Introduction

Making and Hacking

Annika Richterich and Karin Wenz

> "While hacking is a wonderful way of viewing the world, 'making' was a more positive framing for customizing and changing the world."
> (Dougherty 2014)

In August 2014, hackerspaces in the Netherlands issued an open letter to the Dutch *Public Prosecution Service* (PPS): in this document, members of hacker communities from Amsterdam, Heerlen, Utrecht and other cities called upon the governmental institution to revise the definition of 'hacking' as presented on its website (Walboer et al. 2014). While the PPS described it as "breaking into computers without permission", the hackerspace members highlighted that hacking refers to citizens' creative engagement with technologies. Opposing the reduction of hacking to illegal activities, they described hacking as exploration of technological possibilities and boundaries in unforeseen, innovative ways.

Even though this particular initiative was started in the Netherlands, the letter echoes wider, historical as well as ongoing negotiations regarding the meanings and origins of hacking. It seems closely related to earlier requests such as an open letter to the *Wall Street Journal* which was written more than 20 years ago by Richard Stallman (presumably). In this letter, the founder of the *Free Software Foundation* states:

> There's nothing shameful about the hacking I do. But when I tell people I am a hacker, people think I'm admitting something naughty – because newspapers such as yours misuse the word 'hacker', giving the impression that it means 'security breaker' and nothing else. You are giving hackers a bad name. (Raymond 1996: 532)

While one cannot find any explicit reference to this letter on Stallman's own website, similar statements were made in his article 'On Hacking' (n. d.) which he published after a visit to Korea in 2000.[1]

1 In this article on his personal website, Stallman, for example, states "Yet when I say I am a hacker, people often think I am making a naughty admission, presenting myself specifically as a security breaker. How did this confusion develop?" (Stallman n. d.). In contrast, the quote mentioned above has been published in *The New Hacker's*

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Contradictory efforts in shaping the meanings of hacking are therefore far from new – but these negotiations are still ongoing. In popular culture, hacking is usually equated with illegal activities related to breaking into computer systems. Hackers have long advanced to popular subjects of Hollywood blockbusters, already in the 1995 movie *Hackers* (Iain Softley), more recently in *Blackhat* (2015; Michael Mann) and in series such as *Mr Robot* (2015–present; Sam Esmail). In 2015 and 2016, news outlets were dominated by reports on hacking as threat to political and private relations alike. Newspapers and platforms worldwide covered the 'Russian hacking campaign' concerning the email accounts of prominent U. S. Democratic Party members such as Hillary Clinton. In the aftermath, it was controversially discussed if the leaked information was indeed related to Russian intelligence and how this might have influenced the 2016 U. S. presidential election (Harding 2016; Sanger 2016; Heavey 2017).

In addition to the political significance assigned to hacking, it was likewise continuously depicted as threat to personal privacy. This was for example illustrated in the 'Ashley Madison hack' which received much attention due to the sensitivity of data collected by the online dating service. The leaked information not only indicated users' inclination to extrarelational affairs, but also revealed their sexual preferences, credit card details and phone numbers (Goodin 2015). Such public discourses which prominently feature the term 'hacking' show very clearly: attempts to dissociate this notion from illegal practices and cyberthreats by introducing alternatives such as 'cracker/cracking' or 'black-hat' were unsuccessful (see also Jordan 2016).

Interestingly, meanwhile, the term 'making' has increasingly attracted – predominantly positive – attention (Fallows 2016). While 'hacking' often evokes associations with criminal activities and malicious cyberattacks, the term 'making' is being established as a byword for technological creativity and ingenuity. When it comes to the 'maker movement', particularly the personal/communal joy and the educational benefits related to technological DIY culture have been emphasised (Tanenbaum et al. 2013; Halverson/Sheridan 2014). Moreover, it was frequently praised for democratising "access to and information on using tools" (Van Holm 2015; see also Richardson et al. 2013). At the same time, this phenomenon is closely related to the *Make* magazine and the commercial ecosystem of (digital) DIY tools.

