through which communities and publics were formed. Traditionally, this "text-based" community of readers and contributors to a newspaper (Warner 2002, 51) was a "kind of public that comes into being only in relation to texts and their circulation" (Warner 2002, 50). In the early twentieth century, the sociologist Robert E. Park made the obvious but important point that "[a] newspaper is not merely printed. It is circulated and read. Otherwise it is not a newspaper" (Park 1923, 274-275). Forming reading publics through the regular provision of printed news calls attention to the material object of the newspaper that is flexible and mobile enough to be inserted into an unlimited number of social contexts. Through the institutionalisation of the urban newspaper, Straw points out, the circulation of news gradually moves away from the "chance encounters" in "the chaotic unpredictability of urban life" to take the form of structured deliveries to households in "repetitive, bureaucratized routines" (Straw forthcoming; see also Boutros and Straw 2010). In light of more recent technological developments, the newspaper then appears as a "mobile-interface" for printed information (Sheller 2015, 13) that establishes certain conventions and cultural forms to distinguish itself from more quotidian practices of disseminating information and forms of knowledge. Publics begin to form in relation to the modern newspaper that now serves as a document of important knowledge and official information. As the profession of journalism begins to establish rules and guidelines to turn "less authentic types of knowledge" into news, information on the printed page becomes "more or less authenticated by the fact that it has been [published and] exposed to the critical examination of the public to which it is addressed and with whose interests it is concerned" (Park 1940, 679). News as a journalistic and narrative genre codifies both a 'politics' on the relevance of certain pieces of information (Schudson 1995) as much as it creates the

reading public in perpetual response to the cyclical provision of identical copies of printed documents. The circulation of news as a cultural form and the creation of publics as a social structure thus are written into and derived from the specific materialities of news journalism itself (de Maeyer and Le Cam 2015).

These established modes of circulation in journalism, and their underlying routines of news production continue to exist today. They correspond loosely to what Nerone respectively calls the "commercial public sphere" and the "expert public sphere" that came with the institutionalisation and professionalisation of journalism in the late 19th and early twentieth century (Nerone 2015, 191). With the emergence of a "networked public" (boyd 2011) or "networked public sphere" (Benkler et al. 2013), we arguably seem to witness a return to more chaotic modes of circulation, in which 'chance encounters' often structure interaction in diverse social settings. The "new forms of the public sphere" that are emerging at the intersections of various networks of actors, institutions and media outlets in many ways "straddle the modern divide between active and passive publics" (Nerone 2015, 191), a divide which was constitutive of the professionalisation of journalism in the early 20th century. Apart from the widely distributed forms of news that journalists continue to produce, news now also structures interpersonal information, e.g. through emails, blog posts, feeds, or tweets. News in this wider sense emerges out of processes that "blur the production, consumption, and distribution of news into a single [multi-directional] flow of ambient live updates of an on-going situation" (Sheller 2015, 20). At the intersections of different technological systems and networks of digital communication, users are embedding the creation, distribution and curating of news from a wide range of online sources in quotidian practices of communication. This shapes what Sheller calls "ambient news flows", the constant circulations of news that "re-situate how we understand where we are, who we are connected with, what our 'present' moment actually is. The now-ness of news, in other words, offers a new sense of the present" (Sheller 2015, 24).

Understandably, journalists are keen to tap into this constant news flow, using social media as an "awareness system" for upcoming stories (Hermida 2010) or as a means to access prominent (and less prominent) sources (Broersma and Graham 2013). Journalists, as a specific professional 'culture of circulation', now need to assume new roles in relation to their content and the audiences that connect to it (Bødker 2015, 112). But by integrally embedding content from non-journalistic media (e.g. social networking sites, syndication services) journalism is also coming to depend on resources that are beyond its own control. As Ananny argues in relation to networked news "those with power are increasingly technologists and advertisers—not journalists—whose platforms and commodifications control how and when news circulates" (2016, 12). The temporal and spatial circulation of journalistic news comes to be co-determined by processes outside the institutional settings of journalism itself, e.g.

through the availability of network bandwidth, the importance of search algorithms to find content and the pluralisation of outlets for advertising, which often enough infringes on the exclusivity of certain occupational roles and their respective fields of expertise (Rodgers 2015). Despite such developments in digital media and journalism, the "concepts of sender, channel, message and receiver are still the most common starting points for much journalism research" argue Sjøvaag and Karlsson (2016, 1) in the introduction to a recent special issue of *Digital Journalism* on research methods. To bypass this established set of analytic categories, we argue that the circulation of news should not only be restricted to occupational roles, institutional settings or professional values but also include a focus on the creation of social value across different networks of actors. Limiting journalism to its products, e.g. news, overlooks that journalists interact on a regular basis with a wide range of actors, many of whom are nowadays also communicating independently within their own 'personal publics' (Schmidt 2014). Seeking the social value of news only in the products of journalism (e.g. in the content of an article, in information about an event) misses out on the opportunity to regard journalism and its wider spheres of circulation as equal parts of a social structure that is newly realised in each new interaction (Raetzsch 2015).

2.1. The Circulation of News as Social Value

The new prominence of 'less authentic types of knowledge' now circulating online has created an urge to defend professional ethics and roles among journalists and journalism scholars alike (McNair 2013; Pavlik 2013; Meyer 2004). Quality and trust in journalism are regarded as important values both commercially and socially to sustain journalism in a dispersed environment of communication online. One key issue in this negotiation over value is the "professional-participatory tension" (Lewis cited in Carlson 2015, 11) that arises from the growing possibility of non-journalists to engage with journalism in equally public fashion. Comment sections of online news sites, now already in decline (Ellis 2015), were an early setting in which a "constant contestation [over authority]" between journalists and their audiences took place (Robinson 2015, 161). Following Papacharissi these comment sections can be regarded as "[l]iminal spaces … where journalists and citizens meet, to collectively shape a story" (2015, 37). Negotiations over authority and identity may indicate a "de-differentiation" of occupational and professional roles in journalism (Loosen 2015). Whether this is the case, is still subject to debate. Nonetheless, these negotiations between audiences and journalists signal that we need to shift away from seeing journalism mainly as an institution to seeing it as a "performative discourse" that is able to "simultaneously describe and produce social phenomena" (Broersma 2013, 33). Through this performativity of journalistic practice, we can highlight that journalism sustained in its varied historical forms and media of communication a

social structure between different types of actors – the public in the wider sense (Jones and Salter 2012).

The business of news has for a long time been about turning the immaterial or social value of news into monetary value. This model for news has become a lot harder to sustain with declining numbers of people regarding newspapers (even when they are digital) as necessary constituents of their own conversations. The percentage of people who discover news through social media first has risen from 2013-15 in all the countries measured in the *Reuters Institute Digital News Report* although there are still significant differences between countries (e.g. 20% in Germany and 48% in Brazil). The proportion of under-35s that discover news through social media is, in all countries, higher than for the over-35s, and the proportion of women is, again in all countries, higher than the proportion of men, who use social media to discover news (Newman et al. 2015, 76). Exposure to news is more and more tied to an immediate social environment, as a sign of embedding attention to public affairs with interpersonal communication on a regular basis.

Elisabeth Bird points out that "news is received and circulated almost constantly – even more so today with the rise of social media" (2011, 490). User practices of engaging with journalistic and other types of content become a lot more apparent and transparent, as they are objectified as comments, links or likes. A lot of meaning-making that had been taking place outside the media is nowadays increasingly mediated as well: "Previously most people's commentary on the media was lost in the ether – a shout at the television, a scrawl in a book, a remark to a friend. Now our commentary is automatically archived and made visible online" (Couldry 2012, 54-55). Digital traces of online interactions feed databanks with detailed records of user behaviour, preferences and social connections. Traces of 'chance encounters' are becoming "extractable as data" (Beer 2013, 17) as more and more "objects ... capture data about their use" (Beer 2013, 18). Interactions between users become structured by a "variety of practices that blend news co-creation with social practices of sharing" where journalistic stories are embedded within other modes of storytelling in "affective news streams" (Papacharissi 2015, 28). Whereas the newspaper (print or online) was and is a fairly fixed container of circulation, personalised news streams fuse the circulation of content with the creation of social meaning. The combination of "news reports with emotionally filled and opinionated reactions to the news […] makes it difficult to discern news from conversation about news" (Papacharissi 2015, 32). This new hybridity of information, circulation and commentary makes news streams on social media "affective" in the sense that they "emerge out of collaboratively generated flows of information" (35). Social media are used as a "commentary filter", as a "hybrid between earlier informal retellings and repetitions […] and published commentary within journalism" Bødker (2013, 213). The distinction between circulation as the movement of artefacts and circulation as a process of

constructing meaning is further blurring in such media environments in that the artefact (e.g. the article) now often circulates with comments attached to it (as meta-text), which is somewhat different from newspapers circulating and being talked about.

The new quotidian practices of circulation attract the attention from media institutions and academics alike. Jenkins, Ford and Green have introduced the term "spreadable media" to develop a "hybrid model of circulation, where a mix of top-down and bottom-up forces determine how material is shared across and among cultures in far more participatory (and messier) ways" (2013, 2) than was possible in the era of broadcasting. Circulation in the context of digital and networked media means to understand how meaning is created through the interaction of social networks, artefacts and media texts (Jenkins et al. 2013, 35). Sharing and commenting become intricately linked to a "culture of connectivity" (van Dijck 2013) and sociability itself (cf. Hermida 2014).

