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Policymaking in Hong Kong

Open Science and Biology

Sociotechnical Privacy

Surveillance in the City

Technologically Dense Environments

STS in Portugal

No stars

When artists draw on materials and techniques from an area such as science, they must be able to keep free from demonstration and verification. It is to be good at having a lyrical approach, imagining "the Earth is still flat" and considering science and technology as mysterious and fantastic tools.
In the proposed image, a model of the tetrahedron designed by the Canadian scientist and inventor Alexander Graham Bell as a module for the gliders is altered. The change is made by the torsion of a plane surface, through developing formal ambiguity, thus depriving the object of its aerodynamic function.
The model was then made available to a group of people with whom the artist opened a dialogue. Hence a spontaneous conversation was triggered about the nature of the object itself, from which it turned out a kaleidoscope of assumptions, definitions, visual projections, constituting the series "No stars".
Some stretches of the dialogue:
"There are surfaces to which you can adhere in a metaphorical sense";
"The rotate plane is a lever that multiplies these surfaces toward infinity";
"Ironic instruments punctuate the experience";
"I can still imagine the earth as flat".
Reflection concerns the inevitable sophistication produced by the attempt to define a form. And this sophistication is a "problem" we have in common. In fact a strong ambiguity is always encountered when it is sought to define an object, for the object is not merely placed in a space, but is itself a space.
By de-contextualizing the object we have a first difference of meaning and by altering it we have a second one. Thus it becomes as a "lever", which projects an endless becoming and an unbreakable repositioning of itself, transporting us in a field of huge possibilities.
"No stars" is a work in progress based on a single rule: neither the object nor its shadow will ever match the shape of a star.

by *Alia Scalvini*

(the work in its entirety can be viewed at:
http://aliascalvini.altervista.org/Sito_2/Works/Pagine/Thetraedron.html)

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Exploiting Uncertainty and Ambiguity in Policymaking

Hong Kong and Investment in the Pearl River Delta Region

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Abstract: Drawing on a case study on Hong Kong government policymaking, this paper identifies a potentially fruitful intersection between science and technology studies (STS) and policy studies whereby the latter would benefit from conceptual resources originating in STS. Hong Kong has sought stronger economic ties with the Pearl River Delta (PRD) region of Mainland China since the late 1990s, using social and economic indicators to promote increased investment in the region. During this process Hong Kong effectively expunged uncertainty (creating a "certainty trough") while constructing a definitive representation of the PRD region to serve as a social technology in public policy discourse. The paper argues that the government exploited a form of interpretive uncertainty – ambiguity – to attract potential investors, suggesting that STS concepts, such as the co-production of social technologies and MacKenzie's (1990) "certainty trough", could be effective tools for analyzing social and economic policymaking.

Keywords: uncertainty; ambiguity; policymaking; Honk Kong; Pearl River Delta.

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1. Introduction

Sheila Jasanoff suggests that science and technology studies (STS) would benefit from interdisciplinary "conversations" with scholars in other areas (Jasanoff 2004, 2) and in this paper I identify one site at which such a conversation might fruitfully: a case involving the construction of

social indicators by the Hong Kong government to promote investment in and stronger economic ties with the neighboring Pearl River Delta region (PRD) in China's Guangdong province. As STS scholar focusing on innovation systems and economic development who tracks Hong Kong's interest in expanding its economic relationship with the PRD, it occurred to me that, although there were no material technologies or scientific issues at stake, some useful concepts and principles established in STS – emerging in particular from the sociology of scientific knowledge (SSK) – might be applied to the relationship between experts and economic policymakers in the Hong Kong government.

My work in developing a case study of the Hong Kong government's policy towards the PRD region suggested to me a pattern in the production of technology familiar to STS scholars, involving factors through which key actors construct certainty from uncertainty in the course of producing scientific results or technologies. Such results, which are produced through social relationships involving negotiation, contestation, and interpretation, came to be known in SSK as *social technologies*. In the case at hand, the social technology in question – a representation of the PRD region that would attract business investment – was, as Theodore Porter (1995, 229) terms it, a representation of the PRD region involving "public forms of knowledge [...] shaped for policy purposes". Moreover, in producing its PRD construct, the Hong Kong government disregarded or otherwise disposed of myriad sources of uncertainty.

In this paper I explain how an iconic STS/SSK hypothesis that is commonly depicted in a figure known as the 'certainty trough' (MacKenzie 1990, 370-372; see figure 1) may be usefully applied to a non-STS context, providing a model of the process through which uncertainty was eliminated and of the relationships between actors who were involved. In this way, I hope to identify a juncture at which a conversation such as Jasanoff mentions would benefit scholars interested in policymaking by making STS conceptual resources available to them.

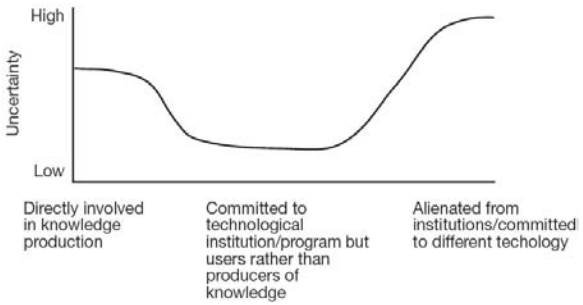

Figure 1 – The Certainty Trough

2. Social Construction of Technology

The proposition that technology and scientific knowledge are socially constructed has become common in STS. Scholarly work has revealed how ambiguous and even contradictory results from scientific and technological tests, calculations, and experiments become established as acknowledged facts[1]. Historical and ethnographic case studies have exposed how such uncertainties and contingencies are in effect set aside and thereby transformed into certainty[2].

According to this social constructivist tradition, those who produce scientific or technological results, familiar as they are with theoretical, empirical, and statistical sources of uncertainty, tend to downplay the certainty of their results, in order to preserve their credibility in case uncertainties are later revealed. Those who eventually put the results to use, however, tend to accept the science or technology as bedrock fact. In many cases opposition groups materialize, comprising actors opposed to the particular use of the scientific or technical results in the given case, and in their discourse the uncertainty returns and tends to be even more pronounced than it had been among the producers.

To illustrate this phenomenon, Donald MacKenzie, while studying the social forces that shaped the development of nuclear missile guidance technology, posited a figure with a somewhat irregular "U" shape forming a trough: the abovementioned certainty trough. MacKenzie argued that, in the production of new technologies as in the production of science (as had been previously argued by Collins 1985), facts are constructed (by 'producers') amidst acknowledged uncertainty that is effectively ignored by those whom he identified as the 'users' of technology. He then posited that the 'alienated' would re-open debate about the uncertainty and possibly identify new sources (e.g. Pollack 2012 [2007] situates the alienated in the political class).

The trough figure represents the degrees of uncertainty involved, with the trough itself representing the certainty that users attribute to what is produced. In this paper, I revisit this argument as it applies to the use of data relating to the PRD region by the Hong Kong government. The result of this effort was in itself a social technology, produced through social processes engaged in by experts and policymakers, who used public knowledge – in part by exploiting the uncertainties involved – to con-

[1] The canonical literature in which these social constructivist insights have been achieved includes Fleck (1935), MacKenzie (1981), Knorr-Cetina (1981), Campbell (1985), Lynch (1985), Latour and Woologar (1986), Collins (1987), Pinch and Bijker (1987), Wynne (1988), MacKenzie (1990), and Shapin (1994).

[2] Key studies include Star (1985), Bijker, Hughes, and Pinch (1987), Bijker and Law (1992) and Pickering (1992). More recent studies that have continued this tradition include Collins and Evans (2002) and Lahsen (2005), as well as MacKenzie (2006, 2009).

struct a representation known as the PRD region. In calling the PRD construct a social technology, I use the concept of a social technology introduced by Pinch (1987, 2), according to which a social technology includes: "processes [...] or procedures (or combinations of these) which are built around or have embedded within them a systematic attempt to change human behavior". Clearly the PRD construct is intended by Hong Kong's chief executive to change the behavior of business interests in Hong Kong by persuading them to invest in the region. In this sense, it constitutes a form of technology.

2.1. Uncertainty and Ambiguity

In my study of the use of data to promote investment in the PRD region, I found a pattern similar to the certainty trough, in which uncertainty arising in the production of those data was purged when the data were presented as settled facts (intended to constitute an attractive target for investment). I observed two forms of uncertainty: *technical uncertainty*, associated with the statistical and other techniques of measurement on which the data are based; and *interpretive uncertainty*, both in the course of collecting the statistical data and in the application of those data in practice. Technical uncertainty occurs, for example, in almost any process to which statistical methods apply, or in which degrees of tolerance must be taken into account, in short, in which it is inherently difficult or impossible to obtain perfect accuracy in measurements or predictions. Interpretative uncertainties occur whenever decisions or choices not dictated by technical or quantitative findings or measurements had to be made. Interpretive uncertainty might involve choices about how to apply a technology; or about which of several possible results of a calculation under varying conditions to accept; or about the meanings of terms or constructs that are involved in reporting or making sense of the results of tests or calculations.

I found the technical/interpretive distinction helpful in tracing how the Hong Kong government used data to identify social indicators on which to base its case for investment in the PRD, as this case was presented with no reference to such uncertainties. The real work of eliminating uncertainty here exploited another type of indeterminacy: technical and interpretive uncertainty created *ambiguity* – a form of uncertainty in its own right – that had to be eliminated in identifying or defining the entity that was to count as "the PRD region". My study identifies, then, a higher-level form of uncertainty – ambiguity – that arises in the production process and is exploited to construct a definitive representation of the PRD region, which lies at the bottom the certainty trough, for the government's rhetorical purposes.

Before analyzing Hong Kong's promotion of investment in the PRD region, I should clarify an important point. The literature in which the

social construction of scientific knowledge was conceived bears a somewhat oblique relationship to my central argument. New scientific knowledge and related technologies that have been analyzed by STS and SSK scholars typically involve highly specialized work in what Collins and Evans (2002) call "esoteric science", areas characterized by a wide gap in scientific and technical expertise between the producers and the users. The gap in the Hong Kong PRD case is quite different, as the indicators in question do not rise to the level of complexity or technicality involved in, say, climate modeling (see, for example, Lahsen 2005). The technical uncertainties involved in producing these indicators are in principle manageable because they can be easily quantified (Baker *et al.* 2013). Nevertheless, in the process through which the government obtained these indicators, that uncertainty was transformed into certainty. Although esoteric uncertainty exists in both cases, it stands at several removes from the policymaking arena here.

In summary, then, my argument is that the Hong Kong government, led by successive chief executives and relevant bureaus, exploited a source of ambiguity (namely, uncertainty inherent to the production of key social indicators) in order to create a rhetorical construct (the PRD region) which represents an attractive environment for investments on the part of business actors in Hong Kong.

3. Methodology

The material on which this paper is based was collected through documentary research, including interviews of Hong Kong government officials, data from official Hong Kong government statistics, statistics from Hong Kong government-sponsored agencies and Chinese government, plus newspaper articles. Former Hong Kong chief executive Tung Chee Hwa's annual policy addresses from 1997 to 2003, additional policy statements made by his successor, Donald Tsang Yam Kuen, and other members of the Hong Kong government in 2008 and 2009 (as well as a major conference on the Pearl River Delta held in Hong Kong in 2002) were the major sources of documentary information pertaining to Hong Kong's top-echelon political leaders. The context within which to interpret these findings was established in part through interviews conducted with officials within the executive branch of government and with officials and consultants associated with government-sponsored organizations[3].

[3] Officials included then-chief executive Tung-Chee Wha and his personal secretary, Vivienne Chow. The two Hong Kong government-sponsored organizations are the Hong Kong Trade Development Council (HKTDC) and Invest Hong Kong (InvestHK). The HKTDC is charged with promoting external trade. It also creates and facilitates opportunities in international trade, especially for small and

Data analysis involved examining both governmental and quasi-governmental sources of statistics and comparing the results to uncover interpretive uncertainties and to determine from which sources Hong Kong ultimately drew its figures. The content of speeches and newspaper reports on government statements was used to indicate the government's emphasis on the PRD as a site for business investment. Regarding the interviews, although I was able to make out the broad outlines of the process through which the indicators were determined, I did not interview members of the government with the certainty trough in mind. When I began to explore the applicability of the certainty trough to the case, I hoped to be able to develop an ethnographic account of the process.

4. The Pearl River Delta Region

The PRD region, situated within Guangdong province, is named for the Pearl River, which flows just south of Guangzhou and then spreads east and south to form a large estuary between Hong Kong and Macao. The river links the city of Guangzhou to Hong Kong and the South China Sea and is one of China's most important waterways for trade.

4.1. Hong Kong's Investment Policy

Since 1997, Hong Kong has expended considerable effort in promoting the expansion and intensification of its economic ties with Guangdong, and in particular with the PRD region. The Asian economic crisis of that time added to Hong Kong's motivation to increase its role in the Chinese economy[4].

In a conference focusing on the region's prospects held in Hong Kong in July 2002 entitled: "Forging a New Economic Force", Tung (the chief executive) vowed to "break down the barriers" with Guangdong by improving infrastructure links and expediting customs clearance[5]. "Hong Kong's potential can only be fully realized if we work together with the Pearl River Delta", he said (Tung 2002). Christopher Cheng, then head of the Hong Kong General Chamber of Commerce, echoed these sentiments

medium-sized enterprises. InvestHK provides information, assistance, and guidance regarding direct investment opportunities.

[4] In addition to Hong Kong's motivation to increase its role in the Chinese economy, the Asian economic crisis also drove new initiatives promoting innovation and technological development in Hong Kong (Sharif 2006).

[5] The conference (2002, 4-5 July) was jointly organized by the Hong Kong General Chamber of Commerce and the South China Morning Post, sponsored by Mainland Headwear Holdings Limited.

at the same conference: "As China's economy grows and changes, new ways are needed to take advantage of the growth in China" (Cheng 2002).

In the abovementioned speech, the chief executive stressed that Hong Kong can offer regionally unique business and economic benefits to the PRD region – strong rule of law, sound market principles, and good corporate governance. Hong Kong also offers overseas market contacts and an institutional framework within which to raise foreign capital. It also represents competitive advantages in trade, transport, and logistical support, as well as a thriving professional services sector. Conversely, Tung outlined what the PRD has to offer Hong Kong – an abundance of land, a high-quality inexpensive labor force, excellent infrastructure, ample investment opportunities for business, and a huge consumer market (Tung 2002).

The new chief executive, Tsang, maintained this pro-PRD investment posture, arguing in a speech given in October 2008 that:

> To stand out in the face of severe competition, we need to broaden our horizons and intensify economic integration with the Pearl River Delta (PRD) Region [...] [taking] the lead in building a Hong Kong–Shenzhen international metropolis as well as strengthening co-operation with the [PRD].

Later in October 2008, Hong Kong's financial secretary, John Tsang, advocated for several large-scale infrastructure projects, including a Guangzhou-Shenzhen-Hong Kong Express Rail Link and another railway connecting Hong Kong International Airport and Shenzhen Airport with a 29-kilometre bridge spanning Hong Kong, Macau, and Zhuhai. Addressing these major infrastructure projects, transportation and housing secretary Eva Cheng (2008) noted that their "timely implementation [...] will [...] reinforce Hong Kong's position as a premier gateway to the Mainland".

By the beginning of 2009, the pro-investment approach regarding the PRD region had been thoroughly institutionalized into government policy, as noted by chief executive Tsang in a January speech, in which he argued that Hong Kong "has a vital part to play" in the Chinese government's reform program, which targets Guangdong and the PRD for rapid development. Thus has Hong Kong pledged itself to a massive program intended to bring to fruition the intentions of a policy it has been pursuing since 1997.

Having established the priority that Hong Kong assigned to expanding and intensifying its economic relationship with the PRD region, I now examine the governmental rationale behind this policy, specifically its use of social and economic indicators of the potential return on investment. Although these indicators are subject to well known sources of uncertainty, Hong Kong exploited the resulting ambiguity to create a social technology to attract investment in the PRD region.

5. Finding the Pearl River Delta: Uncertainty, Ambiguity, and Public Policy

5.1. Uncertainty in Leading Indicators

In promoting investment in the PRD region, Hong Kong relied on several social and economic indicators to fix that entity as a rhetorical object or social technology. These included a specification of the area of the PRD region and population figures. Determining values for these indicators involved inherent sources of uncertainty, but apparently government officials considered them to be largely irrelevant.

This is perhaps easy to understand with respect to technical uncertainty. Scientific and technical test procedures inevitably involve some degree of technical uncertainty, that is, uncertainty with respect to statistical or other formal parameters that are measured in making a given factual determination or designing a technological artifact. Here I am extending the notion of technical uncertainty to scientific data with political, economic, and social significance. For example, modern census-taking methodology involves sampling and projection over populations, with measurable degrees of uncertainty. Counting a very large population with perfect accuracy is in any case practically impossible, yet governments eventually determine populations with figures that are presented as though every member of the population has been counted.

STS is of course not the only area of scholarship interested in uncertainty, which also figures in policy studies. Among the issues related to policymaking this literature addresses the difficulty of presenting knowledge based on statistical intervals (Manski 2013) and economic data (Walker and Marchau 2003; de Vries *et al.* 2010), and difficulties involved in communicating uncertainty in public policy discourse (Aikman *et al.* 2010).

In practical terms, interpretive uncertainties tell us more about how the PRD region became a social technology for policy purposes than technical uncertainties. Interpretive uncertainties in esoteric science and technology constitute uncertainties about how to apply statistical or mathematical results. McKenzie (1990, 216) observed: "MIRV [rockets carrying multiple warheads that deploy differentially at multiple points over the course of their trajectories] [...] was a technology that displayed remarkable 'interpretive flexibility,' not simply meaning different things to different 'inventors', but also being seen by different groups as a solution to quite different problems". The interpretative flexibility that MacKenzie observed is an instance of what I call interpretive uncertainty. In the case of the social and economic indicators now under consideration, however, analogous interpretive uncertainties pose considerable challeng-

es because the terms in which the outcomes must be determined and communicated are ambiguous and, in many cases, they can be disambiguated only arbitrarily. In examining the context in which Hong Kong defined the PRD region, I discovered that these interpretive uncertainties suffer a fate similar to that of analogous uncertainties in esoteric science and technology.

5.2. Quantitative Representation of the PRD Region: Persuasive Indicators

The effort to promote Hong Kong business investment in the PRD begins with some basic yet necessary questions: What exactly *is* the PRD? What geographic area does it cover? What is its population? How big is its economy? Social and economic indicators are required to illuminate these key characteristics to support judgments about where in the region to invest, how much to invest, and in which industries. InvestHK states the case as follows:

> There must be a clear understanding about the basic facts concerning the Pearl River Delta and its development [...]. Only then can they be clearly communicated to the multinational community. (Invest Hong Kong 2002)

Quantitative indicators are desirable because quantitative evidence accords prestige and power. As Porter (1995, ix) argues:

> Quantification is a technology of distance [...] [that] exacts a severe discipline from its users, a discipline that is very nearly uniform over most of the globe.

Porter continues:

> In public [...] uses, though, mathematics [...] has long been almost synonymous with rigor and universality. Since the rules for collecting and manipulating numbers are widely shared, they can easily be transported across oceans and continents and used to coordinate activities (Porter 1995, xi).

It is exactly such portability that the Hong Kong government is striving to achieve in attempting to represent the PRD region with numbers. Only by doing so are they able to convey and "sell" the attractiveness of the region to Hong Kong's populace and overseas investors – particularly to those segments of the public who may be skeptical and lacking in intimate knowledge of the PRD region or trust in the government[6]. Most sig-

[6] Given the poor state of the Hong Kong economy following the Asian Crisis in the early 2000s, regular polls had shown an alarming drop in confidence in the government, and in particular in the leadership of its then-chief executive, Tung

nificantly, by characterizing the region in terms of quantitative determinants, the government is seeking to manufacture: "a highly disciplined discourse [...] to produce knowledge independent of the particular people who make it" (Porter 1995, ix). This is especially true in areas of policymaking that are subject to political pressures, and surely Hong Kong's economic policies are such. As Porter (1995, 229) puts it: "not science, but politics, demands narrow rigor. [...] The enormous premium on objectivity [...] is at least partly a response to the resultant pressures".

Yet, as Manski (2013) notes in recent work on the treatment of uncertainty in public policymaking, couching values in numerical terms is subject to uncertainty that policymakers typically resist sharing with constituents. Manski posits the following formula to represent the broad outline of a policy analysis process such as the Hong Kong chief executive led in constructing the key indicators to represent the PRD: "assumptions + data → conclusions" (Manski 2013, 11). His point is that data alone do not suffice to justify a given policy. The two terms on the left side of the equation, "assumptions" and "data", are both subject to uncertainties, the former primarily of the interpretive type and the latter primarily of the technical type. The goal for the policymaker, according to Manksi, is to achieve "incredible certitude", by which he means that the policymaker must convince constituents of the credibility of the data involved while knowing that such data is subject to uncertainty. This creates a powerful incentive to establish the certitude of data, which in turn leads policymakers to prefer what Manski (2013, 4) calls "point predictions" over "interval predictions", providing a definite quantitative value rather than a range of possible values. As I will show, this analysis applies to at least one of the two indicators that I discuss here.

In order to show how Hong Kong treated interpretive uncertainties underlying key indicators, we review Hong Kong's determination of two such indicators (others were involved but these suffice to illustrate my point):

- the boundaries, and hence the area in square kilometers of the PRD region
- the population of the PRD region

Note that determining the area means determining the boundaries; and that determining the population also requires determining the boundaries. Note also that an area with a higher population is likely to seem more attractive to investors because it represents a larger market for goods and services.

Chee Hwa. The economy rebounded significantly in the second half of the 2010s, but was hit again by the global recession of 2008–2009.

5.3. Interpretive Uncertainty and Ambiguity: Key Indicators

5.3.1. Determining the Boundaries and Area of the PRD

A main source of interpretive uncertainty relating to the PRD is the absence of consensus on the boundaries of the region. In the aforementioned July 2002 conference, Hong Kong's chief executive mentioned improving the flow of people and goods across the border, improving transportation links, enhancing customs, immigration, and clearance services, developing express cargo services and passenger ferry services to connect ports, building regional express rail lines, and so on. But where are express rail lines to be built? Which ports are to be connected by ferry? Which airports are planes meant to use? Where do transportation links need to be improved? The answers to these questions depend on the geographical area that constitutes the PRD region: what is the exact area of the PRD region, and which parts of Guangdong province does that area cover?

The chief executive, Tung, had mentioned the PRD in 1999, when he asserted: "...the 50,000 sq. km. region encompassing Guangzhou, Hong Kong, Macao, Shenzhen and Zhuhai will become a more integrated regional economy". While Tung spoke glowingly about the region's potential, he did not delineate its borders or boundaries.

Hong Kong chief executive	50,000 sq. km
	Guangzhou, Hong Kong, Macao, Shenzhen, Zhuhai
Provincial government of Guangdong	45,000 sq. km
	Bolou County, Dongguan,Gaoyao, Huidong County, Huiyang County, Huizhou urban district, Jiangmen, Shenzhen, Sihui, Zhaoqing urban district, Zhongshan, Zhuhai

Table 1 – Varying Figures on the Size and Boundaries of the PRD Region

This ambiguity in the definition of "the PRD region" exists even though, in 1994, Guangdong officially defined the PRD Economic Zone as covering "the areas of 14 cities and counties, including all or parts of Guangzhou, Shenzhen, Zhuhai, Foshan, Jiangmen, Dongguan, Zhongshan, the urban district of Huizhou, Huiyang County, Huidong County, Boluo County, the urban district of Zhaoqing, Gaoyao, and Si-

hui" (Invest HK 2002, 5)[7]. According to this definition, the PRD covers one-quarter of the area (or 45,000 sq. km.) of the province of Guangdong.

Figures and geographical components representing the area and boundaries of the region are summarized in Table 1, making it clear that the boundaries vary depending on who defines it. I refer to these figures to show that the chief executive might have defined the PRD region differently. Two main trends can be identified. First, the chief executive uses a higher estimation of the area than the provincial government. In other words, in Hong Kong's version of the PRD region, the boundaries extend further southward. If, however, Chinese government statistics are to be used, the area of the PRD region is more clearly stated and the boundaries of the region exclude Hong Kong and Macao.

It is telling that Hong Kong did not adopt what would seem to be the official designation of the PRD region, but its motive for doing so is quite apparent, since a larger area will have both a larger population and consequently greater potential for economic development. Hong Kong was able to cite a greater area than the Guangdong government because of the interpretive uncertainty involved in specifying the components of the PRD region. There are, to be sure, technical uncertainties involved in setting out boundaries. For example, land areas determined by satellite-based imagery are subject to discrepancies related to pixel counts. If boundaries are to be determined by the use of a survey map, technical uncertainty arises because accuracy varies with the scale of the map (see, for example, Maynard 2005).

To estimate the land area and boundaries of the PRD region, however, it is understandable that such technicalities would play almost no role in shaping how Hong Kong sought to apply the concept of the PRD region. For its rhetorical purposes, defining the PRD region was essentially arbitrary, because the term "PRD region" was ambiguous. Any number of agencies or other actors might speak about "the PRD region" without being committed to a specific quantity or configuration of square kilometers. Yet the chief executive not only seems to have ignored the technicalities or interpretive uncertainties, he did not specify PRD boundaries at all, preferring simply to provide a large round number that was greater than that provided by the Guangdong provincial government.

5.3.2. The population of the PRD Region

Whenever a population for a given polity is cited, the figure is in effect a point prediction (a prediction of the figure such that, if it were possible to count every person on a given day, the count would yield that figure),

[7] 2002 Guangdong Statistical Yearbook, 541, as contained in Invest Hong Kong.

whereas in reality population is, statistically speaking, always an interval prediction because populations change every day. Depending on the variables that apply to a given population, that interval will be wider or narrower.

In his 2001 Policy Address, Tung stated: "[w]ith a population of 40 million and many affluent consumers in a number of areas, the PRD is an enormously attractive market". Yet several months later he spoke of the PRD region and Hong Kong as having "a population of over 50 million" (Tung, 2002).

Given that Hong Kong's population was 6.7 million (Hong Kong Census and Statistics Department 2001), and that of Macao was 0.44 million (Government Information Bureau of the MSAR 2003)[8], and given that the chief executive includes Hong Kong and Macao in his definition of the PRD region, this means that the population of the PRD (excluding Hong Kong and Macao) amounts to at least 42.86 million. The Hong Kong Trade and Development Council states the permanent population of the PRD to be 30 million (InvestHK 2002, 31) whereas a second governmental institution – InvestHK – puts the figure at 23.37 million (based on the figure from the 2002 Guangdong Statistical Yearbook). Finally, the population figures contained in China's 2000 census stated the population of the region to be 40.77 million (InvestHK 2002, 8). See Table 2 for a summary of the differences.

Hong Kong chief executive, 10/2001	40 millions
Hong Kong chief executive, 07/2002	42.86 millions
Hong Kong Trade Development Council	30 millions
InvestHK (Guangdong Statistical Yearbook)	23.37 millions
Fifth National Chinese Census, 2000	40.77 millions

Table 2 – Varying Figures on the Population of the PRD Region (excluding Hong Kong and Macao)

Why this rather large discrepancy? The main reason, explains InvestHK, is that the census population includes the PRD migrant and floating populations, whereas the sub–40 million figures do not. As the PRD has begun to prosper economically, large numbers of individuals from provinces far and near have flocked to the region seeking higher incomes[9]. It is difficult to obtain accurate counts of either the migrant or the floating populations. Those in the floating population have no residence associated with them and many avoid being counted for fear of being sent back to their home areas (Liang and Ma 2004). The migrant

[8] Figure rounded off to the closest 10,000.

[9] There are 23 provinces in China, 5 autonomous regions and 4 municipalities.

population is difficult to count because of China's longstanding household registry system. Urban migrants typically have migrated from rural areas, but their household registrations remain tied to their rural origins. The complex rules pertaining to the registration system, which depend on time spent away from the residence of registration, create interpretative uncertainty because there are gray areas within which it is difficult to ascertain the correct location for census purposes.

Clearly the Hong Kong Government would like to use the highest possible figure to make the region attractive to those considering investing there. The motive here is the same as the motive to present the largest possible geographic area for the PRD region. A larger population means cheaper labor for manufacturers; a larger market for manufacturers, wholesalers, and retailers; a larger workforce for multinationals; and so on. Yet if the rationale for the higher figures is utilized, the question immediately arises whether they represent primarily a labor force or primarily a consumer market and, if so, what kind of consumer market, given that most migrant workers tend to repatriate the larger portion of their earnings back to their homelands or home provinces. There are, then, a range of uncertainties – technical and interpretative – involved in census taking of which the Hong Kong government has made no mention in promoting investment in the PRD region.

6. Discussion: Eliminating Uncertainty and Exploiting Ambiguity

The pattern we have seen in Hong Kong's policymaking approach regarding investment in the PRD region is no doubt repeated in policymaking circles across the globe. Following this pattern, technical and interpretive uncertainties that are characteristic of the processes through which various government agencies collect data and make calculations to support their policy initiatives are in effect ignored, allowing the policymakers to assert with apparently total confidence that their policies will succeed. In so doing, the inherent social scientific uncertainties suffer the same fate as that of analogous uncertainties in the production of esoteric science.

I turn now to a seminal figure in the social constructivist canon – Donald MacKenzie – to provide a reference point that illustrates the aforementioned pattern, by which Hong Kong policymakers selected data that were subject not only to standard sources of technical and interpretive uncertainty, but also to ambiguity. To promote investment there, Hong Kong arbitrarily gave a specific meaning to the term "PRD region", creating a social technology for attracting such investment. We can see this social constructivist pattern in MacKenzie's certainty trough, which, in spite of having been devised some 20 years ago, continues to be cited

in the recent literature (see e.g., Collins and Evans 2002, 287; Lahsen 2005, 896; Evans *et al.* 2010).

This is not to say that the Hong Kong chief executive and his advisors were aware of themselves as negotiating uncertainty away. What they wanted was an attractive construct – the PRD region – to sell as a target of investment. As I was gathering data to build a case study illustrating Hong Kong's policy, I realized that the PRD region was likely constructed through a social process similar to the one MacKenzie analyzed in positing the certainty trough. If I am right, policy scholars would have much to learn by treating policy instruments as social technologies and examining their development using the techniques pioneered in STS and SSK.

Although I did not conduct the sort of research that would reveal the social relations and processes through which Hong Kong policymakers and their government experts constructed the PRD region for investment purposes, such a study would likely reflect important elements of the co-productionist framework that has attracted close attention from Jasanoff and other STS scholars. In Jasanoff's terms, co-productionism is an "idiom" through which to understand that:

> scientific knowledge [...] embeds and is embedded in social practices, identities, norms, conventions, discourses, instruments and institutions – in short, all the building blocks of what we term the *social*. The same can be said even more forcefully of technology. (Jasanoff 2004, 3)

Moreover, the co-productionist framework provides a means of exploring "how knowledge-making is incorporated into practices of statemaking [...] and [...] how practices of governance influence the making and use of knowledge" (Jasanoff 2004, 3). Such an emphasis suggests that co-productionism might prove very useful to policy studies scholars examining cases such as the one at hand. Here we have a public knowledge construct, the PRD region, which in this light seems very aptly described as co-produced by the two main actor groups involved, expert analysts and data gatherers on the one hand and executive policymakers on the other, with the result being a social technology that policymakers use to persuade the Hong Kong business and financial communities to invest in the PRD region. To paraphrase Jasanoff, the PRD region had crystalized over the course of the production process into objectified knowledge.

In broader STS terms, an object that had emerged in recent decades as its own entity through its distinctively local mix of population, culture, proximity to Hong Kong and other variables had now stabilized into a definite entity through co-production in the hands of the abovementioned actors. Jasanoff posits four "sites" of co-production: "making *identities*, making *institutions*, making *discourses*, and making *representations*" (Jsanoff 2004, 6, emphasis in original). While I would suggest that in the Hong Kong–PRD case the actors were involved primarily in making a representation of the PRD region by creating an identity for it, it is clear

that more generally any of these four sites of co-production might be involved in a given policymaking process, and that this would not be restricted to science and technology policy.

In making the case for the co-productionist idiom, Jasanoff notes that STS has traditionally paid too little attention to relations of power and the influence such relations have on the social construction of technology. Yet, as she notes, the "dynamics of politics and power [...] seem impossible to tease apart from the broad currents of scientific and technological change" (Jasanoff 2004, 14). This would seem all the more true of economic and social policy, providing yet another juncture at which STS resources might serve policy scholars well. In discussing the work of the political scientist Benedict Anderson, Jasanoff reports that on his account "nation-making crucially depends on deploying persuasive representations" and that among the instruments involved are the census, which we have seen played a critical role in our case (Jasanoff 2004, 26). While Hong Kong's construction of the PRD region may not seem like nation-making, and Hong Kong is now part of greater China, it seems reasonable to suppose that it might have the effect of expanding Hong Kong's footprint as an entity in the region. As I note below, issues involving political and economic power played into the Hong Kong-PRD case as opposition to the policy coalesced around concerns that infrastructure projects associated with the policy would disadvantage low-income citizens. Let us now, however, return to the certainty trough to see how we can map the Hong Kong-PRD case onto the figure.

The certainty trough posited by MacKenzie (1990, 372) to illustrate how technological communities experienced typical adjustments to technical and interpretative uncertainties in the course of developing working missile guidance systems for government agencies or contractors, with the latter communities adopting these technologies as though they were subject to very little uncertainty. The concept suggests that, within the scientific and technological communities that were involved in these efforts, considerable uncertainty attached to their results. These communities, as I have noted, constituted the *producers* of the technology. The government agencies and contractors who would apply the technologies in the construction of nuclear-armed devices, the *users*, descended abruptly into the trough seen in the figure, essentially ignoring the uncertainties. Later in the process, MacKenzie observed, some interested parties formed an opposition community, in which uncertainty about the technologies rose to new heights as the *alienated* sought to plant seeds of doubt.

To apply the analogy explicitly to the Hong Kong case, we would identify as the producers those agencies that gathered and analyzed data and calculated figures that constituted the indicators that stabilized the PRD region as a social technology. The executive branch, the users, then used that social technology to persuade investors in Hong Kong to invest in the PRD region; the alienated consisted of groups within Hong Kong who opposed the policy. This configuration of actors can be mapped on-

to MacKenzie's certainty trough without much distortion, although there are of course some notable differences. For one thing, the alienated are not rival statisticians or economists who would correspond to the rival scientists who preferred another MIRV technology. In the Hong Kong-PRD case the opposition raised doubts about some quantitative forecasts, although not to my knowledge the population or geographical indicators.

Thus to complete our mapping of the Hong Kong-PRD case onto the certainty trough, we identify an opposition even if it does not consist of figures comparable to the producers. That is to be expected if we are to extend the use of the certainty trough figure to public policies that are not informed by esoteric science, where the opposition of the alienated class is more likely to reflect political objectives, particularly when there is a question of distribution of power or resources. Indeed there is in Hong Kong a political party, the League of Social Democrats (LSD), which has publicly opposed the pro-PRD investment policy. Its opposition arises within a broader agenda of economic equality and redistribution of wealth, and the LSD's opposition role is perhaps best seen in its opposition to the abovementioned high-speed rail link. The LSD argues that the link's benefits will elude the lower classes and, more directly, will not prove cost effective in light of its environmental impact (I have no data indicating whether the LSD enlisted experts to support its claims).

Thus, while the LSD's opposition to the rail link – which we have seen is among the key infrastructure investments meant to support increased business investment by Hong Kong interests in the PRD region – rested primarily on political grounds, it also took issue with a type of quantification involved in making the case for business investment, by suggesting that it would not be cost effective. In criticizing such quantification, which Porter regards as a social technology in its own right, the LSD was in effect impugning the objectivity of Hong Kong's representation of the PRD region. As Porter (1995, 215) says: "no matter how rigorous" is the result of quantification, a set of actors "cannot make strong objectivity claims when it has strong rivals". This is not to suggest that the LSD represents a major threat to the configuration of power in Hong Kong, although it remains active to this day. More generally, if STS conceptual resources are to be applied in studies of social or economic policymaking, opposition classes are all the more likely to reflect political opposition.