Dictionary (1996) and its current online version "The Jargon File: Version 4.4.7" (http://www.catb.org/jargon/html/appendixc.html). This document was originally a communally compiled documentation of hacker culture. Meanwhile, it is solely maintained by Eric Raymond who has been criticised for putting "[...] his own evangelizing into the Jargon File" (Trbovich 2016). We mention this source nevertheless, since it is often referred to as inspiration for similar letters (see e. g. Uytterhoeven 2006). A document closer to the 1988 "Original Hacker's Dictionary" and critical comments on Raymond's editing have been published by Paul Dourish (n. d.).

The emerging coexistence, the links, overlaps and (potential) frictions between hacker and maker cultures are main reasons why it seems relevant to continue reflecting on both terms, as well as related practices, actors and spaces in this journal issue. In doing so, it is not our intention to unanimously define what these notions mean, but rather to investigate how contemporary and past practices have shaped different meanings and entanglements. In this introduction, we will therefore first provide brief overviews of current perspectives on hacking, making and related issues. Subsequently, we will introduce the authors and their specific contributions to this book and relevant debates.

On hacking

The term 'hacking' has its roots in phreaking, hobbyist computing, programmer subculture and the early MIT hacks. Today, it is closely associated with illegal activities (cracking) and computer security issues, and also with coding for free and open source software. The public discourse about hacking in the media shows that hacking is dominantly considered to be a criminal act (Chandler 1996; Jordan/Taylor 1998, 2004; Alleyne 2011; Ziccardi 2013). However, hackers also support certain civil liberties such as freedom of speech and privacy whilst disclosing vulnerabilities of computers and networks. Deseriis (2015) describes hacking as an incision creating a portal into a virtual realm and in turn opening access to data. Following such a positive view on hacking it seems to combine expertise with creativity and a playful approach to technology. Thus, a hack can be considered as a "[...] material practice that involves making a difference in computers, communication and network technologies, which may well be illicit and be subject to seemingly technical criteria of excellence through which community relations are negotiated" (Deseriis 2015: 3).

The 'original' *Hacker's Dictionary*, which evolved at the Massachusetts Institute of Technology (MIT), offers a rather positive definition of the term 'hacker' as well (Steele et al. 1983; see also Dourish n. d.). The dictionary understands a hacker as an individual who is interested in acquiring knowledge about programming systems by venturing beyond their limits (Dittrich/Himma 2006). Here again we see that hackers are understood as skilled individuals who possess a proficiency in network and computer systems as well as a desire for intellectual challenges. That this proficiency can also be used for malicious and criminal activities has led to the aforementioned discourse in society understanding hackers as hostile intruders attempting to gain (or steal) information.

A definition of this activity including both, those who engage in hacking out of curiosity and those who have criminal intentions, is given by Jordan and Taylor (1998). According to Jordan and Taylor, a hack can be considered an activity of a community that endeavours to illegitimately utilise certain networks. A 'good hack' is "the object in-itself that hackers desire", not its outcome (Jordan/Taylor 1998:

760). Hackers use a variety of techniques in order to gain unwarranted access to computer networks, be it through guessing or randomly conjuring or by stealing a password. The nature of these illicit intrusions comprises of three main principles that outline what can be considered a good hack: (1) the tenet of simplicity (these activities must be straightforward, yet also be equally outstanding); (2) mastery (all acts, no matter their simplistic attributes, must emanate from an advanced form of technical proficiency); (3) their 'illicit' quality (these acts must oppose some form of legal or institutional regulations) (Jordan/Taylor 1998).

Hackers are strongly driven by curiosity accompanied by the thrill of illicitly discovering something new online. This results in a common identity, based on shared practices and goals. Being rooted in the assumption that individuals need to be able to open up/deconstruct technology in order to improve and apply their knowledge, hacking has been and still is closely related to developers' involvement in free/libre and open source projects (see also Jordan 2015, 2016).