On the level of digital code, a circulated artefact can be detached from its original location or context, "converting information that has distinct spheres of circulation into a homogeneous, commutable format" (Raetzsch 2015, 69). An article or just parts thereof can be remediated and recombined endlessly, just as images, database entries, tweets and posts can be copied and republished instantaneously in various platforms with an ever growing reference scheme of links keeping taps on the changes occurring every second on a global scale. The link-based economies of digital circulation trigger new assemblages of objects, meanings and social actors. What emerges out of these economies, then, are new "cultural forms", to use a term employed by Gaonkar and Povinelli (2003). On the basis of digital encoding, symbolic content, which previously existed only in a limited, material form and sphere of circulation, can now acquire new "edges" through metadata, syndication and linking. Following Straw, we can perceive of these edges as "constitut[ing] the interfaces of cultural artefacts with human beings and other forms" (Straw 2010, 23). Such edges are now an integral part of the practice of journalism itself, as likes, tweets, RSS feeds and news alerts become embedded in the production and circulation of journalistic content. But through these same technologies and protocols of digital circulation the previously ancillary practices of audiences in debating, referencing and circulating content – whether journalistic or not – sustain a now quotidian "communicative performance of endless distribution and flow of media texts and images" (Sumiala and Tikka 2011, 147; see Aronczyk and Craig 2012). This communicative performance of individual actors can include original creations or the remediation of texts (blogs, photo collage, mash-up, remix, wiki), where the "distributed texts, images and symbols are a material site of the exercise of circulation" (Valaskivi and Sumiala 2014, 232-233). Circulation here designates a process of creating social value that is intimately linked to its modalities of communication, i.e. the digital encoding of content coupled with the ability to trace, store and reconnect content,

actors and resources across different platforms. In the following section, we want to address these modalities of digital circulation through the concept of the communicative object in order to foster methodological innovation for the study of journalism and its publics. We here agree with Kitchin et al. who argue that "much more research needs to be undertaken with regards [sic] the social and spatial processes by which knowledge circulates and mutates through social media, *its intersections with other fora such as broadcast media*, meetings, classrooms, pub talk, and so on, and how tokens of credibility, authority and reputation are recast and negotiated" (Kitchin et al. 2013, 100, emphasis added).

3. Communicative Objects as Cultural Forms

On January 7, 2015, the French graphic designer Joachim Roncin (@joachimroncin) created an iconic image and posted it to his Twitter profile. Only an hour after terrorists had attacked the satirical weekly Charlie Hebdo, Roncin's image captured the feeling of speechlessness and solidarity with the victims. Using the typeface of *Charlie Hebdo's* cover page, Roncin put just three words on a black background: Je Suis Charlie. Seven minutes after Roncin's image had appeared on his profile, Thierry Puget (@titi1960) used the image and added the hashtag #JESUISCHARLIE (Beech 2015). In the two weeks after the tag had occurred, it was used roughly 5 million times on Twitter.[1] In the hours after his image had gone viral Roncin was busy replying to other users and journalists, asking whether they could re-use his image. He replied "yes and we have to" (tweet by @joachimroncin, January 7, 2015; 20:54:58). Roncin's image appeared first online but in its most notable manifestations, the image was taken to the streets by people all over the world. The image was printed and adapted, appearing in different forms in shop windows and on social media profiles, on cars, as projection on walls and even in the source code of software.[2]

The example of *jesuischarlie* shows very clearly the dynamics of circulation that we address in this paper. Parallel to the reporting of the events of January 7 in journalistic media around the world, the image and hashtag from single users of Twitter created "ad hoc issue publics" (Bruns and Burgess 2011, 7) for the event. Through their digital circulation, the tag and the image became manifest objects through which an evolving public discourse and response to the events took shape. Our aim in this section is to use the example of #jesuischarlie for a theoretical elaboration of our concept of the communicative object. By using the term object, we do not mean to "objectify" or simplify the social process-

[1] Estimate created by the app Sifter on Texifter.com for the hashtag #jesuischarlie occurring between Jan 7 and Jan 21, 2015.

[2] See https://en.wikipedia.org/wiki/Je_suis_Charlie for examples.

es in which meaning is created. In contrast, we regard communicative objects in their duality as both *digital objects* (e.g. Roncin's image file, Puget's tweet, the hashtag #jesuischarlie) and as *epistemic objects*, as a stage in the process of circulation, where both form and meaning become temporarily fixed by certain actors to sustain particular aims. We adopt this dual viewpoint to understand how the materialities of digital communication are tied up with and are now often constitutive for social processes of interpretation and meaning making. The concept of communicative objects emphasises that digital circulation relies on the meta-textual description of digital data (metadata), which creates the edges for particular objects to be copied, linked or remediated. In turn, circulation creates on the cultural level a form of epistemic object, an object of knowledge that emerges from the temporal layering of references and links between actors, content and platforms.

3.1. Communicative Objects as Digital Objects

At first sight, digital circulation seems to warrant a distinction from analogue circulation. In journalism, the number of copies of a newspaper or the number of viewers of a television program was and is often used as a key figure to determine circulation. And this remains the case in many branches of the media industries, which rely on advertisers for a large share of their profits – whether they are traditional journalistic ventures or social media platforms. With digital circulation this production of identical copies of a single artefact has even become much easier, which makes it difficult to posit a difference between digital and analogue on the basis of the materialities of media production or distribution. But what we believe distinguishes digital from analogue circulation is the prominence of links and metadata – descriptive data about data – which create a referential layer of information *in addition to* what is manifest as content. As Rogers and others argue, links are "natively digital objects" (Rogers 2013, 19) and were a central innovation in the development of the first HTML standards for websites (Berners-Lee and Fischetti 2000). When we encounter 'text', 'image' or 'video' in digital media, these media forms are universally encoded digitally, but in addition, are endowed with meta-textual elements such as tags, links and other descriptors.

Hui argues that digital objects are experienced on the user side in similar ways as "natural objects" e.g. objects perceived in space. Despite the sensory deprivation and privileging of the visual sense in computer-mediated communication, the construction of digital objects through code is effectively obliterated by means of graphic and interaction design: "Digital objects appear to human users as colourful and visible beings. At the level of programming they are text files; further down the operating system they are binary codes; finally, at the level of circuit boards they are nothing but signals generated by the values of voltage and the operation of logic gates" (Hui 2012, 387). The complexity of the technological lay-

ers involved in digital circulation has, however, little importance for assessing how users experience digital objects, because their experience is structured around a flexible and continuous responsiveness of digital systems to input: buttons are 'clicked', a line is 'drawn' and appears on the screen, a tweet is 'sent' and appears in another user's feed only milliseconds later. Hui points out that "one fails to see the whole landscape if one simply understands the digital as only a 0 and 1 binary code; rather, one should grasp the digital as a new technique to *manage data in comparison with the analogue*." (ibid. 387, emphasis added). Instead of insisting on a rupture of the digital with the analogue, Hui regards the digital as an additional descriptive layer of our quotidian world, in which new social practices in conjunction with technological systems become possible. In comparison to natural objects, digital objects can become more "concrete" as more and more descriptive attributes are added through metadata, creating new possibilities of connecting, circulating and transmuting such objects: "When there are more digital objects, there are more relations, hence the networks either become larger or new networks are actualized" (390). Endowing objects with enough description to make them mobile and readable to machines is what Hui calls the "datafication of objects" (389). What seems trivial from the perspective of user experience (seeing and finding an image online, reading a tweet) is based on standardised descriptions of data across different platforms, groups of users and computer systems. A hashtag found on Twitter like #jesuischarlie is significant insofar as it functions as a descriptive metatext, which allows for different tweets to be aggregated from various users, while it is at the same time also a form of content, which is embedded into the grammar of the message.

In journalism, the *rNews* metadata framework was developed to describe in a structured fashion types of information and relations between them that were logically unreadable for machines when presented in the narrative formats of journalism (Raetzsch, forthcoming). Although a human user may know that "Omaha" is a CITY and that Barack Obama is a PRESIDENT of a COUNTRY called "United States of America", such categories and relations need to be defined by metadata to enable subsequent digital operations. A search query like "PRESIDENT in CITY on DATE" requires a prior definition of what type of information in a narrative journalistic text will qualify as data for each of the three categories. A sentence like "The president visited Omaha yesterday" is replete with contextual information that is not usable for calculation when it is presented in narrative form. A tweet containing only the hashtag #jesuischarlie is not meaningful in itself, unless a lot of contextual information is available. The same definition of information through metadata – what is commonly called *semantic web technologies* – applies to new forms of communication like tweets, wikis, or blog posts. Researchers in the social sciences and those employing "digital methods" typically take advantage of the high level of structuration in web and social media data for auto-

mated data retrieval and scraping of online sources. While it is easier to scrape all posts from Twitter containing a particular term or tag, the challenge for researchers is to understand in what functions and social relations a retweet, for example, is used as an endorsement, as a criticism or in an effort to build social networks.