Moreover, the case at hand does not turn on esoteric science, although of course data of the types that were involved are assumed to have some basis in scientific fact. Nevertheless, the result to be produced was, in effect, a definition of the PRD region to be used by policymakers in communications with investment communities in Hong Kong and elsewhere (for more on how producers and users co-construct meaning, see Oudshoorn and Pinch 2005). In order to use these data as constitutive of the PRD region *qua* social technology, Hong Kong's government not only set aside the technical and interpretive uncertainties, they exploited ambiguities to construct, somewhat arbitrarily, an entity that would be

known as the PRD region for the purposes of attracting investment there. There were no "facts" providing a precise definition of the PRD region so the government was able to depict the PRD region unambiguously as an entity ripe for investment.

The analogy between this process and the scientific and technological processes involved in the phenomena that MacKenzie studied underscores the important role that interpretive uncertainty plays. In referring to the interpretive flexibility involved in the MIRV case, MacKenzie (1990, 260) argues that the technology involved was in effect interpretable as applying to a range of possible outcomes, and while the social indicators cited by Hong Kong as constitutive of the PRD region involved several types of interpretative uncertainty, it is arguable that the term "PRD region" also exhibited interpretive flexibility, rendering it suitable to the government's efforts to make the case for investment. More precisely, the term "PRD region", having no determinate a priori meaning, exhibited *ambiguity* that played into policymaking deliberations, whereby the government was able to select from a range of possible interpretations of what would constitute the region.

A recent study carves out a more prominent role for ambiguity in studies of government rationality and international relations. Best (2008, 360-361) argues that even the best efforts to control uncertainty and risk fail to account for ambiguity, because: "even if we [...] resolve such uncertainties [...] we would still be faced with the challenge of interpreting [...] that information". In the context of Best's analysis of the concept of ambiguity, then, the construction of the PRD region to serve as a social technology clearly exploited the ambiguity, or interpretive flexibility, of the area, population, and GDP of the region (while ignoring the technical uncertainty). This is particularly clear insofar as Hong Kong included both itself and Macao within the PRD region, something that the provincial government of Guangdong has so far avoided, but which enhances the attractiveness of investment in the PRD region.

If we now return to Figure 1 and the certainty trough, we see that although the technical and interpretive uncertainties of the data-collection processes involved in determining land areas, political boundaries, population, and GDP may have fallen away as the PRD region was constructed, another form of interpretive uncertainty came into play at that point. Within that region of the figure, the government made rhetorical use of the ambiguity inherent in the multiple sets of figures that various agencies produced in order to construct a version of the PRD region that was conducive to making its case. For example, Hong Kong included both the floating and migrant populations in the figures that it cited. That these figures were inaccurate from a census-taking standpoint was not much at issue; populations change constantly. What mattered was that Hong Kong chose a figure that could be defended only if those populations were included, and thereby disambiguated the concept of the PRD region that was the object of its policy. From a set of alternative versions of the

PRD region, Hong Kong chose the one that best supported its position. In Best (2008, 356) terms, this was a case of "government through ambiguity".

7. Conclusions

The case of Hong Kong's promotion of investment in the PRD region illustrates how uncertainty can be ignored or exploited in policymaking. I have showed how technical and interpretive uncertainties are eliminated as policymakers move a construct into a certainty trough. That is, in Hong Kong's promotion of investment in the PRD region, the sources of uncertainty and ambiguity inherent to the processes through which it determined what would count as the PRD region are not explicitly acknowledged as the government presents the case for investment, but they provide the flexibility the government needs to justify its policy. Since there is no definitive PRD region, the government's version cannot be rejected as inaccurate, providing it with Manski's incredible certitude. Groups such as the LSD might object, but to do so effectively they will need to produce their own analyses, which are similarly subject to uncertainty and ambiguity.

Admittedly the government's conduct here is neither surprising nor earth shaking, nor is its behavior particularly contemptible. What I found interesting about this, from my STS perspective, is that the same pattern that emerged from SSK analyses on esoteric science and technology production processes is replicated in policymaking for economic development. Economic and social policymakers have their own certainty trough. No such analysis has hitherto been applied to this region. The comparison is possible, however, because in STS terms, the PRD region construct that emerged from policy deliberations is a co-produced social technology; the fate of uncertainty in the two domains – policy-relevant esoteric science and policy-relevant social science – bears a range of interesting similarities and differences. This is, of course, only one example of social or economic policymaking that might be illuminated by the analytical resources of STS, and it is likely that other cases will involve other variables and social dynamics.

I leave to other scholars the task of applying the methods of STS from which the concept of the certainty trough emerged to further study of policymaking processes in government agencies. As I discovered, it can be difficult to study social processes among government actors. Nevertheless, ethnographic studies of policymaking cultures might shed additional light on the degree to which uncertainty or ambiguity are consciously ignored in policy debate or simply do not arise once the issues involved percolate up the decision-making chain. The results of such work would seem able to inform studies in a range of disciplines that might include

sociology, political science, policy studies, and international relations – several of which are mentioned by Jasanoff as appropriate sites for conversation between STS and other disciplines – while opening up new areas of study, not just in STS.

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Geni ribelli

La scienza aperta nell'immagine pubblica di due biologi

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Abstract: Open science is a form of knowledge production that relies on the open sharing of information through digital media. In this article I wonder which scientists' cultural elements sustain new open science practices. Against the celebrations of the revival of a 20th century Mertonian ethos of disinterest, I suggest that an ethos of openness can include justifications related to sharing as well as features such as anti-bureaucracy rebellion, hedonism and search for profit. It is a recombination of the modern scientist's ethos with cultural systems related to hacking and information technologies. To show this emergence and thus the importance of hacker cultures for contemporary societies, I studied the public images related to the establishing of two open access genetic databases, and in particular the two biologists who lead those projects: Ilaria Capua and Craig Venter. This recombination maintains an ambivalence: while both cases are geared against today's incumbents' concentration of power, the justificatory system they have in common does not exclude entrepreneurship and profit.

Keywords: open science; public communication of science; cultural studies; digital media; justificatory regimes.

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1. Introduzione

Il concetto di scienza come produzione di conoscenza pubblica, che oggi può apparire ovvio, è in realtà il risultato di dinamiche sociali complesse e stratificate. Le forme con le quali si gestiscono la condivisione e la comunicazione di informazione e conoscenza scientifiche sono il frutto di negoziazioni e scontri e sono in continua evoluzione. In questo articolo analizzo il diffondersi di pratiche di scienza aperta, o *open science*, basate sulla condivisione pubblica di dati e conoscenze tramite i media digitali e senza restrizioni all'accesso. Nel corso degli ultimi due decenni si è assisti-

to alla diffusione di nuovi mezzi di comunicazione online e di pratiche di condivisione e cooperazione mutuate dal mondo del software. Nella ricerca scientifica un ruolo cruciale è stato assunto dagli strumenti open access e open source, in particolare nelle scienze della vita[1]. I media digitali hanno infatti reso possibili nuove forme di comunicazione e condivisione che vengono raccolte sotto la definizione "scienza aperta", un termine ombrello che racchiude elementi molto diversi tra loro come riviste scientifiche online, database ad accesso aperto o piattaforme cooperative, in opposizione a pratiche altrettanto diversificate come brevettazione, segretezza o pubblicazione su riviste o database soggetti a restrizioni all'accesso (Nielsen 2012). In questo articolo mi concentro sulla nascita di due database open access. In questo modo mi propongo di approfondire la visione diffusa tra i sostenitori della open science e tra gli stessi scienziati, secondo la quale il successo di nuove forme di scienza aperta si baserebbe, oltre che sulla diffusione della rete come strumento di comunicazione, anche sul ritorno all'ethos di condivisione e disinteresse della scienza moderna messo in luce da Robert Merton (1973). Una descrizione diffusa di questo fenomeno sostiene che l'ethos di condivisione, eguaglianza, disinteresse e ricerca del bene comune che guidava il lavoro quotidiano degli scienziati sia stato scalzato da nuove regole imposte dall'ingresso dell'impresa privata nella ricerca e che non prevedono la spinta a condividere dati, informazione e conoscenza (Slaughter e Leslie 1999; Stodden 2010). L'allargamento dell'uso di forme di proprietà intellettuale e la ricerca del profitto costituirebbero l'opposto delle norme della scienza aperta novecentesca, della "adesione all'ethos della ricerca cooperativa e della libera condivisione della conoscenza" (David 2003, 3; vedi anche Heller *et al.* 1998). Questi cambiamenti sono stati interpretati come il segno di una drammatica mutazione etica, "una corrosione delle norme della buona scienza" espressa dall'adesione dei produttori di sapere scientifico ai valori delle imprese (Hedgecoe e Martin 2008, 824; vedi anche Lam 2010). Da qui l'idea che occorra affiancare ai nuovi strumenti tecnologici e legali a disposizione dei ricercatori un ritorno alla cultura della scienza aperta mertoniana.

Tuttavia il riferimento all'ethos della scienza moderna non è sufficiente per comprendere le trasformazioni che la scienza sta attraversando nell'era dei media digitali. Innanzitutto, diversi autori hanno sottolineato come l'immagine dello scienziato accademico non interessato al denaro o alle questioni economiche sia da considerarsi semplicistica, e lo stesso atto della condivisione sia parte di un'economia di scambio: secondo Richard Barbrook (1998): "nella scienza l'opposizione tra donare come forma di socializzazione del lavoro e la merce non è mai stata reale". Una separazione netta tra scienza accademica, in cui gli scienziati condividono i dati, e ricerca condotta in imprese private che adottano politiche di brevettazione oppure fanno uso del segreto industriale, non è una descrizione ac-

[1]In Italia vedi Gruppo Laser 2005; sulla biologia open source vedi Hope 2008..

curata della scienza novecentesca, dato che pratiche opposte di gestione dell'informazione venivano messe in campo in entrambi i contesti (Shapin 2008). Nella scienza contemporanea il quadro si è complicato ulteriormente, dato che sono comparse figure ibride, come scienziati-politici o imprenditori che fanno parte sia della comunità accademica, sia di altri gruppi sociali, e forme differenti di gestione e proprietà dell'informazione che convivono in un'ecologia sempre più complessa (Etkowitz 2008, Hope 2008, Nowotny *et al.* 2001). Infine, economia del dono, accesso, condivisione, partecipazione, gratuità sono divenuti modelli di appropriazione del valore prodotto dalla cooperazione online in molti settori di produzione di informazione e conoscenza (Barbrook 1998, Terranova 2004). Anche nella ricerca scientifica il ventaglio di opzioni politiche aperto dalle dinamiche di condivisione dell'informazione legate all'uso della rete è più ampio ed eterogeneo di quello descritto da molti dei lavori sulle trasformazioni avvenute nella scienza, e non può essere ridotto al ritorno dell'ethos mertoniano come arma per sconfiggere capitalismo accademico e privatizzazione della ricerca.

La mia ipotesi è che nelle scienze della vita contemporanee stia emergendo un nuovo tipo di scienza aperta, eterogeneo e non ancora stabilizzato, che rappresenta in parte un'evoluzione dell'ethos mertoniano del Ventesimo secolo ma che include anche elementi nuovi, e i cui effetti non sono limitati al cambiamento delle dinamiche di circolazione di informazione e conoscenza, ma coinvolgono l'ecologia istituzionale della ricerca biomedica.

2. La scienza: da Merton agli hacker e ritorno

Perché gli scienziati scelgono di condividere informazioni e conoscenze? Nel 1942, Robert Merton propose quello che è oggi un elenco classico dei valori e delle norme di comportamento che regolano il lavoro degli scienziati accademici e che comprendono il *comunismo*, cioè la condivisione delle conoscenze, l'*universalismo*, il *disinteresse* e lo *scetticismo organizzato* (1973). Come sottolineato dallo stesso Merton, i valori che compongono il cosiddetto CUDOS non sono però né una descrizione accurata del lavoro dello scienziato, né un set di norme morali individuali. Si tratta piuttosto di una serie di imperativi istituzionali in grado di fornire agli scienziati gli strumenti per posizionarsi all'interno di uno specifico sistema di incentivi che regola la ricerca scientifica. Nel caso delle dinamiche di comunicazione, tali norme favoriscono per esempio la pubblicazione delle conoscenze su riviste peer-reviewed, che è incentivata da specifiche dinamiche di funzionamento delle carriere scientifiche all'interno dell'università. Numerosi autori hanno cercato di contestualizzare e sottoporre a critica la visione di Merton, e il risultato è un quadro complesso. Le norme del disinteresse e dell'universalismo possono assumere si-

gnificati molto differenti, e comportamenti *contronormali* che implicano la loro violazione sono frequenti e spesso premiati (Laudan 1982). Insieme al positivismo popperiano, le norme CUDOS sono state interpertate come un "mito organizzativo della scienza" (Fuchs 1993). Tuttavia, in determinati contesti istituzionali e in presenza di incentivi adeguati, all'interno quindi di specifici contratti sociali della scienza, le norme mertoniane, così come le contronorme individuate da altri autori, forniscono strumenti ideologici e retorici cui gli scienziati possono attingere per dare senso alle proprie azioni (Bucchi 2011, Krimsky 2006).

Ma quali norme guidano la scelta di condividere informazione e conoscenza nella ricerca contemporanea? In un quadro di profonda trasformazione del contratto sociale della scienza e di evoluzione delle tecnologie per la gestione dell'informazione, emergono nuovi tipi di incentivi alla condivisione e gli strumenti forniti dall'ethos mertoniano non sono più sufficienti a rispondere alle esigenze degli scienziati contemporanei. In contesti di cambiamento e trasformazione gli individui riconfigurano elementi appartenenti a una o più culture preesistenti in modo da rendere possibili nuove strategie di azione. Ann Swidler (1986) usa la metafora della "cassetta degli attrezzi" per definire il repertorio simbolico e di visioni del mondo che gli individui possono usare in diverse configurazioni per risolvere i problemi che hanno di fronte. Per Swidler le "vite instabili" sono i momenti di trasformazione e contrasto in cui riorganizzare i modelli culturali è più urgente, mentre Luc Boltanski e Laurent Thévenot (1999) parlano di "momenti critici" in cui riappropriarsi di competenze culturali create in un certo contesto storico non esclude la possibilità di modificarle per riadattarle a nuove circostanze. Infatti, l'influenza di un determinato set di elementi culturali può perdurare anche al di là dei fenomeni che lo hanno generato. Tuttavia esso deve essere rielaborato introducendo elementi provenienti da altre culture. Quali altri elementi concorrono allora a costituire la cassetta degli attrezzi ideologica e retorica con cui gli scienziati danno vita a strategie di azione all'interno delle possibilità e degli incentivi della *open science*?

Per comprendere i fenomeni di ridefinizione delle relazioni tra ricercatori e istituzioni scientifiche e delle dinamiche di circolazione di informazione e conoscenza scientifica proprie della scienza aperta introduco un sistema culturale legato alle tecnologie dell'informazione: l'etica hacker. Come dimostrato da diversi studi storici e sociologici, l'etica hacker è erede diretta dell'ethos della ricerca scientifica (Levy 1984, Paccagnella 2007). In questo articolo suggerisco che questo rapporto si sia invertito: anche se i riferimenti non sono sempre espliciti, le culture legate all'hacking stanno influenzando l'evoluzione della biologia contemporanea. Secondo le mitologie più diffuse, l'etica hacker è nata al Massachusetts Institute of Technology negli anni Cinquanta ed è un'importante elemento del mondo dei media digitali, fatto di start-up, fuoriusciti dall'accademia, reti imprenditoriali, garage e dipartimenti di informatica (Levy 1984). Anche se dell'etica hacker esistono definizioni molto eterogenee, le prin-

cipali narrazioni e studi sugli hacker e la loro etica dipingono alcuni tratti comuni: l'hacker, nato sotto il segno dell'influsso dei movimenti controculturali americani degli anni Sessanta e Settanta (Turner 2006), non è solo indipendente, mosso dalla curiosità, innovatore dedito alla condivisione del suo sapere ma anche un eretico, ribelle contro le istituzioni e la burocrazia, un edonista che lavora per divertimento, pur restando una risorsa pronta a vendersi al venture capital (vedi per esempio Ippolita 2005, Best 2003). Nel suo lavoro sulla storia dell'hacking, Levy elenca alcune precise norme di comportamento. L'*accesso* ai computer deve essere completo e illimitato per chiunque voglia metterci le mani. Tutta *l'informazione deve essere libera* e quindi dati e conoscenze devono essere condivisi affinché gli hacker possano usarli per migliorare un sistema. *Diffida dell'autorità e delle burocrazie*, dato che esse non favoriscono la libertà di esplorare i computer da parte degli hacker, imponendo logiche estranee e non trasparenti. Gli hacker devono essere *giudicati per i loro hack*, e non tramite criteri come titoli, età o posizione. Con i computer si può *creare arte* e migliorare la propria vita, se si lascia libero l'impulso creativo degli hacker che lavorano per divertimento e passione. Tra i principali elementi dell'etica hacker vi sono dunque l'enfasi su un "accesso attivo all'informazione" e la presa di posizione contro le restrizioni alla sua circolazione (Best 2003). Secondo Kelty, le comunità hacker sono "pubblici ricorsivi" che contribuiscono direttamente a progettare e mantenere le proprie infrastrutture di comunicazione (2008). Della cultura hacker è stato anche sottolineato il ruolo di ethos che guida lo sviluppo del capitalismo basato su produzione e scambio di informazione (Castells 1996, Himanen 2001). Queste descrizioni non colgono tuttavia la complessità del fenomeno, composto da culture diverse ed eterogenee e non riducibili a norme statiche. Gli hacker contribuiscono nel loro agire a reinventare e ridefinire termini cruciali per le società contemporanee, quali *libertà* e *apertura,* i quali vengono usati da attori molto diversi o persino in aperta contrapposizione tra loro, come progetti no profit (Debian), corporation (IBM) o attivisti anti-corporation (Indymedia). Nell'etica hacker, sulla quale si è basata la nascita di una parte importante dell'industria informatica, il disinteresse non è sempre premiato (Coleman e Golub 2008, Kelty 2008).

Studiare il rapporto tra questo sistema culturale e quello della scienza mertoniana offre la possibilità di evidenziare gli strumenti a disposizione dei biologi per agire in un contesto di cambiamento in cui mutano le relazioni tra ricercatori e istituzioni scientifiche così come l'ecologia istituzionale in cui ha luogo la ricerca biologica. L'hacking del resto è una componente cruciale delle società dell'informazione: contribuisce a guidarne lo sviluppo tecnologico ma si è anche diffuso sino a influenzare pratiche sociali molto diversificate, come testimoniano casi noti come quello della rete di attivisti Anonymous o di Wikileaks, o meno conosciuti come l'emergere di pratiche che fanno riferimento alle culture hacker in settori come la moda, l'attivismo politico o la produzione di oggetti materiali

(Bazzichelli 2013, Magaudda 2012, Söderberg 2011). È lo stesso per la ricerca scientifica?

Per mostrare l'emergere di questa riconfigurazione delle culture scientifiche ho studiato l'immagine pubblica di due biologi responsabili della nascita di due database genetici open access. Il primo è il biologo statunitense Craig Venter con il caso del Sorcerer II, una nave da ricerca che ha raccolto campioni di batteri marini dai mari di tutto il mondo per sequenziarne i genomi, dando vita al database CAMERA. La seconda è la virologa italiana Ilaria Capua con la nascita del database GISAID, usato per risolvere un problema di accesso ai dati dell'influenza aviaria legato a una controversia causata dall'Organizzazione Mondiale della Sanità (OMS). Anche se si tratta di due casi parziali e non generalizzabili, le loro traiettorie fanno parte di un movimento più ampio che si sta affermando nella biologia contemporanea, nel settore pubblico come in quello privato. George Church di Harvard, soprannominato *esibizionista dell'informazione*, è il direttore del Personal Genome Project e persegue politiche di accesso radicali. Drew Endy del Mit Biobricks Project parla spesso di "hacking del Dna" e produce parti biologiche che chiunque può assemblare per produrre organismi artificiali. DIYbio è una comunità di biologi non professionisti, che si autodefiniscono *biohacker* e si propongono di fare biologia al di fuori dei contesti istituzionali. Nelle conclusioni accennerò a come le strategie di azione rese possibili dalla riconfigurazione dell'ethos dello scienziato siano in grado di creare nuove possibilità per hackerare la biologia: una metafora per un approccio attivo e trasformativo all'ambiente politico e sociale della biologia contemporanea.

3. Casi di studio e metodo

I due scienziati analizzati condividono una forte visibilità mediatica, una delle caratteristiche rilevanti che hanno orientato la scelta dei casi studio. Infatti non ho analizzato i risultati scientifici dei due progetti esaminati, ma mi sono concentrato sulle attività di comunicazione pubblica, che rappresentano un'importante strumento di posizionamento all'interno del dibattito scientifico (Bucchi 2000). Con Bourdieu (2001), ritengo che le strategie comunicative siano cruciali negli scontri che caratterizzano il campo scientifico. La scelta di due casi appartenenti a setting istituzionali differenti mi ha permesso di interrogarmi sulla ricchezza, la complessità e l'ambivalenza delle nuove forme di scienza aperta nel momento in cui forniscono ai ricercatori nuovi strumenti per accumulare capitale simbolico strategico per la determinazione dei risultati delle tensioni e trasformazioni che attraversano la ricerca, ma anche per negoziare e partecipare a nuove forme di accumulazione di profitto. Gli scontri che si

svolgono nell'arena pubblica e sulle reti digitali possono concorrere a plasmare non solo un fatto scientifico, ma la struttura stessa del campo. In un'attività altamente mediatizzata come la ricerca scientifica contemporanea l'immagine pubblica dei ricercatori può essere un elemento cruciale della nascita di un nuovo regime di giustificazione funzionale alla risoluzione di una disputa (Boltanski e Thévenot 1999). Elementi culturali e ideologie come quelli forniti, in questo caso, da ethos mertoniano ed etica hacker rappresentano i mattoni con i quali si costruiscono le strategie di legittimazione che vengono espresse e negoziate nell'arena pubblica.

Inoltre la scelta di Craig Venter e Ilaria Capua mi permette di analizzare contesti istituzionali differenti: uno è un free lance della biologia, noto per essere il simbolo della commistione tra ricerca biomedica e impresa privata, mentre l'altra è una ricercatrice del settore pubblico che lavora per un'ente governativo.

Nel caso di Craig Venter ho studiato la Global Ocean Sampling Expedition: una missione scientifica intrapresa dal Sorcerer II, lo yacht di Venter trasformato in nave da ricerca del J. Craig Venter Institute. Tra il 2003 e il 2006 il Sorcerer II ha circumnavigato il globo fermandosi periodicamente per raccogliere campioni di acqua da cui estrarre batteri marini per sequenziarne il genoma e scoprire nuovi geni da usare in progetti di biologia artificiale. Venter è noto per aver fondato Celera Genomics, l'azienda privata che ha sequenziato il genoma umano nel 2000, e incarna l'idealtipo di scienziato/imprenditore: è stato etichettato con soprannomi come *bad boy* della scienza e *Darth Venter* per il suo rapporto con le imprese e per le sue politiche relative ai diritti di proprietà intellettuale. Tuttavia i dati raccolti dal Sorcerer sono stati pubblicati in CAMERA, un database di metagenomica open access creato ad hoc. Inoltre gli studi derivati da questo progetto di ricerca sono stati pubblicati in un numero speciale della rivista open access *PLoS Biology*, appartenente al gruppo Public Library of Science. La Global Ocean Sampling Expedition è stata cofinanziata da Moore Foundation, US Department of Energy e Discovery Channel, che ha inviato una troupe a bordo per girare un documentario intitolato *Cracking the ocean cod*e (Conover 2005). Altri giornalisti sono saliti sul Sorcerer, che ha ricevuto una importante copertura mediatica a livello internazionale, per esempio da *Wired* e *The Economist*.

La seconda scienziata è Ilaria Capua, una virologa veterinaria che lavora presso l'Istituto Zooprofilattico Sperimentale delle Venezie, a Legnaro (PD). Nel 2006, durante la crisi globale dell'influenza aviaria, Capua si è opposta all'Organizzazione Mondiale della Sanità, forzandola a cambiare le sue regole sull'accesso ai dati dell'influenza aviaria. Fino ad allora infatti l'accesso al database dell'OMS era limitato a pochi laboratori di riferimento. All'inizio del 2006 Capua si è trovata a dover depositare i dati relativi al sequenziamento di alcuni ceppi di H5N1, il virus dell'influenza aviaria, uno nigeriano (la prima diagnosi effettuata in Africa) e uno italiano. Ma invece di consegnare i dati all'OMS Capua li ha pubblicati su Genbank, un importante database open access, e in una let-

tera aperta ha spronato i suoi colleghi a fare lo stesso, rifiutando le policy dell'OMS (Anonymous 2006b, Capua *et al*. 2006, Enserink 2006a). Dopo aver acceso un dibattito sulle principali riviste scientifiche (*Nature*, *Science*, *The Lancet)* e sulla stampa internazionale e italiana (tra cui *New York Times*, *Washington Post, Wall Street Journal*, *Il Messaggero*, *Il Corriere della Sera*, *Le Scienze*), Capua ha ottenuto la modifica delle politiche dell'OMS e ha fondato la Global Initiative for Sharing Avian Influenza Data o GISAID, un'istituzione che gestisce un database open access sui virus influenzali alternativo a quello dell'OMS. In seguito alla vicenda GISAID, Ilaria Capua è diventata un punto di riferimento per i media italiani in tema di scienza aperta.

Il mio materiale è stato raccolto tramite l'uso di motori di ricerca e con l'aiuto degli uffici stampa dei due progetti e include prodotti comunicativi internazionali e nazionali di natura eterogenea. Per il Sorcerer II l'intervallo temporale di raccolta dei materiali va dall'inizio del viaggio, nella primavera del 2003, fino alla pubblicazione del primo set di risultati, nella primavera del 2007. Il materiale include cinque articoli della stampa internazionale, otto pubblicazioni scientifiche legate al progetto di ricerca, due apparizioni televisive, due libri, l'autobiografia di Venter, un documentario, e infine i comunicati stampa e i contenuti del sito web istituzionale del Venter Institute. Per Ilaria Capua il periodo preso in esame comincia nel gennaio 2006, con l'invio della prima email ai colleghi tramite la mailing list ProMED-mail, e continua per quattro anni fino alla fine del 2009. Il materiale è composto da trenta articoli di stampa nazionale e internazionale, diciotto articoli o lettere pubblicati da riviste scientifiche, un intervento a una conferenza, un libro, oltre a comunicati stampa e contenuti dei siti web istituzionali. In entrambi i casi sono stati scartati blog, giornali online non specialistici e stampa locale.

Nell'analisi ho usato i precetti dell'ethos mertoniano e dell'etica hacker come strumenti analitici, ricercando nelle immagini pubbliche dei due biologi gli elementi riferibili a uno o all'altro sistema di elementi culturali. L'analisi comprende contenuti mediati da operatori della comunicazione e contenuti prodotti direttamente dai due biologi o dalle loro istituzioni. Tuttavia si tratta sempre di attività di comunicazione pubblica, che contribuiscono alla costruzione dell'immagine pubblica complessiva dei due ricercatori. L'intersezione continua dei due piani, cioè la rappresentazione fornita dai media e le forme di auto-rappresentazione messe in atto dai due biologi, può rappresentare una complicazione per l'analisi dell'immagine pubblica ma apporta anche una ricchezza comunicativa che verrà evidenziata, quando necessario, nei paragrafi successivi.

Gli elementi presenti non sono stati inseriti esplicitamente dai due biologi nelle cornici culturali che ho studiato: non ho quindi cercato componenti dell'immagine pubblica che venissero attribuiti direttamente all'ethos mertoniano o alle culture hacker. Piuttosto tramite analisi del discorso ho rintracciato la presenza di forme di giustificazione che fossero riconducibili alle versioni conosciute dei due sistemi culturali, per capire

in che modo essi stessero integrandosi e convergendo, quali fossero comuni ai due casi e quali specifiche dell'uno o dell'altro. A questa analisi ho affiancato una ricostruzione della nascita dei due database e del rapporto tra i due scienziati e le istituzioni scientifiche. Ciò mi ha permesso di comprendere in che modo l'ethos della scienza venga rimodellato e adattato per dare vita a nuove strategie d'azione e quale influsso le culture hacker abbiano sulle attività di legittimazione della ricerca scientifica.

4. Le vacanze di Craig Venter

Nelle narrazioni dei media, la spedizione di Craig Venter si ricollega esplicitamente alla lunga tradizione dei viaggi di ricerca scientifica, in particolare la spedizione di Charles Darwin a bordo del Beagle (Gross 2007 and JCVI 2004). La costruzione del legame tra questi eventi è evidente nell'analisi dei discorsi, che contribuiscono a creare un'immagine pubblica di Venter come esploratore precedente alla formazione delle strutture della scienza moderna, uno scienziato che conduce ricerca al di fuori di laboratori e accademia. Le sue imprese vengono descritte come un tentativo di esplorazione del mondo e spostamento delle frontiere della conoscenza umana. La partecipazione di Discovery Channel fa parte del suo programma Discovery Quest, un'iniziativa per finanziare una "nuova generazione di scoperte scientifiche", condotte da ricercatori ed esploratori. Nel caso di Venter, le due figure si sovrappongono. Il 4 marzo 2004, il Venter Institute tiene una conferenza stampa per presentare lo studio pubblicato nel numero di *Science* di quella settimana, che descrive il primo set di dati raccolti nel Mar dei Sargassi. Durante la conferenza stampa, Craig Venter annuncia che in quel momento il suo Sorcerer II è alle Isole Galapagos, sollecitando i giornalisti a sottolineare il legame tra il suo viaggio e quello di Darwin. Il titolo della copertina di *Wired* menziona esplicitamente il più importante lavoro di Charles Darwin: "L'epico viaggio di Craig Venter per ridefinire l'origine delle specie" (Shreeve 2004). Anche le riviste scientifiche, le stesse *Science* e *PLoS Biology*, sottolineano le similitudini tra i due viaggi. Una delle immagini pubblicate da *PLoS* mostra Craig Venter alle isole Galapagos, in posa di fianco alla *Estación cientifica Charles Darwin*. In tutti i discorsi prodotti dai media, l'esplorazione viene associata alla scoperta di mondi sconosciuti e al raggiungimento di obiettivi scientifici eccezionali:

> negli oceani c'era un mondo sconosciuto e mai visto che potrebbe essere cruciale per capire meglio la diversità sul pianeta, così come per risolvere alcuni dei problemi ambientali emergenti, come il cambiamento climatico. (Shreeve 2004)

Anche nel documentario prodotto da Discovery Channel (Conover 2005) compare l'immagine dell'esploratore di nuovi mondi. Craig Venter

sta esaminando una mappa prima di esplorare un'isola tropicale, con l'oceano alle sue spalle. Equipaggiato come un sub, si tuffa nelle acque delle Isole del Cocco mentre la voce narrante dice: "nelle profondità della Terra stanno accadendo strane cose […] e Craig Venter è qui per investigare". I batteri infatti sono la materia oscura della vita i cui segreti vanno svelati. Nei resoconti mediatici e nelle interviste, Craig Venter non si limita a sottolineare l'analogia con Charles Darwin ma vuole superarlo grazie agli strumenti tecnologici di cui dispone e alla sua visione del mondo naturale, che gli permettono di estrapolare informazioni più approfondite e quindi di "cambiare il mondo" più di quanto abbia fatto lo stesso Darwin.

L'immagine pubblica di Venter è anche ricca di riferimenti al suo ruolo di scienziato dell'informazione, un altro tipo di esploratore di nuovi mondi. Craig Venter usa per il genoma metafore legate alle tecnologie dell'informazione: "non è che un microrganismo […] dobbiamo conoscere il suo sistema operativo". Il suo obiettivo è creare "la madre di tutti i database" (Shreeve 2004), perché "i genomi sono come il codice informatico. E come il codice, i genomi possono essere mappati" e registrati su un disco: "dalla vita... a un disco", diventando così "codice digitale pronto per essere processato da un computer" (Conover 2005). La vita è composta da informazione genetica il cui codice deve essere svelato. Anche l'hacker è uno scopritore di codici, di segreti nascosti da linguaggi codificati che possono risultare utili, fantastici, sorprendenti. Nel logo usato da *PLoS Biology*, il Sorcerer II naviga su un mare fatto di A,T, C e G, le iniziali dei quattro nucleotidi che costituiscono il Dna. Venter sta cercando di "cambiare il futuro del pianeta crackando il codice dell'oceano" (Conover 2005). Nel gergo informatico "crackare" significa svelare un codice crittografato o aprire una breccia in un sistema. Anche il Sorcerer II sta cercando di crackare un codice pur senza conoscerne l'uso immediato. Come nei miti fondativi del mondo hacker, non c'è bisogno di trovare un'applicazione ai codici decrittati. Come dice Venter, "abbiamo trovato 20.000 nuove proteine che in un modo o nell'altro metabolizzano idrogeno. 20.000!" e il codice genetico è di per se stesso "una fonte di potere" (Conover 2005). Come nei miti fondativi della cultura hacker, la "nuda" informazione viene dipinta come un obiettivo di per sé, un'avventura, e fermare le persone che cercano di ottenerla è una pratica dittatoriale.

Nelle narrazioni sul Sorcerer II il gusto della scoperta è sempre mescolato con il piacere della vita, un altro tipico ingrediente dello stile hacker. Le forze che spingono un hacker sono curiosità e libertà. Il desiderio di conoscenza e autogestione rende il divertimento un importante componente delle attività degli hacker, e ai loro occhi burocrazia e istituzioni acquisiscono un'immagine negativa. Quando alcuni critici rimarcano che avrebbe dovuto usare una vera e propria nave da ricerca e non la sua nave da diporto, che sembra uno yacht di lusso, Venter risponde di voler combinare lavoro e piacere, sottolineando con sarcasmo "molto presto raggiungerò la nave per dirigermi verso la Polinesia Francese. È un duro la-

voro...” (conferenza stampa del 4 marzo 2004, citata in Pollack 2007). Il titolo dell’articolo dell’Economist recita: “Le vacanze del dott. Venter” (Economist 2007). Craig Venter ha anche contatti diretti con le aziende dell’IT, per esempio con Google: oggi, nella visione di Venter, la vera sfida della biologia è organizzare e analizzare le enormi quantità di dati contenuti nei database genetici, e i matematici, gli scienziati e la potenza di calcolo di Google forniscono il potenziale per farlo con successo (Vise e Malseed 2006).

Venter è noto per aver adottato strategie di segretezza e privatizzazione dei dati genetici. Con la sua Celera Genomics aveva sfidato le norme della scienza accademica forzando la rivista scientifica *Science* a cambiare i suoi standard di pubblicazione e ottenendo il permesso di pubblicare lo studio sul sequenziamento del genoma umano senza rendere pubblici tutti i dati (Castelfranchi 2004). È stato al centro di furiose polemiche legate ai brevetti già quando lavorava agli NIH, e ancora oggi insiste in tattiche di brevettazione aggressive: le controversie sul brevetto richiesto dal JCVI (2007) su un “batterio sintetico” sono solo un esempio. Nel caso del Sorcerer II i profitti restano al centro della scena, ma Venter sceglie di rilasciare tutti i dati nel dominio pubblico e pubblicare i risultati principali su *PLoS Biology*, una rivista leader del movimento per l’open access (Rai and Boyle 2007). Con il Sorcerer II, Venter dimostra che il confine tra scienza accademica e industriale, per quanto riguarda le pratiche di condivisione, è diventato talmente poroso che attraversarlo non richiede più una trasformazione della cultura dello scienziato. Craig Venter sottolinea continuamente che sta producendo dati che chiunque potrà esplorare liberamente dal proprio computer e che saranno a disposizione dei ricercatori di tutto il mondo senza che il JCVI richieda brevetti o altri diritti di proprietà intellettuale sui dati relativi alle sequenze genomiche. Tuttavia, quasi subito arrivano accuse di biopirateria (vedi Pottage 2006), quando l’Ecuador e la Polinesia Francese, le cui acque territoriali erano state attraversate dal Sorcerer, si oppongono ai campionamenti temendo si tratti di un tentativo di sfruttamento delle loro risorse genetiche. Un accordo viene raggiunto dopo lunghe trattative con il governo francese. Nel frattempo, Venter viene criticato dall’organizzazione non governativa Etc Group (2004) nel documento *Playing God in the Galapagos* e nominato “Biopirata più avido” dalla American Coalition Against Biopiracy (2006) che gli assegna il premio Capitan Uncino 2006. Eppure Craig Venter si presenta come difensore dell’accesso aperto alle conoscenze scientifiche, rigettando le accuse: il biologo americano sta regalando tutto e:

> fa tutto quello che può per convincere il mondo che non è spinto da ragioni commerciali: “Ecco, prendete tutto, non chiedo nulla in cambio” (Shreeve 2004).