Hackers and developers of free/libre and open source projects often refer to principles of a hacker ethic. Such a hacker ethic has been formulated by Levy based on a list of pragmatic imperatives and ethical codes. These include unlimited and complete access to computers and networks. Hackers resent any obstacles, be it individuals or laws that prevent them from acquiring knowledge (Levy 1996 [1984]). A key aspect of the hacker ethic is that information should be free from restrictions such as ownership or monetary aims. This call for complete access challenges authorities as it asks for free flow of information through a system of transparency. We know from discussions around *Wikileaks* that this (de-) constructive and sovereign nature of hackers is considered a threat. Computers are then not only viewed as the basis of creativity but also as the tool for uncovering the 'truth'. Thereby, the hack can clearly relate to political goals as in the case of *Wikileaks* and hacktivism. Hacktivism challenges two institutional forces, the first being the violation of human rights and the second being profiteers utilising the Internet as a piece of merchandise or as a commodity (Manion/Goodrum, 2000). Hacking then turns into a form of 'warfare' (Hearn/Mahncke/Williams 2009), hackers engage in to advance their political agendas. Nissenbaum claims that hacktivism is often associated to "[...] anti-social, possibly dangerous individuals who attack systems, damage other people's computers, compromise the integrity of stored information, create and distribute viruses and other harmful code, invade privacy and even threaten national security" (Nissenbaum 2004: 198). But, hacktivism can also be viewed as a form of civic participation that is politically motivated as hackers are prompted by their desire for social change (Himma 2005; Jordan 2009, 2015; Hanley 2011; Hampson 2012). Proponents of hacktivism justify their acts with the claim that political and institutional superpowers prevent individuals from accessing their fundamental human liberties. Additionally, these acts are conducted in order to advance one's right to freedom of expression. By utilising the Internet, individuals are given the ability to push and challenge political ideologies and express their points of view. Within hack-

tivism, various disruptive digital practices are utilised for activist purposes and interventions, some being highly contested among involved actors. Scholars such as Gabriella Coleman (see Coleman 2012, 2013a, 2013b, 2014) have empirically explored and shown how practices of hacking have been relevant to activist movements such as *Anonymous*. Hacktivism gains its motivation from offline political issues through online means described as a practice of "acting on media" (see Kubitschko in *In conversation with*). Hacktivists utilise technology as a means for assisting non-hacking groups to achieve certain objectives, thus politicising the role of technology in relation to society. They have been depicted as an extremely politicised unconventional movement using the Internet to castigate globalisation and corporate control (Nissenbaum 2004; Paget 2012). Actions by hacktivists such as *Anonymous* are motivated by an eagerness to inflict chaos in the name of 'lulz', free speech and to defy those who wield power (Coleman 2012; Wong/Brown 2013; Fuchs 2013, 2014).

Public institutions and corporations have long discovered the potential of hacking as highly creative, collaborative and hence profitable practice. Hackathons are widely used as innovation grounds, and 'ethical hacking' is being explored by educational institutions. As a form of IT competence, hacking expertise is in high economic demand. Moreover, we can increasingly observe the use of 'hacking' in a more figurative, metaphorical sense: you can hack your food, your furniture, your wearables, spaces (such as museums), biology and even your life – at least according to topical websites and social media. This is of course not an entirely new discourse. With regards to Stewart Brand's 'Spacewar' article, published in the *Rolling Stone* in December 1972, Evgeny Morozov described the term's implications: "To convince consumers that they were rebels, [Stewart] Brand first convinced them that they were 'hackers,' [...]." (Morozov 2014)