To summarise, communicative objects as digital objects are distinguished not primarily by their different form of encoding but by the possibility of assigning metadata, which creates new edges. These structured ontologies of describing properties of data allow for the calculation, storage, and circulation of content across platforms, types of software and hardware, and open up new possibilities for social science to use automatically retrieved data as sources for investigations of digital circulation.

3.2. Communicative Objects as Epistemic Objects

The digital side of communicative objects becomes apparent when we consider single objects, e.g. a post on a website, a tweet or simply an entry in a database. Links to this object can proliferate around the web and social media. Because the description of the object remains stable, e.g. through a link, we can retrace circulation as the proliferation of links in a variety of contexts. The link thus functions as an indicator to wider cultures of circulation, to social networks in which a given object is endowed with particular meanings and can fulfil very different functions. In digital circulation, however, the objects themselves are also changing and proliferating, being remediated, adapted, and connected by social actors. Objects appear much more prominently as instances of on-going and constantly evolving processes of communication and negotiation. When an image like Roncin's appears in journalistic reports, it simultaneously exists in other users' profiles and feeds, is printed and handed out at demonstrations, thus assuming a variety of material forms that are often remediated to the digital, e.g. through photographs uploaded to individual profiles on social media. We thus begin to see that communicative objects do not have fixed identities, but are part of a continuum of on-going cultural interpretation and production that functions as a permanent contestation of what it means to live in the present. Not least because of the enhanced possibilities to track and trace journalistic reporting over time, we are beginning to realise that each journalistic object in circulation (an article, an image, a video clip) is merely an instantiation of meaning-making processes that take place across a wide domain of actors – in journalism and society as a whole. The novelty here is not, that these processes are taking place, but that our awareness of them is now considerably more pronounced as links and references are made explicit in digital circulation and subsequent aggregation. We propose to regard communicative objects not only as digital objects but also in their function as "epistemic objects", a term that was originally coined by Karin Knorr-Cetina to describe practices of knowledge creation among scientists.

In her article *Objectual Practice*, Knorr-Cetina argued that knowledge production in science needed a relational approach to practice, in which the connections of subjects and objects could be captured reflexively. She underlined that objects of knowledge were always rather markers in a continuous process of research than fixed entities. Epistemic objects were defined by a "lack in completeness of being", functioning more "like open drawers filled with folders extending indefinitely into the depth of a dark closet" (2001, 190). In contrast to seeing such objects as internally defined and externally limited, Knorr-Cetina argued that epistemic objects are "always in the process of being materially defined [and] continually acquire new properties and change the ones they have" (ibid.). Epistemic objects are stages in a sequence of communicative acts that involve the transformation of stocks of knowledge, references and shared meanings. Epistemic objects thus have an "unfolding ontology" (ibid. 196) in time and are "meaning-producing and practice-generating" (ibid. 192). Knowledge production constantly reintegrates and questions what is already known, formulating concepts and theories that are instrumental for a given question but that more importantly serve to generate new questions. In science, Knorr-Cetina argues, the designation of an epistemic object like a theorem or a neuron "is not an expression and indicator of stable thinghood" but rather an attempt "to punctuate the flux" of constantly shifting stocks of knowledge and "to declare them as pointing to an identity-for-a-particular-purpose" (ibid. 193).

From this conceptualisation of the communicative object as an epistemic object, we can draw important parallels to journalism. Similar to the creation of knowledge in science, journalists provide to a certain degree – and with less theoretical and methodological rigour – preliminary interpretations of present events and developments as they unfold. The objects that journalists circulate have the character of an unfolding ontology meaning that journalists struggle to establish meaning about events as they unfold, while reacting to what is already known and what others are saying at the same time. In this sense, news as a narrative form "conventionalizes" events and "rewrites history for immediate popular consumption" (Langer 1998, 20-21). One of the core tasks of a journalist is to determine in what ways events or developments are significant for his or her readers, why they matter and what the consequences may be: "To ask 'Is this news' is ... to ask 'Does this mean anything?'" (Schudson 1986, 84). Designating particular events or issues by names and keywords is a central journalistic practice to ensure that a 'story' is continued and can be followed by audiences. In digital circulation, the designation by name or special terms is now a widespread, quotidian practice, which in turn exemplifies how the exclusivity of journalism in determining public relevance is under siege. The hashtag and image of #jesuischarlie became synonymous with the public response to the terrorist attacks in Paris but they were not the creations of journalists. With communicative objects as epistemic objects, we see processes of meaning creation unfold, under-

stand how a given meaning emerges in response to particular events by following the adoption and recirculation of given objects by different actors.

3.3. Communicative Objects in Digital Circulation

To theorise digital circulation in relation to journalism, we have proposed the concept of communicative objects. Our main aim was to understand in what ways the materiality of digital communication can be related to a reconsideration of the social processes of negotiations over meaning that occur publicly in web and social media. The particularity of the communicative object as a digital object consists in its capacity to accumulate rich descriptions, either through metadata or links from different sources. This descriptive layer allows for the emergence of new social relations, which are often only momentarily stabilised, and which expand well beyond those established categories of journalists and their audiences. By focusing on objects, rather than discourses or networks, we maintain the central theoretical premise of Lee and LiPuma (2002, 192) that cultures of circulation are "created and animated by the cultural forms that circulate through them, including – critically – the abstract nature of the forms that underwrite and propel the process of circulation itself". In digital circulation, communicative objects appear as temporarily and materially defined cultural forms, which sustain the continuous (re-)production of social relations on the basis of content shared by actors across platforms and networks, both inside and outside journalism. Communicative objects as digital objects can be connected, transmuted and reactivated, creating sequences of communication between different actors over time. As layer upon layer of objects and references accumulates, a technologically simple object like #jesuischarlie can assume a history of meanings across very different sets of actors.

Far from objectifying social processes, the communicative object in digital circulation should be seen as a manifestation of the dual technical and cultural constitution of meaning where primary agency is ascribed neither to technology nor to users alone. The challenge for researchers in this environment is to develop methodologies that can capture the unfolding and potential unpredictability of the emergence of communicative objects. Not surprisingly, the development of digital methods has proven that on the basis of user data we can research social processes rather than treating data as stand-in for such processes (Rogers 2013). But an overt focus on data itself risks to exaggerate the statistically significant (top ten users, most active sites, most tweeted messages) in comparison to the less significant but equally important cohorts in a dataset. Taking circulation seriously as a critical theoretical and methodological concept will require an integration of statistical and qualitative methods in order to grasp how objects emerge constantly at the intersections of social networks and computational routines (Gillespie 2014). Modelling such temporalities of

circulation between different actors, platforms and data formats will be a central challenge for innovating methods in journalism studies.

4. Conclusions

This paper has pursued two interrelated goals: I) a description and discussion of how digital circulation can be understood in relation to journalism apart from its established association with distribution, and II) a theorising of digital circulation through the notion of communicative objects. In the conclusion, we want to outline a few suggestions as to what these considerations imply for journalism studies.

A first consideration addresses the increasing complexity of the processes through which the publics of journalism are formed. While journalism never had just one public the various possibilities and practices of digital circulation create an intricate, fluid and 'messy' image of how publics are formed, interact and confront each other over the definition of 'now-ness' (Sheller 2015). The exclusivity of journalism to speak with authority on behalf of a wider public is in many areas of social life waning, as users prefer to connect directly to sources they deem relevant. A related issue here is whether and how journalists connect to their own publics. Frequent interactions on many levels of intensity mean that journalistic texts and meta-texts are accumulating as communicative objects in their own right, texts which can be re-activated and re-contextualised later on. Such processes of (re-)circulation mean that journalists and their institutions are becoming increasingly aware of the life of their work, as well as their own role in its creation. Neither the "continuous present" of news journalism (Schudson 1986, 86) nor the "permanent amnesia" of journalists (Bourdieu 1998, 72) are certain any more, as algorithms define what is new and relevant and databases store any snippet of exchange for later retrieval.

For journalism studies circulation poses some of the same challenges as it does for journalism. Scholars and practitioners alike are increasingly focused on mapping the trajectories of communicative objects and understanding the public spheres that they create and sustain. Integrating an understanding of the processes of digital circulation with the social and cultural processes of meaning-making urges us to come to terms with the duality of communicative objects, as both technological and cultural forms. But developing methods for the study of communicative objects requires the acquisition of knowledge and skills that neither journalism scholars nor journalists have traditionally mastered. While the meaning of news has always been linked to their specific mediation there has been a tendency in journalism studies to push aside the meaning of form. Given the increasingly varied mediated forms of digital circulation such a neglect is increasingly difficult to defend.

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Tarleton Gillespie, Pablo J. Boczkowski and Kirsten A. Foot (eds.)

Media Technologies. Essays on Communication, Materiality, and Society, Cambridge, Massachusetts, The MIT Press, 2014, pp. 326

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One of the most recent and emerging strands in STS is the encounter with media and communication studies (media studies from now onwards), which also inspires this *Tecnoscienza* special issue. Such a fascinating and not linear encounter is concerned with looking at (new) media and mediation as technology–based, an inextricably material and not only symbolic process.

Beside coining a new term which identifies an emerging field of theoretical and empirical research, *Media Technologies. Essays on Communication, Materiality, and Society* proposes a multiplicity of sites and sights to look at the convergence and interconnection between materiality of artifacts, practice and politics on the one hand; meaning and discourse on the other. Actually, the various book chapters represent and account for a number of intersecting paths traceable between STS and media studies, making media technology a field of "hybrid" scholarship.

