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Enactments of Change. Gender and Technology as material-discursive practice
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Powerful entanglements and meanings of difference between machines and humans, designers and users, women and men become enacted in technical devices. Is there a potential for an emancipatory interference with industrial machines, their users and their designers? To answer this question, this paper develops a theoretical account from a feminist new materialist perspective on phenomena as political objects, machines as material agents, and gender as a material-discursive practice. To exemplify the theoretical claim, findings from an interdisciplinary research and development project are presented and discussed. Thereby, I argue for emancipatory interferences with machines on three levels. First, emancipatory interferences take place in the everyday “intra-action” between professional users and their machines with regard to the production of goods and thus gainful (self-)employment. Second, emancipatory interferences occur within collaborative research of these practices, and intervene in the apparatus of that research. Third, emancipatory interferences occur in the machine design process by enacting heterogeneous processes of experiencing and knowing that are diversely situated within both practices and practitioners in the workplace. I demonstrate how the project supported enactments of change as transformative becomings in the situated production of knowledge and items created with industrial machines.

The argument of this paper is that enactments of change can be provoked and made visible through queer-feminist studies in technology development and research. To understand gender and technology as material-discursive practice helps to see how these enactments of change can be researched and installed.

Keywords: gender, emancipatory interference, material-discursive practice, industrial machine, engineering

The Future of Sustainable Buildings
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An historic agreement to combat climate change towards a low carbon, resilient and sustainable future was agreed as binding agreement by 195 nations in Paris in December 2015. The agreement central aim is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. Additionally, the agreement aims to strengthen the ability of countries to deal with the impacts of
climate change. To reach these ambitious goals, appropriate financial flows, a new technology framework and an enhanced capacity building framework will be put in place, thus supporting action by developing countries and the most vulnerable countries, in line with their own national objectives.

The sustainability of buildings, which means the application of the principles of sustainable development, plays a key role due to the enormous material or energy flows and the associated environmental impacts as well as due to its economic and socio-cultural importance. „Sustainable Construction” in this context means, to plan, build and operate buildings holistically from a lifecycle perspective in a way they are an asset for future generations and not a burden. The current trend towards energy-efficient buildings highlights the construction products and their related embodied energy or greenhouse gas emissions, in addition to life-cycle costs and other aspects regarding the optimization increasingly into focus. The keynote is primarily devoted to the methodological questions for the operationalization of sustainable construction and the assessment respectively as well as the implementation in the construction practice. Different opportunities to support the Sustainable Development Goals (SDGs) by sustainable buildings or by digitalisation, such as building information modeling and its implications will be elaborated.

Keywords: sustainable buildings, operationalization of sustainable construction, life-cycle

**Metrics, competition and epistemic capitalism. Shifting valuation practices in the sciences and their consequences**

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The growing importance of research evaluation metrics and their impact on academic research practices has been critically discussed. This is important, but a too narrow focus on metrics and their impact may also obscure their role in wider cultural changes in contemporary cultures of knowledge production. In this talk, I will argue that a focus on academic valuation practices can contribute to a deeper understanding of these shifts. Drawing on work from both STS and the emerging field of valuation studies, I argue that research metrics are not only indicators representing research performance but also infrastructures for the accumulation of forms of worth (credit) that serve as a crucial resource for competition on different markets related to academic jobs, funding or institutional recognition. Epistemic capitalism as a concept aims to capture these forms of non-monetary accumulation of worth in research, but also asks how they play out differently in different institutional contexts. It poses the empirical question how regimes of ascribing worth to research that allow the accumulation of worth (credit) are related to other regimes of valuing epistemic work in a specific empirical context. Drawing on examples from fieldwork in the life sciences, in both academic labs and startup companies, I will first touch on how these accumulative tendencies, if left unchecked, displace or colonize other registers of defining the value of research practices. Second, I will discuss how actors understand and resist these dynamics.

Keywords: cultures of knowledge production, metrics, epistemic capitalism, life sciences, competition
Normalizing by data. Queer perspectives on the rise of data technologies

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This paper follows the assumptions that data are becoming more and more important in our society. Thereby processes and practices of translating the social into (digital) data structures form a constitutive and transformative moment of our current society (see Kitchin 2014; Mämecke/Passoth/Wehner 2018; Houben/Prietl forthcoming). There is a growing body of literature on how this increasing datafication effects social interactions, the social structure of society and the organization of every-day (work) life. Very little, however, is known about the construction of data and data technologies (Iliadis/Russo 2016). In every-day knowledge data – just as numbers – are usually considered to be neutral and objective. This broadly shared belief is expressed in the public outcry following publications of self-learning algorithms producing racist and sexist results – as has been shown for an AI judging in a beauty contest or for Google’s Ad posting algorithm (Datta/Tschantz/Datta 2015; Angwin et al. 2016).

While the rise of big data and self-learning algorithms may itself be understood as a Eurocentric and androcentric project in the light of feminist technoscience (Bath 2009), I want to focus on the normalizing effects of this development. Drawing on Queer Theory this paper tries to understand self-learning, data-driven algorithms as normalizing technologies, i.e. as technologies that take part in the production of Eurocentric, androcentric and heteronormative ‘normality’. By technically pre-structuring what becomes visible and thereby making invisible what does not comply with the cultural matrix of intelligibility, these technologies reify and materialize social inequalities and stereotypes. This in/visibility work must not be underestimated as algorithms literally decide what comes into being in the so-called data society.

Queer interventions must therefore start by questioning the neutrality and objectivity of data technologies and their output. Furthermore, a lot can be learned from Heintz (2007) elaborations on how to challenge numbers. She points out that negating numbers requires either having alternative numbers available or discrediting the way the numbers in question have been produced. Thus, queer interventions into data (technologies) must engage with and scrutinize
the methodological basis by for instance pointing out the flaws in the data bases and algorithmic assumptions. Secondly, it will be necessary to produce alternative data that allows for juxtaposing diverse possible normalities.

**Keywords:** data (technologies), algorithms, normalizing technologies, queer interventions

**Rethinking the Body as a Network: Drawing Inspiration from Japanese Animated Cyborg Bodies**

**JAKEŠOVÁ, Markéta**

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There is a prevalent tendency among Japanese to be skeptical towards medical transplantations of vital organs, especially when their donors should be so-called “brain-dead” persons. This is because it does not necessarily have to be the brain which (alone) ensures a person’s identity and also because the “foreign” parts in the receiver’s body can endanger his or her integrity (cf. Ohnuki-Tierney, 1994). This may indicate an understanding of the body as a compact and bounded entity, however a lot of Japanese anime movies and series offer a rather different picture. Especially works dealing with cyborgs (Ghost in the Shell, 1995), humanoid robots/mecha (Patlabor, 1989; Neon Genesis Evangelion, 1995–6), and virtualization of reality (Paprika, 2006; Denno̤ Coil, 2007) use a sometimes uncannily unstable way of representing all types of bodies. First, the differences between animal, human, vegetal or mechanical bodies are fluid and unsteady, so they change both their form and substance, and second, the bodies seem to flow between material, virtual, and dream realities without any apprehensible anchoring.

This paper aims to propose an integrated understanding of these two techno-socio-cultural phenomena by using some of the philosophical approaches that draw on both Japanese and Western traditions. The philosopher Ichikawa Hiroshi describes various types of the body, which are and are not the same body at the same time: some of them are not limited by the skin but rather represent a structure or a network intimately connected to their environment, other bodies included. The phenomenologist Yuasa Yasuo treats the well-known problems of subjectivity and body-mind unity but instead of taking it as the point of departure and then explaining it, as would be the case in many Western philosophies, he sees it as a possible goal of bodily techniques inspired by Buddhist meditation practice.

Thus it seems that not only is the subject fundamentally embodied (as for example in the phenomenology of Maurice Merleau-Ponty) but most importantly, it appears to be able to absorb and integrate into itself anything (both biological and mechanical) from its environment, and change with it. I will argue that this way of thinking can offer some alternatives to the highly individualistic Western milieu and could even be a better departure for responding to environmental issues while more justly treating all possible relations and connections between different people, biological species, and other entities.

**Keywords:** Actor-network theory, anime, Japan, organ transplantations, phenomenology
Sex Robots and (Re-)Constructions of Gender
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TU Munich, Germany

This presentation seeks to diagnosis and discuss the main difficulties in promoting gender inequality at universities and research centres with a view to present a set of good practices which can help people to deal with those kinds of inequalities within that contexts, as well as to guide policy makers to enhance policies and measures that can actively ameliorate women’s and man’s lives at these institutions. For this to happen, it is our view that a time politics, as well as a diversity politics are needed and they should be integrant parts of a broader equality evolving culture. In fact, recent years were highly prolific in studies addressing gender inequalities across diverse organizations and fields of work. What rests intriguing if the manner in which these results and its recommendations are hardly incorporated in institutional actors' practices. Being part of a broader invisibility and forgetfulness of other scientific results which touch deeply matters of class and status inequality, the lack of reflexivity about the results being produced concerning gender issues within academy and science, allied to a strong ideology deep routed on capitalist and linear managerial principles, has been leading to a strong disregard of gender studies and gender themes, with impact over the importance of social sciences, in general, and the accurate valorization of women scientists and academics. This communication debates some of the main scientific results obtained through studies made within the academic and scientific settings and, together with an analysis about the good practices being presented for European context, analyses the processes and the conditions under which gender can be object of reflexivity and participative debate in academic institutions. For this purpose, authors will present and discuss the results of a research made in Portugal concerning the uses and representations of time of academics, including professors in policy making positions inside research and academic institutions in Portugal.

Keywords: sexrobots, STS, queer theory, gender stereotypes, (un)doing gender

Regular Sex: On the Prospective Regulating of Sex Robots
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Recently there have been some highly publicized calls for regulation of robots that will “work” in the sex industries (see e.g. Guardian, Forbes Magazine, BBC, Register, DailyMail, Mirror, foreignpolicy.com, Catalyst). Yet though research and development are certainly underway, sexually servicing robots do not currently exist as imagined, or as described, in these petitions and reports. Are the calls grounded, in their various appeals to control, monitoring, and containment? Are they clutching at pearls?