On making

While the term hacking has been around since the 1950s, since the 2000s one could witness the rise of a technologically inspired revival of DIY culture, commonly labelled 'maker movement' (see e. g. Davies 2017). It has been described as global network of somewhat idealistically motivated (Hatch 2013) and entrepreneurial minded (Anderson 2012; Lindtner 2015; Van Holm 2015) communities and individuals dedicated to creating (technological) objects. Makers' engagement and interaction are said to rely on virtues such as sharing, learning and self-expression (Hatch 2013; Foster et al. 2014). The movement is often depicted as part of a "new industrial revolution" (Anderson 2012) in which affordable and accessible tools such as 3D printers enable individuals to engage in tailor-made manufacturing more easily and on a comparatively larger scale. Moreover, this trend is frequently hailed as digital democratisation of production and manufacturing (Anderson 2012: 111 ff.; Stangler/Maxwell 2012). Comparable to the relevance of F/OSS for

hacker culture, open source hardware – such as the *RepRap* 3D printer which is capable of printing some of the parts needed for another machine of the same kind – is essential for the maker movement (Powell 2012; Ratto/Ree 2012).[2] This does not mean that open source/free software is not relevant to the movement, on the contrary; but deliberations concerning software have been complemented by efforts aimed at realising similar characteristics and values for material, technological objects. In this sense, the maker movement also goes hand in hand with the development of digital technologies enabling civic creativity and individuals' involvement in manufacturing. It has been critically remarked that – as so often – the dawn of the movement has been accompanied by overly optimistic promises and overstated manifestos (see e. g. Morozov's 2014 article in which he comments on Hatch [2013] and Anderson [2012]); but more recently, also inherently critical approaches have been discussed (Ratto 2011; Heertz 2012; Alper 2013; Kohtala 2016). Ratto suggested for example 'critical making', in the spirit of critical design, as a reflective process of technological creativity which explores the social implications of tools, practices and products. With this concept, the author wishes to bridge between "[...] critical thinking, typically understood as conceptually and linguistically based, and physical 'making,' goal-based material work" (Ratto 2011: 253). Such rationales, as he emphasises, can already be found in (critical) design practices and other forms of artistic research (Ratto 2011: 252–254).

Just like the term hacking, the meanings of "making" and being a "maker" are in this sense contested and in flux. While "making" is often related to the employment of digital technology, it is also used when referring to more "traditional" creative practices such as knitting, sewing, woodwork or metalwork. Particularly in relation to hacking, Gui Cavalcanti, founder of the communal fabrication centre *Artisan's Asylum*, illustrated the understanding of making as "material creativity":

> No amount of cajoling on my part will get a professional artist or craftsman unfamiliar with the terms to call themselves a "hacker", or their vocation "hacking"; in fact, if I were to say "I like how you hacked that lumber together into that table" to a professional woodworker at *Artisan's Asylum*, I would run the significant risk of insulting them. (Cavalcanti 2013)

While this quote hints at crucial differences regarding common associations with both terms, it remains to be explored how the actual practices of hacking and making may differ from or resemble each other. Yet, in light of the terms' connotations, one should also consider how they have been (and may be) strategically used.

2 Ratto argues that "[...] the real value of the RepRap, as seen with other open source initiatives, lies in the manner in which the developments become appropriated and modified to suit alternative needs and visions. Many hackers have appropriated RepRap electronics to make customized Cartesian fabrication robots, and perhaps the most well known of these is the MakerBot" (2012).

In this context, it is insightful to look at one of the main icons and (commercial) drivers of maker culture: the *Make Magazine*. *Make* is advertised as news, information and instruction platform for "DIY projects and ideas for makers" which "[...] celebrates your right to tweak, hack, and bend any technology to your own will" (*Makezine* n. d.). It appears bimonthly and is linked to the popular online platform *Makezine*. The magazine's inspiration is often traced back to the *Whole Earth Catalog* with its DYI focus and slogan "access to tools". It has even been called the WEC's "modern-day equivalent" (Foster 2014), but as opposed to this, its founder Dale Dougherty rather emphasised magazines such as *Popular Mechanics* and *Popular Science* as important influences (Dougherty 2014). *Make* was launched in 2005 by *Maker Media, Inc.*, originally as part of O'Reilly (until its spin-off in 2013; O'Reilly Media 2013). The company likewise initiated the well-known *Maker Faires* in 2006 (see also the article by Kat Braybrooke and Tim Jordan in this issue). These fairs take place in cities worldwide and are based on individuals/entrepreneurs showing, sharing and potentially selling their expertise and DIY creations.