Gillespie, Boczkowski and Foot assemble a book whose format (essays plus commentaries; workshop devoted to build up a collected volume) is overtly inspired to an STS classic seminal work (*The Social Construction of Technological Systems*). The editors aim to question and overcome both the technological and the "socio-cultural" determinism, which inspired and characterized the field of media studies, especially the mass media but also, due to the mimicry occurring when innovations enter the stage of public discourse, early new media studies. On other hand, dissatisfaction with both technological and social determinism constituted the primary trigger for the emergence and consolidation of STS as a field.

By addressing the materiality of mediation as well as the social practices and meanings which sustain media technology, both the editors and the contributors of the collection engage with shifting from the binary discourse of media/technology impacting on society (and vice versa) to the multiple arrays and articulations of the material, the social and the cultural and their "concurrent realities", as Brunton and Fenton describe them in their chapter on hardware, infrastructures and superusers.

Overall, the collection accounts for the decreasing invisibility of technology in media studies and of media in STS, a path which starts and burgeons with the emergence and configuration of information and communication technologies, especially the rise of the Internet and digital social media.

The account starts from theoretical and epistemological reconstructions of the two fields (STS and media studies) and the ways they engaged

with materiality of technologies and media, as broadly illustrated by Leah Lievrouw. Her analysis points out how materiality has been addressed but not sufficiently articulated in media studies, and that the prevailing orientation towards meaning-making and socio-cultural dimensions still forces materiality to the margin of the field, which she qualifies as "an unfinished project" (24).

While emphasizing that there is no necessary equivalence between technological determinism and materiality, even if the two issues tended to overlap over time and studies of media and technologies, the whole book tries to argue and show that materiality does not exclude reference to texts, content, meaning, cultural forms and public discourse. These dimensions enter the STS stage in multiple ways and connecting them to materiality is one of the ambitions of the encounter and hybridation between STS and media studies.

Boczkowksi, a pioneer in bridging STS and media studies through his research on online journalism, and his co-author Siles attempt to go beyond the finished and closed provinces of established scholarship in media research, steadily identified by two binary frameworks: production/consumption and content/materiality. The two authors propose to adopt a cosmopolitan sensibility to go towards transdisciplinary analyses of the whole life cycle of media technologies.

In fact, focusing on materiality and doing it at the crossroads of STS and media studies means to address the specificity of media technologies which "are about the linkages between the symbolic and the material. That is, all technologies have a symbolic dimension, but media technologies have distinctive, material capabilities to embed, transform, and make accessible symbolic content (….)" (10).

The various chapters of the book focus on different parts of such linkages. Editors and contributors share the aim of overcoming barriers and fences which separated content from materiality (technology/medium), production from consumption, design from use, practice from discourse and so on.

The result is a material shift or material turn in the analysis of media technologies that configures the concept as very hybrid, heterogeneous and not univocal. Materiality is something which goes deep into the installed basis of technology and infrastructure, "close to the metal" (Brunton and Fenton); it is something which demands care, maintenance and repair: ordinary but not trivial practices, crucial and inextricable sites of innovation as world breaks down continuously (Jackson). And it can be retrieved even in apparently "abstract" concepts such as positive and negative liberty, which play an unexpected role in shaping the history of computing beyond its most popular (libertarian and utopian) versions, as shown by Kelty.

Beside the main focus on materiality and the material, few other concepts seem to bridge the diversity and variety of encounters between the material and the symbolic, production and consumption, design and use,

local practices and public discourses presented in the book. In particular, it is crucial the concept of infrastructure, both in an implicit and explicit way, starting from Lievrouw's model of mediation as a tripartite infrastructure constituted by artifacts, practices and social arrangements (and corresponding processes of reconfiguration, remediation and reformation).

Brunton and Fenton look at the material, social and discursive dimension of infrastructures such as Anonymous movement and Spam emergence and management, getting close to the hardware components which are necessary but not sufficient to understand infrastructure itself. Of course the concept is of the greatest importance to Bowker's analysis of academic knowledge and databases, and his concern about massive, mass-produced and standardized data whose main model of circulation is still the single-author paper.

Jumping (infrastructural) contexts is the key of Downey's historical, STS-oriented research on information labor in early electrical media and organizational technologies (telegraph, stenograph and libraries) which shows how networking characterized other new media of the past, well before what we refer to as digital and social media today.

Both Gillespie and Jackson, respectively looking at algorithms and repair, deal with different infrastructural dimensions. Gillespie shows the inextricable opacity of algorithms, an automated and legitimized mode of knowledge (a *logic*), which constructs public relevance and calculated publics, more and more in competition with an editorial model of knowledge (traditional, expert-based journalism). The installed basis of algorithms as infrastructure stays opaque, never fully accountable to users and even providers. Jackson unveils the deep and hidden power of repair practices, usually neglected in the study of innovation, indeed crucial to change and transformation of the world we inhabit as subject to continuous breakdown and restoration, which call for sustainability and ecological issues in infrastructures and beyond them.

In sum, it can be said that infrastructure, consistently with its etymology (*infra* means in-between) constitutes a central bridge to put STS and Media Studies together, not as a juxtaposition but as a combination, hybridation and reciprocal fertilization/openness (in Boczkowski and Siles' terms, a "cosmopolitan" approach or (in)sight).

Another *fil rouge* which can be traced is constitutively linked to infrastructure, namely invisible work and opacity/ambivalence of knowledge (Brunton and Fenton; Bowker; Downey; Gillespie; Jackson). As a counter-part, there is a visible and publicly relevant work, that of mass-media, techno freaks, gurus and politicians in associating new technologies and media with ideas of freedom and liberty, in both overt and implicit forms, as Kelty points out in his illuminating chapter on media, technology and political theory.

The scope and range of research in media technologies presented is very broad; both contemporary and historical cases are analyzed. Continuities and contradictions of knowledge and media infrastructures are

pointed out, e.g. the centrality of human labor for networking (Downey) and the opposite (complementary) automation of algorithms (Gillespie).

The fertile encounter between STS and media studies is evident through concepts like information labor (vs media broadcast/production); power users or superusers (vs designers/users); calculated publics (vs media audience). Such concepts emerge exactly from media technology as a cross-field convergence.

The book as a knowledge enterprise attempts to re-think about given classifications and infrastructures of disciplinary knowledge in two fields of established scholarship (namely, STS and media studies). As such, it is very much attuned with an STS sensibility, summarized by concepts like "mutual constitution", "co-construction" and "heterogeneous networks".

Indeed, as a scholar trained in Communication Studies then focused on STS, my critical remark after reading the book is that it embraces more of STS lessons than of Media Studies, despite the declared aim to make the two fields fertilize each other. This is an outcome that can be interpreted in different ways– it could be Media Studies scholars are more open "to be hybridized", or more cosmopolitan than provincial in their scholarship. It could also be that this STS-driven hybridation is the inevitable result of electing heterogeneous materiality (in an STS vein) as the starting and entry point of most contributions to the volume.

However, this leaves the main merit of the book untouched. It soundly succeeds in showing that materiality matters and is there, going beyond and against the resistant myth of immateriality and de-materialization as univocal, irresistible hallmarks of digital media technologies, eventually bringing the myth itself in the picture and connecting it to wires and cables.

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Nick Couldry

Sociologia dei nuovi media. Teoria sociale e pratiche mediali digitali, Milano, Pearson, 2015, pp. 288 [italian translation of *Media, Society, World. Social Theory and Digital Media Practice*, 2012]

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One of the most interesting debates in the field of Media Studies is about which role social theory plays. This debate stems from the critique of postmodernism and the disappearance of the social that usually afflicts cultural studies and thereby Media Studies. Trying to solve this problem, Nick Couldry makes a very delicate as much as fascinating intellectual move: the proposal of a socially oriented media theory (9). This proposal

is very important from different points of view. Moreover, it is especially relevant that such proposal can find his way into the Italian debate about Media Studies thanks to this translation of a work of one of the most interesting authors of the great Media Studies' school deriving from the researches of David Morley and Roger Silverstone.

Couldry's proposal is very important, first of all, because media in social theory have always had a marginal role, usually considered as a useful addendum of wide social processes. A demand for a sociology with the media, and not anymore – or not only – a sociology of the media, is emerging more and more, in the same way in which, within the tension between culture and society, there is the need of a cultural sociology and not simply a sociology of culture (Alexander 2003). Secondly, the need to use the ability of social theory to go deep into media processes is getting stronger and stronger, because the study of media never has had the social theory it deserves.