The presentation includes reportage of the author’s ethnography with existing android/gynoid robots in Japan. It reviews recent scholarship and industrial developments at the erotic edge of the emerging field of roboethics, and unpacks some of the legal and media discourse currently addressing future robosexual companionship. While scholars tend to advocate for principles of
non-discrimination and non-stigmatization, the writing reviewed lacks an educative or empirical perspective and examination of service robots’ actual material conditions of production. The literature in technical fields to date focuses on regulation and monitoring. The paper argues that there is a middle-ground to be found between sermonizing and standardizing approaches, at that this might well be fertile ground in which to queer the intimate machine. Commerically-marketed sex toys are prescriptive and unvaried. Instead of technology capitalizing on (or capitalists technologizing) mass-manufacturing techniques to produce the same objects, we have the technology (due, for instance, to advancements in printing) to effectively unshackle sexual objecthood, which could gradually become infinitely more varied, bespoke and individual. What, then, of the more anthropomorphic, complex and human-sized objects being slowly developed in research labs? These are not yet nearly mass-marketable; now is the time to be having discussions around variance. Instead, given that the service role sets they are assigned—e.g. ‘health care, children/disabled people/elderly assistance, babysitting, office clerks, museum guides, entertainers, sexual robots...from therapy to prostitution’ (EURON 2007)—are those to which most societies “naturally” assign binary gender and fixed ethnicity, today’s android robots are being made in the stereotypical image of the baby-minder, secretary, sex worker, cleaner, nurse. This is done with the stated caveat of avoiding both unpredictable service-class behaviours, and unenthusiastic reception by humans. Implicitly conservative ideas about gender, ethnicity and class are embedded in preliminary roboethics documents, which often employ the doublespeak that robotic androids are intended as “partners” that coexist with individual humans, whilst making recommendations for the robots’ regulation, allocated embodiment, and specific and situated deployment. Recommendations concern safety (control and limitation of robot autonomy); security (hardware and software keys); traceability (registration and documentation); identifiability (ID and security numbers); and privacy (encryption preventing unwanted communications). These conditions already exist in relation to the governance of the human subject under global capitalism; but more extreme scenarios are imaginable. They will intensify and confuse as bodies are queered across the non/organism, in succeeding cyborgian and biomachinic iterations. Therefore, regulating the (re)production of already regulated social groups is, or should be, a delicate consideration requiring attention to economic, sexual, and cultural difference and diversity.

Keywords: feminist technoscience, roboethics, humanoids, sex robots, sex toys
How to build queer-feminist sex robots? – No construction plan.

ANSLINGER, Julian, EYSSEL, Friederike
Bielefeld University, Germany

Several companies are on the verge of putting the first sex robots on the market. The upcoming arrival of sex robots in our bedrooms has fueled an ongoing debate about their societal impact. The Campaign Against Sex Robots, founded by the anthropologist Kath-leen Richardson, believes that sex-robots will reinforce power relations of inequality and violence. Like feminist adversaries of pornography did assume for pornos (e.g. Catharine MacKinnon, 1985), the campaign rests on the assumption that sex robots will fortify the sexual objectification of women in our society. Philosopher Robert Sparrow (2017) moreover discussed whether sex with a robot would even represent rape per se, because a robot is not (yet) able to explicitly consent to sex. He further states that the rape of robots might function to subordinate and objectify women. Hence, from a psychological viewpoint one could suppose that people might even buy sex robots in order to emulate rape or sexual objectification. To get an insight into people’s motivations of buying/using/testing/etc. a sex robot, we conducted a survey with 106 cis-male and cis-female participants. The analysis shows that the interest in a sex robot is statistically significant predicted by the interest in short-term sexual contacts, like one-night stands (SOI; Jackson & Kirkpatrick, 2007) and the desire to have sex in general, when controlling for all other variables. Contrary to our assumption, we could however, not obtain a statistically significant association of the interest in sex robots with the frequency in which people engage in sexual objectification (ISOS-P; Gervais, DiLillo, & McCharque, 2014) or the general proclivity to sexually objectify others (SOOI; Anslinger & Eyssel, 2017), when controlling for all other variables. Though our data suggests that people who are prone to sexual objectification do not show a greater interest in buying/using/testing/etc. a sex robot than people with low sexual objectification proclivity, we cannot rule out that the actual usage of a sex robot would not increase the proclivity to sexually objectify others. Indeed, we render it no small possibility that sex with a robot will shape human-to-human sexuality to a similar extent as the consumption of pornography does (e.g. Braithwaite, Coulson, Keddington & Fincham, 2015). Drawing on sex-positive feminist literature on pornography (e.g. Carter, 2000) we argue however, that the societal impact of sex robots, can, depending on their specifications, result in negative or positive, destructive or constructive, uninformative or educative, uniform, pluralistic or other outcomes. But how can the robotic counterparts of (queer-) feminist pornography look like? What are the features those robots have to possess and by whom should they be produced? We will share our preliminary answers to those questions and hope to engage in an informative discussion.

**Keywords:** Sex Robots, HRI, Queer-Feminism, Sexual Objectification,
Session 2: Re-configuring computing through feminist new materialism

Chairs: DRAUDE, Claude, KLUMBYTE, Goda,
University of Kassel, Germany

Performing ubicomp’s stories
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Haraway tells us that there is no way out of the stories. We exist in a sea of powerful stories’ that weave the technical, social, political, mythic, organic, textual together in their world-making patterns. Indeed, story-telling, telling technological stories is central to computing as its different instantiations weave and tinker their innovative paths from obscure tech labs and sites to the imaginaries of popular culture.

In this paper, I focus on the story of ubiquitous computing which made its first appearance in the late 1980s, in the labs of Xerox’s Palo Alto Research Center (PARC) as the ‘third wave’ in computing. Mark Weiser along with his collaborators at Xerox PARC envisioned a ‘new technological paradigm’ which would, not only, leave behind the traditional one-to-one relationship between human and computer, and spread computation ‘ubiquitously, but invisibly, throughout the environment’ but also ‘bring communities closer together’ and ‘make using a computer as refreshing as taking a walk in the woods’.

Such broad and ambitious visions gave rise to interdisciplinary collaborations that ranged from computer science and HCI to cultural studies, phenomenology and the arts. Weiser himself was proud of his lab’s close ties with the work of anthropologists and artists who worked under the roof of PARC and was keen to stress the inspiration that the social sciences and humanities had provided in the ways that he envisioned ubiquitous computing. Since then, there have been several ubicomp researchers who have attempted a similar disciplinary “reaching out” either through collaborations or by venturing out themselves to other disciplines and fields in order to try to understand and engage with ubicomp in different ways.

Under this light, I see ubicomp’s endeavours to engage with other disciplines as an invitation which I wish to accept. But on what/whose terms? How can one participate in ubicomp’s interdisciplinary endeavours and discussions without necessarily having to accept the framings or politics that they put in place? How can one take a critical stance towards ubicomp without having then to follow this critique with a proposal of how we can make ubicomp better, or with strategies for an alternative ubicomp?

In this paper I will present my way of navigating this encounter, a process that ended up as my PhD project. This was a process which was inspired by those within feminist technoscience and STS which argue for forms of engagement and critique that do not pretend to gaze objectively and, hence, irresponsibly, but seek to participate messily and partially in the making and the
unmaking of the worlds that technoscientific projects seek to bring forth. And it was a process that ended being an invitation itself to a critical and ethical encounter addressed back to ubicomp, which opens itself to the possibility of surprise for everyone and everything involved.

**Keywords:** ubiquitous computing, feminist STS, stories, critique

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**Thinking computational driven knowledge production with the term intuitive Intention**

**FITSCH, Hannah**

**TU Berlin, Germany**

In my dissertation ... Dem Gehirn beim Denken zusehen? Sicht- und Sagbarkeiten in der funktionellen Magnetresonanztomographie (2014 transcript: Bielefeld) I introduce the term Intuitive Intention to describe the performance of scientists during the brain data interpretation process. In the session Re-configuring computing through feminist new materialism at STS Graz, I would like to discuss this concept in a critical, feminist manner and in a social informatic (Sozioinformatik) understanding.

When I speak of the practice of Intuitive Intention, I understand the computer driven analyzing process as an interplay of apparently ‘objective computational data’ – generated through standardized algorithms in the measuring processes – with subjective, everyday knowledge and aesthetic decisions. The interviewed scientists, who work with brain data, describe the production and mediation of knowledge through computed images as highly intuitive. ‘Intuitive’ here, is used not as a gut feeling one cannot trust, but as the most natural way of presenting and understanding knowledge. According to the scientists, the subjective decisions derive directly from the objective visualizations of the data. With that, the subjective and aesthetic decisions are not visible as the result of an acquired and trained everyday knowledge or Erfahrenheit any more, but appear as logical consequence of a seemingly ‘directly’ conveyed insight provided by the brain images. Through this mixture of subjective decision intertwined with the belief that this way of knowledge production is the most natural and intuitive way of knowledge production, the knowledge about the brain is naturalized and objectified. The projection of recognition and knowledge onto the brainmaps induces the scientists to rely on aesthetical and subjective assessments when reading and working with the visual logics of the brain image. With this normative comparisons along aesthetic and shapely ideas come into the analyzing process which are thus highly influenced by common sense notions of gender, sexuality or ethnicity. With the term Intuitive Intention I introduce a concept that allows to describe the entanglement of these presumptions and the visualized data that is produced during the measuring process in fMRI. In this sense Intuitive Intention is an attempt to characterize the scientific performance during the analyzing process. The visual surplus that cannot be put in language, leads to a re-implementation of stereotypes. In the session at STS Graz, I would like to discuss, how Intuitive Intention could be helpful to understand the moment when the interpretation of the data is re-essentialized through common sense notions in algorithmic, computational analyzing processes.

**Keywords:** knowledge production, algorithmic visualizations, Intuitive Intention, aesthetic, socio-informatik
“Thinking Like a Scientist”: Epistemic Premises of Machine Learning (work-in-progress presentation)

KLUMBYTE, Goda
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In the recent Google Machine Learning crash course (1), Peter Norvig proclaims that the main difference between software engineering and machine learning is that in the latter case one has to “think like a scientist”. However, which kind of science and which scientific modes of thinking are proposed here, and what kind of knowledge is thus produced? This work-in-progress paper investigates the mode(s) of knowledge production in machine learning by asking: what are the principles of “learning” in machine learning processes? What kind of knowledge is learned and what kind of knowledge is generated? How can these principles be engaged with from a feminist new materialist point of view?