Make magazine is on the one hand an interesting case, since it is crucial for the popularisation of certain practices and tools among DIY enthusiasts, and hence plays a role for their (commercial) success (Tocchetti 2012). On the other hand, it is insightful to look at the magazine's emergence, in particular its naming: originally, *Make* was supposed to be called *Hacks*. When asked about the title of the journal, its founder Dougherty stated that his children neither understood nor liked the idea to call it *Hacks*. In an interview, he reflected on his reasons for reconsidering the title: "Originally I was going to call it Hacks Magazine [...]. While hacking is a wonderful way of viewing the world, 'making' was a more positive framing for customizing and changing the world." (Dougherty 2014) Especially the last part of his answer, that is, "making as more positive framing", insinuates that *Make's* founder was concerned about the commercial sustainability and potential target groups of a project called *Hacks*. Implicitly, his comment also suggests that hacking is strongly associated with disruptive or even illegal activities and seems problematic for use in the title of a commercial magazine. Ultimately, this concern relates back to the largely unsuccessful attempts by hackers such as Richard Stallman or journalist Steven Levy who tried to establish a meaning of hacking which is not metonymic with illegal IT security infringements.

Comparable, strategic replacements of the term "hacking" with "making" are also discussed among members of hackerspaces as well as makerspaces. As outlined above, hackerspaces have evolved as physical venues for individuals who are involved in and/or feel associated with hacker culture. Similarly, also *makerspaces* have been launched as meeting places for individuals affiliated with DIY culture. They (potentially) create a communal environment, facilitate learning (Schrock 2014; Sheridan 2014) and enable access to required spaces and tools which some members would not be able to afford or be interested in maintaining on their own (Kemp 2013). Apart from the label "makerspace", similar shared

machine spaces/shops have been opened as the so-called *FabLab* (fabrication laboratory; see e. g. the article by Sabine Hielscher in this journal issue; Walter-Herrmann/Büching 2014; Kohtala 2016) or *TechShop* (Stangler/Maxwell 2012: 6; Dickel et al. 2014). While the emergence of such creative spaces has been greeted with notable enthusiasm – regarding, for example, their enhancement of digital literacy and creativity – more recent research has likewise stressed problematic aspects of maker culture more generally (Ratto 2011; Heertz 2012; Chachra 2015) and makerspaces in particular (partly similar to those remarked with regards to hackerspaces; see e. g. Liz 2014; Toupin 2014). For example, Alper pointed out that "[…] 8 in 10 makers are male, their median household income is $106,000, and 80 % have a postgraduate education" (Alper 2013: 1; based on random sample from *Maker Faire* exhibitors, *Make* magazine and newsletter subscribers). Such issues will also be addressed in the article by Kat Marie Braybrooke and Tim Jordan (e. g. with reference to Csikszentmihalyi 2012), but for now we will go back to the link between "hacking" and "making" and how these terms may be used by involved individuals.