In order to outline this socially oriented media theory, Couldry tries to define a social ontology based on two key concepts: the social practices and the media. The centrality of social practices makes the point inside the current debates on the importance of social phenomena considered as tools people use to makes sense of the world. Couldry is aware of the limits of a solely performative approach, thereby he uses as a theoretical support the Actor-Network Theory of Bruno Latour and John Law to describe in which way social practices become stable and acquire an ontological solidity (56). From this perspective, the idea of considering mobile apps as a way in which this stabilization process works results interesting (57). Going further in this analysis, Couldry tries to make a taxonomy of the practices distinguish between simple forms – "searching", "showing", "presencing", "archiving" (57-69) – and complex forms: "keeping up with the news", "commentary", "screening out," and "keeping all channels open" (69-74). In this continuous research of a social ontology, media are considered as a universe of social practices (59) that became important thanks to what Couldry calls "the myth of the mediated centre" (88). According to this point of view, society would be constituted of a core of truth, a natural centre, and the media would have a privileged relationship to this centre. This privileged relationship is transformed in a series of media rituals namely condensed forms of action reinforcing the myth of the mediated centre (89). Following this argument, the media are neither artifacts, nor languages, but rituals or schematic actions recognizable in their variability (94), organized around categorical differences – like Durkheim's distinctions between sacred and profane. A classical example in this sense is the concept of the "media event", that from being exceptional – following Dayan and Katz's (1992) definition – becomes ordinary (103). To demonstrate how rituals and their categories are understandable in a wider social landscape, Couldry makes a detailed analysis of the celebrity culture (105-110).

Once described the key elements of his original social ontology, the

discourse begins to tackle some of the delicate issues of cultural studies.

The first is undoubtedly the question of the power of the media, a central theme of media studies. Keeping up with the tradition of cultural studies, the power of the media's concept is intended as symbolic power (115), however, in order to maintain the centrality of practices, power is defined as control of a property built by the media themselves. The concept used here is that of "hidden injuries" (118-123), or that sensation of absence created and resolved by the media themselves using the idea that only what appears in the media has value (119). Once Couldry has clarified the hidden injuries concept, the chapter analyzes one of the most studied issues in media studies, with relevant sociological consequences: reality media, their potential to cure the hidden injuries (126), to exercise pedagogical authority and to create social facts in their own image (131). Through this hypothesis, Couldry is able to describe in term of symbolic power the phenomena of celebrity and perceived criminality, as well as the role of gatekeeper played by search engines.

The second question is the relationship between political power and the internet, a great classic in the field of internet studies. The analysis begins with a critique of scholars considered as canonical for this issue: Henry Jenkins and his concept of convergence culture (2006), Yochai Benkler and his idea of commons-based peer productions (2006), Manuel Castells and his analysis based on the dichotomy between the net and the self (1996). What remains of this critique is the definition of the relationship between political power and the internet along three axes: the authority (as political legitimacy), evaluation (assessment of politics) and framing (the world built by politics; 156). From these results, Couldry begins a description of the impact of the digital media on new political actors, how the former can help the latter to have a role in the political debate intended as a form of organized (democratic) power, and in which digital media cannot change well-stabilized trends as the scepticism of young people towards politics.

Couldry's discourse starts to show its limits when he discusses the issue of media culture and media ethics. Media cultures are seen as ways in which media are appropriated by non-Western cultures. At the root of this process there is the idea that media cultures are thickenings of translocal processes that are locally specific (211-212). In order to understand why there is this process of thickenings, Couldry uses the perspective of needs. Media cultures are shaped by a variety of needs such as economic, ethnic, political, religious, social, leisure and recognition related ones. Considering that the variability of media cultures is based on needs is a quite serious limitation, firstly because this idea – classical in Maslow's theory and in the uses and gratifications approach – lets the concept of social structure come back, making the explanation based on practice weaker, secondly because the list of needs is confusing and the categories ought to be mutually exclusive – how can we distinguish the political need from the need of social recognition?

The media ethics is another major weakness of the book. Despite the attempt to take distances from the ethics of journalism (245) and despite a fine discussion of the difference between the ethical systems of Kant and Aristotle, media ethics is intended as an ethical act with media, or media as ethically significant practices. This approach would not be a problem if it were not translated into an ethic of communication, which is something completely different. The question addressed is therefore articulated in the terms of what are the virtues that help to make good media practices. The response is: accuracy, sincerity, caring and knowing what injustices to avoid. However, nothing is said about the consequences of the embedding of values in technological artifacts, such as – for example – the value of sharing on social media platforms such as wikis. The great limit is that Couldry is not talking about the media ethics – in which way the media are shaping the values – but about media morality – what is a good and bad behaviour – and this is an important misunderstanding.

Couldry's work is very important for two different reasons.

The first reason is that it is an attempt to build a social ontology which refuses both realism and radical constructivism, so that it does not lose sight of the importance of processes such as the institutionalization that goes beyond individual practices. In fact, as for cases related to institutionalization, Actor Network Theory as well as a systematic recourse to Emile Durkheim (1912) are used, despite in the preface a reference to David Morley and Roger Silverstone works was promised.

The second reason is related to the fact that the book shows the need to rethink the centrality of media within social processes, knowing that today it is impossible to think about social processes detached from the role of media.

However, the excessive consideration of mass media – mainly television and print – against social media can be considered a limitation of Couldry's discourse. The technological component of social media is certainly not a circumstantial element, so that it is the point on which Science and Technology Studies would have a say, especially in relation to the social component and the link with the values associated with the use of technology.

There is also an unexpected value of the book. His constant reference to the British media culture, television and the internet, makes perfectly understandable the cultural context in which one of the great recent technological dystopian television series like *Black Mirror* (Charlie Booker, Channel 4, 2011-2014) was conceived.

Despite the mentioned limits, which in any case provide relevant grounds for reflection, it is necessary to underline again the value of the introduction of this book within the Italian debate. Mainly for two reasons: a) first, methodological ones: the attempt to bring STS and Internet studies closer to media studies carried out by Couldry has the merit to create a dialogue among different research traditions which, although share a common ground, are now extremely specialized sectors and, ex-

cept for media studies, they also find it hard to get established in Italy; b) secondly, theoretical ones: contemporary society is heavily constructed also through media, however, often the issue of the ontological status of communication and of its media technologies does not receive the attention it deserves, especially in Italy where the reflection on communication intended as social fact is very much influenced by the reflection on cultural industry.

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David Novak and Matt Sakakeeny (eds.)
Keywords in Sound, Durham, Duke University Press, 2015, pp. 272

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Sound studies is a newly emergent interdisciplinary field. *Keywords in Sound* is an attempt to address some of the foundational debates underlying sound studies as well as provide thought-provoking essays on different topics to do with sound. The theme if anything is anthropological: to capture sound in its multifaceted nature globally and historically and to get away from and challenge the rather narrow conception and examples of sound prevalent in the standard Western canon. This is a promising approach. Even an entry on a staid topic like "the Body" is given new resonance through Deborah Kapchan's essay which describes a sufi singer in North Morocco and how she experiences her sounding body. In this rendition sound becomes part of a new turn to ontology. The ontological turn and posthumanism indeed provide the sounding boards for many

contributors.

The pedagogical idea of the volume is also a good one: to force individual contributors to take examples from their own work and push on the example to engage with some of the critical points of discourse swirling around sound studies. So think more Raymond Williams "Keywords" on culture than some sort of lexicon of definitions and explanations of useful terms. It is more a book to think with and teach with than to give to people as an introduction to the field. It is a book to place in dialogue with the major works in the field.

Many of the central figures in sound studies such as, Steven Feld, Mark Smith, Tom Porcello, Jonathan Sterne, Stefan Helmreich and Charles Hirschkind have contributions. Authors who have carried out major studies such as Tara Rodgers, on female contributions to electronic music, Mara Mills on sonic technologies and disability, David Novak on Japanoise music, and Tom Rice on stephoscopic listening are also contributors.

The major terms at the core of sound studies that one would expect are there, such as "acoustemology" (a beautiful essay by Steven Feld on its importance - and in only 10 pages!); "noise" (David Novak of course), "silence" (a beautiful essay by Ana Maria Ochoa Gautier), "listening" (Rice), and hearing (Sterne). Strangely absent is Murray Schafer's term "soundscape". Although that term is today heavily criticized (as Novak and Skeeny point out in their introduction), it is still surely worthy of an entry. New terms such as "transduction" (Helmreich) gain truculent attention. Also familiar terms such as "echo" and "resonance" are reworked in interesting ways. Marc Smith explores echo as a way of thinking about how sound does or does not appear in historical writing. Veit Erlmann takes almost the opposite tack and offers a genealogy of "resonance" on the borderlands between philosophy, science and the humanities.

Readers of this journal will be a bit disappointed in the lack of sonic technologies explored. Radio and phonography are covered but if the goal was to make keywords resonate with the sonic experiences of today's readers, it is odd that there is little on the sonic devices and experiences that animate todays' listeners: music streaming, laptop DJs, mobile listening, smart phones and so on. The book indeed has a sort of "classic" humanities echo to it despite of (or maybe because of) its anthropological good intentions. Entries on "music", "language", "image" and "acoustics", although the individual authors always run with interesting examples, reflect somehow an older genealogy.

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Raymond Corbey and Annete Lanjouw (eds.)
The Politics of Species. Reshaping our Relationships with Other Animals
Cambridge, Cambridge University Press, 2014, pp 296

Ane Møller Gabrielsen *Norwegian University of Science and Technology*

The Politics of Species. Reshaping our Relationship with Other Animals is a collection of 20 essays with a shared objective: To reshape human attitudes towards other species. "Politics" is defined as "the activities that people engage in to define and exercise power, status, or authority, either among states or among groups within a state" (1), and it is clear that this collection represents a deeply critical view of the ways human beings exercise their power over animals. This view is further elaborated by authors with background from animal activism, science, social science and the humanities, who offer a broad range of approaches to human-animal relations and the question of animal ethics.