Specifically, the paper will look at the basic principles of supervised machine learning and the epistemic foundation of these principles, and will provide some initial reflections from a feminist new materialist point of view. Furthermore, it will ask: if machines learn and reproduce biases, as the recent cases of algorithmic injustices have showed (2), what kind of critical, feminist tools for intervention are available to tackle that? The paper is meant to be a report on the work-in-progress and will therefore present preliminary findings and suggestions for further discussion on critical engagement with machine learning as a form of knowledge production.

(1) Google Machine Learning crash course, 2018, available online: https://developers.google.com/machine-learning/crash-course/ml-intro

Keywords: Machine learning, feminist epistemologies, feminist new materialism, algorithmic knowledge production, critical computing
Session 3: Sounding out collaborations in toxic infrastructures

Chair: BERGMANN, Sven – University Bremen, Germany
KLAAS, Franziska – University of Oslo, Norway

Take the translation of collaboration! On multiple ontologies of toxic waste in Cambodia and our part in it
EITEL, Kathrin
Goethe University Frankfurt, Germany

Waste is patterning streets and sewage systems in urban Phnom Penh, Cambodia. It’s omnipresent and pervasive. Waste pickers collect what they find valuable and sellable or reproducible from the ways and paths, looping around dirty and smelly quarters. What remains accumulates, sediments in undefinable sub-pieces and gets part of its environment. Part of the river, part of the sewage system and even part of kid’s bodies when they fish for foreigner’s lost smartphones in sludge-tight sewers.

On policy and multiple ontologies
Whereas different multiple ontologies (Law/Singleton 2014) evolve out of different moments of translations (Callon 1986) within the assemblage of waste, its toxic temporal snapshot, environment and different groups, like waste pickers, kids, or local NGOs, politics still react according to a singularity of one worldview, based on a dichotomy between nature and culture. Neglecting that natureculture nexuses are inextricable because of their different ontologies that are an output of different translations. When it comes to toxic infrastructures of waste the governmental policy in Phnom Penh is famous for its absence and non-reaction of claiming action plans and ideas.

A re-naturalization of waste?
Waste is destroying itself over time on a human’s visible angle, but there’s often a rest “somewhere” in the environment. My argument is, therefore, that this unwanted waste is flowing asynchronous to recyclable waste in a process of devaluation – rather than valuation, as it does in the intraaction, to use Barads (2015) term, between recyclable waste and waste pickers.

Further, it’s material pieces remain in the environment, where it becomes a part of it. In the process of re-naturalization, toxic objects, former waste, become a part of nature (again) – and of natureculture.

Take the change to collaborate!
One has not only to take in account multiple ontologies on waste infrastructure and waste’s deconstruction into toxic substances but also the need to conscious create new entanglements, arrangements, and translations, which are in fact collaborations – this is the case for Phnom Penh as well as for a workshop space at a conference where different people from different background meet and negotiate about a political driven worldview and a politics of action on a certain phenomenon. Focusing on the fact that waste and its attribute of toxicity is a hyperobject over space and time (Morton 2013) new arrangements and forms of collaborations are of special importance.

Keywords: waste, toxicity, city, devaluation, nature
Doing and thinking technoscience in feminist perspective. Learning from an Italian women’s history about feminism, science and Technology

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Different genealogies of the notion technoscience might enlighten different ways this concept is relevant from a feminist perspective. Vice-versa, different ways of thinking a feminist perspective can point to, or only imply, a different characterization of technoscience. This remark is particularly important when we consider how this relationship is outlined in different theoretical frameworks structuring feminist science studies, from postcolonial feminist science studies to feminist new materialism and post-human studies.

This paper focuses on a very limited area of feminist science studies, that is Italian feminist elaborations on S-T, which I propose to consider as a case study significantly able to highlight the importance of making such a point. By arguing this, I concurrently reflect upon a problem addressed in S3, namely the tendency in feminist theorizing on S-T “to keep the subject/object of analysis at distance”, therefore strengthening the gap between fascination of technoscience and on-the-ground engagement.

Italian elaborations on S-T identify a articulated body of thoughts and practices typically intertwined with each-other and overall concluded at the end of the ’90s, past century. Between the ’80s and the ’90s these studies/practices flowed into two informal but nationally relevant organizations, where more than hundred of women scientists and science theoreticians used to meet, discuss and take initiative. The first one was called Coordinamento Nazionale Donne di Scienza (Bologna, 1986 and 1998), the second one named Ipazia, Comunità scientifica femminile (Milano, 1987-1999). Two practiced relationships structured these feminist experiences on S-T, namely the relationship between “women who thinks and who does science” (Coordinamento Nazionale Donne di Scienza, Bologna, 1986-1998) and that one between “women expert and non-expert in science” (Ipazia, Milano, 1987-1999). Both these practiced relationships can be viewed as an overall attempt of bridging the gap between feminist theorizing on S-T and doing S-T as a feminist. Nevertheless, not always this collaboration worked out, especially due to a different notion of technonoscience diversely implied in the elaborations of women thinking S-T from inside S-T, and those of women thinking on S-T from outside.

Although this period of feminist Italian studies/practices is over, during the following decades new beginnings of debates have periodically emerged. I would suggest that they overall have followed the two sides of the above mentioned practiced relationships. From past to present, yesterday as today, in fact, not always feminist elaborations of “women doing science” have met feminist reflection carried out by “women outside science”. The first one, particularly interested in exploring which transformations have occurred within S-T, with reference to the shift from modern to contemporary science – e. g. the emergence of ‘new in-becoming science-forms’, ranging from cybernetics to ecology, the impact of virtual simulation (computing) on the relationship between sciences and applied sciences (to mention to a few issues). The second one, especially since the half of the ’90s, more and more involved in Donna Haraway’s argumentation (the Cyborg Manifesto was translated in Italian in 1995), acknowledged not much
as a prominent approach aimed at specifically interrogating S-T transformations at present, but as a significant feminist theory interpreting subjectivity in technoscientific post-modernity. During the last ten-fifteen years, this attention to Haraway’s issues continues and renews in different areas of gender, queer studies, and post-human studies, lately discussing the more recent “animal turn”, however, still mainly regarded as a reflection upon political-expressive opportunities technoscience opens to otherness. Technoscience here is meant as an essentially positive force de-centering the anthropocentric posture which historically defined what is human. This reflection is to be understood at the light of the urgency to outline new complexity ethical-political forms, especially considering the problem of species survival in Anthropocene. Nevertheless, might it be seen, at the same time, as a fascination towards technoscience, shadowing its other possible meanings, as well as on the ground experiences of it?

**Keywords:** Technoscience, feminism, Italian feminist science-technology studies and practices

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**How to collaborate in political ecologies of ambivalence?**

BERGMANN, Sven

Bremen University, Germany

There is a discrepancy not only between activists and scientists in the field of environmental politics, but also between environmentalism in the ‘Global North’ and the ‘Global South’. While activists are accused of pursuing alarmist rhetoric and simplified approaches, scientists are criticized for “cultivating ambivalence” (Kierans & Bell 2017) and multiple perspectives. Whereas environmentalism in the North is considered a more ‘white’ and middle-class issue and is often detached from other social struggles, in other parts of the world ecological politics are much more intertwined with social conflict. Consequently, environmental activism in other parts of the world (like in Latin America) is a highly risky and life-threatening endeavour.

In my field of research, the problematisation of plastic in the ocean, the question of who is responsible for and who is concerned by the phenomenon is tricky to answer. In order to create *matters of concern*, environmental organisations make use of pictures showing marine animals, which are visibly affected by plastic pollution via entanglement or ingestion. Yet, the mobility and fluidity of plastics and its degradation to tiny fragments (microplastics) in the ocean, complicates the picture: Plastic washes up on shores of remote islands that never have produced one piece of plastic while micro- and nanoplastic and substances attached (additives like Bisphenol A or metals or persistent organic pollutants that get attached in the ocean) bioaccumulates through entering the metabolism of different living beings.

Accordingly, the problem could be also tackled with a concept like environmental justice, although with a more abstract and ephemeral topology – because the production plant for synthetic polymers or the landfill that loses waste is in most cases miles away. In any case, there is a need to search for new tools to address ecological issues as *matters of care* that shows our entanglement with the problem and its consequences. I would like to discuss with other workshop participants if the current debate about matters and politics of care in feminist
technoscience (Puig de la Bellacasa 2010; Martin, Myers & Viseu 2015) might provide helpful tools to make a difference in the world.

In addition, environmentalism in the North has adopted often a quite (neo)liberal stance, that is directed towards the proactive citizen and consumer. Therefore, it regularly implements a moral and normative regime regarding notions of pollution, (im)purity and toxicity that are too individualized to bear any attraction for queerfeminist and antiracist politics. Beyond that, ecological discourses about invasive species sometimes follow the same strands as migration regimes (Subramanian 2014) or racist debates (Chen 2012) and show how the natural and the cultural cannot be easily separated. In my paper I will argue that we need collaborative knowledge production that moves beyond the liberal appeal to the individual, that is rather embedded in critical analysis of actual modes of production and forms of life.

**Keywords**: Collaboration, environmental politics, political ecology, feminist STS, plastic (litter), matters of concern/care

Session 5/6/7(1): Gendered research careers: neofeudalism, networks and stereotypes

**Chairs**: GRASENICK, Karin, HANDLER, Renate – convelp cooperative knowledge design Gmbh, Austria

**Networks, Gender Equality and Career Development – a review on gendered aspects of networking**

**DAHMEN, Jennifer, WOLFFRAM Andrea**

RWTH Aachen University, Germany

Since several years research institutions put effort in developing and implementing career supporting measures, which often address especially female staff members. “Fixing the women” rather than “fixing the system” still seems to be the accepted and in some cases a most reasonable approach for organisations to meet gender equality standards, while the structural level mostly remains disregarded or neglected. Within these solidified structures networks still represent a key for achieving a professorship or leadership position in science and research. In our presentation we will give a review on the state of the art of literature dealing with the
impact (informal) networks have on academic careers and try to connect it with the question, how the current findings can be practically implemented in gender equality plans of research performing organisations.