Nei discorsi sul Sorcerer II gli strumenti *open* vengono presentati come cruciali per l’innovazione. Inoltre è la scienza nel suo complesso a es-

sere sotto attacco nel suo cammino verso nuove frontiere della conoscenza: l'oscurantismo antiscientifico si materializza quando un ricercatore è obbligato a "navigare nel complesso territorio delle leggi […] 'se Darwin fosse vivo e cercasse di condurre i suoi esperimenti oggi, non gli verrebbe permesso,' dice Venter" (Nicholls 2007). Il futuro è ancora una volta in gioco: "se non percepite le possibilità offerte da questo cambiamento, se dite *no* invece che *sì*, verrete lasciati nel passato. Intere società finiranno a servire cocktail sulla spiaggia perché non lo capiscono" (Shreeve 2004).

Venter si distanzia dalla tradizione dell'ethos mertoniano per incarnare diverse figure: lo scienziato vittoriano, l'amatore in cerca della verità, l'hacker del terzo millennio, e l'ambizioso e proattivo *homo economicus* della società della conoscenza. Venter rappresenta il lato schumpeteriano e neoliberale della scienza aperta. Nelle narrazioni mediatiche è un bioimprenditore che riesce a liberarsi dalle costrizioni burocratiche e istituzionali della scienza del Ventesimo secolo restando esterno alle loro dinamiche: "il mio più grande successo è che sono riuscito a farmi odiare da entrambi i mondi" (industria e accademia) (Shreeve 2004). Il suo è un modello imprenditoriale e di ricerca in cui attori diversi e forme di condivisione e proprietà intellettuale diverse convivono in un ambiente complesso e che gli permette di navigare le acque di una nuova configurazione delle scienze della vita. Decine di istituzioni scientifiche hanno contribuito alla spedizione, mentre al suo finanziamento hanno partecipato agenzie pubbliche, fondazioni e mass media. Il modello di business di Venter non è basato sulla vendita dell'accesso ai dati, un modello ormai poco sostenibile (Mills e Tereskerz 2007), ma sulla condivisione delle informazioni genetiche e la capacità di sviluppare e vendere servizi legati ai dati stessi. I suoi risultati sono stati usati in seguito per lo sviluppo da parte di Synthetic Genomics, cioè l'azienda for-profit di Venter, di progetti di biologia sintetica destinati al mercato. Stefan Helmreich (2007) sostiene che il Sorcerer II sia un mezzo per deterritorializzare le risorse genetiche e creare un nuovo spazio di accumulazione capitalista. Tale accumulazione è resa possibile dalla circolazione dell'informazione genetica in forma aperta ed è sostenuta da una trasformazione dell'immagine pubblica di Venter che include giustificazioni legate a condivisione e apertura ma resta legata alle libertà individuali e del mercato.

5. La ribellione di Ilaria Capua

Le narrazioni sulla nascita di GISAID dipingono Ilaria Capua come una ribelle, una rivoluzionaria. Per descrivere la sua vicenda ricorrono termini come rifiuto, ribellione, rivoluzione, denuncia, sfida, mentre dall'altra parte ci sono segretezza, i soliti noti, un circolo autoeletto che deve essere infranto. In questa vicenda l'immagine pubblica dello scienziato è quella del ribelle che combatte contro gli ostacoli che i meccanismi

perversi di una burocrazia antepongono alla libera circolazione dell'informazione. Capua si ribella contro un'istituzione pubblica, l'Organizzazione Mondiale della Sanità, ma anche contro i meccanismi di pubblicazione e di riconoscimento che caratterizzano il lavoro dello scienziato. Capua dice "no al galateo della scienza" (Oriani 2006) e lo fa "battendo i pugni sul tavolo", "rompendo gli schemi". Nel mese di dicembre 2008 la rivista *Seed* la include tra le "menti rivoluzionarie" che cambiano la scienza, e sottolinea come a Capua non basti accontentarsi dello status quo (Anonymous 2008). Capua è descritta come "una solitaria scienziata italiana che sta sfidando il sistema rifiutando di mandare i suoi dati a un archivio protetto da password" (Anonymous 2006a). Il biologo iconoclasta ed eretico è un classico elemento delle narrazioni sulla scienza moderna (Harman e Dietrich 2008). In alcuni casi la ribellione diventa parte dell'immagine pubblica del ricercatore, come nel caso di Barbara McClintock (Keller 1983). Spesso l'iconoclasta diventa un'icona, nel momento in cui i ruoli cambiano e il ribelle ottiene pieno riconoscimento dalla comunità scientifica o altre comunità. Anche se la ribellione è spesso un'autodescrizione retrospettiva da parte degli scienziati stessi, in alcuni casi può divenire "una strategia per raggiungere e mantenere il potere" (Morange 2008). In questo quadro Capua si ribella a partire da una posizione sfavorita. La sua immagine pubblica descrive un'outsider, una pioniera, che lavora dietro le quinte e per cui "la strada è tutta in salita" (Coyaud 2007). Se non lavora in un garage, come vorrebbe la mitologia hacker, in quanto donna, italiana e veterinaria Capua parte da condizioni che rendono più difficile l'accesso al circolo esclusivo della scienza. A questa caratteristica si somma la dimensione di scelta etica individuale che emerge da tutte le narrazioni su GISAID. Capua (2009b) sostiene che la sua sia una "rivoluzione etica":

> Mi trovo di fronte a un bivio: entrare a far parte degli autoeletti depositari della scienza, oppure mettere a disposizione della comunità scientifica i nostri dati.

Ilaria Capua però non si ribella contro un sistema di conoscenze, come in una rivoluzione kunhiana. I suoi nemici sono le istituzioni burocratiche, in particolare l'OMS e i suoi meccanismi di pubblicazione dei dati. Gli storici della scienza hanno sottolineato come lo scienziato ribelle possa comparire sia all'interno, sia all'esterno dell'università, ma debba comunque rompere con le istituzioni e l'autorità dei pari. Tra i biologi, Thelma Rowell sosteneva esplicitamente di essere stata educata a mettere in discussione l'autorità (Despret 2008), mentre William Hamilton "disprezzava autorità, gerarchia e tabù" (Segerstrale 2008, 296). I nemici degli hacker sono invece le corporation del software: burocrazie vecchie, lente e gerarchiche che impediscono l'accesso all'informazione per tenere i concorrenti fuori dal mercato, privatizzando la creatività e rallentando l'innovazione. Per le prime generazioni di hacker, i burocrati si nascon-

dono dietro a regole arbitrarie per negare trasparenza e accesso. Negli anni Sessanta, l'epitome di questo fenomeno erano i grandi computer mainframe IBM, mentre in anni più recenti è Microsoft a rappresentare la burocrazia che ostacola la libera circolazione dell'informazione (Levy 1984). La Microsoft di Ilaria Capua è l'OMS, un'istituzione che nelle narrazioni sulla nascita di GISAID condivide diversi tratti negativi con le grandi corporation. Nell'immagine pubblica di Capua, le decisioni dell'OMS e dei governi possono rallentare la ricerca medica. Ai colleghi chiede di non cedere alle lusinghe della "confraternita" legata a doppio filo alle istituzioni, così come le prime generazioni di hacker diffidavano del "clero" che controllava l'accesso ai computer delle università e delle grandi corporation.

Anche i meccanismi di pubblicazione e di riconoscimento formale della scienza vengono messi in discussione. Nei discorsi di Capua i colleghi, descritti come gelosi e meschini, sono accusati di non rendere di pubblico dominio le sequenze da loro identificate "per timore di non vedere riconosciuto il loro lavoro, o di perderne i diritti di sfruttamento economico" (Pistoi 2006). Capua sostiene che i colleghi ritardino la pubblicazione delle sequenze genetiche per timore che altri ricercatori possano trarne vantaggio e usare i dati per pubblicazioni scientifiche prestigiose. Essi pensano prima di tutto al successo personale, mentre Capua "ha rinunciato al prestigio di una illustre testata internazionale che avrebbe dato lustro alla sua carriera e ha dato precedenza alla velocità dell'informazione (…) con buona pace delle graduatorie" (Calabrese 2006).

Nelle narrazioni sulla nascita di GISAID, il ruolo della tradizionale pubblicazione scientifica su riviste *peer reviewed* viene messo sotto accusa: la *peer review* ritarda la diffusione dei dati. Inoltre nel caso dell'influenza aviaria è guidata dalle esigenze private degli scienziati o da interessi accademici, governativi o istituzionali. Anche l'hacker persegue la conoscenza in modo indipendente dai sistemi di pubblicazione scientifici. L'unico riconoscimento viene dai suoi risultati: aver crackato un codice è di per sé un obiettivo. L'hacker vuole scrivere buon codice, non pubblicare paper di ricerca *peer-reviewed*, e spesso ritiene più importante l'autorità carismatica guadagnata con i suoi hack rispetto ai sistemi formali di riconoscimento (O'Neil 2009). Così GISAID, la risposta di Capua al canonico sistema di pubblicazione dell'OMS, annuncia orgogliosamente di essere un database "per scienziati e fatto da scienziati" e chiede solo di "aderire alle norme dell'etichetta scientifica"[2]. Gli hacker spesso non producono solo software ma anche le regole e le infrastrutture, tecnologiche e legali, per diffonderlo e gestirlo tra pari (Kelty 2008; per un esempio nella storia della biologia, Harman e Dietrich 2008). Capua stringe anche un rapporto intenso con i media generalisti, rilasciando decine di interviste e scrivendo editoriali di suo pugno. Descrive la sua inclusione tra le Revolutionary Mind di *Seed* o tra i 50 migliori scienziati di *Scientific Ame-*

[2] www.gisaid.org, ultimo accesso gennaio 2013.

rican – due riviste divulgative che non hanno alcun valore scientifico secondo i parametri istituzionali – come riconoscimenti formali di livello internazionale, "due dei premi piu prestigiosi che ci sono nel mondo scientifico" (Capua 2009a). Le istituzioni della scienza, con i loro riconoscimenti e sistemi di incentivazione, non sono l'unico mondo in cui Capua si muove e da cui trae legittimazione.

Nelle culture hacker, l'enclosure e la privatizzazione dei dati sono inaccettabili. Bill Gates divenne inviso agli hacker a causa di una lettera in cui si lamentava della libera circolazione di software piratato nella comunità hacker, un evento divenuto noto come "il casino del software" (Citato in Levy 1984). Nei discorsi sulla vicenda di GISAID l'informazione deve essere aperta, accessibile, libera per tutti, a differenza di quella mantenuta segreta o nascosta da un complotto. Anche nella scienza moderna, la denuncia della segretezza può essere un comportamento rituale (Bok 1982). Capua non si limita infatti a diffondere i dati in suo possesso, ma denuncia un meccanismo da infrangere: i dati sono tenuti dietro porte o dentro cassetti chiusi, protetti da una password, e devono essere liberati. Come nei miti hacker, crackare un codice e condividere le informazioni è vitale: "il livello di raccolta e condivisione di dati che abbiamo oggi è inadeguato, date le dimensioni della minaccia" e la condivisione deve essere rivolta a tutti, all'umanità, "al mondo intero" (Bogner *et al.* 2006). L'informazione è buona di per sé, anche se non se ne conoscono le funzioni, lo scopo o se il cammino da seguire per raggiungere gli obiettivi voluti non è chiaro. La scienza ha "fame di informazione (...) con i miei dati un altro ricercatore potrebbe arrivare a conclusioni che io non posso nemmeno immaginare" (Cavadini 2006). Così, gli scienziati che usano GISAID devono accettare di "condividere i dati relativi alle loro sequenze, analizzare i risultati insieme e pubblicare i risultati in modo collaborativo". L'insistenza su condivisione e collaborazione rispecchia la licenza che i ricercatori devono sottoscrivere per avere accesso al database, caricare o scaricare dati: una licenza simile a quelle Creative Commons, che permette agli scienziati di "riprodurre, modificare e disseminare"[3] i dati e agli autori di pubblicare i propri risultati purchè sia riconosciuto il laboratorio di provenienza e il ruolo di GISAID come fonte dei dati. Infine, l'immagine pubblica di Capua è permeata dall'edonismo dei miti hacker. È spesso irriverente, gioca con l'informazione e non cerca riconoscimenti formali. Nell'agosto 2006, dopo il lancio del nuovo database su Nature, Capua commenta: "Sono molto felice. Sento che forse dovrei smettere di lavorare e cominciare a preparare fiori" (Pearson 2006).

Con il rifiuto opposto alle policy dell'OMS e le strategie comunicative legate alla nascita di GISAID, Ilaria Capua ha costruito una reputazione internazionale come sostenitrice del modello open access nella ricerca scientifica. La sua capacità di mobilitare in pubblico l'ethos della scienza

[3] GISAID EpiFlu Database access agreement, www.gisaid.org, ultimo accesso gennaio 2013. Vedi anche http://creativecommons.org/about/licenses.

le ha permesso di contribuire al cambiamento dell'Organizzazione Mondiale della Sanità, che adottando policy per la condivisione dei dati in forma aperta si è inserita in un cambiamento istituzionale già all'opera dall'inizio degli anni Duemila e ancora oggi in corso[4]. Inoltre, ha costruito un'alleanza di scienziati, politici, istituzioni pubbliche e aziende private che hanno sostenuto il suo progetto e resa possibile la nascita del database. Le strategie retoriche di Capua appartengono a una lunga tradizione di scienziati che si ribellano contro le istituzioni della ricerca (Harman e Dietrich 2008). Tuttavia non è solo una scienziata ribelle né solo una sostenitrice del modello open access. Il suo attacco contro un'istituzione pubblica viene condotto in nome della trasparenza e della condivisione dei dati, ma anche per sottrarre potere ai meccanismi di una burocrazia lenta e corrotta. Nella sua immagine pubblica compaiono elementi di giustificazione appartenenti all'ethos mertoniano, come condivisione delle conoscenze e universalismo, i quali sono ricombinati con altri provenienti dalle culture digitali, come rifiuto delle password, avversione alle burocrazie e alla loro capacità di controllare i flussi di dati, circolazione dell'informazione come obiettivo e non solo come mezzo.

6. Conclusioni

I casi che ho analizzato dimostrano come lo scienziato contemporaneo possa ancora reperire nell'ethos della scienza moderna elementi adatti alla produzione di nuove strategie di azione, dato che l'influenza di quella cultura è sopravvissuta alle trasformazioni della dimensione sociale da cui era sorta. Ma può necessitare di ricombinarlo con componenti che provengono da culture legate alle tecnologie dell'informazione che permettano di dotare la scienza aperta di un "ordine morale" in continuità con il passato ma aggiornato e rinnovato (Kelty 2012). Le nuove forme di condivisione di informazione e conoscenza tramite media digitali che costituiscono la scienza aperta odierna hanno infatti bisogno di un adattamento culturale che gli imperativi istituzionali descritti da Merton non riescono più a fornire. Anche se i biologi studiati non fanno riferimenti espliciti all'hacking, è interessante notare come, sia nei loro discorsi sia nelle immagini mediate da operatori della comunicazione, a condivisione delle conoscenze e universalismo si affianchino elementi di giustificazione come disprezzo per le burocrazie, critica alle istituzioni, richiesta di autonomia e trasparenza radicale, uso di metafore informazionali estreme e edonismo, tipici delle controculture digitali.

Il complesso repertorio che ho evidenziato nei ricercatori presi in

[4] Vedi le policy dei National Institutes of Health (http://publicaccess.nih.gov) o le "Bermuda Rules" adottate dallo Human Genome Project (http://www.ornl.gov/sci/techresources/Human_Genome/research/bermuda.shtml).

esame non è riducibile né alle descrizioni novecentesche dello scienziato che lavora nell'accademia, disinteressato e non compromesso con il mercato, né a quelle del capitalismo accademico, che contiene elementi di segretezza, privatizzazione e accettazione degli obiettivi aziendali: tracciare una separazione netta tra scienza aperta, orientata alla condivisione disinteressata, e scienza privata o sottoposta a restrizioni all'accesso, impedisce di comprendere un fenomeno complesso e sfaccettato in cui si inseriscono nuove forme di appropriazione economica, la ricerca di autonomia dalle burocrazie e la necessità di infrangere i monopoli dell'informazione ed economici che caratterizzano le scienze della vita. Con il Sorcerer II, Venter ha messo in circolazione i dati genomici all'interno di una rete di aziende private, università, fondazioni e mass media. La sua impresa è volta al profitto, e sfrutta l'accesso aperto per partecipare a una forma di biocapitalismo in cui la circolazione dei dati è importante quanto la loro raccolta e gestione. Capua ha dato vita a GISAID per rimuovere i dati sul virus H5N1 da un mondo in cui solo una ristretta cerchia di laboratori ufficiali aveva accesso al database. Rifiutando le policy di segretezza dell'Organizzazione mondiale della sanità ha spinto una grande istituzione al cambiamento.

La ricombinazione di elementi culturali che ho segnalato in questo articolo non è che un aspetto della complessità e ricchezza della scienza contemporanea. Tuttavia la ricombinazione di elementi di legittimazione che in forme differenti viene espressa da Capua e Venter sembra in grado di fornire strumenti utili a dar vita a nuove strategie di azione, anche in contesti istituzionali differenti, all'interno della complessa configurazione socioeconomica della biologia contemporanea. Le culture legate all'hacking sono interessanti, da questo punto di vista, perché permettono di evidenziare le caratteristiche comuni ai due casi in esame e allo stesso tempo forniscono un range di opportunità eterogeneo e diversificato. L'hacking si è infatti dimostrato in grado di influenzare settori di produzione di informazione e conoscenza diversi da quelli canonici del software, e studiare la sua espansione permette di comprendere l'emergere di pratiche sociali diffuse di cui la ricerca scientifica è solo uno dei possibili esempi. L'hacking è quindi cruciale per la comprensione delle società contemporanee nel loro complesso.

La gestione diretta di strumenti di comunicazione – in questi casi due database – da parte di singoli ricercatori fa parte dei fenomeni di redistribuzione di potere sull'informazione legati all'emergere di nuove tecnologie informatiche. Tuttavia questo cambiamento deve essere analizzato nella sua complessità. Il software libero, per esempio, è ambivalente, dato che può essere percepito sia come modello di appropriazione, sia come strumento di resistenza all'appropriazione privata del suo valore (Coleman e Golub 2008). Questa ambivalenza non è nuova, se a ogni nuovo ciclo tecnologico riappare il discorso redentore di una società dell'informazione distribuita, orizzontale e aperta, e allo stesso tempo la storia dei flussi di informazione è strettamente legata a deregulation e

neoliberismo: eliminare le restrizioni alla circolazione dell'informazione può essere un imperativo liberista legato alla creazione di mercati più dinamici e non rallentati da frizioni e attriti (Harvey 2005, Mattelart 2001). Nel capitalismo informazionale contemporaneo sono emersi modelli di business open source fondati sulla gestione dei dati più che sulle restrizioni all'accesso. Del resto la cultura della condivisione rappresenta un cornice ideologica in cui rientrano nuove forme di appropriazione basate su apertura e cooperazione – dalle piattaforme dei media sociali generalisti a quelle specifiche per la biomedicina (Gillespie 2010, Levina 2010; per la biologia open source vedi Hope 2008).

L'emergere di nuove forme di scienza aperta deve quindi essere analizzato all'interno di trasformazioni che attraversano non solo la ricerca scientifica ma più in generale la società dell'informazione e i suoi modelli di produzione di conoscenza, che avvengono in ambienti abitati da creature eterogenee come imprese, università, movimenti di cittadini, istituzioni di ricerca pubbliche e start-up. Tuttavia la direzione che questo fenomeno prenderà e il ruolo al suo interno delle culture degli scienziati restano problemi da decifrare. Attraverso la loro mobilitazione pubblica di alcuni elementi culturali, i biologi che ho studiato mettono in atto strategie che fanno parte di un ordine controsimbolico: mettono in discussione alcune forme di concentrazione di potere nel settore delle scienze della vita. Il loro è un approccio attivo alla gestione non solo dell'informazione ma anche delle sue infrastrutture tecnologiche e sociali. In questo senso le loro storie fanno parte di un cambiamento comune ad altri regimi di innovazione, come quelli del software, dell'hardware o del design, in cui attori emergenti stanno attivamente partecipando alla costruzione di nuove forme istituzionali (Kelty 2008). Pierre Bourdieu (2001), che pure si riferiva a cambiamenti epistemologici e non delle forme di circolazione dell'informazione e degli strumenti usati per gestirla, ha sottolineato che lo scienziato rivoluzionario punta non solo a vincere ma anche a cambiare le regole del gioco e i principi di formazione dei premi. Le "ribellioni" di Venter e Capua utilizzano giustificazioni appartenenti a sistemi culturali differenti per risolvere dispute in cui, come sottolineano Boltanski e Thévenot, le attività di critica e trasformazione tendono a modificare i principi stessi della valutazione (1999). Il ruolo trasformativo dell'hacking è assimilato al punto da renderlo uno strumento utile per intervenire attivamente in queste dinamiche anche nella ricerca scientifica.

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Technologically Dense Environments: What For? What Next?

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Abstract: This conversation stems from and relies on the lectures presented by the three authors at the second STS Italia Summer School (2013 June 12-14, Ostuni, Italy). The text by Attila Bruni portrays in an impressionistic (and partly ironical) way the "genesis and development of a scientific fact", namely technologically dense environments (TDEs), sketching some of its basic characteristics and antescedents. Trevor Pinch, again in a personal anecdotal style, offers various examples of mundane interactions with technologies in dense and less dense environments, underlining how sociomateriality must always be unpacked, beside any innate or transformative properties of the materials themselves. Cornelius Schubert, finally, rather than closing the conversation, offers a case in point, focusing on improvisations in TDEs and, in particular, in medical practice.

Keywords: Technology; density; sociomateriality; improvisation; affordance.

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Technologically Dense Environments: The Genesis of a Scientific Fact?

Attila Bruni

The expression "technologically dense environments" (TDEs) has been gradually defined on several occasions, while (at the same time) offering the excuse to activate such occasions.

The last one was the summer school organized this year by STS Italia. But the first one was the fieldwork carried out for my doctorate thesis. This was centred on telemedicine and, in particular, on shadowing the introduction of electronic patient records (EPRs) in the oncology department of an Italian hospital. I thought that I would observe the prob-

lems and difficulties that usually arise when a group of actors begin to relate to a new technological object, but I noticed something that I found more interesting. Not only were the humans required to learn how to handle the new technological tool, but they also had to ensure that the latter 'got on with' the plethora of already-existing technologies in everyday use, both in the department and in the departments with which oncology is usually connected (radiotherapy, for example, or the blood chemistry laboratory). Having just undergone a cure based on ANT-CoP (which could be the name of a drug but instead is the acronym of Actor-Network Theory and Communities of Practice), I began to think of the EPR as a new s-object[1] encountering (and being socialized to) a more composite 'community of objects'. The EPR appeared to me a 'newcomer' in the already-existing 'community of objects' (made up of drugs, blood-test results, radiographies, and so on) which marked out the material boundaries of everyday work in the Oncology Department. I began to see the EPR as 'contending' with this community for its practical relevance and 'negotiating' with the objects already present in the organization for spaces of action. In a non-reflexive manner, as if it were a simple matter of fact, I then began to use the expression 'technologically dense' to denote the type of practices and environment that I was observing (Bruni 2004, 2005a, 2005b). After all, given the entire tradition of STS studies, it seemed to me that authors much better qualified than myself had already declared that the contemporary world is characterized by 'technological forms of life' (Lash 2001) and by an 'object-centered sociality' (Knorr-Cetina 1997).

Years later (and this was the second occasion), I was involved by Silvia Gherardi in writing a book on the study of work practices (Bruni and Gherardi 2007[2]). I was therefore pleasantly surprised by the proposal to put the expression 'technologically dense' (referenced to me!) in inverted commas, to indicate it as one of the distinctive features of contemporary work environments (and therefore of the practices that take shape within them). Also in this case, the expression was used as if it referred to a matter of fact, but the inverted commas emphasised its somewhat less irreflexive use.

The third occasion came in 2008 during the second national STS Italia conference. Together with Manuela Perrotta I organized a thematic track entitled "Working and Organizing in Technologically Dense Environments." We received around ten submissions, some more attuned, others

[1] By this trick of words, I intend to stress that objects, like subjects, always stand in relation to a social world, so that 'observing' a s-object means looking at the relations of which it is part, the contexts in which it is located, the practices that construct it socially, and the other s-objects that cross its trajectory (Bruni 2005a).
[2] Updated and authored by Silvia Gherardi, the book is now available in English with the title: *How to Conduct a Practice-Based Study*.

less so, but in any case signalling that the expression had a minimum of meaning for others as well.

One year later I was invited by Francois Cooren, at the University of Montreal, to discuss the doctoral thesis of Consuelo Vasquez, and I had the occasion to hold a seminar within the research group to which Consuelo and Francois belong. In an attempt to present something sufficiently original, I decided to make TDEs the subject of my paper. This obliged me to come up with a definition of TDEs. I started with the individual words. As regards 'technology', I resorted to etymology (*tekhne* + *logos*, crafts + knowledge), as for that matter do McKenzie and Wajcman in the introduction to *The Social Shaping of Technology*; 'density', according to the Oxford Dictionary, refers to "the degree of compactness of a substance"; by 'environment' I meant the surroundings (or the ecology of elements) in which action takes place. I sought to concentrate on 'density', as a term able to express both the quantity and quality of relations that arise among a set of elements. I framed the idea of TDEs as a 'sensitizing concept' (whilst defining concepts furnish instructions on what to see, sensitizing concepts suggest directions in which to look - see Blumer, 1969). I then identified three characteristics that, in my opinion, define TDEs:

- working implies complex sociomaterial practices and a specific technological know-how;
- human actors and technological objects work 'together';
- interaction is made possible by technologies and time and space are reconfigured on the basis of such interactions (and technologies).

I then provided some concrete examples of TDE. The first that came to my mind was a coordination centre (Engerstrom and Middleton 1998; Luff et al. 2000). Going somewhat back in time, however, also Laboratory Studies (Latour and Woolgar 1979; Lynch 1985) furnish good examples. Moving to the present day (and to recent developments in the STS debate), the most effective example seemed to me that of financial markets (Knorr-Cetina and Preda 2005). Finally, I cited medical settings, which I undoubtedly know best and which first suggested the idea to me. In regard to these settings I provided a series of detailed ethnographic examples. I concluded that the notion of TDE refers to:

- the stratification of texts, architectures, knowledges, objects, and technologies that characterizes an organizational environment;
- the essential (and practical) proximity between the 'functioning' of technologies and the 'functioning' of work;
- the heterogeneous and scattered dimension of working and organizing;
- the constitutive (in ethnomethodological terms) role of technologies for working and organizing.

Elaboration of the concept (if it can be described as such) was still in an embryonic state. But during the seminar I received comments, criticisms and stimulating suggestions. Above all, nobody disputed the idea of TDEs; rather, all those present seemed to grasp the idea intuitively and had something to say on the subject.

The fifth occasion was the EASST conference organized in Trento in 2010. In this case, Manuela Perrotta and Maurizio Teli organized a thematic track on TDEs and thus gave international visibility to this new 'label'. As part of the track I gave a paper, at the end of which a colleague asked the so-what question: "Ok, we live in a technologically dense world. Didn't we already know that?!". Probably yes, I replied, but it is precisely for this reason that it is interesting to study how this technological density is constructed, performed, and practised. Fortunately, at that point the bell rang for the coffee-break.

While waiting to find the time to write a rigorous article on TDEs, and in an attempt to involve other interested researchers in discussion of the idea, I actively constructed the next occasions. Together with Manuela Perrotta and Anne Mayére, I organized a thematic track on TDEs at the 27th Egos Colloquium (in Gothenburg, 2011), and whose call for paper received a good response. In particular, Carsten Østerlund (Østerlund et al. 2011), Jon Rennstam (2011) and Cornelius Schubert (2011) sought to 'operationalize' the idea of TDEs and show its heuristic potential[3]. Then, together with Cornelius, I organized a track at the 4S/EASST conference held in Copenhagen in 2012, which received a limited number of submissions but all of great interest and targeted on the topic. Above all, they all sought to give concreteness to the idea of TDEs and to define it more clearly. Personally, this was the occasion on which, above all thanks to my discussions with Cornelius Schubert during organization of the track, that I was able to focus more closely on the need to conceive 'density' as something that emerges from the context and from its relations, not as a property of the environment or of those relations themselves. With a play on words, the technological density of TDEs is entirely to be demonstrated. Put otherwise, it is not enough that an environment comprise a large number of technologies, or that patterns of action require the use of various technological artifacts, for that same environment to be defined as technologically dense. It is necessary instead for technological density to emerge in relational terms as a problem, routine, or a spur to improvisation. In this regard, I shall now provide a brief example.

Around a year ago, I began research in an university laboratory of environmentary chemistry. The laboratory engages in analysis of atmospheric particulates. It conducts innovative research for which a standardized methodology and/or instrumentation does not always exist. Obviously, all activities in the laboratory are accompanied by some kind of technologi-

[3] A revised version of the paper by Jon Rennstam has been published last year in *Organization Studies* (2012, vol. 33, n. 1071).

cal instrumentation and (equally obviously) numerous situations arise in which the researchers must 'support' the correct operation of the technologies and/or make sense of the numerical values yielded by those technologies. It should also be borne in mind that, given the cost of certain technologies and the shortage of funds, in very early experimental stages the researchers must themselves construct makeshift instruments, whose definitive set-up (if the hypothesis to be tested proves sensible) is commissioned from specialized firms. Yet I would not cite this as an example of a technologically of dense environment. For this it is not an environment in which, by observing the technologies, one can understand the nature of interactions and work organization practices (which I instead began to think resided in the dynamics of taking the laboratory in the environment and the environment in the laboratory). From the point of view of the actors involved, the technologies available to them were simply tools and, as such, subject to malfunctions and breakdowns, as well as having an entirely accessory role with respect to a much more complex activity, that of producing scientific knowledge.

It can certainly be objected that this is one of those situations in which technology is such a routine infrastructure for action that it becomes invisible to the researcher, because its 'density' may also obscure the practices and relations bound up in it. But the debate has just begun, and this conversation is only a further occasion to continue it.

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Sociomateriality and Technological Dense Environments

Trevor Pinch

Introduction

This essay has its origins in a lecture given to the 2013 STS Italia summer school held in a gorgeous and rustic atelier outside Ostuni in Puglia, Italy. My abiding memory of the workshop is one of the grad students, Joan Donovan, "desperately seeking signal" for her laptop. Under some definitions of technology we were definitely in a technologically sparse environment. But the environment was rich in the mundane technologies needed for nurturing a wonderful social ambience. The mistral cooperated and kept the temperatures comfortable. The seating arrangements were cushions; the food was locally produced pastas; and the drink was wine from the owner's own vineyard. Yes it was as close to heaven as you can get for academic encounters these days! I have deliberately kept

the style of this essay informal, merely polishing the text of the conversations we had at the workshop. The personal anecdotal style I find works best in teaching, so it runs throughout this essay. We as academics are first of all story tellers. Some of the crucial terms I will be referring to are technology, materiality, infrastructure, sociomateriality, affordances and scripts. Bruno Latour first discussed some of these terms in a provocative way, in an article he wrote about the missing masses and the sociology of a few mundane artifacts (Latour 1992). Bruno too likes storytelling and one version of that piece was originally framed as an account provided by a fictitious engineer called Jim Johnson, from the Colorado School of Mines. As with so much in our field, there is more to say than Bruno said. But I think the genius of that early piece was how Bruno/Jim took objects he encountered in his everyday life - doors, grooms, seat belts, speed bumps and so on – and weaved them into little stories which made them analytically interesting. In this essay I shall try do something similar. I shall describe my encounters with various mundane objects and try and see what lessons we can learn.

1. Dense and Sparse Technological Environments?

What makes an environment technologically dense or for that matter "sparse", clearly depends on your definition of technology. For instance on some definitions of technology languages are technologies and since that is the one thing all humans share then clearly all human environments are technologically dense. Defining technology is notoriously tricky. As Leo Marx has pointed out, the definition has changed throughout history. Back in the times of the ancient Greeks the word *tekhne* was used to describe the mechanical arts, but for some influential thinkers about technology (e.g. Heidegger) the *poesis* involved in the craft of pottery is very different from a technology which *enframes* humans. Karl Marx in *Capital* (Vol. II) avoids the word technology altogether preferring to talk about machines. The word technology starts to gain salience in the late nineteenth century when technology came to refer to what Thomas Hughes called "large scale technological systems" such as the telegraph, the railroad, and electric power. This meaning of technology captures not only the material systems but the new sorts of managerial skills needed to run such systems and turns engineers into what John law calls *heterogeneous engineers* who must deal with the managerial, social, economic, political as well as the technical aspects of systems. Leo Marx notes that even with the founding of MIT in 1861 technology had not yet stabilized as a word. Today technology is often associated in the media with particular devices such as cell phones, computers and the like.

A working definition of technology comes from MacKenzie's and Wajcman's classic book (1999) *The Social Shaping of Technology* where technology is defined as involving three aspects: knowledge, artefacts, and

practices. Most definitions of technology need to capture the human enabling quality of technology and it is this which separates technology from simply material stuff. A piece of wood worked into the case of the minimoog electronic music synthesizer is a material artefact, part of a technology, whilst the walnut tree growing in Robert Moog's garden in Trumansburg, New York, from which the wood was cut is simply part of the material world. Animals, of course also make use of the material world and some theories of material agency would also want to grant similar powers to animals. Indeed within science studies, "multispecies ethnography" is in vogue. The important notion of "affordances", as first suggested by psychologist James Gibson (1986), was developed as part of an ecological approach which included animals. Thus Gibson talked about a tree giving animals affordance to climb to safety. If animals use of the material environment is considered part of technology then we will find TDEs everywhere we encounter bee hives and termite mounds!

We will return to affordances later in this essay, but for now I want to suggest that it is the knowledge aspect of technology which makes it hard to classify termite mounds and the like as technological systems and termites as heterogeneous insects! Whilst animals, such as apes, may use objects they encounter in the environment, such as sticks as tools, it is as far as we know, only humans who have the capacity to make and manufacture tools. Knowledge involves language and although animals have sophisticated communication systems it is arguable whether they have developed language.

2. The Material Turn

In recent years there has been a turn towards the study of materiality more generally in the academy. Scholars in fields such as anthropology, archeology, feminist theory, and of course subfields such as the sociology of finance all lay stress upon materiality. Crude ways of measuring which academic terms are trending, such as Google N-grams, also indicate the rise of the word material. And of course our own field of science studies has always laid claim to materiality. Madonna's song title "Living in a material world" has been stolen by at least two of us (Andy Pickering and myself). This interest in materiality when it is taken up by social scientists is sometimes expressed within the lexicon of "sociomateriality".

So what is sociomateriality? One definition is provided by organizational studies scholar, Wanda Orlikowski, who refers to it as 'the constitutive entanglement of the social and the material in everyday organizational life' (Orlikowski 2007, 1438). Taken seriously, sociomateriality is more than simply a fascination with the 'things' that shape or are deployed within human action, as found, for example, in the growing research agenda which examines artifacts and boundary objects, Rather, it is a serious attempt to understand how human bodies, spatial arrange-

ments, physical objects, and technologies are entangled with language, interaction, and practices in the doing of activities. It is a useful way of capturing what I see as the essence of TDEs – how humans interact with the material artefacts that make up technologies.