The Politics of Species consists of three main sections. The essays in the first section, "Moving beyond speciesism" explore the roots and effects of *speciesism*, i.e. human discrimination of other animal beings on account of their species membership, and argue in favour of non-hierarchical thinking about humans and other animals. Section two, "Sentience and agency" focuses on the emotional and cognitive capacities of different animal species in order to defend their status as moral beings, while the third section, "Toward respectful coexistence", explores the conditions for respectful coexistence between humans and animals through various approaches.

Although *The Politics of Species* is thematically situated within the emerging field of animal studies and its variants human-animal studies (HAS) and critical animal studies (CAS), human-animal relations are also relevant for science and technology studies and have been addressed by several STS-scholars. One example is Bruno Latour, who in *The Politics of Nature* (2004), argues for a "new constitution" that also takes the voices of non-humans into consideration. While *The Politics of Species* criticizes the political distinctions between humans and non-humans and calls for respectful coexistence, Latour's aim is to designate "the right way to compose a common world, the kind of world the Greeks called a cosmos" (Latour 2004, 8) through engaging a *collective* of humans and non-humans. Thus, the two books share a common theme.

A reworking of the relations between humans and non-humans is crucial for Latour's project, and the first section of *The Politics of Species* can be said to lay out the theoretical and philosophical framework for such a reworking by defining the limits for the non-human animals worthy of inclusion in the collective. The contributors to The Politics of Species could further be seen as examples of Latour's *spokepersons* (Latour 2004, 62)

who speak on behalf of the non-humans. The spokespersons differ in who they speak for, some speak on behalf of certain species like chimpanzees or dolphins, others speak for broader categories. An example of the latter is animal rights advocate Joan Dunayer, who states that the attempts to overcome speciesism has led to "new speciesism", reserving rights and moral obligations only for those beings who are considered most similar to humans. Non-speciesism, Dunayer argues, must grant rights to life, liberty and property to all sentient beings, which for Dunayer include "all creatures with a nervous system" (30).

The essays in *The Politics of Species* convey an impressing amount of knowledge about animals and the mechanisms of exploitation and discrimination. However, as Latour stresses, spokespersons should always be treated with scepticism (Latour 2004, 62). One problematic aspect is that the line for moral inclusion is still drawn by the capacities recognizable as "human". An example is "Human, dolphins, and moral inclusivity", where behavioral neuroscientist Lori Marino argues that the obvious bodily differences between humans and cetaceans make it difficult to acknowledge how similar they actually are to humans in terms of intelligence, self-awareness and emotional and social complexity. Thus, as similarity with humans constitute the main moral criteria throughout most of the book, the spokespersons in *The Politics of Species* argue in favour of non-humans from a firm human standpoint and in a way that reproduces the human-animal dichotomy it tries to diminish.

However, there are exceptions. In "Entangled Empathy: An alternative approach to animal ethics", philosopher and gender scholar Lori Gruen states that simply expanding the circle with (some) humans as the moral centre is not enough. "[I]n our magnanimous embrace of the other, we end up reconfiguring a dualism that will inevitably find some "other" to exclude", Gruen writes (224), and suggests exercising moral agency not by including, but by *responding* to the multitude of beings we are already engaged and entangled with.

Another interesting essay is philosopher David Livingstone Smith's "Indexically yours: why being human is more like being here than like being water". According to Livingstone Smith, both those in favour of and those against the moral inclusion of non-humans confuse the human/non-human distinction with the distinction between *Homo sapiens* and other species. However, discrimination of "non-humans" is not simply a matter of discrimination on biological grounds, he argues, but rather a phenomenon rooted in the ways "human" is constructed through language. Thus, Livingstone Smith's claim is not *that Homo sapiens* discriminate against other species, but rather that "we", whoever we might be, tend to discriminate against "others".

Gruen and Livingstone Smith's approaches to animal ethics resonate with the work of another STS-scholar, Donna Haraway, who in *When Species Meet* (2008) relentlessly stresses that "[e]very being is a multispecies crowd" (Haraway 2008, 165) and "[t]o be one is always to be-

come with many" (Haraway 2008, 4). This could be termed a *posthumanist* view on human-animal relations (Wolfe 2010), a view that is also present in cultural anthropologist Eben Kirksey's contribution, "Interspecies love: being and becoming with a common ant, Ectatomma ruidum (Roger)".

Referring to the works of Latour, Haraway and philosopher Isabelle Stenger, Kirksey describes the ants as "agents of cosmopolitical assembly, conscious beings who become involved with other creatures through relations of reciprocity, kinship and accountability" (165). As also humans are capable of being enrolled in these elaborate networks of relations, Kirksey suggests that "we should learn to better embrace species such as Ectatomma, cosmopolitical creatures that are good for humans to live with in common worlds" (175).

Kirksey's account of the ants is the most explicitly STS-oriented essay in *The Politics of Species*. The ants are described as agents in material-semiotic networks (167), the larvae are viewed as obligatory passage points for food (168), and the building of "cosmopolitical worlds" through "political articulations" with plants and insects (173) resonates with Latour's understanding of politics as "the entire set of tasks that allow the progressive composition of a common world" (Latour 2004, 53). It is somewhat amusing that it is the ants that fuse STS and animal studies. Latour once wrote that the acronym was the reason he chose to stay with the term actor-network theory, stating that "A.N.T. was perfectly fit for a blind, myopic, workaholic, trail-sniffing, and collective traveler. An ant writing for other ants, this fits my project very well!" (Latour 2005, 9). The ants also fit the project of *The Politics of Species*; through their interspecies associations, they offer a promising prospect of a multispecies politics for "respectful coexistence" in shared worlds, or *cosmos*.

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Margaret Grebowicz and Helen Merrick

Beyond the Cyborg. Adventures with Donna Haraway, New York, Columbia University Press, 2013, pp. 206

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As stated in the title, main goal of this book is to critically engage with the thought of Donna Haraway going beyond the well-known metaphor of cyborg. It's an ambitious challenge indeed because, since the publication of the *Manifesto for Cyborg* in the early nineties, Haraway's name has been intertwined with this symbolic figure that constitutes an essential reference both for feminist and science and technology scholars. I still remember when I read it in my twenties as a young feminist and philosophy student: back then I'm sure I failed to grasp the complexity of Haraway's thought, but that metaphor stuck with me ever since giving me a powerful tool to understand many of the cultural, social and political changes that society was going through. Therefore, when I started reading Grebowicz and Merrick's book, I wondered why someone would want to go beyond cyborg? The answers the authors provide in this text are really worthy to be read.

Before moving to the book analysis, I should focus on the adverb beyond. As well explained by the authors, going beyond cyborg doesn't mean to leave it behind by seeking for something new in Haraway's theories, but rather to go in depth in the cyborg metaphor "to argue for and hopefully effect a desedimentation of this figure, putting it to *work* in ways that are more central to current feminist (and not only) concerns" (p.7). According to the authors, *putting cyborg to work* has a twofold meaning: it means trying to critically engage with Haraway's thinking looking to what in her theories and powerful metaphors is still at stake in the challenges of contemporary society; and to explore how and to what extent her contribution has been overlooked in the mainstream (but also feminist) genealogy of critical thinking of the last thirty years questioning the very process of knowledge production.

The book develops around five (always plural) concepts: natures, knowledges, politics, ethics and stories. The chapter on Natures examines Haraway's attempts to *queer* nature (or to explode the dualism nature-culture and the predominance of the human) and, more interestingly to me, in the to read these attempts against Judith Butler queer theory. Haraway's reflections on animals, sexual agency and human-animal kinship are put in dialogue with Butler's theories on sexuality, gender and queer kinship providing a deep insight in the theoretical and political consequences of the reframing of kinship relationships.

The chapter on Knowledges focus on a critical examination of standpoint theory and situated knowledges unfolding the usual ways Haraway's work on these issues has been interpreted. Using the metaphor of

the "colonial organism" – one of the member of the companion species – and creating a fictional dialogue between Haraway and Lyotard the authors re-examine Haraway's epistemology and her intellectual journey to find "nonstable grounds of knowledge production" (Haraway 2004, 337). The "democratic faith" that underlies the traditional feminist vision of situated knowledge is here troubled in favor of an epistemology of dissent.

The chapter on Politics examines her contribution to contemporary political theory by proposing to read Haraway's thinking on animals and non-humans as a cyborg politics that challenges the traditional (and liberal) notion of democracy. By putting Haraway into dialogue with well-know contemporary political thinkers like Toni Negri, Chantal Mouffe and Bruno Latour – to name some – the authors propose to rethink the cyborg as a tool to reframe the relationships among the technologically mediated humans and the Political. Together with Latour, Haraway wonders how to build a politic of alterity that seriously takes into consideration the encounter with non-human others. In so doing, and again together with Latour, she neglects the idea of consensus as the compulsory ground to build political relations and she moves the reflection forward: how to build a political ground of dissensus that accounts for a common space human and non human actors share? Exceeding the boundaries of science feminist theory, through this chapter Grebowicz and Merrick relocate Haraway at the heart of contemporary political theory and shows how her reflections are still worthy to be explored to understand the characteristics (and failures) of contemporary democracies.