Our deliberations and the literature review are embedded in a newly funded EU project on organisational structural change in science and research institutions (CHANGE), as well as on one action funded since November 2017 by the German Federal Ministry of Education and Research (GenderNetz), which deals with the gendered career bias of postdocs in the engineering and information technological sector.

**Keywords:** Gender equality, organisational change, networks, network behaviour, career progression

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Yes you can, just believe in yourself! Individual coaching and networking in study and profession of computer science

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**Theoretical framework:** Earlier results show that particularly female computer scientists show a lower self-efficacy. Similarly, gender-typical attributions, in the sense of gender stereotypes, are considered a disorder. As a result, a coaching program and networking opportunities preparing computer scientists for their professional life and supporting and fostering leadership aspirations were developed.

**Aims and objectives:** Coaching and networking strengthens computer scientists in their motivational resources and enables them to take advantage of professional opportunities. A scientifically founded analysis of their potential helps the coachees to become aware of their abilities and talents.

**Sample:** The project includes students/graduates.

**Methodology:** The coaching program based on a potential analysis and interviews, takes important life goals of the coachees into account. Individual career plans are developed in coaching sessions, including a clear definition of the objective and implementation strategy. Furthermore, a network is established that enables computer scientists to exchange and support each other at different stages of their studies / professional entry phase. In addition, professionals and executives who share their professional experiences are addressed as mentors. The participants create their own profile with information about their person and their networking interests. The last component of the coaching network consists of workshops for students, junior staff, professionals and executives. Students report on their experiences in the fields of study, internships, international experience, or student work. It is about the acquired knowledge and skills beyond ones studies.

**Results:** The following aspects were mentioned as supporting and career-advancing by the participants: company culture, (a) personal mentor, family-friendly environments, home office, flexible working hours and forms of child care. The lack of professional appreciation of self-confidence, role models, and gender-typical attributions demotivate and hinder women to aspire leading positions.
Scientific and applied significance: Due to the high demand for coaching, the concept was expanded for male students.

Keywords: computer scientists, self-efficacy beliefs, potential assessment, career development, coaching and networking

Gendered Networks: The Case of Industrial Start-up Hub in Munich

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One of the most common career paths of STEM students is to start their own industrial start-up, typically while at the college or right after graduation. As a major perquisite of starting a start-up, networking plays a key role in both creation and development of high tech start-ups (Ferrary and Granovetter, 2009). This proposed study aims to understand the role of networking in industrial start-up hubs, both in a formal and informal manner, asking following research question: How and in what ways are networks gendered in industrial start-up environment which is currently facing a digital transformation? Such question encompasses a main assumption that networking in digitalised industries and gender relationships are mutually shaping one another. Proposed work is based on an empirical case study of digitalized industrial start-up hub in Munich, consisting of an ethnography and a series of semi-structured interviews.

It is not revolutionary to think that the ways industries organized co-shaped along with gender relations. Remember the first industrial revolution, back in 18th century. One of the biggest impact of the industrial revolution was its alteration of distribution of gender roles in society. It positioned women as domestic subjectivities, causing ages long inequalities. Currently, we are witnessing an alteration in material infrastructure in modern industries. Such digital technologies which are based on “brain rather than brawn, on networks rather than hierarchy, herald a new relationship between women and machines”(Plant, 1997) offers an opportunity for destabilizing conventional gender inequalities. One of those areas of destabilization and change occurs in the ways that networks are built.

Mutual shaping of gender and technology, in which technology is conceptualized as both a source and consequence of gender relations has its own historical roots (Wajcman, 2010). Both upstream and downstream aspects of co-shaping of technology and gender, namely the configuration of users (van Oost et al., 2003) and consumption junction (Cowan, 1987), has been well studied in the literature. Most of those studies, however put a certain artifact into center of question such as robotics (Suchman, 2008) or affiliative objects (Suchman, 2005). Unlike such studies, I instead position the act of networking at the core of my research and aim to look at how identities, working practices, discursive framing, material means, ideas and norms are gathered together in a gendered manner.

Because of its industrial character, Munich is known as one of the vibrant industrial start-up hubs, giving researchers a good basis to search social issues like networking. That is why I chose Munich as a main research field. Empirically, I plan to focus on different activities, spaces
and organizations located in Munich: a) co-working spaces, b) entrepreneurship center at technical universities, c) start-up contests, d) organizations aiming to empower women in STEM and d) launch parties and kick-off events. By investigating specific locations, activities and organizations of high tech start-up hub in Munich, this proposed study aims to understand the characteristics of industrial networks, the conditions that they are built and the ways that gender is situated among such networks.

References:

Keywords: start-up, gender, networks, digitalisation, industry
Increasingly precarious working conditions have become a common phenomenon among academics of both genders at universities in Germany in the last two decades. Gender Equality Plans (GEP) usually include an assessment of current data relating to the (un-)representation of women at different stages of their academic careers. The article scrutinizes the (equal) opportunities for female researchers in the faculty of medicine at a German university, the process of individual careers in academia, the factors preventing the females from reaching leading positions as well as the instruments and measures favouring the career of female researchers. We performed several quantitative studies on the working conditions as well as surveys on mentoring effects for researchers at a Medical Faculty in Germany. We analyzed the employment contracts over a period of four years (2012-2015) and collected data regarding contract duration, weekly working time, age, gender and parental leave. Our main target group includes female scientists at the postdoctoral phase of academic qualification. During the postdoc phase, the specialist training for physicians pursuing a medical career and/or a so-called “Habilitation” process for researchers pursuing an academic career generally take place. This postdoc phase is considered to be crucial on the one hand, but on the other hand, it is the most critical stage for women on the career path to a leading position, especially in the field of medicine. The main finding of our analyses is that men and women are on equal terms of employment regarding the fixed-term contracts in academia. But otherwise, the significant gender disparity in academic careers is apparent. Usually male researchers receive contracts with longer working hours than female, who often prefer part-time jobs. This leads to a gender pay gap and prospectively to a gender pension gap. Male academics are also twice as likely to get a permanent contract as their female colleagues. Gender has the most considerable influence on the claim and the duration of parental leave. Mentoring programs are viewed as one of the effective instruments of the equal opportunities policy at many German universities. Especially the female-oriented mentoring programs enable early-stage female researchers to identify, develop and systematically implement their personal skills and competencies in planning their careers. Mentoring programs precisely set the goal of more female management in academia. Experienced mentors support the younger academics by sharing their experiences and describing their career paths. According to the empirical data from surveys, mentees effectively questioned their mentors about their career choices, motivation, advice, personal
development and estimation of their own skills and found the experience especially supportive. With much consideration of special issues and requirements of early-stage female scientists, mentoring offers a hierarchy-free space for the casual exchange and agency of the insider knowledge of experienced mentors to developing mentees.

**Keywords:** gender balance, precarious employment conditions, individual careers in academia, mentoring

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**Understanding disciplines and overcoming gender biases**  
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Scientific disciplines are characterized by their specific terminologies and methodological approaches, but also by norms and values as an unconscious basis. The disciplines differ in their leading perception on excellent science and how to achieve it. Disciplines form their own community of practice and risks are high to underestimate or even devalue divergent scientific approaches and disciplines. Moreover, the imperative for specialization in higher education might impair mutual understanding for different scientific approaches without sufficient resources and extra effort. Furthermore, the distribution of men and women varies across scientific disciplines. Hence, the perception of other disciplines is interlinked with gender biases and leads to the reproduction and manifestation of stereotypes on skills and aptitude in connection with gender but also in connection with scientific disciplines. Especially for inter- and transdisciplinary research it is crucial to become aware of these biases and to strengthen cooperation based on mutual appreciation – for the contribution of the discipline as well as the individual researcher. At the session we will present an exercise for an open reflection and contributes to a better understanding of disciplinary and gender related biases thereby setting the baseline for a positive development of inter- and transdisciplinary research collaboration. We will share our experiences with this tool which has been tested in several workshops so far and discuss conclusions for further development of an intersectional approach in anti-bias training.

**Keywords:** gender, interdisciplinary research, intersectionality, bias, training

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**Cultural change in academia – precondition or challenge for women in higher education management?**  
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For the past 20 years, one of the most important goals of gender equality policy in science and research was increasing female participation in top positions of academia. In Austria targeted policies aimed at increasing the number of female professors (e.g. excellentia, Wroblewski, Leitner 2011) and the introduction of a female quota for decision making bodies lead to a
significant increase in female participation in management positons (e.g. rectorate, senate, university council). Hence, Austria is presented in international comparisons as a good practice case regarding the increase of women in top positions in science (e.g. Lipinsky 2014). Following Kanter’s (1977) argument, it is assumed that women in top positons will initiate cultural change which will make academia more women friendly, inclusive and fair. An analysis of key indicators of men and women holding vice rector positions showed that women are on average younger than their male counterpart and they more often do not hold a professorship before entering the management positon (Wroblewski 2017). Hence, one may assume that women are more often integrated in management as experts and do not represent the “old” management model (rectors as primus inter pares). The paper focuses on the question how women who made their way into management positons in universities deal with the assumption that they pursue cultural change. How do they define their role regarding gender equality and cultural change? Do they feel responsible for cultural change? If so, how do they pursue this goal? In a first step the management approach of women in vice rector positons will be described and the relevance of gender equality in that context. It will be shown that the management approach does not only influence the extent to which female vice rectors feel responsible for gender equality but also the way how they plan their future career. Finally, the dilemma of women vice rectors who are wiped out between expectations of neoliberal higher education policy and claims from feminist/gender equality activists is discussed. The analysis is based on qualitative interviews with women who still hold or held vice rector positons at Austrian universities since the implementation of the new organisational law (Universitätsgesetz 2002, UG 2002) in 2004. With the UG 2002 universities became autonomous institutions and university rectorate a management body. Members of rectorate are no longer primus inter pares but should act as managers. References Kanter, Rossabeth M. (1977), Men and Women of the Corporation. New York: Basic books. Lipinsky, Anke (2014), Gender Equality Policies in Public Research. European Union Publications Office. Wroblewski, Angela; Leitner, Andrea (2011), excellentia. Evaluationsbericht, Studie im Auftrag des BMWF, Wien. Wroblewski, Angela (2017), Frauenkarrieren im Hochschulmanagement, Studie im Auftrag des BMWF, unveröffentlichter Zwischenbericht, Wien: IHS.