3. Making Invisible Infrastructures Visible

I live in a tiny little hamlet called Forest Home just outside Ithaca in what is called upstate New York. "Upstate" says it all – it is not New York City, it is somewhere up the state. It is rural and as we like to say about Ithaca where Cornell University is located - it is "centrally isolated". But we manage.

Now Forest Home is a beautiful little place and our little hamlet has its own housing association quaintly called "The Forest Home Improvement Association". Life is good but not as good as in Southern Italy. There is always room for improvement. So citizens volunteer for the Improvement Association. One of the mundane examples I want to talk about comes from involvement with this organization.

I was attending a meeting of the Ithaca Town Planning Committee, when a rabbi from Cornell University proposed that our town be surrounded by an invisible wall - a very special form of wall known in Jewish Law as an *eruv* (the Hebrew word for mixing or blending). An *eruv* surrounds a space with a series of symbolic gates (as to a temple) and enables a blending of the public and private space within. Once in existence, this invisible wall gives the space within it special religious significance, a form of virtual temple, and allows Orthodox Jewish religious observances to be carried out in an easier way. It would permit an Orthodox Jew, say, to take property from his home that would not normally be allowed on the Sabbath.

So the Town of Ithaca got down to considering the rabbi's request. The first problem is that building an invisible wall turns out to be a non-trivial matter. The *eruv,* the rabbi explained, must consist of a continuous wire around the space with columns hanging from it at certain fixed intervals to symbolize the gates. An immense stroke of good fortune is, however, on the side of the modern *eruv* builders. Most cities and towns are already surrounded by wires with columns attached to them - telephone poles and power lines! The rabbi pointed out that the necessary wires and poles could be cleverly adapted for *eruv* purposes. There was one problem. Jewish Law stipulates that the poles should be placed precisely under the wires - a position to be determined exactly using laser measurements.

Part of the job of town planning committees is to make the normally invisible infrastructure of towns visible. In other words to make mundane artefacts a little bit less mundane. The first issue to be addressed at any

such gathering is money. How much will this cost? The Town Supervisor clarified with the rabbi that it would not cost the town of Ithaca anything as all costs were to be born by the Cornell Jewish community. But members of the committee were worried about other aspects. Wasn't there meant to be a strict separation of church and state? The town clerk had diligently gone on-line and circulated a case of a *eruv* in Palo Alto which had been opposed on exactly these grounds. "What if a less benign religious group wanted to nail crosses to every telephone pole in Ithaca?" asked one member of the committee, who prefaced his remarks by stating that he had been brought up Jewish and "to be frank I find the whole idea of a *eruv* silly". The rabbi had his reply ready. He understood where the criticism was coming from but the *eruv* demanded no precedent because it was simply allowing religious people to do what secular people did all the time. In short it permitted something secular to happen rather than prescribing something as religious.

The Town lawyer then spoke. She had researched other cases and felt that the Town could maintain its discretion in the future to ban any less benign walls. But members of the planning committee still felt uncomfortable because the request came from a specific religious group with a specific religious purpose in mind. The discussion wandered over the exact wording of the request and whether other religious groups would tolerate the wall. The lawyer questioned whether the wall would break local signage ordinances – Ithaca has strict rules about signs being posted on telephone poles and this looked like a sign. No, argued the rabbi, it wasn't a sign because it was invisible to most people. The lawyer came back; the definition of a sign is something that conveys information and since the wall will convey information to some people it could potentially be a sign. The committee decided further investigation was required. Someone whispered in my ear after the rabbi had left. "If God was really omnipotent he wouldn't be fooled by this fake wall anyway!" The last word as always was with God.

In the ten-minute discussion the Planning Committee had ranged over some of the most salient issues in sociomateriality. The example reminds us again that technologies carry no intrinsic meanings. Their meanings are always to be found amongst social groups who interact with the technology and share a meaning of the technology. Most people share the meaning of poles and wires as carriers of part of our technological infrastructure – power lines and telephone lines. Such objects are mundane and we barely notice them. Now a new meaning of the poles and wires was being asserted; that they also carried religious significance. This meaning was shared amongst a specific social group - namely Orthodox Jews.

In the case of the *eruv* it is important to note that, although the meaning of the technology is mainly symbolic, materiality is involved. The wires and pipes need to be precisely aligned. In short "religious functionality" requires its own non-trivial material alignment. Measuring each pole with laser equipment and retrofitting if necessary is a huge investment in

time, technique, and money. Furthermore technologies and their meanings do not exist detached from the rest of society, its institutions, culture, and the vast assemblages of technologies and humans we have already built. This point is nicely illustrated by the Planning Committee's discussion which ranges over economy, law, religion and the nature of signifiers.

4. Affordances Revisited

The example can also be used to exemplify a very common way of dealing with how mundane technologies interact with humans, namely affordances. As I mentioned earlier, this term comes from Gibson and has been extended by Don Norman (1990) as a way of ascribing some sort of agency to mundane objects and technologies. The chair is used for sitting and therefore affords seating. Now there are many problems with affordances. The word itself with its economic overtones is a weasel word – it is very vague to talk about what can or cannot be "afforded". Can I afford to buy a new car, for example, is a complex question. It is clear also that an affordance is a relational property depending upon the relationship between an object and someone using that object. Affordances also don't only "afford" – they prevent, prohibit and protect. The electrical power lines around my town give affordance to people who want to use power in their homes to run electrical appliances and so on. But by being raised up high on poles the power lines protect people from being electrocuted. We could express this property as giving them the "affordance" to travel in safety. This form of protection again is relational, depending upon the user. This was brought home to me by a family accident. One of my cousins likes to sail and forgot to lower the mast of the boat he was launching when he passed under some power lines. He was electrocuted and as a result today only has three fingers. The protection afforded by power lines does not apply to very tall people or people launching sailing boats! In other words built into every affordance is a particular sort of user.

Work on affordances needs to be tied in with user studies in S&TS (Oudshoorn and Pinch 2003). It is clear not only that technological artefacts have more than one affordance as the *eruv* example reminds us, but also that new affordances can arise in the context of use. For example, the affordance of the early motor car as a stationary source of power was something that only developed in the context of use (**Kline and Pinch 1996**). "Affordance" is an overly passive term as the issue of new uses of technologies reveals. It is not that affordances are waiting to be discovered in objects – the creation of a new affordance is often a struggle involving active work by users. The disappearance of an affordance, or the non appearance of an affordance that should be there, is also worth reflecting upon. It was a power play by Henry Ford and the Ford Motor Company

that helped kill the affordance of using the car as a stationary source of power.. Affordances can thus involve politics.

"Affordance" as a term, in short encourages sloppy thinking. It is often used as a convenient short hand, particularly in information science, to describe the functional attributes of a piece of technology. You will read that the internet provides the "affordance" of remote access, cutting and pasting, and copying. But as soon as one examines the particular use of a technology in context, say using the internet in Iran or copying an iTunes music file several times, you are reminded that it is only a shorthand.

We clearly need terms for describing how humans interact with technologies and the material world. The key issue for me is that even if we want to use a term like affordances, the affordances of a technology (including what it will permit and prohibit) can only be made visible and stabilized within the complex social setting of the mundane technology. Whether the retrofitted poles afford religious functionality or the mechanical functionality of carrying power and telephone lines or both or yet other affordances can only de determined by looking at the precise cultural and social setting within which these technologies are embedded and used.

5. Scripts

"Scripts" as introduced by Madeleine Akrich (1992) is another way of thinking about the same issue. Scripts can be read from an object and she allows for the possibility for objects to be "descripted" and "rescripted" in the context of use. This is a more satisfactory way of talking about the interaction between humans and non-humans than the language of affordances. In the strong form of scripts argued for by Bruno Latour with his famous examples of sleeping policemen and seat belts the danger is that the script is read from the object rather than the context of use of the object. This becomes particularly problematic when an intention is said to be embedded within a script or delegated to an object. The example of the sign "Slow down" which is replaced by a speed bump seems intuitively compelling because the sign (the intention) has been replaced by the material artifact which now "scripts" us to slow down.

An example I like to play with here which shows how complex this process can be is one where a sign replaces a material artefact. The case I have in mind is a peculiarly US one where American dog owners restrain their pets with a technology known as an "invisible fence". This technology is a wire which is buried in the ground around the owner's home. The dog is trained by wearing a special collar which administers a small electric shock when approaching the wire. Soon the dog learns to stay within the assigned area and the shocks can be replaced by sonic signals and

eventually the whole device works passively. Owners who employ this technology always put up a sign saying "Dog restrained by invisible fence". So in this case a technology - a fence - is replaced by a sign. But reading intention into the sign is problematic. My own enquiries into the meaning of the sign have produced many different sorts of readings and the intentionality implied. I have been told it is: (a) an advertisement for the invisible fence company, (b) a means of showing people that the dog is actually restrained in case they are scared, (c) a warning to people not to try and steal the dog, (d) a residue of a training exercise, (e) a legal necessity for liability purposes. No one told me it was a warning to be read by the dog! Obviously if we added in animal intentionality and behavior to the analysis, the case would become even more complicated because the fence is not "invisible" to the dog. The particular breed of dog may also be important – a rotweiller requiring perhaps more symbolic restraint than a playful poodle. This example reminds us again that the language of scripts only works with close attention paid to specific users and the context of use.

6. What to do with a Limp Clipcard!

I will introduce one last example to amplify these points. Prepaid "stripcards" or "clipcards" are commonly used to pay for rides on trams and subways in the Netherlands and Denmark. You typically pay for a number of rides in advance and each time you take a ride you "clip" your card at a machine. In a way this technology fits nicely the Latourian story of delegation. On buses in the UK ticket collectors (known as "clippies") used to "clip" bus tickets by punching a hole in them. In Denmark a machine, into which the card is inserted automatically, reads and "clips" the card (by removing a fixed part of the edge corresponding to one journey or a segment of a journey).

When visiting Copenhagen I regularly use such a card to pay for my trips on the very fast and efficient subway. On a recent visit I had one last journey to make to the Copenhagen airport from my hotel in the middle of town. I planned to use my clipcard as I had just enough segments left on it. Because I had a heavy bag I used the elevator to enter the station. On my way into the elevator I lent a hand to a woman having difficulties getting her pram inside. Once on the platform I tried to use my clipcard, but the machine would not clip it – the card had become limp from being bent over in my wallet. I struggled with the machine before the woman I had earlier helped noticed my problem and came to my rescue. She showed me with a knowing smile what to do: spit on the clipcard! I did just that and lo and behold the machine "accepted" my card and I was able to complete my journey legally and happily!

What do we make of this vignette – this little ethnographic encounter with machines? The normal use of the clipcard could be described as a case of affordances or Latourian scripts. indeed we might rename the card a "script card" in honor of Madeline Akrich! The card and card clipper give affordance to the journey. The card is scripted to be inserted into the machine and receive the requisite clipping. But a crumpled or limp card breaches the material script for which both card and machine have been designed and which are necessary parts of the sequence of actions to legally board the train.

At its most fundamental we see that the actions of the woman is in repairing the script, which had been breached by the breakdown of the interface between the card and the machine. That is, the designed affordances or scripts that enabled connection between the clip card and the machine reader have broken down, thus preventing the material script of actions encoded within them. The woman simply uses other material possibilities, such as moisture, to make the repair. It is in no way exceptional; the woman knew exactly what to do as a practical everyday behavior to enable action to continue.

Repairing is itself an important aspect to consider in understanding the situated interaction between the social and the material. But we need to look beyond the specific instance of repair to fully understand sociomateriality in context. We cannot understand this social activity of accomplishing the boarding of a train, if we do not consider the multiplicity of context and action implicit within it. First, the very act of repairing is uniquely situated within its cultural context; Danes know that clipcards sometimes fail and also what 'usually works to fix the problem (they have other ways of repairing the situation). Second, the action was facilitated by the social interaction that preceded it – the materiality of the pram and elevator through which the association was brought into being and which facilitated the woman sharing her tacit cultural knowledge of how to repair a perceived breakdown of human and material interactions (not to mention conventional gendered notions of politeness, would I have as willingly helped a man struggling with, say, a huge keg of Tuborg?). Third, which material affordances and scripts should we privilege to explain this incident: the pram, the elevator; the clipcard; the wallet in which it became crumpled; the ticket machine; the boarding of the train; or the broader Danish context within which the design of the clipcards, their possible breakdowns, and their knowledgeable repair are entangled? Of course, none can be privileged. They are all part of accomplishing activity with materials (Jarzabkowksi and Pinch forthcoming). In order to focus on and explain the specific instance of repair we must of necessity explain the broader activity and surrounding materials within which that instance is situated, and without which it occurred. Even the intentions of the actors are not always clear. We impute that both actors in this encounter intended to help each other on their journey – but maybe their intentions were less clear. Maybe they intended to fall in love as in classic

movie stories of chance railway encounters. In such a scenario the spitting on the clipcard might mean something else altogether!

All these examples of mundane interactions with technologies in dense and less dense environments serve to remind us that sociomateriality must always be unpacked. As we focus upon contexts of use we observe reappropriation, repair and also improvisation. The agenda of technology studies will be best served by situating materials, mundane artefacts, and technologies within the accomplishing of activities in multiple contexts. It is these contexts and activities that best explain the interaction of the social and the material, rather than any innate or transformative properties of the materials themselves.

* * *

Improvisations in technological density

Cornelius Schubert

Introduction

My input to the conversation seeks to connect the idea of technologically dense environments (TDEs) with the concept of improvisation as a form of technical practice.[4] The term improvisation carries a dual meaning. On the one hand, in its original sense, it positively refers to the artistic quality of situated performances which do not follow a pre-given script and often include the mastery of (musical) instruments. On the other hand, it has taken on a negative meaning of makeshift tinkering which implies the inability of doing something properly. The latter meaning typically prevails in technical settings, where improvisation is considered to be a partial fix and inferior to pre-planned control. The former meaning entails that improvisation itself is a form of mastery and this understanding is typically found fields like the performing arts. On the following pages, I will outline an understanding of improvisation in TDEs which draws on the positive notions of mastery and competence from the performing arts and which conceptualises improvisation as an essential aspect of working in TDEs. My reflections are set against a background of ethnographic observations during surgical operations (Schubert 2007) and conceive modern medical care as a prototypical technologically dense environment.

[4] I am especially indebted with the participants of the 2013 *STS Italia Summer School* for the fruitful discussion around improvisation, TDEs, and medicine.

1. Improvising as skilled and situated performance

Let us first come to terms with the manifold meanings of improvisation. The word was originally used in the arts, starting in the 18th century and referring to a situated performance that would not be rehearsed like classical script based theatrical plays or musical pieces (literally meaning "un-foreseen"). Improvisation was performed in front of small audiences and typically consisted of creative acts like thinking up a poem. This performance did not, however, come out of thin air. The improvising artists were credited for their skill and competence in situated creativity. From there on, different facets of improvisation have become a central virtue in many artistic fields, most notably jazz music (Berliner 1994). In jazz music, improvisation typically denotes the skilled and situated variation of existing musical themes by experienced players (Becker 2000). Yet, in different performing arts, different notions of improvisation can be found. Theatrical improvisations, for instance, often aren't variations of an existing theme, but stress the ad hoc creation of the play as it is performed. This brief glance at improvisation in the performing arts should suffice to highlight two core aspects of improvisation. First, improvisation is a *skilled art* which has to be learned, often over many years of training and experience. In contrast to the negative meaning of improvisation as a lack of mastery, it connotes a highly professional competence. Second, improvisation is a form of *situated conduct* which highlights the contingency and adaptations in concrete actions and interactions. Thus, it connotes the intentional deviation from pre-planned scripts or protocols.

Such an understanding of improvisation and especially the notion of jazz improvisation have been fruitfully extended within organisation studies (Weick 1998; Kamoche et al. 2002). The idea of organisational improvisation mainly serves as an antidote to prevailing assumptions about order and control in organisational theory. Weick, for instance, argues that assumptions about order make it difficult for organisational scholars to address issues of creativity and innovation, since they impose an overly rational model of organisational structure and process. In addition, improvisation implies a situation which deals with the unexpected and unplanned. This is not to say that improvisation lacks order. Rather, improvisation is a process in which a specific situated order is created.

We can extend this thought towards a more general understanding: Improvisation is a situated combination of already existing and newly created elements. It is a creative process by which a number of situated "givens", e.g. musical themes, instruments and knowledge are recobined and adapted according to an ongoing situation. It is a process through which the situation itself is instantaneously created. But it would be wrong to equate improvisation with simple spontaneity or creation ex-nihilo. What makes improvisation an interesting concept is the creative relation of the old and the new. In such broad terms, improvisation is in

effect an essential aspect of all human action, since we are always faced with open ended courses of action and the need to adapt to changing environments, be they natural, social or technical.

2. Improvising in technical settings

Even though jazz improvisation provides a fruitful point of departure for discussing improvisation in technological dense environments, it may also be misleading in some ways. I will point out two critical issues. First the idea of the human mastery of a technical instrument and second the idea of improvisation as an end in itself.

Jazz improvisation is a capability of highly skilled experts and requires years of training and experience. This is an important point to note, since it provides the argument against notions of improvisation as inferior makeshift tinkering. At the same time, expert jazz improvisation implies the mastery of the musical instrument (Becker 2000). The instrument has to "withdraw" in a phenomenological sense (Heidegger 1996 [1927]: 65), so that the musician may exert full control over it. Only if the instrument has become "at hand" ("zuhanden" in German, ibid.: 66), i.e. if the musician can essentially forget about how he or she has to play the instrument and is therefore able to focus on making music, will improvisation become an artful and creative mastery. In this understanding, the creative aspects of variation solely reside on the side of the human musicians and improvisations in effect become a one-sided perspective, privileging the creativity of humans while depicting instruments as functional appliances. But as Heidegger has also noted, tools must not necessarily withdraw to be only ready at hand – rather they may become conspicuous, obtrusive or even obstinate in use. Indeed, some forms of musical improvisation, like experimental electronic or ambient music, use "malfunctioning" instruments or random sounds in order to create unexpected elements in their music. Even if this essentially returns a malfunction into some form of functionality, i.e. the creation of the unexpected, it counters the notion of mastery and withdrawal. In other genres, like drone metal, electric amplification and feedback are used to create lasting soundscapes (drones). The minimalist improvisations of drone metal point to the material arrangements required to create such sounds and highlight the artists reflexive engagements with the instruments during improvisation. In both cases, the locus of creativity is shifted from the solely human side towards a distributed creativity between instruments and musicians. This form of improvisation might be closer to improvisations in TDEs, where tools or instruments may resist intentional human action (Pickering 1993) and must be considered not as functioning appliances but as unruly technology (Wynne 1988) or clumsy golems (Collins and Pinch 1998).

The second and more important difference between musical improvisation and improvisation in TDEs is that artistic improvisation is an end in itself (the opus operatum), whereas improvisation in TDEs is a means for ensuring a more or less stable flow of work (a modus operandi). Improvising in TDEs means to cope with the numerous contingencies and complexities by repairing, adapting to or working around more or less unexpected disruptions in the planned course of events. In contrast to artistic fields, where improvisation is explicitly made visible (or audible), improvisation in TDEs largely remains "invisible work" (Star and Strauss 1999). This is not to say that improvisation is not valued at all. Especially experienced practitioners know about the necessity and skilfulness of improvising in technical settings and many ethnographies of work have highlighted the importance of such "repair work" in various fields (cf. Strauss et al. 1985; Orr 1996). So, even if improvisation in TDEs is not an end in itself, but rather a mode of conduct, it is by no means a negligible aspect of work. Instead, it is a constitutive element of all technical activities. This also means that we should not conceive of TDEs as clean and functional settings, but rather as more or less messy places which continuously provide for unexpected situations and call for adapting the course of work to situational contingencies. Increasing technological density thus cannot be equated with increasing integration and alignment, but should be conceived as increasing heterogeneity and the disorderly layering of manifold technologies one over another. In case of medicine, for instance, diagnostic instruments or monitoring technologies overlap with documentation systems and administrative infrastructures. All these different technological layers are enmeshed with each other and unforeseen connections between them are likely to grow as they are used in practice. Under such conditions, improvisation denotes the skilful articulation of all these layers for creating a situationally ordered sequence of events (cf. "articulation work" in the hospital, Strauss et al. 1985, pp. 151).

Let us briefly reconsider the argument so far. Building upon the idea of artistic improvisation as skilled and situated performance, a general concept of improvisation was put forward which does not equate improvisation with mere spontaneity or the absence of order, but with the competent adaptation and situated creation of order in the relation of the old and the new. In a second step, the specifics of jazz improvisation were critically discussed with regard to improvisation in TDEs. In the latter case, improvisation was conceived as a mode of conduct in dealing with unruly technologies. Following this line of thought, improvisation is neither an inferior mode of conduct compared to pre-planned control, nor is it a simple functional addition to otherwise rational technical procedures. Rather, improvisation itself combines different modes of routine and flexibility or repetition and creativity. It is skilful, situated, technically mediated and embodied, drawing both on explicit as well as implicit knowledge. Extending the concept from the performing arts to technologically dense environments highlights these features of a professional

practice, which essentially exists in the intentional and controlled deviation from standardised procedures. With growing technological density, as messiness and unruliness increase, TDEs do not withdraw into being ready at hand, but constantly challenge prefabricated scripts and demand situational adaptations. Stretching the metaphor a little, we could say that the instruments in TDEs in a way tend to play their own songs (like in drone), than that they are being played (like in jazz).

3. Modern medical practice and technological density

In the last step, I will relate the concept of TDEs and that of improvisation to the specifics of modern medical practice. In order to do so, I will provide answers to two questions. First, can we speak of modern medical practice as a technologically dense environment? Second, what implications does this have for our use of the term improvisation?

Let us begin with the question, if medicine has become technologically more dense. It can easily be argued that medical practice has always been technically mediated and socially organised. This way, medicine can be thought of as having always been technologically dense, at least since the invention of stethoscope and thermometer. The increasing number of diagnostic and therapeutic instruments over the last 200 years would then warrant the claims that medicine has become technologically more dense and that the organised settings of modern healthcare indeed constitute prototypical TDEs. However, a mere increase in instruments is not sufficient to make this claim. Technological density is not only a matter of quantity but more importantly of quality. Because technological density more often than not creates a messy state of affairs, it does not necessarily lead to frictionless integration, but to increased fragmentation and the continual need for conversions between the different layers of technologies, e.g. between circulating pieces of paper, heterogeneous electronic infrastructures and instruments and last not least, bodies.

In case of modern medicine, technological density then does not simply imply an increase in diagnostic, therapeutic, and administrative technologies, but leads to manifold interdependencies between them. Information infrastructures, such as medical records, fuse diagnostic data with therapeutic trajectories and cooperative workflows (Berg 1996). In these cases, it becomes increasingly difficult to distinguish between the epistemic and coordinative aspects of work, i.e. between diagnostic and therapeutic knowledge and administrative procedures. Modern computerised information infrastructures in a way constitute the backbone of many TDEs and this is also true for medicine. A TDE then is not a mere surrounding or frame for the actions and interactions taking place, rather, TDEs constitute basic situations which shape and are being shaped by ongoing work practices. Ogburn (1922) once noted that humans must not

only adapt to a natural environment, but also to a social environment and increasingly to a technological environment. In contrast to the former two, the technological environment is in constant and rapid change. It would thus be wrong to equate a technological environment with stable frame or surrounding. TDEs like medical care are in transformation, they change and evolve along with the work that is being carried out within them.

But how does this relate to improvisation? Interestingly, the term improvisation is also used in medicine. In the late 19th century it was borrowed from the arts to describe the specifics of medical practice under the conditions of sparsity, e.g. in military field hospitals (Cubasch 1884). Improvising was considered to be an aspect of practicing the art (sic!) of medicine without the resources of a fully equipped peacetime hospital. Even though improvisation was – and still is – considered part of the art of medicine, it is strongly linked to situations of sparsity which are technologically less dense than those of routine medical practice. Improvisation and material abundance thus do not seem to go well together and improvisation might only occur in situations where other things become sparse, e.g. the lack of time in emergency situations. Thinking of improvisation mainly as an emergency procedure, a deviation from the norm (no matter how artistic), however, falls short on two accounts. First it would imply that improvisation in TDEs is the exception and not the rule. From the perspective of complex density outlined above, this hardly seems to be the case. Second, it would overemphasise the creative aspects while neglecting the routine structure of improvisation itself.

Finally, this leads us away from the question *if* improvisation occurs in TDEs towards the question *how* it occurs. As a conceptual tool, it makes us sensitive to the interrelation of routine and flexibility, to the experience and skill required to competently improvise, to the relevance of material artefacts, bodily senses and informational infrastructures. It also leads us to questions how improvising is practically legitimated and sanctioned in different TDEs and in how far the TDE itself provides and allows for different forms of improvisation. Medical practice, as Parsons already noted, is inherently uncertain and calls for manifold mutual adaptations of standard procedures and non-standard patients, doctors, and nurses (Timmermans and Berg 1997). Related to this is the question of how improvisation can actually be learned or trained for. Unlike the performing arts, where improvisation is an end in itself, improvisation in TDEs is a modus operandi where the deviations from standardised procedures need to be accounted for in other ways.

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Sociotechnical Privacy
Mapping the Research Landscape

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Abstract While it is extraordinarily difficult to theoretically specify privacy, in the last 100 years or so (social) psychology, philosophy, communication studies, economics, and, to a lesser degree, also sociology and anthropology, provided attempts to conceptualize its meaning. Be that as it may, from the 1960s onwards privacy discourse has focused upon data, understood as "personal information", to a certain extent because of the advent of huge databases and information and communication technologies (ICTs). Influential scholarship at the present time tends to conceive of ICT-related privacy in terms of the "sociotechnical", thus highlighting the interlocking of human and technical agency. Although having developed a manifold of instruments to research sociotechnical phenomena, STS engagement with sociotechnical privacy, so far, has been rather low-key. In our contribution we therefore provide a mapping of the research landscape, identify connecting factors between STS and sociotechnical privacy research, and calling for further STS contributions.

Keywords: Privacy Theory; Sociotechnical Privacy; Quantitative Privacy Research; Qualitative Privacy Research; STS Privacy Research.

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Privacy rhetoric often focuses on the individual (…) Models that go beyond the individual often focus on groups (…) or articulated lists of others (…) But what are the implications of privacy in a networked world where boundaries aren't so coherently defined and when entities aren't so easily articulated?

danah boyd (2013), *Networked Privacy*

1. Introduction

Conceptual work on privacy regularly starts out from the premise that it is extraordinarily difficult to theoretically specify the subject matter.

One of the most thorough accounts of privacy is offered by legal scholar Daniel J. Solove (2008, 1) who states in his seminal *Understanding Privacy* that: "Privacy (…) is a concept in disarray. Nobody can articulate what it means". A closer look at the academic discourse regarding privacy very quickly demonstrates, however, that this conceptual disarray is not at all due to a lack of analytic engagement. Although one cannot but realize a certain "under-theorisation of the private in sociological thought" (Bailey 2000, 382), "much ink has been spilled in trying to clarify its meaning" (Posner 1978, 393). The discourse on privacy, in other words, in the last hundred years or so,[1] has been proliferating, with a whole range of disciplines, such as legal studies, (social) psychology, philosophy, communication studies, and economics participating in the debate, aiming to contribute to an understanding of the concept of privacy[2].

A major reason for the difficulty in tackling the privacy problem certainly lies in the multiplicity of dimensions the term refers to: bodily physicality (intimacy; cfr. Inness 1992), material or immaterial resources (private property; cfr. Posner 1978), space (private sphere; cfr. Rössler 2001), freedom of decision (decisional privacy, ibid.), as well as institutionalized social domains that are (or are deemed to be) free from public authorities' interventions (the whole of society as private sphere with the State not being authorized to interfere at will, cfr. Habermas 1962), may be designated as "private." Another dimension the privacy discourse has focused upon from the 1960s onwards is data, understood as "personal information" (cfr. Westin 1970). To a certain extent because of the advent of huge data bases and information and communication technologies (ICTs) initially only at the disposal of government authorities, scholars, over the last several decades, have increasingly explored the status of privacy in face of the massive digitization of vast spheres of social, political, economic life (Westin 1970; Gandy 1993; Garfinkel 2000)[3]. The resulting, at times rather dystopian, work demonstrates beyond doubt that privacy, to a considerable degree, has become a matter of information flows, and of the technical workings of data processing machines that (in part, but decisively) shape these flows (Nissenbaum 2010). Given that privacy is furthermore a collective achievement (Simmel 1906; Goffman 1973), and thus (perhaps contrary to intuition) not about isolated individuals, but, rather, a social phenomenon, it is appropriate to speak of *sociotechnical*

[1] One might locate the starting point in 1890, beginning with Warren and Brandeis' infamous "The Right to Privacy" (Warren and Brandeis 1890).

[2] And, despite Bailey criticizing sociology's lack of interest in privacy, there are, indeed, useful contributions current debates repeatedly refer to, such as Simmel (1906), Goffman (1973), and Arendt (1958).

[3] At the same time, the neighboring research field of surveillance studies has developed (cf. Lyon 1994). Some scholars consider privacy and surveillance as concepts that need to be distinguished (Stalder 2002), while others seem to somewhat fuse both of them (Marx/Muschert 2007).

privacy when it comes to technologically-mediated, data-driven informational processes (cfr. again Nissenbaum 2010). Accordingly, research on privacy with respect to new, digital data-collecting and processing technologies in distributed, networked computational environments must acknowledge privacy's recent sociotechnical entanglements or dynamic, heterogeneous associations.[4] On this note, Friedewald and Pohoryles, for example, state that: "Technology and privacy are two intertwined notions that must be jointly analysed" (2013, 1).

This is even more true, given that, since the 1990s, sociotechnical privacy has been significantly transformed, again, with the advent of the Internet and the World Wide Web; with the advent of "smart" cards, meters, grids, and homes; with the advent of "virtual" bank accounts and online banking; with the advent of digital navigation through analogous space; with the advent of social media such Online Social Networks (OSNs) for communication and networking, and Business-to-Consumers (B2C) E-Commerce for purchasing and selling goods online. In this paper, we focus on mapping the research landscape of the latter two, both of which involve forms of sociotechnical privacy. The reason for this focus is that, at present, privacy and privacy breaches in OSNs and E-Commerce environments are a major subject in academic research, and also are at the core of the background for staging public policy debates on privacy.

The "sociotechnical" is a classic concept in Science and Technology Studies (STS) (e.g. Akrich 1994, 1989; Bijker and Law 1992; Callon 2004; Law 2000). It denotes the interplay in highly complex situations of technological infrastructures and practices, of social and material agencies, involving a wide array of heterogeneous actors – human and non-human or technical and non-technical – engaged in numerous controversies. Sociotechnical privacy as a concept, therefore, is perfectly suited for STS. We are aware, of course, that STS is a highly contentious field, and that there is no "solid" definition of it (Coopmans *et al.* 2004, 2). However, since the 1980s, the label STS is most commonly used for designating (social) constructivist and post-constructivist research on science and technology, albeit not in a binding or consistent way (Ilyes 2006). However, technology "as an object of inquiry" in STS is generally conceptualized "in terms of an ensemble of social and material elements in which dynamic combinations of determination and contingency generate different sociomaterial configurations" (Boczkowski and Lievrouw 2008, 957). In this sense, a purely technological or tool understanding of the complex, interactive systems that involve sociotechnical privacy falls short of their deep embeddedness and situatedness in, or entanglement with, social (or cultural) contexts (e.g. Akrich 1994; MacKenzie and Wajcman 1999). As we will explain in the conclusion, it is this general insight which renders the con-

[4] Ellison and boyd (2013, 166) define sociotechnical systems as systems in which "social and technical factors shape one another".

ceptual tools and methodological instruments of STS fruitful for research on sociotechnical privacy.

Having said that, we would like to clarify that whereas STS engagement with sociotechnical privacy so far has been rather low-key, the research landscape concerning this form of privacy is much more extensive and diverse than we are able to illustrate on the pages to come. What is more, being located at German research institutions we approach the international research landscape from where we are based, which is why our mapping will predominantly focus on German, European and United States research. For these reasons the map that we draw will be somewhat selective; however, we presume this to be negligible for the argument presented here since our main interest lies in unlocking connecting factors between sociotechnical privacy research and STS, and we assume that our selective mapping is appropriate for our particular concern. So the paper proceeds as follows: in the next paragraph we will offer a rough overview over quantitative studies dealing with sociotechnical privacy in the last ten years or so (1); thereupon we will attempt to map the inventory of qualitative research in this area (2); finally, we will flesh out three possible STS contributions to sociotechnical privacy studies (3).

2. Quantitative Research on Sociotechnical Privacy

Some of the earliest and to date most influential quantitative research on sociotechnical privacy in OSNs and B2C E-Commerce stems from the fields of behavioural economics, communication studies and (media) psychology. This research mostly centres on the idea of individual actors, often conceived of as consumers, who make individual privacy decisions (as explained in Gürses and Diaz 2013, 6); in so doing, these individuals are deemed to trade personal information off for (economic or social) benefits. Behavioural economists Alessandro Acquisti and Jens Grossklags formulated the *leitmotif* of this kind of approach as early as 2003 by identifying "a dichotomy between stated attitudes and actual behavior of individuals facing decisions affecting their privacy and their personal information security" (Acquisti and Grossklags 2003, 1). Those individuals are generally deemed to make rational decisions (Acquisti and Grossklags 2005), therefore research strategies aim to compare users' rational valuation of privacy in online environments with the information they actually reveal via profiles, postings, and so on. A behavioral economics research strategy proceeds by interrogating users, with the help of surveys, on the value they assign to personal information. Additionally, profile data and similar data made available by users in OSNs are collected, examined, and tested for a match or mismatch between attitudes stated in the surveys, and actual profile settings (cf. Gross and Acquisti 2005; Acquisti and Gross 2006). More often than not researchers found a discrepancy

between both. The term coined for this mismatch was "Privacy Paradox" (Barnes 2006).

Research along these lines attempted to identify a series of issues, among them (1) privacy concerns and the trust that users assign to certain OSNs (Dwyer *et al.* 2007); (2) users' perceptions of "benefits" (i.e. social capital) of OSNs for them (cf. Ellison et al. 2007; Ellison et al. 2011; Stutzman et al. 2012a); (3) information protection strategies in OSNs, and the growing awareness of, privacy issues as well as techniques to limit unintended dissemination of information (Tufekci 2008; Young and Quan-Haase 2009; Stutzman and Kramer-Duffield 2010); (4) the cultural shaping of privacy concerns (Wang et al. 2011a); (5) the change in use and perception of OSNs over time (Lampe *et al.* 2008; boyd and Hargittai 2010; Stutzman *et al.* 2012b); and (6) whether and how OSN use affects self-disclosure (Trepte and Reinecke 2013).

Many of these studies were concerned with what was perceived as a discrepancy between stated attitudes and actual disclosure practice in OSNs. In the same vein, early research in the realm of E-Commerce detected a similar dichotomy (e.g. cfr. Berendt *et al.* 2005). As the objective of many of these studies is to inform privacy research in computer science (e.g. on Privacy-Enhancing Technologies, abbreviated PETs) the central question is how to account for this discrepancy and find a design solution. One major approach is the so-called "soft paternalism" approach based on the idea of "privacy nudges", a strategy that works on the premise that users must be nudged by the software into considering the privacy implications of their online actions (Acquisti 2009; Wang *et al.* 2013). For example, studies uncovered that users often regretted having posted a piece of information (Wang *et al.* 2011b). Several suggestions were made and tested. One suggestion was to provide a tool informing users about the audiences for which a post was visible; another one was to introduce time delays to give users the opportunity to reconsider as to whether they wanted to post the message or not; and yet another suggestion was to indicate potentially inappropriate semantics in a post (e.g. swearing; Wang *et al.* 2013). With respect to E-Commerce, researchers experimented with providing tools that indicated the "privacy-friendliness" of online shops, "nudging" users towards financially less attractive but more privacy-friendly services (Tsai *et al.* 2011).