"What's in a name?" remains particularly a (practically) relevant question for members of hackerspaces and makerspaces. It concerns the naming and descriptions of their communal spaces as well as individual practices, and how the choice of words may affect their perception (as e. g. noted in the mentioned quote by Stallman). An insightful online discussion concerning this issue unfolded, for example, among members of the *Knox Makers* community (located in Knoxville, United States).[3] It emerged in response to the aforecited article by Cavalcanti (2013) who likewise started from the question "Is it a Hackerspace, Makerspace, TechShop, or FabLab?" and emphasised the blurring boundaries between differently labelled spaces. The posts of *Knox Makers* members illustrate some of the tensions and deliberations relevant to the use of the terms hacking and/or making as well as hackerspace or makerspace (KnoxMakers 2013). Four points seem particularly remarkable here:

The initiator of a thread titled "Hackerspace vs Makerspace vs TechShop vs FabLab" suggests seeing making as an element of hacking. Using the comparison hacking is to making "as squares are to rectangles", it is implied that all hackers are makers, but not all makers are hackers. According to this view, one surely makes something when hacking, but does not necessarily engage in hacking when making something. This comparatively pragmatic approach is complemented by a second position depicting and employing making as more "family-friendly", unsuspicious alternative to hacking. It is used to speak about practices which

3 In U. S. contexts, the maker movement has been particularly promoted with reference to the history of American inventors, "garage startups", and civic creative engagement. The *Maker Faire* at the White House in 2015 was, for example, advertised using the hashtag "NationOfMakers" and by stating that "America has always been a nation of tinkerers, inventors, and entrepreneurs" (White House 2015).

would be considered hacking by members, while pragmatically avoiding the term in order to circumvent confusion and misunderstandings. Members state to preferably use "making" when explaining their involvement to an "audience" merely familiar with dominant public discourses of (illegal) hacking. A third, more critical position is that making is a term which commercialises hacking. It is seen as closely related to *Make* magazine and is accused of selling out DIY culture. Making and hacking are here interrelated in different ways: as general versus specific label for technological creativity; as communal lingo versus strategically used general term; and lastly as antagonisms with hacking as subcultural and making as commercialised practice. These perspectives are especially insightful, since they also indicate that even within local communities the meanings of hacking and making are continuously negotiated and divergent. Moreover, they illustrate opposing views regarding the relevance of keeping the heritage of hacker culture alive by maintaining its terminology. While some members pragmatically adjust their choice of words to certain audiences, others still seem to carry forward the legacy of hackers such as Stallman. To them, asserting a positive meaning of hacking – rather than assigning these to "making" – goes hand in hand with maintaining the legacy of developer (sub)culture.

The fourth, main issue raised in the *Knox Maker* thread brings up the matter of inclusivity. Due to its broader appeal, making, as highlighted by a member, may also open up the community to a more diverse range of practices and (potentially) individuals: "A makerspace includes more things and hopefully more people as well. I want to work with people who do amazing and creative things, even if they have nothing to do with electronics and computers." (KnoxMakers 2013) This position also relates back to concerns related to the often homogenous demographics among members of hackerspaces and makerspaces. Here, the term "making" is not only used in order to avoid confusion, but also to communicate a community's accessibility and appeal for a wider range of potentially interested members. This approach seems particularly relevant in light of more recent debates on inclusivity in hackerspaces/makerspaces (Alper 2013; Toupin 2014; Davies 2016). Within hacker as well as maker communities, one can observe deliberations and efforts to include more diverse audiences. These often concern communal gender gaps, have fostered heated debates and in some cases revealed misconceptions followed by "lasting feminist mockery and ire" (Henry 2014). In a hackerspaces.org mailing list thread on "Women in Makerspaces", it was, for example, stated: "If a hackerspace has one female and she wants more females in the hackerspace then she should start a campaign to find more females. It could be that she host[s] a class about e-textiles or whatever it is females like to talk about." (Women in Makerspaces 2013) While this comment mainly yielded mockery, Liz Henry, cofounder of the (women-centred) hackerspace *Double Union*, likewise stressed that the thread in which this line appeared also included "[...] many truly appalling, misogynist, sexist posts" (Henry 2014). Inclusivity, related negotiations and tensions are hence still a core issue for techno-creative communities.

The term "making" may to some appear as more inviting alternative to hacking, but one should yet question the implications and motivations of such linguistic attempts at signalling inclusivity.