Keywords: women in university management, cultural change, gender equality policy

Analysis and perspectives of inter*, non-binary and trans in higher education (and research)

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In the last year awareness about the relevance of gender in higher education and STEM has increased. Institutes of higher education have often programs to increase gender diversity. Funding of research in science and technology requires a statement to or inclusion of a gender dimension. Yet gender is most of the time still understood as a binary construct of female and male fixed at birth. This continues the exclusion of marginalized genders and sexes – inter, non-binary and trans (INT). Inter, non-binary and trans persons still face varies forms of discrimination in their life. In institutes of higher education specific forms of discrimination can
occur additionally. The high administrative overhead of institutions can prolong transitions or even ignore the reality of people. IT systems that only include a female-male-binary enforce the discrimination.

Changes to the system are considered an insurmountable obstacle. This leads also to an erasure and leads to incorrect statistics. A difference in discrimination is also in the status groups – students, staff and tenure professors. Depending on the individuals status institutes of higher education implement changes, but those often only effect the privileged group of tenure professors.

In few countries a legal recognition of inter* and non-binary identities has been given by introduction of a legal gender category outside of the female-male-binary. In the European Union this was done by Malta and Germany. This legal changes also have an impact on all institutes of higher education in countries of the European Union, because of the highly international education system in Europe and the equality of EU-citizenships. In Germany this did not translate into a recognition of this genders in institutes of higher education. For example information management systems for students and staff only include a female-male-binary. This reproduces a discriminatory system.

Self-representation groups of students and staff have been formed to improve the situation for INT students and staff and raise awareness for INT related topics and issues. Examples for this initiatives are are in Austria “NaGeH – mein Name, mein Geschlecht, meine Hochschule” and in Germany “AG trans*HoPo – Arbeitsgemeinschaft transemanzipatorische Hochschulpolitik”.

The session will view the situation from different perspectives and will focus on the institutional aspects like policy, infrastructure and environment, rather than INT in research. Included is an analysis of discrimination of INT people in institutes of higher education and guidelines, demands and suggestions for improvement of policies, processes and infrastructure. The activities of NaGeH and AG trans* HoPo and the national situation of Austria and Germany will be presented. Space for discussions and comparison of different situations provided by participants will be given.

**Keywords:** queer, inter* & trans & non-binary, institutes of higher education, gender equality, structural change

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**Towards a Feminist Theory of Expertise**

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Contemporary theories of scientific expertise - particularly those comprising the ‘third wave’ of Science and Technology Studies - offer normative and prescriptive accounts of the production of expert knowledge claims (Collins and Evans: 2007). Such accounts lack both an interdisciplinary perspective, and an appreciation of the ways in which gendered conceptions of expertise distort, and silence, the feminine perspective.

This paper demonstrates the limitations of these accounts. It draws on empirical research into the production of forensic-scientific truth claims, and their constitution as forms of expert knowledge. The paper proposes a new, relational theory of expert knowledge: a theory which
views expertise as rhizomatic rather than hierarchical. A theory which is both normative, and relational, and which highlights the flexibility and contingency of scientific expertise: features which allow experts to adapt knowledge to disparate contextual scenarios, negotiating inconsistent (and often conflicting) rules, and reconciling the differing requirements of separate, and overlapping, domains, on the perceptual, cognitive, and epistemological, levels. It is suggested that the ability to perceive, and to account for perceptual, cognitive, and epistemological, relationality - is a defining feature of expertise. It is further posited that expertise is a gendered construct and that the theoretical approach outlined above may contribute towards a more developed, and dynamic, form of feminist standpoint theory: one which resolves many of the problems associated with postmodern 'mobile positioning' (Harraway: 1988). Finally, it invites us to ask whether alternative ‘ways of knowing’ may themselves constitute a form of expertise.

**Keywords:** Expertise - STEM - Feminism - Standpoint Theory - Mobile Positioning

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Session 8: Experimental methods as modes of intervention in the study of STS

Chair: FOSTER, Ellen – Rensselaer Polytechnic Institute and Institute for Advanced Studies in Science and Technology Studies Graz, Austria

**Researching the Relational and Sound’s Role in the Co-Constitution of Matter through Musicking**

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My research investigates the possibility that the relational between matter can be triggered and highlighted with musicking and sound, and that musicking contributes to the generation of substance. In the shared space of music, or focused sounding, and its vibratory sound waves, all bodies are stimulated with shared frequencies. In this shared experience I posit that we have access to the emergence and complexity theories that posit the dynamic co-constitution of each other. From this engagement, we can posture that sound waves connect us to other bodies in our environment, and stimulate dynamic co-generation with matter around us. My primary research tool is composition, which is performed and installed. My data is gathered
mainly through various forms of listening. My listening investigations take place in the forms of deep listening sessions, field recordings, spectral analysis, and echo and frequency response tests. My secondary mode of research invokes theories of environmental ethics (deep ecology), systems theory/ecological cognition, and new materialism, as well as sound’s physical behavior. But to transcend modernity’s binary complex (or, as I like to call it: subject/object disorder) I believe that to think about the relational, and dynamic, generative processes, as insufficient. Alternatively, I propose that there is much knowledge available in the doing of music, or musicking (as denoted by Christopher Small, which creates a verb out of any form of engagement with music). Musicking events are what Andrew Pickering referred to as “ontological theaters”, creating spaces that reveal performative interaction and “endlessly emergent systems (of which we humans are just one sort).” It’s my belief that musicking contributes to an ecosystem’s co-constitution by vibrating bodies simultaneously with shared sound, engaging sensorimotor patterns which “links the nervous system with the sensory surfaces and motor abilities that connect the organism to the environment.” With this presentation, I’d like to share my approach, tools, successes and failures of the aspect of my research project known as Resonance & Resemblance (herein known as R&R). R&R was a 50-minute sonic meditation created for designer Russel Wright’s 79-acre woodland garden, Manitoga, in Garrison, NY, with about 150 people in attendance. The piece had two parts: a guided soundwalk followed by a listening meditation around a quarry pool. The listening meditation component featured four recorder players in kayaks, within the pool, and myself, on shore on electronics, performing a fixed improvisation I composed. The musical aspects were composed to interweave with the existing sonic environment (whatever that might be, hence the improvisatory elements), and to trigger resonant frequencies from the structures in the environment. R&R was a phenomenological investigation into the theory that musicking bodies, stimulated by shared sound waves, slip into an ontological flow that allows them access to their dynamic co-arising, and interconnectedness with the heterogeneous bodies around them. I would also like to use the time to discuss methods of empirically supporting my phenomenological findings.


**Keywords:** Sound, Knowledge Production, Complexity, Performance As Research, Environmental Engagement

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Blockchain-based crowdsourcing for natural language data: implementational and ethical challenges

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The current paradigm at the intersection of language, communication and computing is a probabilistic one: ‘gold-standard’ datasets are used to train algorithms that process natural language produced by people, in real-time, both online and offline. By design, most current systems necessarily involve homogenisation of diverse kinds of input. Because systems are trained to recognise patterns, regional, non-standard or atypical language practices are automatically marginalised, with preference given to talk that more closely follows the norms of training data which can by definition never truly represent a given language, genre, topic, dialect, or interpersonal configuration.

A main reason for this problem is that these ‘gold-standard’ datasets are profoundly lacking in contextual information; included texts are often nothing more than newspaper articles that have been manually annotated with grammatical and semantic information that may or may not reflect the ways in which language figures into the lived experience of real people. Providing such systems with more data therefore inevitably aids the homogenisation of language and culture, creating a techno-scientific landscape in which machines take the role of the hegemon, and in which humans must modify behavioural and linguistic choices in order to produce successful human-computer interactions. Indeed, it is already well-recognised that machines have the potential to script and restrict, rather than enhance and augment, natural and diverse human behaviour and interaction.

Two key reasons for this is that (a) it is difficult and expensive to produce ‘gold-standard’ data that is rich in contextual information, and (b), the extent to which such data can be used to develop human-centred AI is so far relatively unexplored.

In this presentation, we describe and present a prototype system for natural language data collection that rewards diversity of speaker backgrounds and expertise. The system produces language games tailored to user profiles, stores solutions in a publicly accessible database, and rewards high-quality responses. Both the database and the reward system are built on blockchain technology, ensuring the production of a trustless, version-controlled database of context-rich linguistic information that can ameliorate noted concerns of exploitation and access restriction in current models of crowdsourcing.

We remain aware, however, of the fact that while blockchain-based systems have the potential to liberate people from centralised systems rooted in hierarchy and social capital, such systems also have the potential to exist entirely independently of human control, while also potentially facilitating new models of surveillance and control. Discussion therefore centres on challenges inherent to the intersection of crowdsourcing and the blockchain, and on identifying suitable pathways toward a system that can bring about a human-centred framework for AI rooted in open innovation and established ethical guidelines.

**Keywords:** blockchain, AI, NLP, linguistics, language, context, crowdsourcing, open innovation
Critical Workshops toward Unpacking Expertise and Explorations of Skill-sharing Tactics

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Within maker and hacker cultures, workshops and informal skill-shares are a way to share knowledge, expertise, practices, and often help to build a sense of community. They also become a way in which to solidify ‘best’ practices and the expected ways in which to build DIY technologies and prototypes. But what kind of knowledge might be produced when leading workshops that problematize or unpack the types of skills shared, how they are shared, who is involved, and what is considered ‘best’ practice and why? In a more humanistic sense, such an endeavor might enable an exploration of subjectivity, identification, and the communities of practice that are fostered (as well as those that are marginalized or erased) by DIY tech-based cultures. As an extension of research that explores various communities of practice attempting to establish alternative practices apart from dominant maker/hacker discourse, this proposed week of workshops will engage local community contexts, definitions of technologies, skills, and values.