These studies are well suited to take on rather narrowly defined privacy issues on the Internet. However, they rarely consider collective or interactional dimensions of privacy practices (Gürses and Diaz 2013; Dourish and Anderson 2006). In fact, what is termed "practice" in many of these studies, empirically and methodologically only comes to the surface in the form of participants' ticking preformulated statements in a survey. Often such surveys consider "practice" to be the equivalent to individuals' behavior, assuming that it is possible to separate "behavioural bits" (i.e. decontextualized privacy decisions, e.g. when setting up a profile, or similar actions) from users' extended social context. In this view, users

give rational and clear-cut accounts of the reasons motivating those "bits". It follows from this perspective that it should be possible to identify these reasons by interrogating users with the help of surveys and juxtaposing them with what is held to be the corresponding "actual practice." In contrast, STS approaches situate practice within the collectivity of sociotechnical "agencements" (Callon 2006), or "social worlds" (Clarke and Star 2008). Empirically and analytically, user practices cannot be studied in isolation from those collectivities. In order to capture user practices *in situ* qualitative approaches are necessary.

3. Qualitative Research on Sociotechnical Privacy

There is to date a considerable number of studies on privacy issues in technically mediated environments employing both a sociotechnical approach, and a qualitative and mixed-method approach to investigate users' privacy management and sharing practices in OSNs (e.g. Besmer *et al.* 2010; boyd 2007; Brandtzaeg *et al.* 2010; Cunningham and Masoodian 2010; Dowd 2011; Fowley 2011; Lampinen *et al.* 2011; Lange 2007; Rotman *et al.* 2012a; Nippert-Eng 2007; Sleeper *et al.* 2013; Viseu *et al.* 2004). These investigations are qualitative (or partly qualitative) user studies conducted in a range of fields such as HCI (Human-Computer Interaction) and CSCW (Computer-Supported Cooperative Work).[5]

There are also some full-fledged ethnographies on OSNs that have become quite influential. danah boyd, for example, in 2008 brought forward an impressive study of US American Teens' use practices in a range of OSNs (or social network sites, abbreviated SNS, as she prefers to call them) (2008b). Moreover, not only did she provide, together with Nicole B. Ellison, what is the standard definition of OSNs (boyd and Ellison 2007), she also developed the widely-used analytical concept of "networked publics" to capture the characteristics of OSNs (boyd 2008). Interestingly, by doing fieldwork, boyd (2011) did not simply offer common explanations of a say-this-but-do-that type of user, but, instead, was able to empirically demonstrate that the users she observed (US Teens) in no way rejected privacy as a value, as it is often claimed (cfr. the debate on the "privacy paradox") Rather, they had the normative expectation that certain classes of actors, such as parents or teachers, were simply not authorized to "sniff out" personal information; doing so was considered a privacy breach, just like reading someone's diary without their consent (boyd 2011). The reason for the occurrence of the so called privacy para-

[5] HCI and CSCW researchers have employed ethnographically informed approaches since decades, particularly to gain insights into actual practices of users of computational environments in workplaces (cfr. Anderson 1996; Crabtree *et al.* 2006; Dourish 2001; Hughes 1995; Viller and Sommerville 2000).

dox, therefore, was not so much attributable to discrepancies between stated attitudes and actual behaviour as to a clash of normative assumptions, as well as to power asymmetries in terms of options to achieve "contextual integrity" (Nissenbaum 2004).

Other qualitative studies on privacy issues in OSNs similarly help to differentiate the specific forms privacy (and privacy practices) take on in online environments. Based on an ethnography of Facebook users, Raynes-Goldie (2010), for example, distinguishes between "institutional privacy", i.e. privacy matters to do with access of providers and third parties to users' personal information (which can hardly be controlled by users), and "social privacy", i.e. privacy matters to do with users' privacy management *vis-a-vis* other users (which is potentially controllable by users with the help of privacy settings provided by OSNs). Raynes-Goldie holds that, typically, teenagers do care less for "institutional privacy", compared to "social privacy."[6]

Despite of drawing on rather small sample sizes, qualitative and ethnographic studies on actual user practices allow a more nuanced perspective on privacy in technically mediated environments. Insights into actual user practices may point to possible solutions for mitigating problems of unauthorized data access, and thus to suggest ways of giving users more control over their privacy settings or to make it easier for users to manage them (Beye *et al.* 2010, 13). In fact, as far as the design of online interactive systems is concerned, bringing an understanding of the social to the research of these systems, and conceiving of them as sociotechnical (or "technosocial") ensembles rather than just technical tools has become a widely adopted perspective. Many scholars in the field of systems design now emphasize anthropological and sociological methodological approaches in order to provide insights into situated and contextualized end users' information practice, i.e. how they manage their activities and security on an everyday, practical basis (cfr. Dourish 2001, 2004; Dourish *et al.* 2004; Dourish and Anderson 2006). Rotman *et al.* (2012), for instance, argue that quantitative methods have only a limited capacity for exploring why people do something online. Ethnographers, they suggest, may uncover implicit meanings and new behaviours by conducting in-depth research in natural settings (Rotman *et al.* 2012b). Sociotechnical approaches are, in fact, employed within the field of systems design (e.g. Sutcliffe 2000; Goggins *et al.* 2011; Mostashari and Sussman 2009), but – with very few exceptions – work in this field makes no reference to STS nor does it employ qualitative user studies.

The latter observation applies to research on sociotechnical privacy in general: studies locating themselves explicitly within the STS field, taking up STS conceptual tools are pretty rare. Here are some of those that do

[6] Other scholars prefer the terms "interpersonal" (Palen and Dourish 2003; Johnson *et al.* 2012) or "interactional" privacy (Lipford *et al.* 2012; Wisniewski 2011).

so: Ochs and Löw apply some of the STS instruments to pursue their more general interest in possibilities of building a "culture of trust" on the Internet including the matching of techno-legal infrastructures, fair information practices and user competences (Ochs and Löw 2012). Van der Velden and Emam (2012) focus on understanding actual privacy-protection techniques of long-term or chronically ill teenagers using social media. Ochs (2013) analytically juxtaposes empirically identified normative scripts shaping users' agency with the cookie script harnessed for targeted advertisement, thus demonstrating the emergence of intrinsically contradictory information practices. Still further in empirically integrating the non-human shaping of sociotechnical privacy go Poller *et al.* (2013). Their work is based on a collaboration between computer scientists and cultural anthropologists using both self-reported data and technically elicited *in situ* data from OSNs to achieve a better understanding of actual user practices and user interactions. By analyzing users' interaction with other users as well as with technology, they aim at making valid suggestions for a more user-friendly software design of OSNs.

In fact, systematically including non-human actors' role – be they technical, legal, or other – in the shaping of sociotechnical privacy is what is urgently required in privacy research. Gürses and Diaz (2013) plausibly argue for an integration of "surveillance perspectives" and "social perspectives", i.e. of what we have called above "institutional privacy" and "social privacy." To understand sociotechnical privacy, in other words, it is mandatory that we account for the wider sociotechnical ensemble or "agencement": users, preferences, infrastructures, providers, technology, laws, etc. Recent research, quantitative as well as qualitative one, has begun to pick up on this insight, including providers and technologies in the research design. Stutzman *et al.* (2012), for example, combined their quantitative longitudinal study of Facebook use by undergraduates at a US University with a qualitative analysis of Facebook privacy settings during the course of the study to explain some of their findings. Raynes-Goldie empirically investigated both OSN users and the provider (Facebook Inc.) to demonstrate that: "Facebook Inc. plays a critical, yet often overlooked role in shaping privacy norms and behaviours through site policies and architecture" (Raynes-Goldie 2012, ii).

Mapping the landscape of sociotechnical privacy research eventually reveals that there is a need to be more inclusive, i.e. to take into account the various heterogeneous actors / agencies shaping privacy practices and shaped by them. This requirement has already been acknowledged for some time within privacy research in general. We argue that STS is perfectly equipped to contribute to this task. So in the remainder of the paper we will suggest how STS may contribute to exploring sociotechnical privacy.

4. Three Possible STS Contributions to Studying Sociotechnical Privacy

Studying online social media on the Internet (such as Facebook, YouTube, Orkut, Twitter, Flickr, Google+, Pinterest, etc.) is a hot topic for researchers from different disciplines. There is hardly any doubt that these media have changed the way the Internet is being used, and that the implications of these changes are not well understood, particularly with respect to privacy and security issues. Increasingly, researchers articulate the need to study these technologically mediated online environments from various perspectives[7]. However, STS has not yet seriously engaged with sociotechnical privacy on the Internet. Although STS programs at universities often emphasize that privacy in technically mediated environments is a central public issue that should be investigated from an STS perspective,[8] few studies have visibly materialized so far[9]. Whereas the theme of surveillance was present to a certain extent at recent STS conferences[10], the question of managing privacy in online social networks by their users was hardly touched[11]. We want to argue, however, that STS with its characteristic non-essentialist and mutual-shaping stance will be able to contribute to research on sociotechnical privacy. We want to particularly suggest three points.

4.1. Situated Actions and Practices

A first move of STS-informed research on sociotechnical privacy would be to step back from given definitions, and to follow agencies as they co-constitute the ontologies of privacies in processes of unfolding in different sociotechnical arrangements or "agencements". Therefore, STS first contribution would be to take privacy not as a given, but to investigate into sociotechnical (or "technosocial") entanglements, i.e. the co-constitution or social shaping of technology by heterogeneous actors or agencies. OSN users' actions are part of wider-ranging sociotechnical practices involving communication, networking and so on, that is, in STS

[7] For instance, recently, at the Second International Workshop on Privacy and Security in Online Social Media, co-located with WWW 2013, May 14, 2013, Rio De Janeiro, Brazil.

[8] Two cases are STS at MIT and Cornell University.

[9] There is some work in STS on other aspects of social media, e.g. on ethical questions, but not necessarily qualitative studies (cf. e.g. Light *et al.* 2008).

[10] For instance, at three panels at the 4S/EASST Joint Conference 2012 Copenhagen.

[11] Two of the few presentations at the 4S/EASST Joint Conference 2012 that did touch this point are by Maja van der Velden and Andreas Poller and Andreas Kramm.

terms, they are "situated" actions.[12] As a consequence, when we deal with a subject that is socially and culturally as loaded as privacy, it seems hardly possible to sever the informational dimension of privacy from its ties to dimensions of intimacy, property, freedom of choice, and so on. Additionally, it is quite probable that conceptualizations of privacy vary with respect to the given social setting under scrutiny. So, instead of portraying privacy as a matter of purely individual behavior, or as something essential, equipped with inherent features, it is more appropriate to investigate (a) into what privacy means in different social worlds to different actors; (b) how the latter relate to different taken-for-granted values, norms, ideas, interests, etc.; (c) how they aim to inscribe these into material structures, given the asymmetric distribution of capacities to do so; and (d) how different notions clash, thus destabilizing discursive, semantic, semiotic, and material dimensions. Furthermore, situated actions and practices are not only produced by those who use some online service, but also by those providing it, including the material agents shaping the flow of information, and others, e.g. regulatory agencies. It may be the case that within such complex constellations there are countervailing "scripts" (Akrich 1994) shaped by quite different norms and values. Still however, insofar as the contradictions do not necessarily become visible, and consequently do not play out, all the agents together might build networks producing practices. For example, users may operate with normative assumptions not matching the technological scripts that shape the flow of information; however, without being aware of it, so in spite of their norms being somewhat violated, they still develop practices in OSNs. Hence, what seems a paradox at first glance might, in fact, surface as a matter of asymmetric translation processes rather than of inconsistency: users may simply not be able to make *their* scripts part of the program running. To sum up, studying situated privacy practices would make the simultaneous fluidity (no once-and-for-all privacy-in-society) and robustness (relatively stable patterns of privacy practices in different social worlds) – that is, the contingencies and regularities of sociotechnical privacy – visible.

4.2. Heterogeneous Actors

We argue that this approach requests us to identify connected sites and stabilizing mechanisms, trace a network and account for how the association is held together (Latour 2005). While keeping an eye on the users, we must also turn the lens somewhat away from them and also include other entities. STS user studies do not only look at users' roles in

[12] The concept of "situated action" has been introduced by Lucy Suchman (1987) to the debate on technical design, and has become a central concept in STS.

technological development and innovation but also at the complex interplay of users and artifacts (cfr. Oudshoorn and Pinch 2008). This perspective points to emergent properties, unintended consequences and coevolutionary dynamics of technical artifacts (cf. e.g. Akrich 1994; Callon 1987). STS emphasizes that there are no "correct" uses of a given technological artifact, only intended, recommended, expected or dominant ones (Aibar 2010, 179). Users do not necessarily "come forward to play the roles envisaged by the designers" (Akrich 1994, 208), but come up with new and surprising uses. Indeed, qualitative, ethnographically informed studies on sharing strategies of OSN users demonstrate that users often do not fully grasp how the system technically functions. They also show that users invent strategies and workarounds instead of using built-in functions (e.g. boyd and Marwick 2011; Poller *et al.* 2013). In this sense, unsurprisingly, users still play an integral part in sociotechnical privacy studies. If we want to come to terms with how practices are collectively produced, however, we quite obviously have to deal not only with users, but also with technologies, designers, providers, shareholders, privacy advocates, regulators, laws, government authorities, global governance agencies, etc., all of them participating in the shaping of practices, attempting to introduce scripts in order to make programs of action run. Sociotechnical privacy may be produced as much by data regulation laws as by users' ideas and actions; it may be shaped by the business models of the Web 2.0 industry just as much as by public discourses on the risks of "social media"; and it may be configured by technical functionalities just as much as by the semantics and semiotics of presenting them to users. We posit, therefore, that the second contribution of STS is to account for all these entities without privileging any of them a priori, but to rather empirically determine their relevance.

4.3. Ethnographically Informed Studies

While the merits of an ethnographically informed approach are obvious, what rains on its parade is that such an endeavour threatens to run into considerable methodological challenges (e.g. Rotman *et al.* 2012; Gürses and Diaz 2013). For instance, on-site observations of user practices in OSNs or on E-Commerce sites can be difficult because unlike in studies implying a physical site, researchers in online environments cannot simply go and visit some place, and observe users in situ. Therefore, in addition to classical qualitative research methods, the deployment of software-supported research techniques may be helpful (e.g. experience sampling, embedded comment tools, activity logs, etc.) to collect qualitative, contextualized *in situ* data.

Another case in point is access to providers' data. Gürses and Diaz point out that in practice it is not possible to observe how providers make

management decisions, nor are the algorithms that shape the flow of information visible. In other words, providers' practices – both human and nonhuman ones – are anything but transparent, and in this sense the "opacity of OSN providers" poses considerable challenges for research in PETs as well as in sociotechnical privacy (Gürses and Diaz 2013, 7). Problems such as these are, of course, not unique to studying sociotechnical privacy but also arise in other fields of STS when corporate interests (e.g. algorithmic financial markets) and other high-level interests (e.g. political decision making) are at stake. Some research draws on alternative strategies, analyzing reverse engineering of the system; public statements of enterprises; the legal framework of services, and so on. However, these strategies often require to establish alliances and collaborations with other disciplines, such as computer science, legal studies, economics, etc. In spite of the methodological challenges we argue that by investigating into actual practices and situated action, STS-informed research may both provide viable suggestions for better privacy solutions, and a better understanding of sociotechnical privacy in emergent systems; for, if anything, STS scholars have proven in the course of the last decades time and again that they are capable of building alliances with other fields and disciplines; and, what is more, that they are not easy to intimidate when it comes to researching fields which are difficult to study. Thus, the third contribution of STS to researching sociotechnical privacy is the doggedness it has acquired over the years.

Let's take up the challenge!

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Surveillance in Urban Nightscapes
A STS-Informed Perspective

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Abstract In the project "Surveillance in Urban Nightscapes", surveillance practices during the night are investigated in Dutch city centers. Besides organizational surveillance technologies such as Cctv and bodycameras, bottom-up image technologies are invading this nightscape (Octv), in the form of mobile cameras. This shared footage affects both citizens who go for a night out – you never know when and where you might have been filmed - as well as organizational surveillance – the amount of sources for watching and reconstructing events that take place in the city centre increases. Theoretically, this can be seen as gradual change in the landscape of surveillance in (nightly) public spaces. This literature review tries to capture and combine different concepts from three disciplines: urban geography, surveillance and STS. The concluding remarks deal with key concepts derived from combinations of literature and tries to explain why and how a STS-informed analysis is necessary when investigating surveillance in urban nightscapes.

Keywords: Urban Nightscapes; Fear vs. Fantasy; Actor-network Theory; Panopticon; Participatory Surveillance.

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1. Introduction

Surveillance is a current theme and locus of attention in Western societies. Accompanying this growing awareness, an increase in both number and type of surveillance technologies can be witnessed. One reason for this state of affairs lies in the assumption that any evidence of a positive relation between surveillance technology and safety supports and encourages the deployment of surveillance technologies in a society. This agenda can be questioned, not only in terms of the necessity of developing technology for the sake of technology, but also in terms of the type of society we want to live in: what is a desirable future when it comes to surveillance

technology in society?

Combinations of new and existing surveillance technologies create new aims in the world of surveillance, such as the creation of "blanket" surveillance in public space, which means striving for a complete coverage of public space, or the ability to see everything all the time. Besides the technological challenges this brings about (challenges of aligning standards, formats, databases, code, storage times, hardware and so on), the goal of creating a totally covering surveillance network generates new problems in the boundary-negotiations of surveillance in public space. E.g. the problem of losing control (or oversight) on what types of technology are actually "surveilling" and who or what is surveilling who or what exactly. Combined with the emergence of more individualized information and communication technologies (ICT) in the same public spaces where surveillance technologies are in place, boundaries and relations between the surveillor and the surveilled become blurry.

By communicating to the public that one is being watched in city centers, and that the city upholds rules of conduct in certain areas, the public who wants to do harm is warned while the public who is there to have fun is reassured: it is a safe but exciting place. In the case of "old" surveillance technology such a Closed-Circuit Television (Cctv), there exists a sense of clear power relations that are at work: a government installs a camera and citizens in public space are the subject of surveillance for that camera. Cameras, as well as the surveillance signs, that can be encountered in public spaces communicate and inform on what is happening: "you are a citizen and as such you are being watched".

However, when this gaze becomes decentralized and somehow ubiquitous, as we can witness with emerging social and mobile media technologies, it becomes more difficult to understand who is watching who and why: power relations and the boundaries of surveillance now have a multiplicity of negotiation-points in public space. This paper aims to understand these negotiation-points theoretically by investigating how both humans and technologies shape surveillance practices in Dutch nightlife districts.

2 Nighttime Economies and Fear versus Fantasy

One of the topics of interest in urban geography is the city as a unit of analysis (see Ramadier 2004). Urban geography looks at how cities and citizens within cities shape and constitute the notion of publicness, and looks at how spaces become places and for whom. Variables that directly spring to mind are that of place and time: who uses which part of the city and at what time. Subsequently, one can think about different rhythms within a city; where certain places are used differently over time (during a day, a week or even during different seasons). The relevance of these no-

tions becomes clear when returning to the specific topic at hand: the nighttime economy. Summarized by the Surveillance in Urban Nightscapes team:

> In keeping with the shift toward consumption as the economic basis of cities, nightlife entertainment districts have come to play an increasingly important role in the fortunes of urban economies across Europe. For the most part these districts are located in city centers where bars, restaurants, discos, cinemas and clubs are spatially clustered. They often attract large numbers of nighttime visitors looking for fun, adventure and enjoyment. (van Liempt *et al.* 2011)

These districts (see fig. 1) are designated places of fun and attraction and as such they are important for the development of a city, or a particular part of a city. Where historically these districts might have sprung up "naturally", or at least accidentally, urban governments and city planners more and more try to steer and regulate the development of these districts. The rationale behind this attempt to regulate is to create "better" nighttime districts that are safe and attractive. The challenge for governments, city planners or architects is then to achieve this attractiveness for as many different crowds as possible. This is described in urban geography as "animation":

> According to Montgomery (1995), the animation of city centers can be stimulated by offering a varied diet of activities in public space. This is what is meant by the development of themed public space. The term "themed", particularly in association with "fantasy", bears connotations of theme parks. (van Melik *et al.* 2007, 28)

Fig. 1 – Nightlife districts

This animation of the city reflects in the emergence of top-down organized events where public spaces increasingly serve as venues for the arts and culture, typically for performances, festivals, concerts, parades or outdoor film shows. These developments appear to serve a common purpose: to attract people with discretionary income to the city centre by transforming it into a "Pleasure Dome" (Oosterman 1992). This purpose is deemed beneficial for different stakeholders in the city. As described by van Melik *et al.* (2007, 32), "investing in public space appears to be a lucrative option, not only for the government but for the business community as well".

Punter (1990) observed a growing awareness among property developers and investors that it can be in their own interest to invest in the quality of the public realm. Doing so would enhance both the value of the scheme and its long- term potential. The focus on safe and entertaining public spaces can thus partially be explained by the economic ambitions of the local government and other actors involved in the development of public space (see van Melik *et al.* 2007, 32). In other words, economic gain turns out to be a driving force behind the aim to create safer nightlife districts (Roberts and Eldridge 2009). The "trap" or the danger of overregulating and hosting such events is that indeed city centers becomes subject of "disneyfication" (Warren 1994) where city centers become predictable and similar.

Another consequence of this gentrification, or even disneyfication, is that the emphasis is put too strongly on turning cities, and nighttime districts for that matter, into safe zones that attract similar audiences and similar venues (the safety of offering a recognizable city centre). Ritzer (1993) labelled this the "McDonaldisation of society". Citizens and tourists as visitors of these city centers, however, might also be looking for something else than a safe and recognizable place to spend their time (and money). Nye called this "risk-less risk" (Nye 1981), which means being able to be adventurous without really taking chances (see also Hannigan 1998, 71). In other words, excitement and even fear might not only be a side-effect of creating "safe and pleasant" nightlife districts, it might also be something that is sought for. As put by Ellin (2001, 879): "by extension, it is not a question of good or bad, safety or danger, pleasure or pain; there is fear but also fantasy, adventure and excitement".

This fear versus fantasy is a precarious balance, and one that is not solely shaped or controllable by local governments, city planners and so on. These citizens and visitors, the users of public space, also have a shaping role. Or, to quote van Melik *et al.* (2007, 30):

> Public spaces are not solely the products of planners and architects but are, as sociologist Henri Lefebvre (1990) argued, produced by and within a society. Other sociologists, from Weber to Giddens, also believed that cities, and thus urban life, can only be understood in relation to the wider societal context.

As argued here, the city is also shaped by others than planners and architects. For instance, the visitors of nighttime districts, who are also under influence of this wider societal context; or the type of international audience (the metropolitan - the globetrotter - the "young urban professional") that Western cities try to attract is becoming a large factor in the shaping of cities. This group reflects a homogeneous lifestyle and a set of norms and values that might prove to comprise more similarities in between cities than for instance, in between nationalities.

Maybe even more important to look into are the ways and methods in which this group is attracted and is attracting; their shaping role has become highly ICT dependent. With the emergence of (mobile) ICTs, every city and every activity has to be digitally present in order to attract attention, or to get noticed. This digitization of the city is in itself a very broad phenomenon, worthy of research in multiple disciplines (see Schwanen *et al.* 2008; Nagenborg *et al.* 2010). In light of city branding and tourism, urban geographers state:

With the expansion of Ict, it has become much easier to choose among the activities on offer. Online tourist information and announcements of forthcoming events can easily be found on the Internet. As personal mobility increases, even distant events come within reach. Furthermore, individualization has made life a "do-it-yourself' package" (van Melik *et al.* 2007, 7).

Where there indeed is "an app for everything" in current city centers, and both the elements of fear and fantasy are mediated through ICTs (safety apps, event apps, location-based services, and so on), emerging ICTs as a part of the city have become a unit of analysis.

3. The Concept of Nightscapes and Rhythms

So far, different stakeholders have been mentioned that, in some form, play a role in constituting the city at night. The assemblage of (amongst others) visitors, facilities and surveillance can be seen as a landscape. Chatterton and Hollands (2003) have combined these factors to coin a "nightscape", by which they mean the urban landscape at night. They describe this term as "socially constructed geographies of commercial nightlife activities".

Within a city center, there can be multiple nightscapes. Although these places tend to look more alike, as described earlier, still each nightscape is unique, due to aspects such as a specific setup of a city center, specific demographics in that city or sub-center of a city, and difference in local policy surrounding nighttime districts. These, and more, elements create specific rhythms of activities in these nightscapes. Drawing on a description by Schwanen *et al.* (2012), time-geography and notions of rhythm have been on the agenda since the 1970s:

> since the introduction of time- geography to the Anglophone world geographers have had a conceptual apparatus to think about rhythms (Crang 2001). Nonetheless, Parks and Thrift's (1979; 1980) chronogeography – directly inspired by time-geography – offered the first comprehensive treatment of rhythmicity in human geography. (Schwanen *et al.* 2012, 5)

Many approaches of dealing with time and rhythm have been developed in the field of urban geography. A first and obvious difference is that of day and night. Distinctions of time-spaces are made in urban geography where the urban night offers a "more intense emotional experiences and provides more opportunities for transgressive and anti-social behaviour, including public drunkenness and alcohol-related violence" (van Aalst *et al.* 2009, 3) compared to the daytime situation. The night allows for – and triggers – different behaviours in public space than the daytime.

Although this might seem obvious, the point here is that this changes the atmosphere and the "stage" in which things take place drastically (see fig. 2). Other rhythmic influences, or "pacemakers" in the nighttime economy can be found in factual aspects (opening and closing times, transportation facilities, the presence of a cash machine). In urban geography, empirical works has been done in this field:

Fig. 2 – Excesses in nightly public space

As described by Schwanen *et al.* (2012, 7):

> Roberts and Turner's (2005) descriptive study of Old Crompton Street in Soho, London, indicates that a nightlife district is indeed a polyrhythmic ensemble in which pedestrian activity, traffic, noise levels, instances of antisocial behaviour, and opening hours of facilities fluctuate and interact over a 24 hour period. Their work suggests that the opening times and availability of different nightlife facilities – bars, clubs, pavement cafés, etc – act as pacemakers for the number of visitors that can be observed on the street.

Besides these hard facts, there are also more 'soft' aspects that might have an influence on rhythms in the night, although these are hard to measure (reputation of a place, hype, "what friends do", accidental passing). Also notions of fear and un-safety can influence visitors to stay away, or visit a certain place. Paraphrasing Schwanen, several studies (Bromley *et al.* 2003; Schwanen *et al.* 2008) indicate that perceptions of crime, disorderliness, and un-safety increase over the course of the night and are among the factors which keep people from participating in the nighttime economy in the later hours (Schwanen *et al.* 2012, 8).

In conclusion, it can be stated that rhythms of a nighttime economy change over the course of a night and that this changing is instigated by both 'hard' and 'soft' facts, or instances.

4. Participation in the Nightscape

As described in the introduction, the sense, or understanding, of public space and publicness is at stake in these nightscapes. During these different rhythms of visitors in nightscapes, different ideas of what publicness means, and what is accepted behaviour, are negotiated. Where there exists an assumption that public space is accessible and open to anyone, this can be questioned by looking at the playing out of surveillance and publicness and the way this shapes a safe place for one, and a dangerous place for another at the same time. Or, as phrased in the original research proposal of the Surveillance in Urban Nightscapes project, "if forms of inequality and exclusion exist here, questions can be raised about the nature of public spaces and local public policies regarding such spaces at nighttime" (Schwanen *et al.*, 2012, 2069).

The question addressed here is if exclusion takes place in the nightscape. A reference is also made to local policies that have a shaping role on this inequality. However, it is not only policy and people that shape inequality. As mentioned earlier, in the nightscape, surveillance technologies also play a role. Where theoretical notions and concepts of surveillance will be discussed later on, here I want to point out that the

physical setup of the nightscape, but also different technological devices in that nightscape, can have an influence on who is participating in the nightscape and when.

Technologies and physical infrastructures are important means to serve the goal of creating "safer" (but not necessarily more equal) nightscapes. In putting these surveillance-means into practice via different channels, forms of exclusion might emerge:

> One consequence of the increased importance of the nighttime economy and the pervasive culture of fear surrounding nightlife districts has been the intensification of surveillance: police agents, private security firms and technologically advanced Cctv (Closed Circuit Television) systems aim to reduce crime and make visitors' experience of the nightlife area as pleasant as possible. The rationale underpinning this approach is that new visitors may be attracted to nightlife areas if they are safer and more secure. However, the implementation of enhanced security measures for the benefit of some visitors may entail the exclusion of other groups, who may be singled out by surveillance agents as constituting a potential risk on the basis of their race/ethnicity, dress, comportment, etc. These issues raise questions about the effects of surveillance practices on the public character of public spaces. (van Liempt *et al.* 2011)

Although this quote describes the issues of nightscapes and notions of publicness poignantly, these "enhanced security measures" are (as of yet) not defined. Where to find these places or touch-points where this negotiation and possible exclusion of the public takes place? One would expect that during busy times and in busy areas, experiences of fear in the public space would be less:

> Underlying the earlier mentioned "animation" approach is an assumption that crowded places are safer. Concentrations of people will presumably make it more likely for offenders to be seen and apprehended or even prevented from committing a crime. Now that mobile phones with cameras are ubiquitous, people will be more likely to participate in surveillance. (van Melik *et al.* 2007, 4)

Referring to the question of means, these authors point to an interesting observation; that people more and more carry a mobile phone, often equipped with one or multiple cameras. When local governments try to regulate these spaces and make them safer, there is the implicit or sometimes very explicit danger of promoting certain individuals or groups while excluding others (see Lyon 2003; Helms *et al.* 2007).

However, as earlier mentioned, it is not only local policy and government-owned means such as Cctv cameras that determine and shape the nightscape. Where we have already established that visitors have a large

role in defining the public in public space, this visitor also has access to means that can have an influence on that nightscapes (see Hardey 2007). These means, such as a mobile phone equipped with a camera, might not have been developed as a means for safety or surveillance as such, but does hold with it the potential to be used for these purposes in the nightscape. In how far both these government-owned "official" means and the potential means of visitors have an actual influence on the rhythms and behaviours of visitors, is an empirical question. Schwanen states:

> A strong visible presence of well-equipped surveillance agents may draw some people into the nighttime economy yet trigger suspicion in and deter others [...] The rhythmic presence of police officers, for instance, may reflect the anticipation, on the basis of past experiences, of undesired events and risks involving certain (types of) visitors at particular times and places during the night. (Schwanen *et al.* 2012, 8)

The suggestion made here is, based on past experiences with a certain rhythmicity in the nightscape, that presence of surveillance agents indeed already have a (strong) influence of who visits the nightscape and at what time.

Where this is a human agent, means such as Cctv cameras, and maybe more importantly, signs stating that Cctv cameras are present, as non-human agents also have an influence on visitors. Where the effect of Cctv presence is as of yet a point of (academic) debate (see Norris and Armstrong 1999; Hempel and Töpfer 2002), the challenge here is to look at the entire network of human- and non-human agents in the nightscape; to the entire landscape of surveillance.

To summarize, urban geography has introduced relevant concepts to analyse surveillance in urban nightscapes. First of all, this discipline points to the city, and especially city centers, as potentially rich research sites. Processes of gentrification and McDonaldisation lead to an increase in similarity of city centers. This leads to recognizable and controllable spaces, where surveillance is one of the means of control and regulation.

However, via the concept of rhythms, urban geography also shows that these places are under constant negotiation and flux. Where during the day a city centre might be aimed at shopping, the same district attracts restaurant public in the evening and clubbers in the night. Together with the different rhythmicalities of facilities during a day and a night, the message is that these places are never the same and never homogeneous; it is a constantly changing landscape.

The introduction of the dichotomy of fear versus fantasy shows the tension in these spaces at night; they have to be attractive yet safe in order to become a "thriving" nighttime economy for different stakeholders. One way of doing so is via surveillance and regulation.

The nighttime economy is made up of a complex network, dubbed a

"nightscape", a term referring to the urban landscape at night. The concept of the nightscape is used here to point out not only to human factors in nighttime economies, but also at technological means such as Cctv or mobile phones as shaping factors of urban landscapes at night. Scholars in Urban Geography as an academic discipline look at experiences in the nightscape of different groups of citizens and surveillance professionals. Surveillance studies can complement this view, because it is specifically focused on questions of surveillance and power relations in society.

5. The Panopticon as a Model for Thinking About Surveillance

Probably the most famous example – and model – to think about surveillance is the Panopticon (see fig. 3). Originally, it is a design for a prison, thought up by Jeremy Bentham. In short, the idea is to create the ultimate prison, where all cells are placed in a circle. All cells face each other, where the only visible blockade are the bars of the prison cell. In the middle of this circle of cells, there is a watchtower. The watcher in this tower can see every prisoner, at all times. This watchtower was to be built in such a way that the prisoners cannot see in which direction, or at what times the watcher is watching. Bentham's idea was that, because of this setup, prisoners would be under constant surveillance; because they cannot know when they are watched, they will have to assume that they are watched all the time (or take the chance). Besides this practical aspect, the main consequence of such a prison is that the prisoners "will stop wanting to do wrong" (Dorrestijn 2012, 30).

Fig. 3 – A prison based on the Panopticon design

Taking this prison as a diagram, Foucault projected this notion on other parts of society in analyzing power-relations and models of governing (Foucault 1975). When everybody is constantly watched, an internalization of control, of morals and values, will take place. Based on historical research, Foucault coined this type of society the disciplinary, or discipline society, where (in Western societies), we have seen a development to technocratic approaches to governing. Foucault's study on power consisted of formal and evident institutions, where the Panopticon was introduced as an "ideal" system to internalize the power struggle from institution to the individual.

Another French thinker responded to Foucault, stating that the object of study in "current" society (the 1980s) begged for a different analysis, where the routes, or "touch-points" of power between institutions and individuals are not so clear-cut anymore. Deleuze and Guattari in their publication *Milles Plateaux* (1987), made the observation that Foucauldian institutions no longer existed, at least not in the form as described by Foucault.

In comparing Foucault's and Deleuze's objects of study and "spaces" for study, one can state that they are closed (Foucault) versus open (Deleuze) spaces, leading to respectively a controlled and a disciplined society. Foucault used enclosed spaces as space of study, like the factory, the prison, or the hospital, where the object of study was the individual: the body. In order to make bodies docile, the use of surveillance (the Panopticon) internalizes power-struggles and the will to "do good". Through control at a distance and technologies of power, a chain of behaviour emerges: bodies (and minds) reform through daily regimes that are instigated by the ones in power.

With Deleuze, the object of study alters, due to the fact that society has altered: he introduces the dividual (Deleuze 1992). Where society is becoming fragmented, so does the individual; the panopticon becomes blurry and the individual is split up into pieces, where the "new" power of consumerism is demanding all kinds and types of attention from the citizen/consumer. In a Deleuzian society, it is not about making bodies docile anymore, but about moulding the consumer (who consists of a real body and a data-body, where the latter becomes more important). Where Foucault would talk about the shift in power from "taking life or let live" towards an administration of life (bio-power) "to foster or disallow life", Deleuze states that power has taken another shift, towards access.

Subsequently, Deleuzian places of study would be airports, borders: access points. The notion of the dividual and the turn to access points as object of study mark the point of a post-Foucauldian direction, and to a certain extent the beginning of "surveillance studies". Surveillance studies in a post-Foucauldian fashion thus emphasize the importance of looking not into the top-down institutions who are "disciplining" the visitors of these nightscapes, but rather look at interaction, or touch points of power and surveillance in that nightscape, that take place between humans and

technologies. The Deleuzian notion of the dividual allows us to look at individuals not as complete or uniform beings, rather as entities that have potentially many roles, or forms in that nightscape.

6. What Is There After Foucault? Questions in Surveillance Studies

Attempts have been made in surveillance studies to get away from the panopticon model. The idea of internalization of control via one-directional top-down technologies of surveillance did not seem to fit contemporary societies anymore, mainly because Foucault did not, and could not, include electronic layers of surveillance.

However, as David Lyon, a leading author in this field, describes in the book Theorizing Surveillance (2006, 4): "we cannot evade some interaction with the Panopticon, either historically, or in today's analyses of surveillance". This, he claims, is due to the ever-growing presence of "watching and being watched" via all kinds of new technologies or paradigms. Where the idea of the panopticon and the goals of creating docile bodies has spread from the prison to, for instance, the workplace and the government for reasons of productivity and efficiency managing, it also travelled to "softer" forms of entertainment and marketing. Via forms of voluntarily being watched in reality shows or YouTube, to be watched becomes a threshold, an advantage (a YouTube adagio of the more views the better). Lyon coins this "panopticommidy" (Lyon 2007), Whitaker the "participatory panopticon" (Whitaker 1999).