The fifth chapter on Ethics explores how and to what extent her work on the animal trouble both the traditional categories of ethics and those developed within some feminist and post human works. Putting once again Haraway's thinking into dialogue mainly with Derrida, Butler and Levinas the authors explore the encounter with the other and the mechanisms of recognition (in Butler's terms) are explored. The final chapter on Stories examines the science fictional elements of Haraway's work. While for many readers – including me – Haraway's engagement with science fiction is one of the most interesting (yet challenging) feature of her style, Grebowicz and Merrick taught me that this is not the case for many readers, especially feminists. The authors then propose a reading of SF in Haraway's texts both a source of inspiration and metaphors and as a methodological approach to theory and writing.

As a gift for the reader, the book ends with the text *Sowing Worlds. A Seed Bag for Terraforming with Earth Others* written on purpose for this book by Donna Haraway. I won't sum up nor discuss what Haraway proposes in this text – for the fear of failing my interpretation and to give you the pleasure to read it without any heads up. The metaphorical seeds she plants throughout the text, however, are the proof (if any was needed) that Haraway is still an inspirational thinker and that many ideas, challenges and revolutions are waiting for us beyond the cyborg.

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Malcolm Nicolson and John E.E. Fleming

Imaging and Imagining the Fetus: The Development of Obstetric Ultrasound, Baltimore, John Hopkins University Press, 2013, pp. 336

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Until fifty years ago, pregnancy could only be studied through its effects on the pregnant woman's body. Hidden from the medical gaze, the fetus was a part of a process, more than a specific subject with its own identity and rights. In the last fifty years, however, the fetus has acquired a social status of its own. In their book *Imaging and Imagining the Fetus,* Nicolson and Fleming investigate this changing perception of pregnancy by analysing the development and diffusion of the ultrasound scanner, as "both a major agent for and a potent symbol of the medicalization of childbirth" (3), retracing in a very detailed manner the complex interactions of social, medical, and technological conditions that led to the establishment of this new technology as a widely accepted medical instrument.

The book benefits from a multidisciplinary approach, thanks to the different backgrounds and perspectives of the two authors. Working side by side, Malcolm Nicolson, Director of the Centre for the History of Medicine at the University of Glasgow, and John E. E. Fleming, retired engineer who was part of a team working on the ultrasound scanner's prototypes, wrote a book that is both historically and technically accurate, making it a compelling account of how technological innovation is a winding and messy path, more than a straight line from one point to another. By investigating the original documentation as well as by re-enacting some of the experiments, Nicolson and Fleming manage to highlight the complex and sometimes fortuitous sequences of connections and coincidences that led to the diffusion and stabilization of the new technology.

Between the 1950s and the 1970s, experiments on the medical applications of ultrasound were ongoing, more or less independently, in different parts of the world. Nicolson and Fleming's work focuses on the British context and, more specifically, on the role of Ian Donald, Regius Professor of Midwifery at the University of Glasgow, and key figure in the development of the ultrasound scanner in the UK. The book is a rich ac-

count of the complex network of actors involved in the development of Donald's prototype of the ultrasound scanner, and includes references to similar experiments in Sweden, Japan and the US. Their work, however, risks focusing a little too heavily on the influence of Donald, as great care is dedicated to retracing his personal and professional life more than that of others involved in the development of the ultrasound.

In terms of its structure, the book can be divided into three main sections. In the first section, Nicolson and Fleming retrace the history of ultrasound from its early application for military purposes. Chapter 2 brings the reader to the origins of ultrasound echolocation, back to the first sonar (SOund Navigation And Ranging) that was employed by the Royal Navy in 1922 to detect enemy submarines and anti-submarine weapons. In peacetime, sonar became a common method to measure the depth of the sea. During the 1930s, the ultrasound found an application in industry to detect flaws in metal machinery parts. Investigators in different parts of the world also started researching possible clinical uses of the echolocation technique, thanks, in part, to the cheap electronic parts made available by the military surplus. At the same time, Ian Donald started his education at St. Thomas's Hospital Medical School, an institution that valued a holistic approach to illness, encouraging students to be moral guides as much as a doctors. Nicolson and Fleming analyse the influence that Donald's (Anglo-Catholic) religious and academic education had on his profession, with chapter 3 being a detailed account of the formative lessons, both moral and professional, that Donald received at St. Thomas, and of his early interest the clinical use of ultrasound.

In the second section, the authors painstakingly recount the several attempts made by Donald and his team to use the industrial flaw detector for medical investigation, from the A-scope to the first automatic scanner, and finally the Diasonograph. Nicolson and Fleming reconstruct the series of fortunate events that allowed Donald to secure the academic and financial interest to pursue his project, and the valuable partnership he forged with Thomas Brown, an engineer at Kelvin and Hughes Ltd. Brown fixed and improved Donald's machine, but most importantly he convinced Donald, initially sceptical, to find a way to display the information collected with the ultrasound in a brightness-modulated form. With Brown's method, the pulse-echo signal was no longer producing a pattern of spikes, but rather a two-dimensional image. The images that Brown's prototype was able to produce, however, were very crude and hard to interpret. As the authors clearly explain, making sense of these pictures was difficult also because what was displayed was something completely novel; no one had ever looked at the abdomen that way before, and the pictorial reproductions of the organs in anatomy books were not helpful. Moreover, the body itself proved to be a challenging subject of study; apart from the individual differences between subjects, the conditions affecting the ultrasound echoes were many and hard to predict. With a precise account of the team's many attempts and failures in chap-

ters 5 and 6, Nicolson and Fleming convincingly prove their point, according to which "[t]he development of obstetric ultrasound [was] a particular sequence of complex interactions between physical entities (sound waves, piezoelectric crystals, potentiometers, and the like), the biological substrate of the human body, and human actors from a variety of backgrounds and with diverse skills and interests." (8)

In chapter 7, they recall the last steps that led to the commercialisation of the final prototype of the Diasonograph. An important move forward was possible thanks to Brown's development of an automatic scanner, which allowed him to produce consistent and comparable scans. As Nicolson and Fleming note, the automatisation of the scanning process was instrumental to the diffusion of the scanner as a black-box. Brown's last prototype, a semi-automatic machine with a manual probe operated by the practitioner, could now be used by physicians with no understanding of engineering, and it quickly made its way to the market as a medical commodity.

The third and last section engages with the consequences of the incorporation of the ultrasound scanner into medical practice. Allowing the physician as well as the pregnant woman to see, for the first time in history, a fetus long before it was born, the ultrasound scanner had great impact on people's perception of both the fetus and the pregnancy. As Nicolson and Fleming argue, "the ultrasound scanner does not reveal the fetus directly or unproblematically" (267). The last three chapters are, indeed, an attempt to investigate what happened after the new technology became black-boxed. Aware that the stabilization of a technology is not the end of the story, the authors recount the controversies following the general acceptance of the ultrasound scanner as a valuable tool for clinical investigation. Clearly, most of the controversies revolve around changing perspectives on pregnancy. In order to make sense of the new social status gained by the fetus, Nicolson and Fleming adopt Donna Haraway's approach to human experience as technologically mediated (1991). The fetus comes to be a cyborg, accepted as a patient on its own through the mediation of a technology. This changing status of the fetus affected people's attitudes on abortion and, consequently, on a woman's right to terminate her pregnancy. The possibility of actually seeing the fetus had a huge impact on women's rights, casting a long shadow that is still evident fifty years later, as the ultrasound images of the fetus are still used as political tools by the pro-life movement against those who decide to terminate their pregnancy. On the other hand, as the authors recall, being able to detect fetal pathologies at a very early stage might foster abortion in case of malformations, a possibility that Donald considered morally repugnant.

Nicolson and Fleming's account of the ethical and social consequences of the diffusion of the ultrasound scanner is remarkable, yet they only partially succeed in problematizing them, as a close examination of the effects of the invention on women's agency is somehow missing. The au-

thors recall a few different, and sometimes opposite, positions on the medicalization of childbirth coming from feminist scholars; as explicitly stated, however, Nicolson and Fleming decided "not to interrupt the flow of the narrative with theoretical digressions or engagement with the work of other scholars" (7), and only briefly mention the controversies and conflicts following the changing attitude towards the fetus.

In conclusion, *Imaging and Imagining the Fetus* constitutes a valuable example of the messy path that leads to the emergence and stabilization of a new technology. Following Pickering's framing of research as a pattern of *modeling*, *resistance*, and *emergence* (1995), Nicolson and Fleming convincingly describe the complex entanglement of personal skills and interests, social and political context, technical and financial resources, as well as fortuitous encounters, fundamental for a technological innovation to be successful.

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Philippe Sormani
Respecifying Lab Ethnography: An Ethnomethodological Study of Experimental Physics, Farnham, Ashgate, 2014, pp. 278

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This book presents a laboratory study based on the conviction that laboratory studies have failed up to now to achieve their goal. According to the author, laboratory studies' failure is "the *failure to describe any particular discipline of the natural sciences in its constitutive practices*" (16). The very constructivist approach that has characterized lab studies from their beginning contributed to such failure, because it drove to interpret laboratory practices in terms of concepts alien to them. There arose the tendency to ignore any self-instruction in the enquired domain of research practice, and the interpretively analytic relevancies distanced themselves from the practically ordered ones. To avoid such trap, Sormani's study accomplishes a change in orientation lead by ethnomethodology. Its central concern is to recover the local production of social order in a physics

laboratory for the study of superconductivity. In a rigorous ethnomethodological approach, it focuses on the description of local order production instead of on a theoretical interpretation of the observed setting.