By using the workshop as a form of inquiry, my research aims to develop experimental methods that allow analysis of dialogue which is opened during material praxis. While I have been working to establish or develop a critical workshopping method (Foster 2015), precursors and continuing influential figures for these actions are important to identify. Initial momentum of this work stems from critical making, reflexive design, and critical technical practice practitioners. In the doing of this work, I have also encountered new instantiations such as Max Liboiron’s work which asks participants to explore the politics embedded in scientific research technologies. Encouraging them to design and make water plastics detection devices that either critique or make visible power relations, ideologies, and greater structures at play (such as capitalism, patriarchy, inefficiency, feminism, queerness, etc.), Liboiron has developed a workshop that critically engages the design of objects. In my own work I aim to critically engage the skills in and of themselves that fit into the design and maker narrative, something which is in current need of development and which I hope to garner feedback from in this presentation.

Keywords: feminist technoscience, workshops, citizen science, experimental methods, pedagogy
Will the digitisation of environmental science change science-society relationships?

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The increasing use of computer simulation modelling in the environmental sciences has had significant impact on research practice. This paper looks at the digitisation of environmental science and considers its potential impacts on science-society relations. I will focus on three key elements: data, organisation and projection.

In the past data for use in environmental science were created through field observations and experiments. That made data scarce and valuable, it was often viewed as an asset, as personal property. Today environmental data are generated by instruments remotely sensing changes in physical processes, or in their proxies. These instruments generate large, spatio-temporally consistent, data sets that get centrally stored and can be used in many different computer simulation models to answer new scientific questions.

A second element of digitisation is the organisation of research. Historically environmental science was organised as a craft, small teams of scientists undertook investigations in processes that started in the field, then involved transforming physical samples to numerical data, finally analysing the results and reporting the findings. Today large projects bring scientists from different natural science disciplines and separate institutions together virtually. Using digitally accessible big data sets and generating new synthetic data, they run simulations in ‘relays’ where the outputs from one model is used as input to another.

A third change is that computer simulation modelling allows environmental science to address ‘what if’ questions and project possible future evolutions of environmental processes. Questions about process evolution under different circumstances, addressed by extrapolating scientific knowledge across contexts generate anticipation rather than new empirical insights. Expressed in numbers and graphs such projections appear plausible. Digitisation changes the scope of scientific claims, from explaining ‘what is’ to talking about ‘what might become’. This paper pivots on the question of how these changes in environmental science knowledge generating practices affect science-society relationships? Does the digitisation of environmental science change its relationships with policy makers and/or with publics?
To explicate the argument and address the question I draw on ethnography of scientific projects modelling hydroclimatic risks in the UK. This includes a) looking at what the increasing reliance of flood risk science on remotely sensed data implies for its role in local flood risk management; b) examining a research project on drought in the UK organised as a relay of models in relation to current science funding regimes; c) critical scrutiny of how scientific ‘what if’ scenarios relate to the distribution of power in environmental risk governance.

**Keywords:** environmental science, computer modelling, hydroclimatic risks, policy, publics

**Trust in algorithms. An empirical study of users’ willingness to change behaviour**

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As mobile applications have become part of our everyday life, digital society has begun to use algorithmically generated recommendations as a foundation for decision-making. Whether it is choosing the most efficient route on the way to work, taking an umbrella, when the weather-app forecasts rain, or adapting a daily workout routine according to a virtual trainer – algorithms influence our actions at an increasing frequency.

These recommendations are formed by a process of interaction between users and apps, which depends on large amounts of data. This user generated big data is important for the algorithms to compute a “big picture” of the current situation. Based on this, algorithms submit recommendations to a large number of individual users, who then have the choice to change their behaviour.

This process of interaction has already been extensively studied in the course of the ABIDA (Assessing Big Data) project, which resulted in a big data process model. This model mainly consists of three phases: data generation, data analysis and data use, e.g. for controlling whole sociotechnical systems. In the first phase, data is being generated through the interaction of users and machines, the former of which creates information (e.g. by physical activity) that is then transformed into data by the latter. Subsequently, data is evaluated by algorithms. The resulting enriched data can be used to recommend actions. We assume, that the whole big data process is heavily dependent on the trust that users place in their applications and in data protection and privacy on part of the providers. Both providers of data gathering applications and users need mutual trust to ensure, that the data being put in is of maximal quality. This affects the accuracy of the data and the willingness to comply with the suggested actions. Trust is therefore a key element for the algorithms that generate and use big data.

We conducted a standardised survey to test these assumptions empirically, namely referring to peoples’ trust in applications, their reliance on algorithms when making decisions, and their willingness to change behaviour (e.g. take another route, if proposed by the route guidance system). Taking the Technology Acceptance Model (TAM) as a starting point, we establish an extended research model, including trust as a mediating variable and various external factors, and validated it by empirical data.
The empirical evaluation reveals that the dependent variable of our model “change behaviour” is heavily influenced by perceived ease of use (PEU), technophilia, prior negative experiences with apps and personal competence.

Keywords:
trust, digitalization, survey, big data, acceptance

The algorithmic construction of reality
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Even though we are not entirely determined by technology, we are living in a world that is strongly driven by computational algorithmic technology (Beer 2016). How do they become so ubiquitous and powerful in everyday life? Along with the concepts of sociology of knowledge it can be shown how algorithms shape and construct social reality. First, there is a strong objectification of reality through numbers: The trust in statistics and measurements is big, because one might believe, they are objective and more exact than human cognition. Because algorithms are computational, the acceptance here is also strong. However, if we look into the Black box of algorithms and data, we discover that people are involved at many interfaces: If algorithms come to work they sort, prioritize, decide, and classify. In this process, somebody always has to decide how the steps are defined. Furthermore, when it comes to decisions about which data to use, people are involved. This is for example a central aspect for SelftrackingApplications. They transport the idea, that users receive valid and objective data and make it possible to place oneself in a neutral ranking, and thus transport uncontained knowledge. But as just shown, every kind of data is always influenced and thus constructed by human assessments. Here, on the one hand, an objectification of algorithms is created, and on the other hand they are internalized by the subjects – an objective and subjective reality is constructed (Berger/ Luckmann 1960). Once the process of legitimization has been successful, institutionalization advances in everyday life. The knowledge, which is given to the algorithms while programming, spread through the web to the users. Unlike to other artificial things, algorithms interfere with our practices as decision makers. So there is a new way of constructing norms and reality – namely just by the people who design the algorithm (or rather by the Contracting Authority) or by the algorithm itself. If an area of human activity is institutionalized, it means it is under social control and, it is now able to foresee the actions of the others (this aspect becomes even more relevant when we look at monitoring with collected data). Calculations thus influence and construct our reality, organize it, guide it. They produce correspondences and equivalence systems that select some objects to the detriment of others and impose a value hierarchy that gradually determines the cognitive and cultural fabric of our society. So the user receives a more and more selected input. But the choice between these techniques does not depend solely on the designers; too deep are the changes rooted in our society. In fact, calculations as mentioned can only be calculated in societies that have deliberately decided to be predictable (Cardon 2017). In the context of my PhD, this
development is examined with the help of qualitative as well as quantitative surveys. The presentation will shed light on the aspects discussed above, supplemented with results from expert-interviews and show how our definition of knowledge, norms and reality is changing because of the increasingly influence of algorithm in our lives.

References

Keywords: Algorithm, Big Data, Constructivism, Knowledge, Reality

Shapes of algorithmic shaping: Observations from distributed software development
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Characteristic for the practice of software development is an extensive use of software tools to enable and support the work in and organization of software projects. This is even more prevalent in the case of distributed software development where the team members work in different locations and often are located in different countries so that face-to-face communication is the exception rather than the rule. The range of algorithmic influence exerted by software tools used in distributed software projects can be described as a range between two poles. At one pole, we find software tools that have generic use and allow quite different ways of adopting and using them to support the engineers’ work. Here we got for example Wikis used for software documentation and various communication tools (Videoconferencing tools, Chat tools). Regarding these tools our empirical data show a multiplicity of social adaption patterns, partly highly rule based, like fixed daily Skype meetings, partly unregulated or under constant social negotiation. At the other pole, there are fully automated processes for designated uses, for example, the software repository, which automatically ensures a common code basis and enforces the merging of changes, or automated testing. Our case studies show that even these highly automated tools are not fully prescribing the users behavior. In between the two poles there are many shades of software tools in place where algorithms shape work and work practices shape algorithms. For example, this is true with project management software that on the one hand embeds automated rules but still is highlight adjustable to the teams’ and team members’ needs and practices. In our talk, we will reconstruct and analyze the different degrees of algorithmic shaping of work and work organization in projects of distributed software development. Our considerations are based on literature analyzes and empirical research on projects of distributed software development from our research project.
Session 10 (2): Algorithmic Society: Shaping and relying on algorithms

Chairs: BOTTEL, Matthias – TU Berlin, Germany
JANDA, Valentin – TU Berlin, Germany

The knowledge politics of Intelligent Transport Systems: Questions and early indications from Hamburg

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In what ways do digitization processes and new ICT infrastructures change the way people look at and perceive of cities? What are the implications of new sources of data on the ways infrastructures are managed and governed? These questions are examined empirically in a number of European and Chinese cities by two international consortia of researchers: smartknowledgepolitics.com and smart-eco-cities.org. Changes in the (spatial) perception of cities are particularly likely due to the massively enlarged informational basis of decisions that are currently discussed and experimented with under the headline of “intelligent transportation systems”. The administration of Hamburg aims to position the city as a pioneer in the move towards an integrated and ICT-supported management of multiple traffic flows (BWVI Hamburg 2016). In what ways will or could the proposed changes in the knowledge basis of traffic (and parking) management impact on the ways in which decisions on the future development of transport infrastructures will be taken? Which of these changes could have political and ethical implications in the sense of making managerial decisions (e.g. on a particular prioritization of mobility needs) more or less transparent or amenable to contestation? We build on the traditions of critical urban studies and science and technology studies in raising such questions, and will empirically answer them on basis of expert interviews and document analysis. This contribution explains the (comparative) research design and reports on findings from the city of Hamburg.

Keywords: digitalization, case study, smart city, intelligent transport system, mobility, governance
Cybernetics between utopia and loss of control. Managing transparency and accountability of algorithms through source code?

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The utopia of cybernetics is not new, such is the criticism of the power of those who control the algorithms, which has been put forward by the early Free Software Movement in the Seventies. Recently the discussion of how to enable transparency and control of algorithms has become increasingly important. Since the power of software as authoritative resource becomes evident, the need of holding software accountable is on the table. But who should be accountable?