However inviting these notions may sound, they still lie within the framework of the panopticon and the power struggles between watcher and watched. Lyon states that we do not have to dismiss the idea of the panopticon, but that there are other sources of theory to be found. This can help in creating more balanced, and more informed analyses of current surveillance practices (or to reframe phenomena in society into theories of surveillance).

The problem with most panopticon-based analyses is that of Modernism and the dichotomy between nature and society, between humans and things. This splitting up of subject and object creates abstract entities or categories (institutions, the government), that hold the Power and exercise it upon the Subjects in Society. This perspective ignores any form of situatedness, context, or technology, for that matter.

On the contrary, Latour points out that we do not need to attach our explanations to either Object or Subject/Society. They are both part of the same central starting point: the collective that produces things and humans. Maybe there is more to things-in-themselves than we now give them credit for. On the other hand, the collectives we move ourselves in are maybe more interesting than the humans-amongst-themselves led us

to expect (Latour 1992).

If we look at humans and objects together as a collective, maybe that does tell another tale. The dimensions of these collectives make sure that new hybrids keep popping up: an increasing number of objects needs an increasing number of subjects. The nice aspects of science and technology are that they multiply the non-humans enrolled in the manufacturing of collectives and they make the community that we form with these beings a more intimate one. So in order for these collectives to endure, a different role is given to the hybrid, the quasi-object and the human; one that is not so distinct, but much more networked than thought before (Latour 1992).

Not that technologies of surveillance are not questioned or discussed, however, often this happens in such a way that a) technology is black-boxed ("the Internet" or "ID cards") without examining the inner workings and the "back-end" of these technologies, and b) user-technology relations and questions of remediation (Bolter and Grusin 2000) between user and technology are often neglected.

Fig. 4 – CCTV camera sign in Arnhem, The Netherlands

Scholars such as Dubbeld (2005) and Ball and Webster (2003) or Taekke (2011) have recently taken up these challenges within surveillance studies by drawing on Sts and media studies, respectively. Both these fields can help when looking into networks of surveillance in urban nightscapes, where more and more relations between surveillor – be it organisational surveillance (see Smith 2002; Taekke 2011) or another visitor – the surveilled visitor, and technologies emerge (f.i. mobile phones, urban screens, or ID cards).

These interactions between humans and technology are crucial in surveillance studies because it is in these interactions, rather than – for instance – only in regulation, that questions of power and government become crystallized. Rules and regulations in public space do play an important role in shaping the public nightscape, but I argue here that technologies of surveillance should be seen as forms or extensions of these rules and regulations as exemplified in the signs referring to the presence of Cctv cameras in public space (see fig. 4). Negotiations and adjustments on how to act (e.g. what is the "right" behaviour) in public space are more and more mediated by technologies, therefore the interactions between surveillance technologies and its users (police officers, visitors, bouncers) should be examined more closely.

7. The Surveillant Assemblage

Before examining what is negotiated and how in public space, some framing needs to be done as to how to approach this research without taking a normative stance that was often to be found in Foucault-based analyses. One way of doing this is to take a step back and look at cases of surveillance in a situated and contextual way. Haggerty and Ericson provide a heuristic tool here by drawing on Deleuze and Guattari's notion of an assemblage. By this they mean that:

> This assemblage operates by abstracting human bodies from their territorial settings and separating them into a series of discrete flows. These flows are then reassembled into distinct "data doubles" which can be scrutinized and targeted for intervention. In the process, we are witnessing a rhizomatic levelling of the hierarchy of surveillance, such that groups which were previously exempt from routine surveillance are now increasingly being monitored. (Haggerty and Ericson 2000, 2)

Moving away from Foucault's pre-given entities of those surveilling and the subjects of surveillance, these authors point out to a more recent development in (Western) societies, where we can see a quantitative turn towards citizens, or those being surveilled. The result is that parts of society that were not monitored before, now (can) become scrutiny of surveillance. Once your name, address, occupation or other types of information

are electronically stored, your records can travel. These flows of information are the "things" to be watched and the more spread your data is, in the more flows you are represented in.

Resonating with Deleuze's dividual and the notion of the data-double (Los 2006, 77) as a unit of analysis, this perspective also changes the way we have to look at governmentality and power relations. It is not the individual that needs to become visible and controlled, rather it is the data he or she represents that become the point-of-passage in forms of government (voting, travelling, securing, housing, etc.). The kind of data you represent has to match with a certain query in a database that respectively says "oke", or not. These databases form a rich source for potential surveillance (also dubbed dataveillance), especially when it becomes possible to connect different sources (or "flows") of data. Lyon calls these databases "leaky containers" (Lyon 2007).

New questions then emerge for surveillance studies because more and more responsibilities and decisions are moving towards databases and algorithms (think of automatic face-recognition or the automatic keyword analysis of Twitter-messages) , even to such an extent that surveillance agents base their decisions on what a database query returns. This decoupling of the individual and the data he or she represents implies also a new mode of thinking about public space and what a control-society, or a discipline society is, or even if these are the right terms to start with. For instance, who is accountable for making and sharing footage? And how complete is the user-generated footage or data collected?

Based on the notion of "databased society", Galloway, a new-media scholar, looks at protocol as the new means, or form, of power. With the birth of Internet and its (short) history, forms of power, of freedom and control, need re-visioning. In doing so, Galloway (2004) implicitly states that we are still in a Deleuzian control society, be it that the actors within this society may differ from earlier viewpoints. A periodization map is given (see fig. 5). Galloway claims here that the manager of control society, the distributed society, is protocol. This protocol can be found in computer algorithms and languages such as Html that decide whether a Website works or not, for instance. This protocol is not a normative agency; it is just there, once programmed by somebody and currently the responsibility of no one in particular.

Where Galloway continues by linking protocol to all sorts of new forms of government and bio-power (by linking protocol to Dna), the relevance here is the resonation of the notion of protocol with the context of surveillance practices, which are often (as we will see further on) highly protocolled environments, where human and machine have to operate in a rigid and strict setting. Responding on this rather dystopian view on the power of protocol and the non-role of humans, Chun (2006), a media and surveillance scholar, argues that indeed (computer) code as a language gains more influence, but she states that we will keep having a role in creating machines and their languages in the future. Her investigation into

fibre optics shows different views on what the Internet has been throughout its short history and what myths were created around it. Trying to understand the linkage between freedom and democracy to control, often this relation is constructed via techno-deterministic explanations. Looking at the technology and its effects within a (Western contemporary) democracy, people do not have a voice as individual, but are becoming abstractions, where the individual is disembodied and turned into a statistic of the crowd.

period	machine	diagram	manager
sovereign society	mechanical machines	centralization	hierarchy
disciplinary society	thermodynamic machines	decentralization	bureaucracy
control society	cybernetic machines	distribution	protocol

Fig. 5 – Power-diagram

Chun goes on demonstrating that the Internet does not, through its town halls or chat rooms or through its disembodiment, enable publicity as imagined by the Enlightenment nor do its protocols make its networks transparent. It does threaten a publicity that, as it makes irrelevant the distinction between public and private, enables something like democracy - an ideological polarization around control and freedom.

Summing up, the argument is about how the Internet and surrounding discourses are a reflection on our vulnerabilities. Chun is warning for both utopian and dystopian ideas (extreme perspectives might harm or affect democracy). The image of an Internet has changed since 9/11 attacks on the US, where this happy place, this space for sharing ideas and knowledge, has made way for an extreme paranoia, due to the melting of security with freedom (Chun 2006, 15).

8. 9/11 and New Places of Surveillance

The role of the Internet and new media on society, then, has been acknowledged and researched by both new media and surveillance scholars, who argue that the ways in which we govern "life" in our societies has rigorously changed since this new technology.

However, questions of legitimacy and the ever-growing monitoring on the Web have not been addressed yet. Indeed, as Chun has pointed out, the rapid growth of Deleuzian points of surveillance has spread widely af-

ter 9/11. Bigo (2006) has coined the notion of the BANopticon, in an attempt to conceptualize this event and what it did to notions of control, freedom and security. He points out that a series of events, of which the 9/11 attacks are the most prominent, have declared a "state of unease", and an American-imposed idea of global "in- security" (Bigo 2006, 49). This leads to rhetoric of "better safe than sorry" under which an increase of surveillance measures could take place. Also, this rhetoric paved the way for experimentation with new surveillance technologies, such as body-scanners in UK airports, and the accelerated introduction of the biometric passport and experiments with motion-tracking at Schiphol Airport, for instance (see van der Ploeg 2003, 2005).

Most of these measures could indeed be witnessed in Deleuzian places of access, such as airports and border controls. In how far this effect trickled down into daily life of our public space, is a question still unanswerable. What it did evoke was a renewed interest in the role of surveillance in social sorting (see Lyon 2003). The fear of the other and the difficulty for security services and politicians to distinguish them (Bigo 2006, 55) became pressing matters.

A question that rises then is to what extent this renewed focus on "the other" and processes of social sorting can be found in public nightscapes in the Netherlands. Is 9/11 still resonating in policy and practice, or have we fallen back into the old patterns of social sorting via surveillance technologies? And if indeed something has changed, how and where can we see this taking place?

A comment here is that in all the above, both in surveillance and new media theories on existing and emerging technologies, agency is placed with the technology, still dismissing parts of the lessons drawn from Sts. Technology never acts alone, and technology never comes "out of the blue": it too is developed by people with values, morals and ideas, and these values may partially be inscribed in the machine.

Moreover, when analysing processes of social sorting or exclusion, it can prove insightful to look into forms of resistance against, via or with (surveillance) technology. In using these technologies, as an end-user, or as an implicated actor (Clarke and Montini 1993), there is still room for negotiation and resistance: for "anti-programs" in use. The need to look into actual use becomes thus even more pressing, because it is during use that forms of resistance or anti-programs can be found.

Another challenge when looking into surveillance technologies is to remain as objective as possible and to not render all forms of surveillance technology as invasive and bad a priori. Are there accounts of positive or empowering aspects of visibility and surveillance to be found in surveillance technologies?

9. Empowering Perspectives and the Concept of Participatory Surveillance

One concept, and one author in particular, divert from the solely negative views and connotations on surveillance. Continuing on the topic of new media and surveillance, Albrechtslund argues that since the emergence of ubiquitous computing the panopticon should be reconsidered:

> The entertaining side of surveillance is a phenomenon worth studying in itself, and we expect that this type of study will contribute to an understanding of the multi-faceted nature of surveillance. (Albrechtslund and Dubbeld 2002, 3)

Rather than a place where one looks at many, several new media follow a logic of "many follow many", where visibility is often deliberately chosen. Mann et al. (2002) have coined this "sousveillance", where everybody is watching everybody. Albrechtslund looks at how surveillance is often used as a design principle in, for instance, online games and sports-tracking services. This dwells on the idea that surveillance as a design-principle is used in many contemporary games and installations. Besides a fun aspect, these games can also inform us about how a (part of) society reflects on notions of surveillance.

Going further, Albrechtslund coins the term "participatory surveillance". Many online environments, especially social-network-sites, serve as interesting places to study, since many beliefs, ideas and opinions are shared here. Boyd (2011) and Ellison (2007) even state that social networking sites are dominating online activities today. Where I have strong oppositions to this statement, for now it suffices to state that these places are indeed new arenas for surveillance. However, taking the perspective of the user, this is not necessarily a negative thing. As Albrechtslund states:

> Characteristic of online social networking is the sharing of activities, preferences, beliefs, etc. to socialize. I argue that this practice of self-surveillance cannot be adequately described within the framework of a hierarchical understanding of surveillance. Rather, online social networking seems to introduce a participatory approach to surveillance, which can empower – and not necessarily violate – the user. (Albrechtslund 2008, Introduction)

Participating via, for instance, sharing, responding or liking engages users into these platforms, where the idea of being seen and being "followed" is a precondition rather than a setback. The added value of this approach is a user-centered perspective on surveillance. Together with boyd (2011), this turn makes possible another type of analysis of surveillance, where tracing users' steps and activities reveals another experience of surveillance and visibility. On the question why this visibility is so im-

portant to these users, Koskela (2004) for instance, pointed out that exhibitionism such as shown on social networks sites, or Tv shows, can work empowering. By throwing everything into public arenas, this "visibility becomes a tool of power that can be used to rebel against the shame associated with not being private about certain things. Thus, exhibitionism is liberating, because it represents a refusal to be humble" (Koskela 2004, 210).

The focus in many of these practices is not on knowing who actually is watching, since many online audiences are anonymous. Rather, it is the act of sharing, of "self-broadcasting" that creates the possibility for others in the network to see, read and respond to self-made content. However, if there is no audience, there probably will be silence: sharing is something social. In terms of thinking about surveillance, this implies that from this perspective, users of social network sites want to be watched; it can be empowering (see also Shilton 2010). On the act of sharing, Albrechtslund states:

> Accordingly, the role of sharing should not be underestimated, as the personal information people share – profiles, activities, beliefs, whereabouts, status, preferences, etc. – represent a level of communication that neither has to be told, nor has to be asked for. It is just "out there", untold and unasked, but something that is part of the socializing in mediated publics. (Albrechtslund 2008)

Here, an important point is made, namely that this sharing is an act that does not necessarily lead to a pre-thought consequence or reaction. It is "just out there", where every self- posted media outlet on a social network site will probably have a temporal aspect and will linger for a while before being forgotten. Places such as Facebook did introduce a timeline to make history-browsing possible. This makes surveillance stretchable over time (e.g. it adds a temporal aspect to these mediated publics).

Although the concept of participatory surveillance is valuable, a critique on boyd and Albrechtslund here is that their location of analysis remains within the digital realm and that these realms are not completely public. They too can be seen as walled gardens (Bortoli *et al.* 2009), that create a "participation divide" (Hargittai and Walejko 2008); only those who have the means to be inside the walls of social network sites can actually participate in these realms. I agree with boyd that these places do pose new questions for surveillance and identities. However, it is when these mediated publics start interfering with physical and real publics, that the consequences of social media sites become visible.

In his book Social media as surveillance, Trottier (2012) looks into these situations, by looking at the microcosmos of a university campus under the influence of Facebook. Where at first this is an empowering tool for students, campus security starts using the medium as well, thereby linking a "safe" place for students into a tool for surveillance and con-

trol over student-behaviour. This example shows that online participation is not necessarily empowering when the actions of sharing something have a direct consequence for one's direct physical living space. When pointing out to privacy issues, the usual response is that "you chose to be on Facebook, so you could have known". This type of "publicness-by-default" can be framed as nudge politics (Thaler and Sunstein 2008), where one is part of a system, or of a set of choices, unless the participant or user actively opts out. It can be questioned if this is really the responsibility of the end-user of for instance Facebook, or whether that part of this responsibility lies in how the software is designed and presents the user with choices.

Although both surveillance studies and urban geography acknowledge the role of Cctv, mobile phones and social media as a part of public nighttime experiences, the heuristic tools used in this scholarship tend to consider technological artefacts as black-boxed. A deep analysis of the nightscapes should be able to look at how surveillance technologies exert agency. The question of how both humans and technologies shape surveillance practices demands to also look into surveillance technologies. In order to include these technologies and the networks of surveillance technologies into my analysis, a turn is made to Science and Technology Studies.

10. Science and Technology Studies: Accounting for Things

STS looks at how new facts and innovations come into being, how they are framed and consequently how they alter existing views and practices in society. This latter notion is relevant because it points out that new technologies are never entering society blank or objective and that once they are here, they are therefore not neutral (Irwin and Wynne 2004). For instance, the introduction of a body-worn police camera changes the way of working for a police-officer; it might also change the way nightscape visitors think about cameras, or the legitimacy of filming in public space.

By only looking at the interaction between humans and the social (as often done in the disciplines such as urban geography and amongst policymakers), the material world and the influence of things, in all kinds of processes and events, is dismissed (as being "merely" soulless objects). However, recalling the questions of publicness as stated in the introduction as well as the notions of public nightscapes as posed by urban geography, the objects in this public space then are not just soulless objects, but rather, they can be active in shaping these nightscapes.

As in the example of the police-worn body camera, often technologies introduced in these nightscapes are contested; questions of surveillance, privacy and data protection, for example, make these technologies in

public spaces highly political. In that sense, the non-neutrality of technology as pointed out in STS becomes even more apparent in this context (see Radder 1998 on the politics of STS). Connecting politics in and of public space to artifacts or objects is not uncontested. An example worth noting that surrounds the issue of politics and objects is that of Winner's bridge. The case is that a bridge in lower Manhattan is seemingly designed is such a way that public buses cannot pass. The road that surpasses the bridge lead to a beach. By designing the bridge in this manner, only private cars could reach the beach, thus excluding the public that was dependent on transport by bus. This evokes social exclusion (see Winner 1980).

Another author that contributed in a more fundamental manner to this issue is Latour. He argues that perhaps we need a shift towards the politics of things in order to re-map politics. This can be achieved via the introduction of *Dingpolitik* (as opposed to Realpolitik), combined with a set of experiments to research the following question: "what would object-oriented democracy look like?" (Latour 2005). He states that objects trigger the connections of public issues: "Each object gathers around itself a different assembly of relevant parties" (Latour 2005), and triggers discussion. All these objects, with their issues, are binding us into a "public space". Where this has up to now never been looked into as being political, objects are.

Latour continues by strongly criticizing political philosophy due to its "strong object-avoidance tendency". While always describing the how, and the procedures around the issue, when it comes down to what the issue is, political philosophy has remained silent throughout history about things. Within the *res publica*, the only focus until now has been on the procedures, not on the things that allow for politics, the "matters that matter" (Latour 2005).

Latour continues by arguing that there is a need to investigate how and through what medium the matters of concern are discussed. How are all involved parties, people and things assembled? While one might claim that the actors in this setting are the human beings organizing this assembly, Latour claims that the influence of things have an even role in creating this assembly. However, this brings in another problem:

> to assemble is one thing; to represent to the eyes and ears of those assembled what is at stake is another. An object-oriented democracy should be concerned as much by the procedure to detect the relevant parties as to the methods to bring into the centre of debate the proof of what it is to be debated (Latour 2005, 8)

He also points out how the *Ding* has been around for centuries, referring to "thingmen" dating back from old northern peoples. It has always been things that brought people together, because things divide. Therefore it is time to go back to things.

11. Actor-Network Theory and the Concept of Script

The perspective of tracing the networks of humans and objects has become an important topic of research in STS over the past decade. Especially in the actor-network theory (ANT) approach it is stressed that if actors and circulation are followed, rather than pre-positioned roles or topologies of the social or the technical, new insights can be gained on how realities are shaped.

Where ANT is faithful to ethno-methods (Latour 1999), it is a way for social science to learn from the actors involved. By studying both human and non-human actors and their constant constitution of temporal hybrids with specific roles and actions, the subject of study can be described in terms of networks. Specifically mentioning that the term network here stems from pre- Internet notions, a network can be explained as trails or paths between different nodes in a network, whereby information, or that to-be-transferred alters through every node. These translations happen because every node in a network mediates information, e.g. receives, interprets, and sends. This mediation makes the notion of a network "pre-Internet", precisely because it alters information (rather than information being identically accessible with every mouse-click). The nodes that alter can be human, or non-human; either way they are actors and actants in this network. When engaging upon such a research trail, often we will find interaction between humans and non-humans, both actively mediating. A method for describing these interactions and how these mediations are shaped, can be found in the concept of "script".

The notion of script can be explained as a way to describe these interactions in terms of a film or theatre script: artifacts have certain actions inscribed in them, that tell users how to act with it. The added value of this approach is that it allows for reflection on artifacts and users beyond the functional (Verbeek 2006). This opens up space for moral reflections on user-artifacts and their inscriptions of artifacts. One could reason that an artifact is made my humans, and as such, the developer of this artifact is somehow inscribing his or her morality into the artifact.

Latour describes this inscription process in terms of delegation: designers delegate specific responsibilities to artifacts. When using these artifacts, end users are influenced by these inscriptions in their actions. In other words, these artifacts alter user-behaviour (see Oudshoorn and Pinch 2003; Neven 2010; Tromp *et al.* 2011).

If we return to ANT, this would mean that in the mediation process of information flowing from one node of the network to another, the mediating actor is also being altered in a way. The consequences for the network are that nodes of the network are never constant; they are left in a different state each and every time mediation takes place. Taking a closer look at these nodes, then, can inform the researcher of what and how the nodes change as a result of mediation.

Latour terms these nodes hybrid collectives: a set of human and non-human actors in a certain place and a certain time that create a unique set of values or possibilities. These hybrid collectives keep popping up due to a more widespread saturation of non-humans (things) that we have to interact with. The added value of naming these hybrid collectives is that it allows for thinking about human-thing-relations, diverting and ignoring the ever-existing subject-object dichotomy. Via these hybrid collectives, alternative forms emerge, that allow for new social reflections of certain phenomena.

Can we understand surveillance practices mediated by Cctv or by a mobile camera via the concept of these hybrid collectives? For instance, the nightscape visitor that walks around with a mobile camera can be seen as such a hybrid; due to the combination of human and mobile phone camera, new action possibilities occur (such as sharing the pictures of a night out with friends). Such descriptions of different distinguishable hybrid collectives can serve the purpose of mapping these action possibilities: what kind of actions take place in that nightscape that became possibilities due to this particular hybrid collective?

An Ant analysis can reveal different collectives and their shaping role, their agency, in the nightscape. This agency can be explained as how these hybrid collectives act, and how responsibilities are delegated between humans and technology within these hybrid collectives (see Akrich 1992) However, a challenge when thinking about hybrids in relation to surveillance- related technology is that these technologies might affect people beyond the direct end-user of an Ict. In short, the context and thereby the multiplicity of use have to be taken into account. What is meant here is that, for example, the end user of a Cctv camera is the Cctv operator in a distant room. The visitor of the nightscape that alters his or her behaviour due to the Cctv camera that is in place, is in a way also a "user" of this system. Clarke (1998, 267) has introduced the notion of "implicated actor" to address these types of use of a technology. Oudshoorn has proposed the notion of "multiple users" to address the problem of incorporating more that only the user and the designer in analysing new (ICT) technologies, but rather to look at "the distribution of power among the multiple actors involved in socio-technical networks" (Oudshoorn and Pinch 2003, 7) as an empirical question.

From STS we know that technologies are never neutral. Moreover, Latour explains us that artifacts have a role in negotiations, in politics. This becomes relevant when looking at surveillance technology, since these technologies themselves are often introduced as politicized artifacts.

Furthermore, another insight drawn from STS that serves a purpose in analyzing surveillance in public spaces is the notion of networks. When investigating existing or emerging technologies, the networks of development and use, but also the networks of other technologies that surround the technology-under-investigation, play a role in the shaping of that technology in society.

On the question about how to research emerging surveillance technologies, STS can provide a perspective on how user practices and existing networks of human and non-human actors are affected by the new technology. Concepts of script and delegation of responsibilities between human and technology are central here. New technology-user configurations can be called hybrid collectives and can be found in, for instance, a visitor of the nightscape who is using a mobile phone camera, or a police officer who is using a bodycamera.

Besides being single user-technology configurations, the use of these technologies in public space also affect others. When it comes to visual technologies in relations to surveillance, it can be stated that these hybrids are not only new watchers, they are also being watched. Where the act of filming might constitute an active role for watchers in shaping surveillance, they might at the same time be subject of a Cctv camera, or another visitor using a mobile phone camera. The roles of these hybrids then are multiple: they can be seen as both users and implicated actors of surveillance technologies. These technologies have a strong normative aspect, because (we assume) that they do articulate and mediate processes of exclusion and social sorting in public space.

12. Discussion

12.1. Surveillance Studies Still Black-box Technology by Following Technological Trends

In surveillance studies, technology evidently plays a crucial role. In order to govern a society, some form or method is needed for communication between government and the governed, however this relation is shaped (mutual, equal, hierarchical, rhyzomatic, and so on). Agreements have to be mediated in some form or another. Foucault uses different historical examples such as dealing with the plague, where the local governing actor in that situation had to rely on a wall to separate the sick from the healthy. (Foucault 2003).

Foucault does dives into the technology as an actor in his analysis (in a much more elaborate way than I am displaying here), however, in contemporary surveillance studies, as stated earlier, technology is often taken for granted as a shaping influence, or it is at least black-boxed. Drawing on the terminology that stems from Sts, black-boxing in this case means that technology is discussed as a "box", not questioning the networks this technology act in, nor the inscribed values, meanings and intended goals of the technology.

A common reason for black-boxing is the assumption that what technology does, or how it works, is static and common knowledge. In surveillance studies, however, where questions of power are often played out

via contemporary technologies in society (see Lyon 2003 on new technologies and social sorting; Elmer 2003 on new media and the panopticon; Koskela 2004 on high-tech surveillance means), it would seem obvious that the key to understanding current surveillance practices is to investigate these technologies in their detailed forms of agency.

Another aspect is that these technologies need to be looked at in context. For instance Facebook is crucially different from Myspace, a mobile phone camera serves other logics than that of a bodycamera. Ant can prove insightful when investigating local networks of humans and things in public nightscapes. This also entails turning to a myriad of users of surveillance (related) technologies in nightly public space.

12.2. Surveillance Studies, Users and Post-Deleuzian Theory

Another issue that pops up when drawing on Surveillance Studies, is the little attention for users. As stated earlier, some authors such as boyd and Albrechtslund have taken a user-perspective in their analysis of surveillance. However, I argue that taking the perspective of end-users of surveillance technology is not enough; drawing on (Sts-informed) users studies could help expand the analysis of surveillance technology by looking into how users and technology have a mutually shaping role.

When it comes to questions of governance and how public spaces are shaped by debates or controversies, a trend in many disciplines such as surveillance studies and media studies is to go into quantitative analysis and "big data" in order to find insights by processing large datasets. Large datasets, however, cannot capture the granularity and resolution often required when it comes to a situated and contextualized analysis of a surveillant assemblage. To give an example, it would be possible to measure how many "tweets" were sent on a Friday evening in the centre of Rotterdam between 22:00 and 06:00. Then we could even show the peaks and gaps and thereby conclude that around 00:30 there was something happening in the nightscape because there was a peak in tweets. Without turning this into a methodological debate, it becomes clear that when we want to know how Twitter influences the nightscape, it might provide more fruitful to follow a couple of Twitter users who go out in a large city and see how, when and why they actually use Twitter when going out and if they relate this to any practices of surveillance or feelings of safety.

In this paper I tried to literally ground surveillance studies by taking the latter approach: following actors and actants in the nightscape. Looking at qualitative, ethnomethod-informed and small-sampled accounts of what actually takes place in the nightscape could prove to be more useful when the goal is about reflecting on local stories and contexts of surveillance.

12.3. Surveillance Studies Speak in Messy Metaphors

A definition of "surveillance technology" is hard to provide, and has often changed over time. Most analyses of surveillance societies and their accompanying technologies (or vice versa) start with the example of Jeremy Bentham's prison-design: the Panopticon (Bentham 1791; Foucault 1975).

The panopticon is used by Foucault not only as an example but rather as a metaphor to explain other developments in society. As discussed above this metaphor seems to have lost its relevance in explaining and understanding current changes in surveillance. A more recent metaphor introduced in surveillance studies is the data double (Los 2006; Lyon 2007), a term that points towards the (digital) databased identity of citizens (Whitson and Haggerty 2008).

Where the database is not particularly new, since the digitization of records it has expanded enormously. This resulted in a "double" identity of citizens in the digital realm. This metaphor of the data double invigorates and resonates in recent analyses of security, privacy and society. Here, the data double is clearly linked to online – or digital – existence in relation to its physical counterpart, and the tension between the two. In light of surveillance, issues of representation and access control arise, where mutual proof is constantly needed to confirm a real person's identity with its data double (think of biometric passports, public transport cards, social media logins and passwords and so on). However, records on citizens are far from new, and in that respect, the data-double has been around since the introduction of the first record-keeping of citizens, or archive (see Foucault 1970; Star 1999). In that sense, the notion of the data double remains vague.

The point here is that rather than referring to messy metaphors when it comes to surveillance technologies, it might prove more fruitful to look into the implications of surveillance technologies in urban nightscapes and the different actors who exercise power upon subjects via certain (surveillance) technologies (see Hier 2002; Jespersen *et al.* 2007). Unlike current trends in surveillance studies to look into big data, another angle could be to take a contextual, user- and technology- oriented approach in analysing surveillant assemblages.

If indeed society has become more complex and more technologically mediated via Icts, the concept of the surveillant assemblage provides a fruitful heuristic tool to explain how practices and places of surveillance are not singular or uni-directional. Instead, the complex networks of surveillance actors has to be taken into account. Where this resonates with Sts and Ant, a difference with surveillance studies can be found in normativity: surveillance technologies explicitly deal with (the negotiation of) power-relations in society.

Besides critical stances on post 9/11-spreading of surveillance means in society, Albrechtslund's notion of participatory surveillance also sheds

light on the positive aspects of surveillance in society. The concept of participation and sharing is especially relevant because these are actions with technology that also emerge in the micro-site of the Dutch surveillance nightscapes and as such might be a driving force of alteration of the landscape of surveillance in public spaces. My contribution to studies of surveillance in urban nightscapes lies in the turn towards use practices of emerging surveillance technology to see how these power relations of surveillance are negotiated (Albrechtslund 2005) between nightscape visitors, police officers, mobile phones and Cctv cameras.

13. Conclusions

In order to understand changes in surveillance practices in urban nightscapes, I have approached this nightscape theoretically as a place where surveillance, safety and the concept of public space are under constant negotiations between humans and technologies. Hereby my specific interest lies in how landscapes of surveillance are changing due to emerging technologies.

City centers at night (nighttime economies) are places where fear and fantasy come together in an explicit manner. Dubbed "nightscapes", these landscapes at night are contested, thus providing an interesting site for research. These nightscapes are places where surveillance is fore-fronted as a means to create safe and pleasant public spaces. Rather than looking at a-priori roles or actors that are responsible for this safety through surveillance, I have turned to surveillance practices in order to see how surveillance in urban nightscapes is shaped, thereby realizing that this nightscape is constantly changing due to rhythmical changes of humans and technologies present in these spaces.

Inspired by Deleuze, I have conceptualized differences in surveillance of urban nightscapes in terms of differences in local surveillant assemblages. Following insights of STS and notions of the politics of things as explained by Latour, this article suggests looking into how norms and values are inscribed in these technologies by developers or designers.

In parallel, a turn to user practices is needed in order to see how surveillance crystallizes via practices of the interactions between human and technology. Incorporating both humans and technology in the analysis, I propose to use Ant and the notion of hybrid collectives to allow the researcher to look at how responsibilities are distributed between humans and technologies in surveillance practices. New hybrid collectives such as the mobile phone-citizen hybrid and the police-worn bodycamera hybrid might challenge or alter existing surveillance practices in nightscapes.

The users of emerging technologies such as mobile ICTs not only form new hybrids, they are active users that have a shaping role on the surveillance landscape and they are also implicated actors of other tech-

nologies. Becoming both watcher and watched, active user and implicated actor, their roles in the nightscape are hybrid and multiple. Linking these insights to post-Foucauldian theories of surveillance, it becomes possible to see what kinds or types of surveillance are expressed in these practices.

Finally, via the notion of participatory surveillance, both negative and positive sides of these new hybrids can be explained. Moving from an analytic stance towards an interventionist one, the former steps allow for grounded speculation on futures of surveillance in nightscapes. By analyzing emerging surveillance technologies, questions of good surveillance could be addressed, as well.

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At the (Semi)Periphery

The Development of Science and Technology Studies in Portugal

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Abstract: This article presents an account of the development of STS in Portugal. It pays particular attention to two dimensions. The first regards the domains typically studied by STS scholars in Portugal, grouped in four sections: studies on the scientific system, laboratory ethnographies, research on science and society and risk case studies. The second is the institutional setting in which STS are undertaken, detailing the institutions, groups, journals and associations in this field. The paper attempts to tie the specificities of Portuguese STS with the characteristics of the local scientific system, showing how themes and analysis are influenced by the "semi-peripheral" condition of science in Portugal.

Keywords: science and technology studies; laboratory ethnography; science system; scientific community; public understanding of science.

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1. Introduction

Despite the universalist ambition of science, Science and Technology Studies (STS) have demonstrated over and over again that local conditions do matter in the production of science. And the same can be said for STS as such, as this section on Cartographies shows (see, for instance, Schubert 2011 or Prpić 2013).

Science in Portugal is marked by a "semi-peripheral" condition, that some authors have labeled as "the stepchildren of Galileo" (Nunes and Gonçalves 2001; Nunes 2002). Weighted down by social and cultural factors such as the restrictions of Catholicism, the persistence of low literacy levels well into the late 20th century, an authoritarian regime that distrusted and repressed scientists and barely invested in scientific research, and

an economic fabric that relies little on innovation and technological development (Nunes and Gonçalves 2001), Portuguese science developed late and feebly. Even though the indicators show an astonishing growth in the past few decades (R&D expenditure has soared from 0.27% of GDP in 1982 to 1.52% in 2011; the number of researchers in Full-Time Equivalent has gone from 3,963 to 50,061 in the same period; the number of publications in indexed international journals rose from 1,619 to 41,840 in the same time frame – DGEEC 2013).

Portuguese science is marked by (Nunes 2002, pp. 194):

- internal heterogeneity, especially as expressed in the fluid or floating boundaries between disciplines and fields of research, the heterogeneity of scientists' careers;
- unequal involvement of groups and research institutions with transnational worlds of science;
- strong feminization (in relative terms) of many research areas, in parallel with the difficulty of access of women to top positions of scientific and academic careers and management positions in research institutions;
- sharp dependence on funding from European programs;
- the overlapping between the worlds of science and academia, together with the pivotal role of scientists with "atypical" disciplinary careers and the high dependence of transnational networks for establishing scientific reputations.

Portuguese STS are doubly affected by this "semi-peripheral" condition. On the one hand, STS scholars are part of this system and have endured the same constraints and benefited from the same opportunities as their colleagues in other fields. On the other hand, the choice of research issues and subjects in STS cannot be but influenced by the particular characteristics of the Portuguese scientific system.

There is very little work done on the history of STS in Portugal. Nunes and Roque (2008), in an introduction of an anthology, provide a brief overview of STS in Portugal, setting them against the backdrop of Portuguese science and exploring their mains specificities and thematic dimensions. Much at the same time, Duarte (2009) published a quite detailed working paper on the sociology of science in Portugal, describing its main actors (authors and institutions), subjects of study and methodologies.

The present article purports to be an overarching but not exhaustive account of STS in Portugal, based mostly on books and articles published in journals and conference proceedings. It leaves out many adjoining fields, such as philosophy and history of science or innovation studies, as well as works of theoretical nature, which according to Nunes and Roque (2008) are anyhow scarce. These authors point this as a handicap for Portuguese STS: by focusing on the empirical research of the "national case",

themes and research problems were "endogenised", but excluded Portuguese researchers from wider international debates.

In particular, this article pays attention to two dimensions of STS in Portugal. The first regards the domains typically studied by STS scholars in Portugal, grouped in four sections: studies on the scientific system, laboratory ethnographies, research on science and society and risk case studies. The second is the institutional setting in which STS are undertaken, detailing the institutions, groups, journals and associations in this field.

2. The Pre-history of STS in Portugal

The end of the 1980s and the first half of the following decade in Portugal were marked by an emerging interest in science by the scientific community itself that would spark first internal reflexivity and later on the advent of STS.

One of the earliest indicators of this trend is the creation of the Association of Science and Technology for Development (ACTD) in 1985 (Delicado *et al.* 2013), an advocacy group formed by scientists from across a wide range of fields (as well as business representatives) that aimed to "raise public and politics awareness of the importance of science in economic and political decision" (Gonçalves 1996). This association promoted scientific meetings, organised the first interactive science exhibitions in the country and published a journal, *CTS Science Technology and Society,* between 1987 and 1994, that included some articles reporting the results of ST studies at a national level and translations from leading international authors.