The setting is a laboratory for scanning tunneling microscopy of complex superconducting compounds. For human beings this is a place where special electronic microscopes are used to scan the surface of selected materials (superconductors) and infer their topographic and electronic properties. At the time of the research, the lab hosted six low temperature scanning tunneling microscopy facilities operated by PhD students, post-docs and senior researchers under the management and control of an operating lab chief and a lab director, for a total amount of 15 members at the peak of its activity.

In accordance with the ethnomethodological approach, Sormani's study aims at describing the field under scrutiny in its own terms. The book gives a detailed description of how work is conducted by lab members within the lab, through which methods and practices, under which circumstances and contingencies. It describes how members secure the locally achieved results of their day-to-day work in a way that allows them to generate accurate measurements. Moreover, since it "makes explicit the distinctive 'ethno-methods' of practicing experimental physics in (and as) the highlighted domain" (1), it corresponds to an ethnography of the indicated laboratory. Therefore, it aims at contributing to the ethnomethodological reinterpretation of ethnographic methods, namely to what in Grafinkel's terminology is called a "respecification" of the practices for the production of social order (Garfinkel 1991). Ethnography belongs to those practices. This ethnomethodological study of a physics lab is at the same time a contribution to the exhibition of the *Lebenswelt* origins of lab ethnography as such.

From a methodological point of view, the book tackles a widespread opposition in ethnomethodology between the recourse to the technology of video recording and the practical engagement in the technical activity that is enquired. By means of a combination between the use of video analysis to produce a procedural description of microscopic experimentation and the self-instructive engagement in the process, Sormani achieved with a long-term participant observation a broad and depth understanding of the practices, methods, routines and phenomena involved in the lab work. The researcher can exhibit the lab practices "by having them produced, filmed, and described 'from within'", in a research process ("film it, whilst you do it") that "may be best termed a *practice-based video analysis*" (15).

The book is structured in three parts. Part I aims at describing the laboratory activities by making "one step back" (233) with respect to the interpretative approach of lab ethnographies. The laboratory setting is investigated as a self-explicating setting and lab work is described in its own terms, i.e. according to the narrative that members themselves share. Moreover, lab work is described along with the ethnographer's activities

of talking and observing, which are subjected to a reflective analysis that shows their similarity to the members' activities. Part II reports the author's technical self-instruction in scanning tunneling microscopy and "describes how a valid, reliable, and manifestly objective measurement could be obtained through microscopic experimentation" (103). Practicing the practices constitutive of scanning tunneling microscopy proves indispensable to describe the lab work in its own terms. The practical engagement in the lab activities leads Sormani to discover the "hands on! / hands off!" distinction that the lab members employ to describe the divide between the practicing experimentalist's involvement with the facility and his or her colleague's retreat in the observing attitude of those who see others doing it. This distinction inhabits the laboratory setting rather than characterizing the divide between members and ethnographers. Finally, part III hosts the report of the practice-based video analysis. Thanks to its composition of filming from within while engaging in microscopic experimentation, the practice-based video analysis is presented here as the only methodological approach that fits adequately with the practical distinction between the researchers' collegial "hands off!" and experimental "hands on!" orientation. If doing it yourself is the only way to understand how to do it in microscopic experimentation, the only useful video is the one filmed while doing it.

Sormani's book is a sound and consequent application of the ethnomethodological approach to lab studies. As such, it delivers a double-sided contribution to the field. On the ethnomethodology side, the self-instructive circle it opens up engages in a pre-analytic endeavour that challenges Michael Lynch's post-analytic programme (Lynch 1993). Sormani, by resorting Garfinkel's requirements, attempts to give up the academic tradition of assuming an analytic focus before engaging the field on the base of issues discussed in the literature, either related to the philosophical and historical study of science or to its social study or to both. On the other side, the book brings into contention the established Science and Technology Studies' approach to lab ethnographies. From this point of view, it is a stimulating challenge to STS routines, that it criticizes severely, censuring the "multifaceted interest" and "theoretical eclecticism" (248) that prevents STS from engagement with first-order practicalities. Yet, precisely the focus on practices and first-order practicalities makes the confrontation with STS a little bit schematic. As laboratory practice is at the core of the proposed ethnography, and given that language is always theory-laden, a confrontation with practice theories, from Bourdieu to Shove, could have improved the broad significance of this study. More in general, Sormani's argumentation is hard to follow and to grasp for those who do not share the ethnomethodological stance. A wider confrontation with non-ethnomethodological literature would have helped in making the rich and exciting results more meaningful for the broader audience.

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Janet Vertesi

Seeing Like a Rover. How Robots, Teams and Images Craft Knowledge of Mars. Chicago, University of Chicago Press, 2015, pp. 304

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This is a book that I read with pleasure. It captured my imagination. And, I must admit, it wasn't fun when one of the rovers died. Alone. In the Martian desert. By that point, I had become almost convinced that I too could "see like a rover."

"After you've worked with the team for a while," says an informant, "you kind of learn to see like a Rover." The team is the Mars Exploration Rover Team, and this book studies what does it mean to say that a human member of the team can learn to see how a machine. To address this question, Vertesi take us on a step-by-step journey through the image-making practices that produce those familiar reddish Martian landscapes. The outcome is a well-crafted, highly textured ethnographic account of how the team works with the digital images sent back by Martian rovers. The reader learns how these scientists and engineers make sense of the images, manipulate them to make them "more objective," and use them to orient their action at a distance. A very long distance indeed.

Vertesi does a great job in mobilizing relevant work in the history of science and science studies, centering each chapter on a powerful insight. Her story vividly reminds us of the theory-ladenness of observation, the conventional and local nature of objectivity, and of the fact that scientific images, including photographs, are always and necessarily constructed. It reminds us that instrument calibration is an eminently social process, one that is as much about people as it is about machines. On this particular point, Vertesi goes beyond the narrative of alternative kinds of objectivity, to engage with the process of calibration as integrating machine work and human judgment, in a way that gestures interestingly toward recent

STS work on machine learning and the concept of the mechanizable.

A few main themes run through the chapters of the book. One is an understanding of knowing and visualizing as embodied processes. Vertesi engages with notions of embodied skills and priorities in the making of scientific knowledge, and brings them into Martian territory. Hence her interpretation of the team drawing Mars as something that makes sense to them (e.g. constituted by different kinds of surfaces), which builds on Wittgenstein's notion of "seeing as." There is plenty of body talk when it comes to the rovers and their cognitive as well as physical achievements. It is fascinating to see the way members of the team end up identifying themselves with the rover they are following - not just its mechanical eyes, but its mechanical body as well. The rover is truly a member of the team, and when it gets stuck against a rock, or one of its mechanical arms doesn't work properly, its human colleagues would express and discuss the problem through their own bodies, in a natural, unthinking, and very effective way. I have found these ethnographic passages enlightening, and more convincing that, say, yet another ponderous reflection on the non-human.

Another major theme is captured by the iconic image, at p. 180, from Thomas Hobbes' *Leviathan*: the king's body as composed of its subjects' bodies. How not to think immediately to the rover as an air pump of the 21st century? In fact, all chapters grapple, from different vantage points, with a fundamental insight: making technoscientific knowledge about Mars means stabilizing a particular kind of social order. Each single technical choice made by the team is *also* a micropolitical choice – and it has to be so in order to succeed.

One the most memorable passages, in this respect, is the description of the "happy" ritual in chapter one. At the beginning of each Martian day, the team gathers to go through the activities planned for that day. Resources, including time, are limited, and choices need to be made about how to allocate them. Not all experiments can be performed, and not all routes can be pursued. There might be tensions within the team - for example between scientists, whose priority is to collect information, and engineers, whose priority is the survival of the rover. But even among the different subgroups, say the geologists, one detects different disciplinary agendas that can produce conflicting expectations. The rover will not move until each team member has confirmed that they are "happy" with the plan. There is a precise social mechanism to register consent, and it is also clear how to proceed if someone is "not happy."

Vertesi draws on a venerable tradition of understanding knowledge as a collective phenomenon that has its champions in Wittgenstein and Durkheim. One of the reasons why her case-study is so effective in making this point lies in the nature of the team: it's large, international, disciplinary diverse. These conditions make the work necessary to align interests and perceptions particularly *visible*. The social dynamics of the team are designed to establish consensus and allow goal-oriented action. The

digital images are a site for these negotiations, and the way they are seen it's their final outcome. That these images show something clearly, or tell the team what to do, is indeed the *outcome* of a social process, not its beginning. An image can show something *clearly* only if the alignment has been successful.

Interestingly, Vertesi has not chosen the case of a controversy over digital image making or interpretation. Instead, she describes the mundane operations, the daily rituals that are constitutive of seeing like a rover or, and it's one and the same thing, of being a legitimate and well-behaved member of the team. Rather than focusing on breakdowns and crises, she looks at normal science, the daily routine of making sense of images of Martian things. And it is precisely through the inspection of this routinized, normal procedures that one sees how normativity can only emerge and be sustained by the coordinated activity of concept application carried out by the team, through rituals of perception alignment and mutual symbolic sanctioning.

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