There has been a lot of research on Free and Open Source Software, but a qualitative examination of the social structures and a critical investigation of the promise of control and accountability has been lacking so far. Yet, the early problematization of the power of the manufacturer of algorithms has never been more relevant. Open Source Software opens up an interesting approach towards accountability of software, and software development. Through free licenses it becomes possible to have a look at the source code. But the control and transparency depends strongly on the governance of the community.

In my doctoral thesis I analysed three different open source software communities representing different epistemic regimes to show the very differences of users’ possibilities to gain control and transparency over the software. For that I conducted qualitative expert interviews and analysed exemplary pieces software produced by the community.

On the empirical material I can show how the governance is driven by normative groundings of the community and how the normative regimes shape the commonly produced technology. It becomes clear that the common sense of “meritocracy” in the open source software movement has many different faces. The social structures of governance are key for the question of the user’s influence on the way the software is created as well as the possibility to get to know the reasoning behind the design decisions.

In some cases end-users are fully neglected, in others they are actively integrated. In theory users can always earn merits to achieve the charisma to get involved or at least fork the whole project and change it to their needs. But practically there are limitations of capability, power and sometimes social differentiation.

The findings give insights for a discussion of the potential and limitations of achieving transparency and control over algorithms through free software licenses. Beyond that it provides evidence of the normative order of the production of knowledge and technology and how the normative order resembles in the material outcome.

Keywords: social construction of technology, free and open source software, techno-regulation, actor network theory, theory of structuration
Big Data and the emergence of system identities
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While social identity is an identity continually renegotiated through linguistic interactions and social performances, bureaucratic identity—glimpsed in passports, driver’s licenses, and other identity cards—is a construction of fixed personhood for the purposes of modern organizational needs, ensuring that the member has remained essentially the same despite changes in personality, body, and behavior. With the increasing use of algorithms, however, there has emerged a new variation of identity—system identity, which represents persons as dynamically forming clouds of data. While system identities can serve the bureaucratic need for identifying members, their role far surpasses the functional necessities of inclusion and exclusion. These system identities have not only attained a degree of autonomy from the physical self, they have also become, in certain cases, more effective in predicting one’s life chances; e.g., financial identity as reflected in one’s credit score. This presentation highlights the importance of this differentiation in identity formation, and charts its latest development.

Keywords: Social Identity, collective identity, system identity, algocray, algorithm, information technology

Algorithmic social ordering as regulation
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It is widely accepted that, as quantification and datafication increasingly pervade modern societies, algorithms become ever more decisive in social ordering. Yet, there is little conceptual understanding of how such algorithmic social ordering actually takes place. We propose to close this conceptual gap by viewing algorithms as constitutive elements of a new, distinct type of regulatory processes. Regulation is the intentional attempt to alter behavior in order to reach a specified goal (Black 2014). It can be a state activity, but also take place within companies or other social groups or be a practice of self-regulation. In all of these areas, algorithms play an increasingly important role. Drawing on, among others, Hood et al. (2001), Karen Yeung has proposed a general framework for studying such “algorithmic regulation” by dissecting it into three analytical components: information gathering, standard setting and behaviour modification. Our paper enriches this fruitful perspective by pursuing further its conversation with classical STS accounts. This allows us to deepen our understanding of whether and how algorithms change established forms of social ordering.

Information gathering encompasses both the collection of data and its algorithmic utilization by means of data mining and data analytics. We propose to interpret digital data as a novel form of “immutable mobiles” (Latour 1986): information that is stored in a format that makes unintended changes or losses improbable and that, at the same time, allows for quick transportation, recombination, and aggregation with multiple consequences for the current political economy of quantification. It is precisely this property of digital data that enables a variety of previously
unthinkable descriptive and inferential strategies. Standard setting is the process of defining which goals are to be attained by regulation and how. Far from being neutral instruments, technological artifacts such as algorithms always constitute their own form of politics (Winner 1980) that have the potential to superpose processes of regulation. On top of that, algorithms allow for a bifurcation of stable general goals and adaptive “microstandards” regarding the means, which further complicates the political dimension of algorithmic artifacts.

Behaviour modification encompasses the various means by which behavior is influenced, most importantly through the design of technological architectures. In order to conceptually grasp this specificity, we combine insights into “regulation by design” and “regulation by technology” with an Actor-Network-Theory perspective (e.g., Latour 1990). This perspective draws attention to the ways in which technology semi-autonomously opens and closes various spaces of possible human action. As technological environments become increasingly adaptive and self-learning, their quasi-agency becomes eerily evident.

By applying STS perspectives to the issue of algorithmic regulation, we gain a more complex and ambivalent image of the way modern regulation by technology operates. In order to illustrate how such a conceptual approach can serve as a ground for comparative studies, we discuss several concrete cases. Our main conclusion is that algorithms make regulation both more responsive and more comprehensive.


**Keywords:** algorithms, big data, regulation, quantification
Digitizing science, the negativity of knowledge, and its lack of truth
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For the philosopher of science one field of human activity stands out among the many areas that undergo significant changes due to digitization: science itself. There is practically no part of scientific and research activities that remains unaffected by digital tools: from funding to publication, from experimentation to critical reflection and discussion – all steps in the process from question to theory have become potentially digitally supported or mediated. This includes the automatic creation of models based on large amounts of data; a phenomenon that Anderson has called the end of theory.

On the other hand, we have opponents to the general idea that the digital can deliver knowledge or even theories. For Byung-Chul Han no end of theory is in sight just because we can exploit big data to generate models automatically. He claims that information is only a pornographic form of knowledge without any inwardness. Byung-Chul Han also emphasizes negativity of knowledge: for example, it can only be gained against resistance. In his analysis of the digital, however, the digital is always already positive and smooth. While the lack of inwardness of information may originate from the lack of a knower, there is another way in which knowledge is negative: it usually presents itself only when and where we lack knowledge (Prem 2017). Knowledge already gained is hardly worth mentioning. It is mostly knowledge that we do not yet have that is of interest to us.

Byung-Chul Han is right in that strong theories are more than just models. In a sense, they first create the space in which models can be built: “Strong theories like for example Plato’s theory of ideas or Hegel’s phenomenology of the mind are not models. [...] The theory is a decision that lets the world appear differently, in a different light.” (Han 2012, p. 62) It should be noted that automatically constructed models include such decisions as well: the choice of mathematical structures and algorithms significantly impacts on the kind of models derived from automated data analyses. But for Han, the problem runs deeper because “data-driven positive science” cannot produce knowledge (Erkenntnis) nor truth. Automated insights remain positive; they cannot carry the kind of negativity or exclusion characteristic of knowledge.

Although much is to be said for this perspective, such an analysis does not go far enough and remains mostly descriptive and proposes no remedy. It neglects the origin and embedding of these models in human utility. Secondly, it underestimates the creative potential of the derived models when taken up in human activity. Digitally acquired models are instruments for human sense-making. It remains an originally human task to give purpose and meaning and re-contextualize information into knowledge. The digital has the power to support such a process,
not least because it facilitates access to information, provides information in a networked fashion and includes more than linguistic information (Prem 2016). Pragmatists and constructivists will agree that such models may deliver function, but they cannot create truth that emerges from life contexts.

**Keywords:** Digitization, Philosophy of Technology, Epistemology, Truth, Digital Science

**The future of work: investigating existing work system in digital platformsystems**

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Everybody is talking about digitalization. It is referred to as the “fourth industrial revo- lution”, which is changing the way we are living together to a high extent. New forms of communication arise in addition to permanent accessibility. This trend is enabled and sup- ported by new socio-technical systems. The output of these systems leads to new innovative ideas and more efficient socio-technical systems. At the same time, this trend leads to new problems, which have not been encountered in this form yet.

One specific problem in the context of digitalization is „digital work“. This terms describes employee contracts which are entered via platforms. This problem is increasingly being discussed in the media. The titles of these employees vary depending on the area of responsibility: they are known as freelancers, clickworkers, digital workers or crowdworkers. These employees are digitally acquired via an app or website (platform system) by established companies or start-ups in order to take on specific tasks or partial tasks (microtasking) in defined amount of time. Thus, underlying work model differs from the classical work model. The platform systems may have been set up by the companies themselves or external providers (see for example Amazon Mechanical Turk where Amazon only provided the platform (Strube 2015)). The working conditions within these socio-technical systems are often just regulated by general terms and conditions, which can be changed from the platform operators. The payment depends on the type of work, starting at a few cents up to a few euros per "job" with no minimum wage. Up to now, worker union of these employees is just at the beginning, partly due to the anonymization of the Internet and the platforms. After all, there are hardly any legal regulations for these new forms of work.

It is assumed that these new forms of work will be of great importance in the future (Drahokoupil 2017; Schwepppe 2016). They could have a lasting influence on the traditional forms of work, due to their great potential of making work more flexible and their economic relevance. For this reason, it is very important to place this insufficiently researched field into the focus of science, just as, for example, Leimeister (2015, 2016) attempts.

The aim of this work is therefore to illustrate the extent to which an interdisciplinary view based on industrial engineering, work organization and sociology can support a better understanding, and identify gaps in research of the phenomenon “digital work”. Industrial engineering, which deals with the design of ergonomic working systems and workplaces, has a various number of
established and validated instruments to offer in order to explore the future development of these new work systems. Through the joint consideration of sociological theoretical and empirical tools and mentioned established instruments, this work wants strengthen the importance of this topic as well as the need of collaboration among different research disciplines.

References:

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Keywords: digital work, digitalization, industrial engineering and work organization, sociology, work organization
Architects are supported by digital planning systems that not only take the technical but also the social and ethical implications into account – tasks and interactions are changed by the use of socio-technical systems. How should socio-technical systems like e. g. the tool „CoDesigner“ by Haworth be designed to support and not to replace architects? CoDesigner is a software to be used to significantly optimize and shorten design processes for medium-scale to large-scale office spaces (time savings: from weeks to hours). The revolutionary, AI based, parametric-generative office space modeling approach considers requirements consisting of hard factors (constraints) as well as soft factors (social environment) and operates within different scales (large-scale strategy, feasibility studies, test fits and detailed planning) and stages of the design process. It makes use of project-specific, customizable rule-sets that emulate professional planning strategies. The software generates a dynamic space layout (e. g. for feasibility studies) for office buildings up to 1000’s of workplaces in just 4-8 hours considering most important parameters. By a built-in prioritization process, even contradicting objectives lead to a plausible consensus or to scenarios that can be consolidated. Corporations with complex planning needs get optimized layout solutions with massive time savings for conception and changes & higher process and decision reliability (all key figures needed for strategic planning, detailed planning and for consensus-building workshops with different stakeholders are evaluable in real time).