In 1992 ACTD, together with the newly formed FEPASC Portuguese Federation of Scientific Societies and Associations (Delicado *et al.* 2013), organised the conference "Scientific Community and Power" (Gonçalves 1993), that brought to Lisbon leading figures of STS, such as Steve Yearley and Sheila Jasanoff, but also provided an opportunity for Portuguese researchers to present their work on STS issues (see below). Similar events were organised in 1995 ("Science and Democracy", with Bruce Lewenstein, Toy MacLeod and Erik Millstone, among others – Gonçalves 1996) and in 1997 ("Science, Scientific Culture and Public Participation", with Ulrike Felt, Brian Wynne and Steve Yearley, among others – Gonçalves 2000).

In the early 1990s several books on Portuguese science are published under the aegis of José Mariano Gago, a physicist and founding member of ACTD, that had been President of the JNICT Portuguese National Board for Science and Technology (1986–1989) and later on the first Minister of Science in Portugal (1995-2002 and again between 2005 and 2011). Two of these books are edited volumes devoted to an overview of

scientific research in Portugal (published by the Committee for Europalia 91, an arts festival held in Brussels in 1991 to celebrate the cultural heritage of Portugal), the other an extended essay written by Gago himself. *The State of Sciences in Portugal* (Gago 1992a) comprises 11 chapters, organized by scientific field, divided in small sections by scientific discipline, authored by leading researchers (but not STS scholars) and which proffer a brief stock-taking of research in each of the disciplines. A fairly similar endeavour would be undertaken almost a decade later by the Observatory of Sciences and Technologies (an organization within the Ministry of Science), through the publication of 16 volumes named *Profiles of Scientific Research*. Each contains statistical data and an introductory text signed by an expert (or group of experts) regarding a particular discipline, in most cases derived from an evaluation of research units report (Caraça 2001).

Science in Portugal (Gago 1992b) is a smaller volume that also has four chapters devoted to particular scientific disciplines (chemistry, social sciences, language sciences and biomedicine), but in addition contains a list of research centres in Portugal and three essays that can be seen as one of the earliest publications in STS: one on the history of science in Portugal in the 16th to the 18th centuries; an overview of science institutions and policies (a synthesis of a not yet finished PhD thesis which would have become a proper book later on – Ruivo 1998); an assessment of scientific outputs based on statistical data (publications and human resources, between 1973 and 1986).

Gago's own book, *Manifesto for Science in Portugal* (Gago 1990), is in fact a policy program, providing both an outline of the development of science in Portugal and a set of proposals on how to stimulate that same development. Particular attention is paid to international cooperation (Portugal had become a member of several international or European organisations), scientific education and the promotion of public understanding of science (which would become, during Gago's term as Minister, some of the main dimensions of science policy).

In the same period, another book (Caraça 1993), mostly based on statistical indicators and an analysis of policies (but with a particular emphasis on business R&D and technological innovation), also took stock of the development of science and technology in Portugal. The book derived from a series of articles published in the social sciences journal *Análise Social* (Caraça 1980, 1983) and was authored by another physicist that also had a leading administrative position: João Caraça, head of the Science Department of the Gulbenkian Foundation (the main non-profit organisation in Portugal) since the mid-1980s (and until 2011).

Even though these cannot be considered as STS works, they are a relevant source for characterising the Portuguese scientific and technological system prior to its rapid growth of the past two decades (and before the regular publication of statistical data on S&T, first by the Observatory of Sciences and Technologies, currently by the Statistics Department of

the Ministry of Education and Science) and can be taken as a signal of an interest in science as an object of inquiry. Something that would have soon be taken up by academia in Portugal.

3. Studies on the Science System

The first major research project on STS can be dated to the early 1990s, when the Gulbenkian Foundation commissioned a team of sociologists from CIES-ISCTE to characterise the behaviours, attitudes and expectations of Portuguese scientists. For that, the team applied a questionnaire survey to a sample of a thousand scientists working in higher education and other public institutions (leaving out business companies, where the number of researchers was insignificant), from all scientific fields. The survey encompassed three main dimensions: the social and cultural structure of science, the representation of scientific knowledge and the interaction between science and its contexts, as well as a socio-demographic characterisation of researchers (Jesuíno 1995). This study allowed the analysis of issues such as scientific practices of publication and interdisciplinarity (Stoleroff and Patrício 1995), the representations of science held by scientists (Jesuíno and Ávila 1995; Jesuíno 1996), identities, borders and communication networks (Vala and Amâncio 1995), class origins of scientists (Machado *et al.* 1994), the internal stratification of the scientific field (by measuring the distribution of scientific capital – Ávila 1997), the creation of a typology of researchers according to their patterns of activity (Ávila 1998), and the views of scientists regarding public opinion and science policies (Costa el al. 1995; Costa 1996).

Since then, surveys of scientists have been fairly frequent, but never again with the same broad scope. Some of these studies focused on particular groups of scientists, whereas others resorted to surveying heterogeneous samples of the scientific community on specific issues.

Some examples of the first type of studies are Patrício and Stoleroff's (1996) enquiry on project coordinators and on how they managed their teams and divided labour within research; or Conceição's (2003) study of independent inventors (a rather marginal group in the science sphere), concerning their choice of problems, their sources of information, and their struggle to get their inventions recognised and applied. Costa *et al.* (2009) were commissioned by the Gulbenkian Foundation to examine the career paths of the recipients of the Incentive to Research Prize (1994-2006), a group of a hundred young researchers below the age of 30 that received funding for a one-year project. Their analysis was based on the CVs of the researchers and sought to assess the effect of scientific awards, to identify different trajectories in science careers and the variations by scientific field. Gonçalves coordinated a wider study of a whole scientific field in Portugal, biology, which encompassed a history of the disciplines,

surveys of professional biologists (inside and outside academia) and of secondary education students, media analysis, overviews of educational offer in universities and of job prospects in the private sector (see Gonçalves and Freire 2009).

Regarding the second set of studies, some examples can also be pointed out. Pereira (2001) analysed the international collaborations of Portuguese scientists, both through statistical data and interviews with researchers. In her PhD thesis, Silva (2004, 2005) surveyed researchers on their use of the internet as a tool for scientific knowledge sharing and communication, both with peers and with the public, at a time that this subject had yet to reach the massive proportions it has today. Moutinho *et al.* (2007) conducted a survey on scientists in public sector research organisations (including universities) and on their practices and representations regarding patenting. The practices and perceptions of scientists regarding "open science" (more precisely, the publication in open access journals and other forms of making freely available to the public and to the scientific community research data and results) were the subject of a more recent survey (Cardoso *et al.* 2012). Delicado *et al.* (2013) conducted a survey on scientists concerning the membership of scientific associations in their research project.

Other studies on the scientific system relied mainly on statistical data produced by official sources, some delving on scientific publication (Silva 1992, Silva *et al.* 1993; Pereira 1996; Patrício 2010), others on R&D expenditure and human resources (Gonçalves and Caraça 1984, Moura and Caraça 1993; Pereira 2002; Godinho 2007; Horta 2010; Heitor and Bravo 2010; Heitor and Horta 2012; Heitor *et al.* 2013). Some are quasi congratulatory works, celebrating the impressive growth of the system in the past few decades in terms of input and output indicators. But others also point out to chronic weaknesses of the systems, such as the lack of business investment in R&D (Caraça 1980; Gonçalves and Caraça 1983; Moura and Caraça 1993; Godinho 1993) and academic inbreeding at universities that drive away highly trained human resources (Pereira 2004; Horta 2009; Heitor *et al.* 2013).

International scientific mobility is a subject that has garnered an increasing interest by STS, particularly so in sending countries, concerned with the potential for "brain drain". Portugal is no exception and several studies have attempted to ascertain the inbound and outbound flows, the motivations for leaving but also for returning, and the impact of mobility in the production of science (Pereira 2002; Fontes 2007; Delicado 2010a, 2010b, 2011; Fontes and Araújo 2013; Fontes *et al.* 2013). Conversely, few studies have broached the subject of foreign researchers in Portugal and their role in placing the country in a "global platform of circulation of researchers" (Reis *et al.* 2010).

Another particular trait of the Portuguese scientific community is the unusually high proportion of women researchers (46% in 2011, according to official data – DGEEC 2013), even though, just like elsewhere, this

share is lower in the top echelons of the scientific career. Thus, the issue of gender in science has merited several works, some more general (Ruivo 1986, 1993; Amâncio and Ávila 1995; Reis *et al.* 2010; Amâncio 2003), other focused on particular disciplines (Almeida 1986), others in connection with other themes, such as international mobility (Delicado and Alves 2013).

Science policies have been a frequent object for analysis. Ruivo's PhD thesis, later published in book form (1998) is an in-depth analysis of science policies and their impact on the development of the Portuguese scientific system between 1967 and 1989, paying particular attention to the impact of the transition to democracy and to the role of international organisations. Caraça (1999) updated this analysis, by focusing in the transformations occurred in the 1980s and 1990s, mainly as a result of European structural funding and the creation of the ministry of Science. Heitor and Horta (2012) provide an English language overview of science and technology in Portugal, covering the whole 20th century and the early 21st century, with a particular focus in the past few decades and in policies concerning human resources, research institutions and international networks.

Other works have focused on particular sections of science policy. Gonçalves (1993, 1996) and Pereira (2004b) published articles on the construction of public policies on science and the role scientists play (or failed to play) on it. Henriques (1999) also examines the consultation processes behind R&D funding decisions and the establishment of peer review as the procedure for allocating project grants. Pereira (2004a, 2004b) analysed the public debate surrounding policies concerning the funding of research institutions in Portugal, tracing the transition from traditional models based on greater autonomy to models promoting increasing accountability and government control.

Several studies (Pereira 2002; Patrício 2010; Horta 2010) examined the role of science and higher education policies in promoting the internationalisation of Portuguese universities and researchers. Heitor *et al.* (2013) argue that policies aimed at building advanced human capital are key for the development of S&T systems, illustrating their argument with the case of science policies in Portugal between 1986 and 2010, though it should be mentioned that the main author had direct responsibilities in this matter, since he was the Secretary of State for Science between 2005-2011.

Of a different nature is a survey of members of the Portuguese Parliament on science and science policy, conducted in 1995, that revealed a mismatch between the high valuation of science by parliamentarians and the low levels of government funding for science (Gonçalves *et al.* 1996).

4. Laboratory Ethnographies

The previously mentioned studies are characterised by an "external", Mertonian approach to STS, focused on the characteristics of the scientific community and of the S&T system. A second, though less voluminous, strand of studies concerns the analysis of the production of scientific knowledge, achieved mainly through laboratory ethnographies. But how can the observation of scientific practices in Portuguese laboratories highlight local differences and specificities? Scientific standards are set at the core of the science system and differences at the periphery are caused not just by local "cultural" specificities but also by the unequal power relationship associated with a peripheral condition.

The first laboratory ethnographies were conducted in Portugal in the early 1990s. Martinez was an anthropologist employed by a chemistry and biology research centre in the outskirts of Lisbon who teamed up with sociologists to write one of the first Portuguese laboratory ethnography, combined with document analysis and a survey (Martinez *et al.* 1994). The authors applied Callon and Latour's concepts of translation and actor-network, examining also the cultural patterns and modes of organisation within the research centre.

Cristiana Bastos' PhD thesis on the interactions between AIDS activism, the medical establishment and scientific research in the US and Brazil was partly based on a laboratory ethnography conducted in Brazil. Though the fieldwork was conducted outside Portugal, it is still an influential work in Portuguese STS, since it was published both in the US (Bastos 1999) and in Portugal (Bastos 1997, 2002, 2008). Bastos' host institution is one of the leading research centres in Portugal and she has trained and supervised plenty of STS scholars.

João Arriscado Nunes conducted his first laboratory ethnography at a cancer research laboratory in Oporto. He paid particular attention to the local division of scientific work and to the constraints placed by the lack of resources that force researchers into technical or managerial tasks, typical of a "semi-peripheral" position in the world system of science (1996, 2001). These local conditions are invisible in the "finished product" (the publications) and are also ignored by laboratory studies conducted in more "central" countries, driving researchers to seek allies in international networks and outside the scientific sphere (in public and private funding and regulating bodies). His observations also allowed him to derive inferences regarding the use of microscopy in constructing and learning visualisation (Nunes 2000). In a later work, Nunes (2008) examines how a particular biological and biomedical entity (in this case, a bacteria thought to be responsible for stomach cancer) is enacted as an object of knowledge and "an entity making a difference in the world" (a notion derived from Daston).

Some of Bastos and Nunes' students went on doing similar laboratory ethnographies, both at research labs (Faria 2001) and at other scientific

settings, such as forensics labs (Costa *et al.* 2000; Costa and Nunes 2001) or meteorology services (Praça 2008).

5. Science and Society

Though the issue of public understanding of science (under its multiple labels, from "scientific culture", to "public engagement with science", to "science for and with society", in the latest EU parlance) has become transversal to all countries, it has perhaps gained a heightened attention in STS in Portugal due to the priority it was given in science policy. This priority was mainly expressed through the creation in 1996, under the Ministry of Science, of a national agency (*Ciência Viva*) in charge of promoting a wide array of science dissemination activities (for students and the general public) and setting up a network of science centres (Gonçalves and Castro 2002, 2009; Heitor and Horta 2012).

The (lack of) understanding of science by the Portuguese public was early on identified as a problem that begged to be measured and solved. Following the lead of Eurobarometer surveys in 1990 and 1992, the Observatory of Sciences and Technologies conducted national surveys on scientific culture, measuring the (low) interest in and knowledge of science of the Portuguese population between 1996 and 2000 (OCT 1998; Ávila *et al.* 2000; Rodrigues *et al.* 2000; Freitas and Ávila 2000;). Much like in other countries, these surveys came under criticism from Portuguese STS scholars for their simplistic views on science (Ávila and Castro 2002) and were abandoned since then, even though similar Eurobarometer studies still continue to be conducted and their data is at times used by some authors (Costa *et al.* 2009). In a slightly different vein, two social psychologists, Castro and Lima (2000) also devised a questionnaire survey to assess the variability of notions of science and environment within the public, according to values and identities, and how the two are articulated.

In 2000, the Gulbenkian Foundation commissioned a study on the publics of science in Portugal by a team from CIES-ISCTE. The Foundation was aiming to assess the interest of resuming the publication of their magazine for scientific dissemination *Colóquio/Ciências* (published between 1988 and 2000). Costa *et al.* (2002) thus conducted a national survey on the practices and representations of the population regarding scientific dissemination. The authors derived from the data a typology of ways of relating to science, heavily influenced by educational levels, which comprised seven type-profiles. However, two thirds of the population fell on the three profile-types that are characterised by a significant distance to science.

CIES-ISCTE also conducted other studies on scientific culture, most notably the evaluation of the *Ciência Viva* competition for schools and

some of its other activities (Costa *et al.* 2005), characterising the effect of the activities of this Agency as having generated a "social movement" in Portugal. This team, among others (Delicado 2004), have also striven to extend scientific dissemination to the social sciences and to write about their own experience (Conceição *et al.* 2008).

There are fewer works on the other party of science communication: the scientists. Gonçalves (1996, 1997, 2004; see also Jesuíno and Diego 2002) surveyed the researchers from the Faculty of Sciences of the University of Lisbon aiming to elicit their views on scientific culture and scientific dissemination. Machado and Conde (1997) interviewed science disseminators in order to ascertain their trajectories and dispositions, their place in the scientific field, their practices and notions of dissemination. However, these two works predate the substantial growth in science dissemination activities in Portugal, which has resulted in the involvement of a greater number of scientists. Despite the fact that government funding programmes increasingly demand dissemination activities, it remains to be seen whether this has affected the reward system or the distribution of scientific capital within the scientific field.

The development of science museums and science centres in Portugal in the past few decades has also spurred a significant number of studies on their characteristics, from monographs of particular institutions (e.g. Caldeira and Antunes 2005; Duarte 2007) to wide-ranging works (Delicado 2006, 2009; Andrade 2003, 2010), from surveys and interviews with visitors (Casaleiro 2000; Coelho 2009) to assessing the effects of visiting exhibitions, in particular in school aged children (e.g. Botelho and Morais 2003, 2004; Faria *et al.* 2010).

Another recurrent object of study in Portugal in this particular area of STS has been the presence of science in the mass media and the representations of science they convey (Machado and Conde 1997; Mendes 2002; Schmidt 2008), as well as of particular scientific issues, such as scientific controversies (Correia 2000, 2002; Garcia 2001), climate change (Ramos and Carvalho 2008), biotechnology (Jesuíno *et al.* 2001), or biology (Fonseca and Gonçalves 2009).

If the issue of the public understanding of science has already an established tradition in Portugal, the public engagement with science still has a long way to go. One of the few published records of a consensus conference in Portugal is described in the article by Coutinho and her team (2004). Carvalho and Nunes (2013) promoted a focus group on nanotechnology (integrated in the European research project DEEPEN – Deepening Ethical Engagement and Participation in Emerging Nanotechnologies) that was characterized by the innovative introduction of Paulo Freire's Pedagogy of the Oppressed and Augusto Boal's Theatre of the Oppressed. In fact, the increasing involvement in European projects by Portuguese academics (and even by the Agency *Ciência Viva*) has the potential to lead to the proliferation of engagement endeavours, but more published evidence has yet to emerge.

6. Risk Studies

Another issue that has gained significant prominence in STS in Portugal is the controversies generated by environmental risks and the interactions between science, policy and public participation in the management of such hazards. The late development of science in Portugal, a lack of administrative tradition in resorting to scientific advice for policy decisions and a weak civic culture that hinders public participation were the backdrop to many of these studies, although the seeds of change can be seen in many of them.

Among the earliest 'risk studies' in Portugal is a problem that transcended national borders: the mad cow disease that in the late eighties became a public health problem in most of Europe (Gonçalves 1996, 2000; Gonçalves *et al.* 2007; Pereira 2002, 2004). As in other countries, the government first tried to deny the problem, disregarding (and even discrediting) expert advice, but it was ultimately forced by its membership of the European Union to follow international safety guidelines and take preemptive measures. This zigzag did little to enhance public trust in government but put Portuguese science in the spotlight for perhaps one of the first times.

Another case that sparked the interest of STS researchers was the discovery of pre-historic engravings at the site of a planned construction of a dam hydroelectric in the north of the country (Gonçalves 2000, 2001, 2002). Engineers and archaeologists started a dispute that would spill over to the media (Garcia 2001) and garnered the public interest, eventually leading the (newly elected) socialist government to decide in favour of the engravings and against the construction of the dam. A similar case but with the opposite outcome was studied later by Bento (2008).

Probably the most extensively studied environmental risk in Portugal is the co-incineration of hazardous waste, a controversy that spanned almost a decade (Nunes and Matias; Matias 2004, 2008; Gonçalves *et al.* 2007; Gonçalves and Delicado 2009; Jerónimo 2010; Jerónimo and Garcia 2011). The government's proposal for solving the problem of hazardous industrial waste by incinerating it in cement factories raised a strong opposition from local coalitions of actors (residents, local authorities, environmental organisations), which forced the government to request further expert advice (which was met with mistrust, both from the local actors but also from members of the scientific community, acting as counter-experts). This in turn led to successive delays and changes in policy (with each change in government), lawsuits and other forms of resistance, until the procedure was finally implemented in 2009.

The issue of controversy and participation in environmental impact assessments has also motivated several studies. Gonçalves (2002a, 2002b) examined how changes in the civic culture of Portuguese society had an impact over legislative and institutional frameworks, leading to improved scientific and technical grounding of decisions and more democratic legit-

imacy. Lima (2000) presented the results of a survey of populations living near a projected waste incineration facility, in order to show that this sort of surveys constitute a more adequate way of assessing social impacts and public perceptions than simply scrutinizing the (scarce) participation in public consultation. However, Casto and Lima (2002) have also examined the transcripts of the public consultation for the same facility, in order to analyse the discourses of different actors (engineers, environmentalists, business representatives, local authorities, scientists, citizens) and how science is used to justify contrasting arguments. A later work (Lima 2006) also used survey data to predict attitudes towards the incinerator, namely variable such as perception of risks and justice, expectations, trust, and distance of residence.

Other STS works have dealt with environmental and health risk in work settings, such as an oil refinery plant in Sines (Granjo 2004) or the uranium mines in Urgeiriça (Mendes and Araújo 2010).

7. Institutional Settings

Despite the wealth of STS research in the past few decades, this area of knowledge still lacks some institutional foundations, such as journals, associations, or research units.

STS researchers in Portugal are mainly sociologists by training, although some come from anthropology, social psychology and law. Unlike what is common in other countries, few researchers are from the natural sciences or engineering. STS is barely present in undergraduate education and few post-graduate courses are on offer: a PhD Programme in Knowledge, Governance and Innovation at the University of Coimbra that started in 2005; a Master in Economics and Management of Science, Technology and Innovation at the University of Lisbon that started in 1995 (aimed at the training of science managers that work in companies, R&D units, universities, S&T parks and government bodies responsible for science); and a Master in Science and Technology Studies at ISCTE University Institute of Lisbon that started in 2009 but was suspended in 2012 due to the lack of applicants.

There is no research unit solely dedicated to STS, so researchers in this field are integrated in social sciences centres that cater to different areas of study. STS academics usually are part of broader research areas or groups that deal with issues such as environment, health, knowledge society, innovation, or work: the research group on science, economy and society of the Centre for Social Studies (University of Coimbra), the research area on sustainability, environment, risk and space of the Institute of Social Sciences (University of Lisbon), the research groups on Knowledge society, skills and communication and on Work, Innovation and Economy at CIES-ISCTE (University Institute of Lisbon), the re-

search area on Science, Technology, Health and Professions at SOCIUS (ISEG, University of Lisbon) and the one on Culture, Science and Identity at CICS (Minho University). Finally, there is also IN+, the Centre for Innovation, Technology and Policy Research, integrated in the Engineering School IST (University of Lisbon), plus a few researchers scattered in other sociology or anthropology departments.

There are currently no specialised STS journals in Portugal. As mentioned above, there had been two journals dedicated to science issues, launched in the 1980s, but that failed to take advantage of the growth of the field: *CTS,* published by ACTD between 1987 and 1994, and *Colóquio Ciências,* edited by the Gulbenkian Foundation between 1988 and 2000. A bibliographic study (Duarte 2009) concerning sociology of science in Portugal, in the period between 1988 and 2008, shows that there have been 169 publications in this period, mainly in national social sciences journals and books. The rate of publication was regular since the mid-nineties and increased significantly from 2000 on. International publication is on the rise, driven by participation in international networks and by funding policies that reward articles in indexed journals.

Likewise, there is no STS association in Portugal. The Portuguese Sociological Association (APS) has a thematic section on Knowledge, Science and Technology since 2010, which organized its first conference in November 2011. The section has only 15 registered members, however, in the last national congress of APS around 60 papers were presented in this section. Concurrently, even though the EASST conference in Lisbon in 1998 was an important event for disseminating STS in the country, just 11 Portuguese researchers are actually EASST members.

Funding for research in STS has been granted from two main sources, the Foundation for Science and Technology (integrated in the Ministry of Science) and the Gulbenkian Foundation. In 2008, the Foundation for Science and Technology created STS as a separate field in its R&D project funding calls (traditionally, STS projects were part of the sociology or anthropology fields). Between 2008 and 2012, 12 projects were funded, totalling close to 1.5 M€. The Gulbenkian Foundation, the leading non-profit organization in Portugal, had already played a very relevant role in the development of science in Portugal, from the 1950s onwards, funding the training of Portuguese researchers abroad at a time when government intervention was very limited and commissioning research (rather than launching open calls) in its main areas of interest.

Portuguese STS researchers have also participated in European projects, funded by the Framework programme and other initiatives, such as "Building a common database on scientific research and public decision on TSEs in Europe" (1998-2001), "ADAPTA: Assessing Debate and Participatory Technology Assessment" (1998-2000), "EUDEB: European Debates on Biotechnology" (1999-2000), "OPUS: Optimizing Public Understanding of Science" (2000-2003), "LSES: Life Sciences in European Society" (2000-2004), "STAGE: Science, Technology and Governance

in Europe" (2001-2005), "Deepening Ethical Engagement and Participation in Emerging Nanotechnologies" (2006-2009), or "Researching Inequality through Science and Technology – ResIST" (2006-2009).

8. Conclusions: The Future?

We end as we begun, by briefly exposing the constraints and opportunities that STS in Portugal are currently facing, in tandem with Portuguese science. Though as a weakly institutionalised field, STS are perhaps in a more vulnerable position than others.

Portuguese science is experiencing testing times. Due to the financial crisis and to policy options, government funding is dwindling. A science system built on shaky ground (heavily reliant on public funding and based on a workforce made of temporary contracts and grants) threatens to collapse. Membership of international organisations is at risk, the number of students in tertiary education is starting to decline, institutions struggle with lack of funds to build and maintain networks, and the exodus of highly trained researchers is already visible.

How the science system will respond to these challenges and how scientific practices will be transformed by this new "leanness" of resources will be an enticing matter for future STS research. Provided the field of STS also survives these testing times.

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Daniel Trottier

Social Media as Surveillance. Rethinking Visibility in a Converging World
Farnham, Ashgate, 2012, pp. 222

Andrea Mubi Brighenti *University of Trento*

The so-called social media increasingly form everyday living spaces, spaces where we dwell and which we cross both digitally and materially. Their hybridity and cogency – their veritable 'territoriality' – become apparent when we consider how connectedness to the media now accompanies us in our pockets as well as across the urban spaces we inhabit. Simultaneously, digital media are spaces of visibility and inter-visibility. As such, they entail all the promises and perils of exposure. If, by *public domain*, we mean a contested territory of visibilities and appropriations, social media should be recognized as a noticeable part of it. The phenomenon Simmel first described as the 'mixing of social circles' now takes place in such an enlarged mediated public domain. This fact may cause problems. In other words, since people live different aspects of their lives on these media, the social circles one belongs to can end up by intersecting dangerously.

In his book, Daniel Trottier has sought to understand how the harvesting of personal information for institutional, business or policing purposes – which, on the social media, is an ongoing task – can change people's life. From a slightly different perspective, perhaps, it could be said that the problem arises from a double tension: on the one hand, there is a tension between different *interactional registers* in our lives, which vary in function of the social context – e.g. family, intimate, study, professional, recreational contexts and so on; on the other hand, there is a tension between the *transience* that characterizes the mundane details of everyday life and the *permanence* of networked digital data (let us not forget, resilience was initially a much sought-for quality that drove the development of digital networks). So, data that we did not mean to create – or that we meant to create for a specific purpose – are in fact created and get disseminated in ways which can hardly be controlled by its creators. *A fortiori*, these user profiles, posts, entries, comments and logs can be searched, collected and studied, that is, used by different people for very different purposes.

According to Foucault, surveillance is always a cooperative activity, for it entails self-surveillance, *alias* disciplination. While, taking a broader definition of surveillance, this might not always be the case, in the sense that we could also speak of surveillance in cases where people are unaware of being scrutinized, still, it is certain that in the domain of the social media a wide array of 'self-surveillant' practices is present: many people consciously take advantage of the visibility of others and no less consciously put themselves on stage, distributing personal information about

themselves for a number of reasons, ranging from having a laugh with friends to promoting their professional activity. The problem, however, is that simultaneously users of social media platforms have very limited control over the content that circulates in both their restrained social circles and the media sphere more generally. Most people, in other words, can barely keep up with the *technical* and *legal knowledge* about settings and regulations, as well as with the sheer *quantity of* user-generated *content.* Precisely for this reason, we increasingly record concerns about the 'risks' associated with personal information disclosure. So, while we might not always find the 'disciplination of conducts' Foucault had in mind, we can certainly observe an array of practices consisting in the 'disciplination of data' and data production. The focus, in other words, might not be so much on what one actually does, as much as on which data end up being uploaded and whether or not they 'leak' somewhere.

Trottier's research – based on three sets of semi-structured interviews about Facebook usage, respectively with 30 undergraduates students at a large Canadian university, 14 university administrators and campus employees, and 13 business consultants – illustrates this point. In the first place, social media are a space of interpersonal surveillance, where users are both the subjects and the agents of surveillance. The interactional games Goffman described as 'impression management' and 'face-work' are extensively re-enacted on social media. As one interviewee plainly put it: "there's a necessity to defend yourself or prevent people from really seeing [your own] problematic behaviors such as drinking or, you know, embarrassing photos that have a tendency to get up on Facebook even when you don't want them to" (p. 111). We thus find that pressure to join the media leads to increasing reliance on social media platforms for a number of purposes like meeting friends. Simultaneously, the attempt to secure privacy and the concerns about personal reputations also determine the emergence of sets of normative expectations about acceptable behavior along, with attempts to sanction stalking and other forms of personal harassment. "Users – writes Trottier to summarize these complex and partly contradictory requirements – feel responsible for their presence, but aware that managing this presence is beyond their control" (p. 82).

Besides interpersonal surveillance, social media also enable a good deal of 'parasitical usages', in other words they help all those jobs and professions whose business is to focus on the behaviour – as well as attitudes! – of consumers, customers or suspects, by extracting information voluntarily provided by users (albeit, in many cases, for different purposes). These 'parasitical' actors may of course also have their hard time, not so much in accessing data, as much as in coping with the increasing amount of information that exists on social media. As one interviewed university marketing and communication expert admitted: "it's very explosive, this use of social media that it's pretty hard to keep on top of, there's no one person that can control or audit everything that's happen-

ing" (p. 94). Thus, specialized procedure of *visibilitization* become pivotal, insofar as they provide the essential tools to identify relevant social media data and make sense of them. The capacity of an institution – be it a university or the police – or a market actor to effectively surveil a target population is proportional to its ability to 'visibilize' – rather than merely visualize – information, that is, to crawl through the crowds of information available in order to extract or reconstruct readable patterns. To this, it should be added that, just as other digital media, social media are interactive by definition. In such a fast-changing scenario, skilful surveillance may function by elicitation, turning, once again, into something akin to cooptation.

With this book, Trottier has provided a valuable contribution to the empirical study of everyday surveillance practices. The book is clear and well organized, two qualities which also make it suitable for teaching purposes. While his empirical research is limited to a tiny case (the use of Facebook at a specific Canadian university) and does not include ethnography – which would have arguably made it more exciting – it nonetheless manages to flesh out all the major points and issues in current social media research.

* * *

Antonello Ciccozzi

Parola di scienza. Il terremoto dell'Aquila e la Commissione Grandi Rischi. Un'analisi antropologica [The Word of Science. The L'Aquila Earthquake and the Major Risks Committee. An Anthropological Analysis]
Verona, DeriveApprodi, 2013, pp. 188

Gemma Maltese *University of Calabria / Lancaster University*

The book by Antonello Ciccozzi can be described as an open path through the anthropological rooms and cultural semiospheres – as the author describes them – of the earthquake in the city and among the citizens of L'Aquila. Through the case of the earthquake of L'Aquila, on the 6 April 2009, Ciccozzi shows the divisions, conflicts, dominations, subordinations, alienations that are reproduced through the current relationships between forms of subjected and dominant 'knowledges', in contemporary capitalist societies.

In that earthquake, Ciccozzi was directly involved in several senses: he is a citizen of L'Aquila; he survived the earthquake; he was a 'privileged' witness during the different phases of the trial, appointed to investigate the management of the earthquake of L'Aquila, and, in particular, the

Major Risks Committee (MRC), which was established by the Italian government in the period before the earthquake. In fact, Ciccozzi was called as a cultural anthropologist in order to provide technical advice on the forms of governmental communication and intervention on the perception of citizens of L'Aquila with respect to the different earthquakes and seismic swarms that were occurring in this territory for more than three months before the 6 April. His research experience can be defined as an observant participation of what it meant to be part of the places and community, and of the dynamics of management relating to the earthquake. From this convergence of experiences, this anthropological analysis is aimed at drawing attention to how the forms of communication of the members of the Commission led to an underestimation of risk by a part of the population of L'Aquila that, in turn, encouraged citizens to stay at home during the earthquake. In the "word of science" – in this case, the word of the MRC – and in the desire of the population of L'Aquila for calming and reassuring messages with regard to the several months of earthquake activity, scientific-media communication, structured on the wave of "rassicurazionismo" – being reassuring and persuasive through "science" – were able to penetrate and modify those stratified popular 'knowledges' and 'traditional-instinctive behaviors' that over time in the face of previous earthquakes had prescribed precautionary behavior.

The author does not intend to suggest that the way in which the Commission managed its communication with citizens was the primary or only factor which determined the tragic loss of life in L'Aquila. Nevertheless, Ciccozzi points out how, in particular, the well-publicised visit of the members of the Commission at L'Aquila in front of all the citizenship, the day before the earthquake, had, among other elements, a strong influence: the communication of this Commission acted as a mixture of normative-reassuring knowledge, transmitted to the population of L'Aquila, in a moment of particular individual and collective emotional weakness and fragility. The author reports the testimony of several survivors who tell their stories and the stories of their relatives who were casualties in the earthquake, showing how that night some people decided not to leave their houses during the earthquake, because they were influenced by the reassuring diagnosis of scientists. Observant participation, direct testimonies, in connection to themes of anthropology of risk and the theory of social representations, construct this analysis of the 'scientific' 'manipulation' of the L'Aquila semiospheres of the earthquake: in other terms, the way in which the normative power of technoscience, in politics and the public sphere, particularly in the management of risks and dangers, seems to act as a sort of arbiter-peacemaker in social conflicts and public concerns, and also, ambivalently, as a (modernist) cultural source of both reassurance and risk in current social imaginaries.

In the earthquake of L'Aquila, the condemnation – the blame and anger that Ciccozzi explores, as a member of the (different) communities

that were playing in the 'show' of the governmental management of "Major Risks" – is not against science, but it is against the negligence that has characterized the word of its interpreters. Technicians, scientists, experts have been called to assume their responsibility for risk assessment and communication, and not because they had to be able to predict the earthquake: as Ciccozzi underlines, earthquake-risk assessment and management and its communication are different from the prediction of earthquakes. Nevertheless, particularly in situations of emergency and risk, scientific communications can have – even in the face of a particular cultural semiosphere 'accustomed' to earthquakes and their effects – profound social impact in the perception, representation and evaluation of disasters.

Although Ciccozzi, at the end of his analysis, puts more emphasis on the question of scientific communication in the public sphere, the "word of science" recalls in any case the problem of the technoscientific domain in the relationships between citizens and power (rationalized) institutions of knowledge societies: the word of science is a discourse-dispositive of power. Its normative character is tangled with juridical, political, economic and cultural beliefs, in the construction of our cognitive maps and interpretations of the world and its phenomena. In this sense, imagining reflexively the hierarchical structure between forms of knowledge, and its centrality in capitalist democracies, inside the rooms of the Court of L'Aquila Ciccozzi's analysis played a key role in the trial that ended with a "shock judgment". This was shocking particularly for the national and international scientific community; in many case the press reported comments which link this judgment to the story of Galileo: six years in prison for the Commission of scientists.

Emphasizing the dimension of scientific communication, Ciccozzi elaborates upon one of the key themes of this story: a linguistic misunderstanding about the meaning of the intervention of the MRC. The author explores how those scientists in that meeting and in the previous communications kept telling the citizens of L'Aquila to remain calm: by saying that nobody is able to scientifically predict earthquakes, discrediting any other technical analysis that could go in other directions, the commissioners reassured citizens, and the result was that after the meeting with the MRC everyone in the city of L'Aquila was equivocally talking about "non-alarm". The contradictions of this communication produced, in many people, a subordination of their own memory and cultural-instinctive behavior in an earthquake to the reassuring idea that was transmitted by 'scientists', according to which those continuous quakes could just represent the way in which the earthquake was dissipating. The author expands on the meaning of "non-alarm", explaining in this way why the diagnosis of the MRC was not at all a "failure to alarm" but a "disastrous reassurance". The conclusions which lead his analysis are constructed on the idea that the advice of the MRC was based on two main themes. On the one hand, the author underlines the difference be-

tween the non-alarm and reassurance provided by this institution of power directly to the citizens of L'Aquila. Articulating the "word of science", in the final days of the earthquake authoritative scientists came, delivered and reaffirmed a version that they had already started to communicate to the population during the intensification of the quakes in the weeks before. The theory of power was that the tremors should not be understood as the possible prelude to an earthquake, but as its antidote.