Likewise, Vaage (2016) shows that what is considered a hacker or a maker often depends on the context, as those presenting themselves as hackers in some situations (hackathons, within their hackerspace) call themselves a maker in situations when it seems more convenient to avoid discussion about illegal and illicit activities and focus on skills and creativity instead.[4] The papers of this issue represent both, hacking and making, and the connections between those practices by presenting original empirical, theoretical and methodological reflections on hacker and maker cultures. The main section starts with the paper by Kat Braybrooke and Tim Jordan on "Genealogy, Culture and Technomyth: Decolonizing Western Information Technologies, from Open Source to the Maker Movement". Braybrooke and Jordan investigate the narratives about practices related to hacking and making. These narratives, or technomyths, claim the transformative potential of these practices in respect of technological innovation and also in respect of cultural and social change. The examples investigated are *One Laptop Per Child* in Peru, *jugaad* in India and *shanzhai copyleft* in China. By examining these three "myths of information technology" through materialist genealogy, the underlying assumptions are analysed and critically discussed. The analysis shows that "[...] technological determinism of information technologies, neoliberal capitalism and its 'ideal future' subjectivities, and the absence and/or invisibility of the non-Western" are dominating these technomyths.

In the aforementioned *Makezine* article on differences between various spaces associated with hacker and maker cultures, Cavalcanti writes: *TechShops* and *FabLabs* "[...] are the two easiest titles to untangle, for a very simple reason – they're trademarked names! Referring to a space as a 'TechShop' or 'FabLab' when it's not affiliated with either business or program is like calling every tissue Kleenex" (2013). But even though *FabLabs* are required to follow regulations defined by the *Fab Foundation* (e. g. regarding types and models of tools), when taking a closer look at individual spaces and communities, significant differences become noticeable. This is what Sabine Hielscher shows in her paper "Experimenting with Novel Sociotechnical Configurations", discussing the *FabLab Amersfoort* as case study. The community describes itself as "bottom up grassroots FabLab" and stresses the importance of ideals such as ecological sustainability and open source technology. By drawing upon domestication literature and its attention to individuals' uses, adaptations, choices and rejections of technology, Hielscher examines how indi-

4 Nora Vaage discusses the different concepts biohackers use to refer to themselves, for example, as either hackers or makers, and their practice as bioart, biohacking, biofabbing or do-it-yourself science. Dependent on the context, the acceptance of their audiences or the focus they want their practice to be conceived, a different term is used.

viduals engaged in the *FabLab Amersfoort* interact with technologies, especially in relation to broader social and environmental changes.

A different approach has been chosen by Minka Stoyanova in her paper "Reading Makers: Locating Criticality in DIY and 'Maker' Approaches". Stoyanova traces philosophical roots of an artistic maker subculture by reflecting, for example, Aristotle, Arendt and Heidegger. Stoyanova thereby situates making as a form of artistic practice at the intersection of ideas related to the philosophy of technology. As Braybrooke and Jordan, when discussing technomyths, Stoyanova also points to a discourse around maker culture associating it with a capitalist agenda. Her goal is to show that we can find artistic and philosophical approaches to technology as well that "are rooted in playfulness and critical engagement".

Sebastian Dahm's paper reflects on methodology. With the title "'Just Do It!' Considerations on the Acquisition of Hackerspace Field Skills as an Ethnomethodological Research Technique", Dahm investigates hackerspaces and their practices by applying an immersive ethnographic methodology. By doing ethnography and being engaged in an own project at a hackerspace, Dahm could identify two essential stages of practical insight: (1) observing in order to practice and (2) practice in order to observe. Only through the second stage, an understanding of members' practices and an interpretation thereof was possible.