On the other hand, he focuses on the explanation of how these reassurances communicated by scientists led to a change in the behavior of the citizenry, or rather part of it. The author here uses a theory of social psychology, the social representations of Serge Moscovici. The element of this theory that Ciccozzi particularly stresses is the fact that in "advanced" societies people base their behavior on models of reality that are predominantly predetermined by scientific institutions. Science, in its social uses and functions, provides common sense categories that influence the actual behavior of people. The analysis of Ciccozzi intends to show that the MRC did not alter the ability to judge or act of citizens, but it did determine a collective interpretation that this type of phenomenon (seismic swarm) was 'positive': there was both the construction of a reassuring social imaginary and the persuasion of citizens through the ambivalence of that scientific communication. In effect, in the confusion that the MRC generated, superimposing its assessment and management of the risk of earthquake on the prediction of this event, from this mistake, many people, despite the quakes of the days before and that night, thought that they could safely stay at home. And this reduction in the perception of risk, together with the vulnerability of some buildings, determined the loss of human lives.

After that night, it is not only the buildings but also the "word of science" that has not stood up to the earthquake. From this perspective, this anthropological analysis can be defined partly as a critique of bad science, or more precisely, it is specifically against the quackery and amateurism that pollute the world of science. Furthermore, it shows the irreducible normative dimension of 'science', and, representing also the singularities and some peculiarities of the Italian relationships between scientific and political institutions, Ciccozzi's writing makes visible that form of scientific authority held up through acquisitions of power from politics. The judgment – which is a sentence for negligence – has, in this sense, the value of condemning these forms of the reciprocal admixture of power, strengthening rather an idea of science and politics as independent and autonomous constitutional authorities. In any case, as in that of the earthquake of L'Aquila, in contemporary capitalist democracies, between the divisions and cracks of modernity, the reality is closer to the situation of power acquisition from politics to science, from science to politics, reciprocally, and from political and scientific institutions to economic enterprises and interests. It is a tangled relational process of power, working through the co-production of that normative knowledge which ultimately

finds legitimation in the "word of science", in the name of the maintenance of social order, especially in emergencies, risks, dangers and crises. But when the events contradict this word, memories, fears, old angers resurface and the conflict of subjected knowledges emerges as an open crack in the damaged walls of the rationalized structures of modernity. Through the cracks, the day after the earthquake, between the dust and the rubble, something that was already happening in the days and weeks before the 6th April became clearer: in that period L'Aquila was in fact turned into a sort of laboratory of public fear and reassurance, that was produced by the degeneration of the social function of scientific institutions. The 'bio-political' experiment was to intervene through a "media operation" (as the ex-head of Italian Civil Protection, Guido Bertolaso put it) on a population weakened by weeks of earthquake, with the goal not to discuss, make evaluation, research information: the aim was to reassure people, persuading them that there would not be an earthquake. This is the accusation of Ciccozzi against that "word of science" which provokes death and pain with the negligence and incompetence of power.

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Mathieu Quet

Politiques du savoir: Sciences, technologies et participation dans les années 1968 [*Knowledge Politics: Science, Technology and Participation in the 1968s*]

Paris, Editions des archives contemporaines, 2013, pp. xii+226

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When participatory mechanisms fail, it is because their promoters have taken for granted the founding elements of the very definition of participation – a reductionist view that ends up breaking against the wall of "reality" and complexity of today's political processes. Using as an introductory example the spectacular failure of the 2009-2010 public cycles of discussions on nanotechnology organized by the French Commission for Public Debate (CNDP), this is how Mathieu Quet (researcher at the Parisian *Institut de la Recherche et du Développement* – IRD), introduces us to the central argument of his book, based on a PhD dissertation defended at the *Ecole des Hautes Etudes en Sciences Sociales* in 2009. The definition that the promoters of participatory mechanisms make of participation – often too narrow and reductive, if not outright incomplete or based on powerful assumptions – should be put on trial so as to highlight the plurality of organizational, social and political forms that constitute

"participation" in practice.

To do so, explains the author, it is necessary to retrace the history that has shaped participation as a term. Yet, the book does not have the ambition – which would most likely be excessive – to start this history from the beginnings of political participation, to be traced back to the origins of democracy in ancient Greece. Instead, it focuses on a moment in time and in space when "a notion of participation in science and technology emerges, still fragile, less categorically and hegemonically defined" (p. 4): the 1970s in France. What interests the author most are the discourses of participation rather than its practices: but his approach situates itself in the scholarly current that, blending communication studies with STS, looks at the discursive dimension of problems as issue- and sense-making, having an active role in the shaping of devices, processes and practices. The "suspended genealogy" of the 1970s, as he calls it (p. 5), allows the author to follow the emergence of *what it means to participate in science and technology* as a central issue of our times. His narration is both chronological and analytical.

Chapter 1, an *avant-histoire* covering the 1945-1968 period, analyzes how the emergence of the participation discourse is dependent on a variety of converging social evolutions. The chapter argues that this emergence is the consequence of the 1968 political and cultural movements impacting the French scientific and technical world as it had shaped itself throughout the *trente glorieuses*, the decades of economic prosperity that followed the end of the Second World War. The "infrastructural" context of participation is laid down. A "Big Science" is born, the accomplished integration of science, industry and state, the material changes in living and working conditions reflected in institutional evolutions and changes in the control structures.

Chapter 2 introduces the "explosive encounter" (p. 30) between the new cultural and activist forms, appeared in May 1968, and the powerful Big Science machine. The '68 dynamics of controversy and militancy take hold of issues related to science and technology. In doing so, they plant the seeds of a renovated, less naïve, more complex discourse on the political dimension of science. Declarations of intent to "put the science at the service of people" are no longer enough to face the important questions of societies' relationship to scientific and technical development. As science and technology emerge as bearers of new political issues, new claims of participation in scientific and technological choices start rising.

The birth of the "scientific *autocritique*", known in other countries as *radical science movement,* which will eventually lead to laying down some of the premises of participation, is the subject of Chapter 3. While French activist engagement in science and technology first takes the shape of anti-nuclear critiques and environmental controversies, the "politicization" of science and technology also takes place within the scientific field itself. Researchers renew their political engagement by claiming novel forms of responsibility vis-à-vis their professional activities, which leads, more

broadly, to rethink practices of scientific engagement. The Big Science is not enough and not all: reflections start on the collective practices of science, and on the necessity of a People's Science (as in produced by the people). These reflections lay the ground for some of the premises of participation.

This self-critical movement is soon echoed by governmental institutions (Chapter 4). The entities in charge of scientific policy and foresight are especially receptive to the claims of young critical researchers. A "governmental variation" (p. 79) on the notion of participation takes shape, this time associated with institutions – in particular with the Organization for Economic Cooperation and Development, OECD – rather than with emancipation from politics. By setting the scene for a decade of reflections on technological evaluation, the OECD comes to define participation as the means to regulate the political space by avoiding conflict as much as possible, and the tool for a more effective and rational government. "Participation participates" (p. 102) in the governmental project, by representing and making explicit to governments the interests of social actors.

In Chapter 5, human and social sciences enter the picture – the author presents Science and Technology Studies (or Science, Technology and Society, STS), as a field of study, as an actor in the shaping of participation. Focusing again on the emergence of the field in France, which happens in the mid-70s, the author observes that it entails the "institutionalization of the critique of sciences in university settings" (p. 103). The themes of participation are imported in the academic field, but during this operation, they are reformulated, and give birth to other participatory premises. Notably, participation becomes less of a normative and political matter, and more of an epistemological and descriptive one.

Chapter 6 addresses the different social "circulations" among the three different spaces analyzed in the previous chapters: participation as a governmental tool, promoted by institutions; participation as a means of description of the social, prompted in university settings; participation as need for emancipation and empowerment, fostered by the militant *milieu*. The author argues that these three spaces, as different as they could be, become intertwined again. An integrated analysis of participation cannot neglect the circulation of objects, references, people that "contribute to the reproduction of homogeneity where we see nothing but heterogeneity yet" (p. 129). The last part of the book takes on the discussion of the threads and concepts that are given birth in this common regime of discourse, beyond frontiers and differences specific to each space.

Chapter 7 addresses in more details, and in a comparative perspective, the specificities of the conceptions to be found in each space, before showing what these conceptions share, and what they can contribute to the contemporary definition of participation. The militant space pushes for a reconsideration of the public, coupled with a de-consideration of the expert; the technocratic/institutional space conceives participation as

a tool of pacification of the social order; academic settings produce a descriptive and epistemological conception of participation, feeding the participatory *imaginaire* with the construction of representations of scientific practice. Yet, these three spaces "participate in a same discursive regime" (p. 164): all these significations co-exist, and according to different periods of time, spaces, and configurations, some of them become dominant and more effective than others, determining, in turn, different representations of what *le politique* is.

The last chapter of the book ties its different threads together, arguing for the necessity of a perspective of "pluralization" of the sense that is today most frequently attributed to participation, that of deliberation and precaution in face of a potentially "risky" science. In particular, the author suggests that the participatory discourse of the 1970s can be interpreted as "experimentation" (p. 175). While some elements of each of the three definitions seem to have disappeared from the dominant definitions of today, there is a convergence between the remaining elements. In particular, all three seem to have in-built the "metaphor of experience" (p. 185): a recurring equivalence between participation and experimentation. It is important, the author concludes, to read the participatory discourses of the 1970s less as the predecessors of contemporary participation, and more as the elements of a "suspended genealogy", by means of which participation is founded as a practice of experimentation with formats and contents, not as a practice of deliberation and control.

What does the analysis of participation in the France of the 1970s tell us of the problems, and the potential, of participation mechanisms today? There is little doubt that participation has become a major issue of today's democracies and a *passe-partout* word of global governance. Yet, following Sheila Jasanoff, the author argues that participation as it is defined today does not allow to solve the problem of the democratization of science and technology. The historiography of participation that unfolds in this book, by putting in perspective the *construction of the meaning* of the need for participation, does not have a normative objective, does not wish to prescribe how participation should be. Instead, it can give a toolbox for a better understanding of participation's pluralist nature. The reader – especially the foreign reader – can sometimes have the feeling that she is getting lost in the sea of references and the extremely detailed accounts of French research and science policy that populate the book; however, the epistemological and historical objective of Mathieu Quet's intellectual project is successfully achieved through this agile, well-documented, engagingly-written volume.

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Marko Synésio Alves Monteiro

Os dilemas do humano: reinventando o corpo humano numa era (bio)tecnológica [Dilemmas of the Human: Reinterpreting the Human Body in the (bio)Technological age]
São Paulo, Annablume, 2012, pp. 168

Denise M. Nunes *University of Santa Catarina*

The book by Marko Synésio Alves Monteiro presents issues that cross the process of construction of individual identity, taking into account how the body is perceived by both the individual and the look of others. The volume provides the reader with a reflection on the relationship between body, technology and society, pointing out the inextricable interweaving of these three elements in contemporary times.

Following a STS approach and focusing on sociological insights, this volume analyzes the body as focus and cause of human dilemmas related to health, consumer culture and the politicization of life (just to make a few examples). Inspired by Donna Haraway's political utopia, the author seeks to contribute to debates regarding the relationship between body and science.

The presentation of the book, written by Professor Laymert Garcia dos Santos (University Estadual de Campinas), challenges the reader introducing some "almost existential" questions. Do we have or do we are a body? The dilemma between 'to be' and 'to have' in this case points out the perception of a supposedly singular individual, who has notion of its existence beyond him/herself. Discussions on the body are often polarized between individuals and species, and individuals and society. According to Santos, the book by Marko Monteiro seeks to map what is happening with the body in the "postmodern" age, focusing on its role of information brokerage. Santos explains that for Monteiro technoscience is building an operative logic that sees the body as a cybernetic organism, i.e. the cyborg as presented by Donna Haraway. This assumption leads to one main dilemma: the individuals' ability to reinvent their own body through options offered by (bio)technology. Aiming at analyzing new relationships between science, technology and corporeality, Monteiro discusses dilemmas about the reinvention of the body, in a relational context between the material existence of the body itself and its representations.

The aim of the book is to discuss new relations between science, technology and corporeality, seeking to understand how new scientific practices associated with biotechnology alter the forms of material existence of the body. The book is structured into eight chapters dealing with different situations involving the body's relationship with biotechnology. The work takes as its point of departure the way biotechnologies reshape the body and, as a point of arrival, the way contemporary art uses this re-

configuration from the moment in which artists use their own bodies as part of an aesthetic-policy action. This way, the author want discuss the relationship between materiality (as a material ontology) and body representation. All analysis has as background a rich theoretical framework of the humanities and social sciences.

In the first chapter, Monteiro presents a case study on biomarkers of prostate cancer with the aim of offering a vision of new empirical relationships between living matter and the technology discussed throughout the book. The object of this debate is the DNA chip, they are microarrays where stretches of DNA are fixed in order to determine how they react to medications. This object has enabled a discussion on a perception of the body as object of information, manipulable and measurable. This DNA chip contains organic matter on an artificial blade. It works like a cyborg in miniature, and thus follows a logic of representation and manipulation logic (the digital body). The author sought here to distinguish the idea of the "body as machine" from the idea of the "body as information" that is shaping up inside laboratories through scientific practices.

The chapters two, three and four are addressed more theoretical problems.

Chapter two discuss theoretical problems involving the sociology of science and its epistemological consequence. Introducing the debate existing between authors pioneers in the field of Social Studies of Science and Technology (as Bourdieu, Merton, Latour, Woolgar, etc.), Monteiro discuss the idea of "science as practice" in order to present the scientific knowledge like something socially constructed.

In chapter three, the author presents the body as object of social theory. From the Cartesian perspective, which sees the mind separate from the body (reducing the latter to its materiality), Monteiro shows how this view of the body is insufficient to explain the new developments associated technology. Referring to Pierre Bourdieu, Merleau-Ponty and Michel Foucault, the author discusses the relationship between nature and culture. From this discussion the author concludes that the technologies linked to genetic need to be understood beyond our "representational" (symbolic) body. Monteiro calls attention on the idea of control as a social practice and on the ways in which it starts to engage with the molecular sphere.

The fourth chapter focuses on the concepts of human and humanism, taking as a starting point the new standard for artistic representation of man which occurs in the Renaissance. Monteiro continues showing the Cartesian rupture and the advent of the body-machine: body and spirit are now dissociated. The body is nomore holy and it becomes a functional material.

The genetic theory as a new dogma of biology is the subject of the fifth chapter. For the author, the assumptions of molecular biology are directly related to mechanistic explanations (as he explained in the previous chapter). The genetic is considered to be the holder of the truth

about life and the gene becomes a material entity used for explanatory purposes. In this case, the molecular biology, from genetic theory, provides a "final explanation" for life, as Descartes craved.

Hitherto, Monteiro presents and discusses translations of physiological body to the body-information as it occurs in the laboratory. The author also shows how the molecular biology appears as owner of the absolute truth of the biology. Then, in chapter six he presents a discussion of the possible consequences of these processes. In other words, here are discussed political issues that are raised by the possibility to manipulate the body. The potential here is interpreted as a possible way of linking technology/body/policy arising from biotechnology. This issue becomes central, as a historical example of the most radical expression of a logic of life politicization.

In contrast to chapter six, chapter seven examines practices of recreating the body distinct from those offered by eugenics. The focus is on the manipulation of the living matter (the body) for aesthetic purposes. Bio-art appears here as a particular mobilization of the potential originated from advances in genetics. It dislocates laboratory practice in order to promote an ethical debate about the relationship between technology and life. Bio-art allows to create new ethical uses of technology and this ethic-aesthetic becomes a critical weapon against the possibility of a genetic determinism (author argues).

In the concluding chapter, Monteiro points out that biotechnology should not be banned, although it certainly has an eugenic potential that should be questioned. The author suggests that we should seek new and different machinic assemblages for biotechnologies, more consistent with our democratic ideals and able to preserve existing life forms.

When thinking about the possibility of reinvention of the body in a biotechnology age, many other questions arise and the book by Marko Monteiro presents numerous theoretical concerns and explanations. This is a dense and intense reading highly relevant for scholars interested in studying the body in its social relationship with new (bio)technologies. After its reading, new questions related to the body (and beyond) will arise.

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Stefano Ossicini

L'universo è fatto di storie non solo di atomi. Breve storia delle truffe scientifiche [The Universe is Made of Stories, not Only of Atoms. A Brief History of Scientific Frauds]
Vicenza, Neri Pozza, 2012, pp. 286

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Scientists' research activities have changed considerably since second world war. In addition to an exponential increase of researchers, there has been a significant growth of publications and magazines proposing contributions from various disciplines. Moreover, this growth is linked to the scientists' skills to communicate in an ever faster way, being able to propose results in advance not only to their own community but also to different media. This produces various effects.

The first effect regards a dissemination and availability of scientific news as never recorded in the past. Take for example the medical field, where users have now access to entire databases of biomedical research. These "fields of data" are increasingly used to understand where research is going to take place, to propose treatments and find possible solutions to diseases.

A second effect concerns the difficulty of holding a fast paced which-does not allow journals and peer review systems to work out the necessary checks, so that the meshes of the system cannot hold back the inevitable imprecisions and inaccuracies; not to mention real scams.

The book by Stefano Ossicini allows to reflect on high-profile cases of scientific fraud, but not in order to expose the failures of science or to warn against the supposed authority of the scientific world. It allows us to notice what is changing in the world of research and how the profession of scientist is undergoing rapid changes. In the face of emblematic cases, in some ways paradoxical and sometimes comical, it is possible to distinguish some elements that characterize the role and function of the scientist, now seriously in question.

First of all, we grasp that the process of justification, i.e. the set of methods used by scientists to prove their results, is today increasingly complex and articulated. It is not so easy to produceaccounts which allow (for example) to replicate experiments and, as Kuhn (1962) and Feyerabend (1975) already stated, you cannot easily distinguish between the context of discovery and justification. Moreover, scientists today meet even more difficulties on how to communicate the context of research where ideas, projects and results were produced.

Another important element concerns the authority of scientific institutions. There are strong beliefs assigning an impartial role to science, with the expectation that scientists' messages do not lose their objective and unambiguous character. This is strongly disputed and probably due to a lack of understanding of the historical processes with which science has evolved. These processes demonstrate how disputes and clashes between different positions have always been one of the characteristic features of scientific activity, especially when scientists face public contexts.

The argumentative study of scientific frauds through the analysis of original documents allows checking the dynamics of scientific activity. Here, the establishment of an inquiry commission, the withdrawal of awards, the firing of scientists (as in the case of the high-temperature su-

perconductivity – p. 205) not only report the weakness of a system that must come to extreme measures to defend itself, but show how scientific certainties are constructed through non-linear paths and contingencies.

The author proposes some interpretations on the *ethos* of scientists citing the well-known contribution of Merton. However, we do not find in the text references to the decisive contributions made by Latour (1999), Barnes (1974) and others who have proposed the need of a new process of self-reflection, given that: "scientists are more like players in an intense, winner take-all competition for scientific prestige and the resources that follow from that prestige" (Goodstein 2002, 31).

As demonstrated by scientific fraud analyses, the scientist is not a disinterested servant of the public good nor his/her activities could be fully transparent. Rather, scientists are restricted by instruments, money and attitudes of their colleagues (Feyerabend 1975). At the same time, the key role of science and scientists in contemporary society need to develop a reflexive attitude towards their own activities, questioning things we have always taken for granted.

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Cristina Zucchermaglio, Francesca Alby, Marilena Fatigante and Marzia Saglietti

Fare ricerca situata in psicologia sociale [Performing Situated Research in Social Psychology]

Bologna, il Mulino, 2013, pp. 152

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The book – *Performing Situated Research in Social Psychology* – written by four members of the LInC (Laboratory of Interaction and Culture, at the Department of Psychology of Development and Socialization Processes, Sapienza University of Rome) maintains the promise announced by the title and stated in the introduction. The book in fact narrates, in a very vivid and detailed way, the *situated practices* of doing ethnographic research by retracing its various steps – from the negotiation of access to the field to the construction of empirical data, analysis and presentation of results to research participants. Through a dialogic and reflexive approach, this text reveals practices and empirical solutions, tricks of the trade, precautions, problems and mistakes that are re-situated and adapted to the local context of the empirical study carried out in a wide range of fields.

The book is not simply a manual for novices, even if it thoroughly describes skills, methods and instruments needed for this kind of research. Any chapter and situated practice characterising the research activity is illustrated by the inclusion of: episodes and anecdotes coming from the field, photos of people working together, maps of workplaces, multimodal transcriptions of conversations between social actors, letters obtaining permission and authorisation to enter the field. The examples included in the book reveal the importance of detailed descriptions of sociomaterial practices occurring and performed by actors as observed while carrying out their daily activities, as well as by researchers doing research. The first chapter of the book begins with a three-surgeon team involved in an operating practice. This emblematic situation allows the revelation of the main object of interest in this kind of research. The interactions among the tree surgeons in fact make it possible to grasp the organisation of social action and cognition in action, both taking place in the interaction between the social and material world. Revealing more or less the same ethnomethodological perspective adopted by *Workplace Studies* (Luff *et al.* 2000), authors state that it is only by resorting to publicly accessible configurations of various *semiotic resources* (language, gesture, glance, body position, instruments and artefacts) that actors successfully carry out joint actions (empirically observable and understandable by the co-present colleagues as well as researchers in the field).

In the same way, the second chapter of the book starts with the narration of an episode occurred to one of the authors during a university seminar on social interaction. Through video-sequences showing a discussion among training course participants, students learn (step by step and under the professor's supervision) to acquire the professional vision (Goodwin 1994) to look at (and see) the multimodal resources (speech, body movements, mediating artefacts such as slides, notes and notebooks) used and emerging during the interactions between the actors of the video. Chapter two announces and plays the role of a theoretical manifesto of the book, by arguing and legitimizing an interesting interpreta-

tion of science for STS scholars, which permeates throughout the book as I will now try to demonstrate.

Even if the authors situate themselves within the cultural and interactionist perspective of social psychology, by referring to major scholars (Mead, Vigotskij, Hutchins, Suchman) and to key-concepts (interaction and culture, community of practices, language as social action, cognition in practice, the mediation of artefacts), they show *de facto* how their perspective and practices are shaped with other disciplines. While they are inviting to overcome the vision of psychological and cognitive process (to collaborate, to take decisions, to learn) as purely mental and individual phenomena, they show how to empirically investigate, within the material world, the connection among cognition, interactions and mediated actions. However, they also exhibit the commonality with similar approaches and scientific practices performed in sociology, language and visual anthropology and STS studies. This proves the blurring of boundaries between disciplines sharing similar ways of doing research and reveals a community of research practices.

Moreover, authors demonstrate coherence in maintaining the same theoretical view both to study the practices carried out by actors within technologically dense environments (see the Conversation between Bruni, Pinch and Schubert in this issue) – by stressing the collaborative dimension and the role of mediation of artefacts – and to narrate and reflect on the sociomaterial practices of their research. By referring to a study conducted in an IT company in order to analyse the activities of a team of web designers (Zucchermaglio and Alby 2005), they show how the researcher's interpretation can change depending on whether the attention is only focused on discursive practices or also on the role of objects and technological artefacts (boards, web pages, monitor, sheet of papers) mediating and organising daily work. The epistemological posture of the book is also well argued by stating that the empirical material is always constructed not only through the mediation of a heterogeneity of instruments allowing its "collection", but also through the mediation of the researcher's theoretical view, which allows the material to emerge as significant, salient and interpretable (p. 30). The ethnographic observation once again emerges as a peculiar form of professional vision (Goodwin 1994) and the researcher sees through an externalised retina (Lynch 1988), i.e. the research instruments constructing the phenomena to be observed and allowing these phenomena to become visible. By referring to the pioneering video-based studies conducted by Goodwin (1994) about an expert archaeologist teaching the professional vision to a novice, and by Mondada (2006) on the co-design performed by a group of architects, authors narrate the potentialities and risks of using video. By focusing on otherwise little-known or non-visible "objects", while neglecting others, video-based research implies both the choice of one perspective framing the event and the use of various cameras (mobile and/or fixed) to grasp and make visible actors movements, orientation, deictic gestures and glances

directed toward some pertinent artefacts (maps, pens, trowel, Munsell's colour graph) and places. Authors also give advice on how to do multimodal transcriptions of these video-data, which are not faithful and objective reproductions, but constructions implying choices about what is relevant or not for both the theoretical perspective of the researcher and the actors involved in their activity. They graphically reproduce the principles of transcription of the Conversation Analysis stated by Jefferson and present an example of multimodal transcription taking into account turns-talk, prosodic and sequential aspects, gesture, glances and speeches emerging in the interactions. Finally, they illustrate the tricks used by Goodwin (such as photos and arrows indicating the direction of a glance or gesture) to highlight all the pertinent and multimodal resources used in interaction.

The choice of research topics is oriented by theoretical, epistemological and methodological choices and there is neither a unique method nor a methodology. Authors describe all research steps, showing that the ethnographic methods must be flexible in adapting to the variety of contexts. The attention given to the delicate and time-consuming step of entering the field reveals all the precautions the researcher has to take to formulate the request (an exemplary request letter is shown) and stipulate the informed consent (by indicating the respect of some ethical principles, the aims, instruments, methods of research, as well as the treatment, use and restitution of results). By doing so, authors show that participants – and not simply passive 'research subjects' – are interlocutors and legitimate partners of the knowledge process production (p. 56). At this step, researchers should also be able to understand and overcome the "boundary-making artefacts" (work schedule, badges, doors and gates) and negotiate with gatekeepers, intermediaries and guarantors to obtain the authorisation for access to the field by ensuring the anonymity of actors. At this first step, the research has already started since the fieldworker can familiarise with the context, the participants linguistic repertories and practices, while trying to identify informers and mediators (who introduce him/her to the actors and accompanies him/her on a tour), and acquire the trust and reciprocal understanding that needs to be renegotiated along the field research. The quotation of a text message used by an informer to present the research in an IT company, and the humour characterising the reactions of the web designers, reveal from the beginning of the fieldwork the informal and humorous communication in this community of practices.

Authors empirically demonstrate how this kind of research is also *emic*, since instead of imposing the researcher's meanings and interpretations, it considers those of the community members and invites the evaluation of the quality of this situated research by criteria substituting traditional ones: reliability, validity and repeatability. They instead propose to evaluate the situatedness (methods, results and interpretations situated in the specific domain where the research is carried out), contingency (as-

sessment of the values of research results in this particular community and for these social actors) and reflexivity of the researcher. "The researcher is not a miner who extracts the data which until that moment was deeply hidden, but more of a traveller who searches significant stories to tell upon his return, to recount stories and voices he needs to hear and communicate with the people he met during his travels" (Kvale 1996, cit. p. 35). The authors, throughout the book, take reflexivity as a research practice, by critically monitoring their practices and being aware that interpretations depend on the researcher's position. The researcher is also situated within his/her own history, gender, social and professional origin. It is only by narrating in a reflective way how the research object is constructed (according to his/her own biography, his/her belonging to particular professional and interpretive community, his/her ethical values) that s/he becomes aware of his/her own perspective in viewing the phenomena. This reflexivity is also based on the confrontation with the practices of other researchers, on the discussion of empirical material and interpretations of phenomena, and is carried out by the authors in their encounters within the laboratory. Subjectivity in research, often lived as a threat (or obscured), is transformed into a resource to improve the quality of the analysis. Research processes are not linear, logical or rational. They do not follow the models written in the scientific papers, which are purified (Latour and Woolgar 1986) and intended to perform an ordered, rational rigorous and systemic reconstruction of knowledge. Research processes are instead situated, dialogic, social and mediated by instruments and local artefacts. In the same way, the researcher's team jointly constructs situated interpretations of data. The principles of this research step are: the recursiveness (to frequently repeat the analysis of the same corpus of empirical data to highlight various aims and topics); *the construction of situated interpretations* (respecting and using the participants' points of view and interpretive categories, with an ongoing analysis that implies a skilful and time-consuming practice of "sticking with the data"); the public and sharing nature of practice (jointly carried out by more researchers confronting a plurality of voices, views and interpretations of the phenomena,). This is an internal research group validation of interpretations, even though there are some analytical traps the researcher can fall into during the data session. Just to name the most common: detailed summary of what participants are saying instead of grasping how they produce meaning; use of ethnographic excerpts isolated from the interactive context; temptation to adopt an impersonal and universal style of scientific writing by extracting the observations from the local context of their production to generalize them.

Finally, the restitution of research results to participants, frequently neglected in the manuals, is not an occasion to communicate already closed and sealed results, but rather a way to reward and recognize their collaboration and to confront and share situated interpretations, by trying to use the words of practitioners and answer their doubts in order to acti-

vate a reflexive process on what is taken for granted. This implies the risk to be overcome by the "predatory nature" of data collection in scientific research (Cannella and Lincoln 2007) and to change the analysis by considering interpretative categories (maybe neglected at a first glance) suggested by practitioners.

The book is truly rich and my review, also situated, cannot represent its richness. My intent was to narrate the theoretical concepts and the relevant details of situated research practices – by quoting some significant ones and neglecting others – in order to meet the interests of the professional vision of STS.

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Stephan Moebius and Sophia Prinz (eds.)

Das Design der Gesellschaft: Zur Kultursoziologie des Designs [Society's design. Insights into design from the sociology of culture]
Berlin, Transcript Verlag, 2012, pp. 430

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It is well known that studies on science and technology pay particular attention to the role played by artifacts in social processes. But this is not an interest exclusive to STS. Nor, as sometimes claimed, is it a theme raised for the first time by Bruno Latour in the gestational phase of actor-network theory. It is instead a topic whose origins date back to the birth of industrial society and its attendant socio-economic analysis, particularly Marxian. It then found fertile terrain especially in semiotics (Barthes, Baudrillard) and the anthropology and sociology of material culture (Douglas, Kopytoff, Miller). More recently, it has appeared with increasing frequency in interdisciplinary studies ranging among technology, design, consumption, and cultural production.

It is therefore not surprising that the book edited by Stepahn Moebius and Sophia Prinz – whose purpose is to lay the bases for treatment of design from the standpoint of the sociology of culture – focuses precisely on this topic within the theoretical framework illustrated by the editors. Whilst the book's title specifically refers to a sociology of design, the introduction furnishes a general scheme for a sociology of objects. This seems to produce a sort of mismatch between the book's title and its content. In fact, not all design is the design of objects, and not all objects are objects of design (at any rate, not all things are artifacts). Designing is a much more complex activity, whose object is a multiform reality. This complexity should be handled by a sociology of design.

Instead, the design that the two editors have in mind is not the activity of design as such. They consider a specific, though important, sector of it: the industrial design of the three-dimensional objects (*Dinge* - things) that populate the world in which we live. It is to this design that they apply the overall thesis of the book: that the world of things and its choreography cannot be reduced to a mere epiphenomenon of the process by which human beings associate with each other. On the contrary, things should be viewed as constitutive elements of practices and subjectivities because they actively give form to body movements, attitudes, sense impressions, and visual perceptions. To paraphrase Bourdieu, they are simultaneously structured structures and structuring structures. According to the authors, only scant reference is made to this idea in contemporary sociological theory.

Whilst to my mind the agency of objects is actually a recurrent, though marginal, theme in some recent sociological theories, strangely

enough the area in which it is almost entirely lacking is that of design studies, design research, and the recent methodological approaches to design. In recent decades, the world of design has discovered 'diffuse creativity': that is, the importance of social networks (rather than the individual's creativity) in determining the outcomes of a design process. The focus is, for example, on participatory design, self-production, or crowdsourcing. Nevertheless, the things, the products, still remain in the background as mere inanimate outputs of complex human processes. Things are not considered to be endowed with agency. I would not rule out that this neglect of the structuring impact of inanimate material on people's lives is due to a sort of guilt complex of contemporary design as it seeks to redeem its 'original sin': that of being born as an instrument which served industrial capitalism to subjugate the masses to the culture of consumption.

Additionally, the theoretical approach entirely centred on the equivalence between design processes and the world of objects is not matched by an equally unitary structure of the contributions collected in the book. They instead range among very different and complementary themes, thus justifying the book's generic title. Architecture takes up the most space in the book, but two articles also deal with communication design. By contrast, no space is given to the most current forms of design, those that go by the names of service design, experience design, design for social innovation, etc.

In this regard, it should be made clear that the book serves a purpose strictly related to the German context, in which the issue of the relationship between the design of objects and social forms has not yet found a recognized ambit of expression and discussion. Moebius and Prinz's intention has therefore been to collect into a single volume contributions (some unpublished, some already published elsewhere) by the principal scholars now seeking, in various respects and in very different ways, to develop a sociology of design in German-speaking countries. The aspect of interest is that, by undertaking this task, the book at the same time furnishes to readers external to the German linguistic space a composite and unitary picture of the debate, the themes, and the research currently ongoing within it. And because the contributions are numerous and well-documented, the book's contents also furnish a detailed account of how the social takes shape through the design activity that (actively or passively) involves material things. The disciplinary backgrounds of the authors – sociologists of culture with a particular interest in design – means that a linking theoretical theme runs through all the contributions. The authors are sensitive to STS approaches, in particular to the omnipresent actor-network theory (but not only this), but they usually frame them within socio-anthropological theories: cultural studies, organizational studies, sociology of culture, cultural anthropology.

The book consists of two main parts. The first part comprises six multidisciplinary essays which, with no claim to consistency, discuss the theo-

retical bases of the topic. The second part of the book instead collects empirical analyses of concrete situations of everyday working and non-working life.

It is difficult to provide an overview of the first part of the book (authors: Karl Hörning, Aida Bosch, Albena Yaneva, Joachim Fischer, Heike Delitz and Gert Selle), and I shall not attempt to do so. However, I would stress that reading the book confirms the difficulty for a contemporary theory of objects to contemplate the two opposed aspects of their social role with consistency and thoroughness. As Aida Bosch also points out in her chapter, objects have a twofold nature. On the one hand, they are semiotic entities: that is, they possess a segnic, symbolic dimension. They are (almost) never in and of themselves, but instead refer to something else. In other words, they are dense with meaning. On the other hand, they are also material entities, and as such they incorporate the traces of an existence, an individual biography, and they then interact with human bodies to open up unexpected possibilities of new experiences. As semiotic entities, they 'speak' to humans with an apparent personality, but they are ultimately the product of the human capacity to produce meanings. As material entities, they seem inert, but in fact they silently exercise their agency in human and non-human networks. Hence the effective social action of every thing is always the product of the inextricable interweaving between its agency and that of the humans whose experiential domain it inhabits.

The second part of the book is a collection of case studies that show the influence of the sphere of objects on everyday life and social organization. They are grouped according the different social spaces with which they are concerned. First considered is the private space of everyday life, with particular regard to the home and the car (authors; respectively Christiane Keim and Mareike Clauss). In both cases, the emphasis is on the gender constructs that architecture and design contribute to producing through the action of their respective artifacts. Then several contributions (Claudia Mareis, Hannes Krämer, Guy Julier, Sophia Prinz and Roger Häussling) are devoted to professional life as regards both the designer profession and other professional activities. If some of these contributions – those on design practices and cultures – are merged together, one obtains a first important nucleus of a sociology of design on the production side. In this regard, it should be pointed out that, while the sociology of fashion has since its origins (e.g. in Simmel) jointly considered the two sides of production and consumption, still today the sociology of design tends to divide between two distinct areas, where production is largely the subject of organizational studies and STS, and consumption the subject of cultural studies and sociology of consumption. This division recurs in the book. Finally, a third group of contributions (by Michael Erlhoff, Ann-Lisa Müller, Hanna Steinmetz and Lutz Hieber) address the issue – sociologically highly topical and delicate – of public space. Here the treatment extends to urban spaces, and design is almost

exclusively thought of as architecture and urban planning. One contribution analyses visual communication in public (urban) space, while the objectual dimension disappears. This is striking, because it highlights a historical shortcoming of design studies compared with the large body of literature that now exists, at global level, on public art.

Overall the book, notwithstanding the inevitable limitations of a collection of unrelated studies, is a rich and important source for the sociology of design, and it makes a stimulating contribution to study on the social role of objects.

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Cover *No Stars,* by Alia Scalvini

Essays

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