Hackerspaces and makerspaces indicate an increasing institutionalisation of related movements and emphasise physical aspects of developer and DIY practices. Yet, individuals' communal interactions are not only characterised by digital creativity, but likewise facilitated by Internet technologies. Jeremy Hunsinger's paper "Hacking Together Globally" elaborates on this entanglement between local practices and links across hackerspaces. His paper examines *Global Synchronous Hackathons* (GSH): events that were synchronously hosted by hackerspaces around the globe. Participants were connected with each other by video streams to share activities and experiences in real time. Hunsinger analyses these synchronous hackathons through video repositories. He particularly focuses on the question which norms are being communicated, enacted and mediated between different actors and technologies.

The section *Entering the Field* is dedicated to initial empirical and conceptual work. This part of the journal issue aims to provide a platform for researchers who would like to initiate discussion concerning their research material or methodological insights. Starting this section, Justin Marshall and Catharine Rossi elaborate on methodological considerations for a craft-based participatory approach to maker cultures. Based on their exploration of the maker movement in China, visits and creative encounters during a *Digital Craft* workshop, the authors argue that empirical, immersive and inclusive approaches of social anthropology foster an emphasis on the perspectives of involved makers. They suggest "craft anthropology" as a methodology to be further explored in diverse spaces and cultural contexts, since it shows potential in encouraging responsiveness, empathy, communication and cocreation. Likewise based on a workshop setting, Kate O'Riordan,

Jennifer Parker, David Harris and Emile Devereaux discuss "Making Sense of Sensors". The workshop described was used to present and reflect upon several artistic projects about biosensors. Biosensors offer information about inner bodily states to a user. The project radically integrated biosensors and the information they provide in ways making the inner state also visible while communicating with others. Thereby, they offer new ways of communication, even "radical communication beyond the human". Opposite to the promises made in the development of biosensors, the authors observe that the use in artistic contexts often fails. Failure, thinking about design processes and making have led to reflections on possible new ways to use devices also to communicate signals beyond human perception.

While O'Riordan, Parker, Harris and Devereaux present artistic projects in the moment of their design and making Angela Krewani's contribution "Urban Hacking" investigates historical examples of media art and their relation to a practice called urban hacking, interventions in public, urban spaces. The examples from Fluxus and Viennese Actionism analysed in this paper show that urban hacking is not necessarily related to technology but to subverting the social and to a political and aesthetic approach to urban space. The examples can be understood as forerunners of projects using mobile technology within urban spaces nowadays. The projects established subversive media uses which can be called "hacking" in a spatial sense.

The final section *In Conversation With …* sheds light on recent developments in hacker, maker and DIY communities. Michelle Poon and Wilhelm E. J. Klein, former members and directors of the hackerspace *Dim Sum Labs*, reflect on challenges, peculiarities and conditions for establishing and maintaining a hacker community in Hong Kong. They share personal experiences as well as excerpts from interviews with the members and affiliates of *Dim Sum Labs*. Their contribution elaborates on individuals' reasons for becoming and being involved in hackerspaces, what it means to be engaged in hacker and maker cultures and whether/why clarifying the differences between these interrelated strands actually matters. Finally, in an email interview with the editors, Sebastian Kubitschko talks about his research on hackers' political significance and engagement, particularly with regards to the German *Chaos Computer Club*. His emphasis on the diversity of hacker and maker cultures echoes the personal statements of *Dim Sum Labs'* affiliates. The title of his interview "There simply is no unified hacker movement" likewise reflects a main argument illustrated in this introduction and the articles included in this issue: there is no such thing as a unified historical evolution of neither hacker nor maker culture. Instead, multiple genealogical developments and attempts at defining what these notions imply coexist, not always harmoniously. Likewise, potentially networked, but geographically dispersed and culturally diverse hacker, maker and DIY communities constantly innovate and (re-) negotiate their identities in technosocial practices; these negotiations occur in interaction with versatile economic, ecological and political developments.

We hope you enjoy this fourth issue of the *Digital Culture & Society* journal. As editors, we would like to thank all authors and reviewers for their contributions, collaboration and commitment. Special thanks moreover go to all those hackers, makers, tinkerers and creative thinkers who inspired the included articles and this issue!

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