CoDesigner in an overview:
• a big challenge for corporations is to introduce “agile work” even in offices. But so far, there is no “agile planning” process for “agile work” surroundings. - CoDesigner is an “agile planning tool”
• CoDesigner generates a variety of layout scenarios and potential alternatives in real-time together with the grade of fulfillment of requirements
• the software visualizes target conflicts
• the user interface delivers an unrivalled, unique customer experience for both professional planners and for non-professional participants in co-creation workshops: an easy-to-use design & handling is suitable for both professional planning processes and for live sessions (workshops).

In a joint project by STO and Haworth, sociologists with focus on new socio-technical systems at work, are evaluating the tool CoDesigner in terms of usability and acceptance among future users (architects) of the tool. Therefore, architects are asked about the possible deficits and optimization suggestions during the use of the tool. These suggestions will be summarized in a recommendation catalog. This list of recommendations helps Haworth to optimize their tool further on. The research interest of the sociologists is to investigate, how the professional profile of an architect will changed through digitization and what this mean for the entire industry of planning spaces. With this contribution offer, we would like to present our cooperation between sociology (STO) and economy (Haworth) and present the tool CoDesigner, first evaluation results and we would like to discuss those together in the plenum.
Throughout recorded history, the ingenuity of the human race in accruing immediate gain and material comfort has consistently challenged its sense of collective reflection and societal values. This is especially true in the realm of information and computer technologies (ICTs); where the euphoria of the opportunities unleashed by the internet and the world wide web (WWW) have led to sustained discussion about how to shield netizens from their potentially harmful fallouts. Online rights, ethics, privacy, and information security have become very real issues in the virtual world. I posit that though the internet has been beneficial for society in general, its proliferation is posing several challenges for the netizen and the internet society. In my presentation I will discuss the effect that the challenges arising from the internet have had on society, in light of the policy paradigms of neo-liberalism, good governance, and human rights; and how the values and commitment to the principles behind these policy paradigms are shaped by local exigencies. I will also discuss that my research finds formal risk management techniques an effective mechanism for mitigating the effect of web related challenges. Risk management techniques can be used to predict and control the infringement of rights of the netizen during online activity. My research has also indicated that many of the perceptions vis-à-vis the threats that lead to these challenges have local, even ethnic overtones. The duties of society to the individual are fundamentally a cultural issue; albeit with a political façade. Ulrich Beck1 has characterized modern society as a risk society, “which is increasingly occupied with debating, preventing and managing risks that it itself has produced”. I will present how these risks can be mitigated by a ‘think global, act local’ approach that is based on stochastic risk management.

1Beck U., Living in the World Risk Society, Economy and Society Volume 35 Number 3 August 2006: 329_345

**Keywords**: Risks, WWW, Rights, Information Security, Netizen
Are all pathways to Sustainability paved with Digitalization and Technological Acceleration? A Critical Assessment Mapping of Nordic Social Innovation
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Better control of public spending, more engaged citizens, more sharing, improved performance of public transportation, lighter traffic, development of advanced energy and waste management solutions, optimization of energy consumption in buildings, unlimited connectivity and massive technological digital integration are some of the rewards that cities and decision makers are expecting to get from embracing digital and technological approaches. Many cities are developing projects, supporting social innovation and even designing entire new neighborhoods to set in place intelligent communication tracking capabilities that allow collection of real-time digital data. Social innovative enterprises are effervescent with apps offering to solve many service necessities people may not have even known they have. This is done holding the promise that the data will boost the creation of new urban services and the creation of a new form of sustainable urban ecosystem. Smart city approaches and social innovation and entrepreneurial efforts in several European cities are today enjoying great finance and multi-stakeholder backing. Some of these approaches can be assessed and traced in their evolution over the last five years. This paper poses the question to what extent digitalization and technological acceleration is articulating a form of inevitable pathway through which most of the solution and visionary thinking with regards to sustainability and a low-carbon transition are now being interpreted? The paper focuses in examples of social innovation implemented in Northern Europe and specifically in Nordic countries. The projects target key areas of sustainability such as inclusiveness, democratization and low carbon solutions and the paper analyses the way they have evolved from their idea forming to in some cases becoming a city strategy, impacting a variety of related social projects. For these examples the paper maps the drivers, stakeholders, agency, governing and expected impact contributions to these projects. The resulting positioning and mapping shows how the projects are advancing toward contrasting societal visions between technological acceleration and dessaceleration, and individualization and community forming solutions. The assessment illuminates the ways in which acceleration of digitalization in society seems to be exerting a stronger pull on the thinking and creation of solutions for sustainability that is by now assumed in a taken-for-granted manner by decision-makers and social innovators. While sustainability solutions created via disruption of social practices, new local engagements and typically leading to dessaceleration (f.ex: forms of degrowth fewer cars, shared assets leading to lower energy consumption), are also to a large
extent transitioning digital pathways but still maintaining niche status. The paper raises many more critical questions than offering concrete answers at this point. At the time of submitting this abstract the reflective con- clusive questions needing further investigation are: can alternative non-digital, community strengthening visions and solutions be advanced and gain societal traction to contrast the strength or pull created with acceleration of technology and digitalization society? Will it matter to sustainability?

Keywords: acceleration, digitalization, sustainability, social innovation, individualization, community, degrowth

Science, technology and lived experience in the Global South: viral events, resistance and control

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The role of technology in the digitised society cannot be effectively examined without shedding light on its relation with power and authority. Recently, a woman taking off her headscarf and putting it on a stick in the middle of a busy street in central Tehran has catalysed a feminist movement in a country where wearing of the headscarf is enforced by law. In Iran, where most social media platforms are banned, the consequences of this image going viral on uncensored instant messaging services like Telegram and Instagram can lead simultaneously to increased government knowledge about dissident cultural practices on one hand, and to emancipatory, grassroots political action on the other. A symbolic subversive act from a marginalised citizen, brought into national and international discourse through the affordances of new media, and subsequently galvanised through actions of solidarity and support by other citizens and their bodies, demonstrates the necessity of increased global consideration of the uses and effects of socio-technical developments in life outside of regions typically considered by western academic literature.

In this paper, I use the recent narrative of Vida Movahhed, “Girl of Revolution Street”, as an example of a technologically catalysed sociopolitical movement taking place within the context of the Islamic Republic of Iran, to point out the importance of going beyond the well-known use cases of technology within western environments, if a thorough study is to be conducted. While it is critical to acknowledge that internal affairs should be left within the locals’ hands and that no kind of foreign intervention can be justified, I argue how global scientific engagement with increasingly digitised lifestyles beyond the cultural sphere of the West can serve to mutually empower both groups. Within an open innovation framework, it has already been acknowledged that a diversity of expertise and lived experience can enhance performance on critical work both within and outside academia. At the same time, such a framework ameliorates marginalisation of those living in places with restrictions on the availability and use of consumer electronics and online networks. Discussion centres on pathways toward a framework of STS for (non-Western) research settings that eschews interventionalist or neocolonial methods, in favour of a constructive-responsive collaboration between holders of varied expertise. In this way, I show that it is possible to expand beyond the currently dominant western liberal perspective on the
role of technology in society, adding to existing knowledge a heightened appreciation for the relationship between public access to science and technology, to new sources of local and international knowledge, and ultimately, to the potential for diversifying worldviews such technologies bring about, within the context of social oppression and authoritarianism.

**Keywords:** Iran, viral, social media, resistance, control, technology, empowerment, open innovation

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**Provisioning in the digital landscape. Assessing platform-supported ecosystems to foster collaborative commons at urban scale**

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Appraisals of the disruptive potential for the social good of the blockchain or digital ledger technology (DLT) beyond its original support to the Bitcoin (2009) and other financial assets, make their way since 2014. In fact, the assessment of the potentialities of the DLTs to transform social and economic interactions attracts researchers, engaged citizens and local institutions/agencies at international level with various ongoing attempts to move from the so-called sharing economy, basically dominated by the GAFA model (Google, Apple, Facebook and Amazon), to the self-management or co-production of individual and collective resources. In this context personal data become a strategic asset that can be managed with policy fostering data sovereignty, fueling the collective machinery of the digital commoning. As an example, strategic individual resources such as attention, while becoming scarce, attract market colonization, and risk to be monetized in forms of micro-entrepreneurialship (see the BAT platform). Moreover, fundamental human activities – like childcare etc. - that cannot fully commercialized, open the door to a reflection of the role of fiat money and the possibility of creating tokens enable people to recognize and share what care most. The transformative power of digitalization cannot grow without a full awareness of the social skills, intended mainly as soft and life skills. They are more and more recognized as basic human resources on which the commons – and not only them - can rely for their flourishing. Soft skills relate mainly to conflict resolution, critical thinking, creative thinking, etc... Life skills refer to self-management: ego-centered behaviours affect also the commoning, as very often very interesting and advanced programs fail not for economic or structural reasons but for the self-Factor. A provisional description of theoretical and practical attempts to match DLTs with a more sustainable process of provisioning can include ECSA (Economic Space Agency), Metacurrency and FairCoin. A critical analysis of these three projects can help to disentangle the main problems occurring when dealing with the development of a DLT out of the financial sector toward a full-fledged self-reliant ecosystem. The urban context seems to be at the center of attention for its bringing a concrete opportunity of social transformation offered by the potential of digitalization. So far, efforts oriented to the construction of an urban blockchain are built within an ecosystem allowing interoperable transactions and facilitating collaborative economy, peer-to-peer production and the commoning. In this sense it is illustrative the Co-City project in Turin, an action-research based
on the co-designing of the urban territory. The trans-disciplinary approach (Nicoleşcu, 2000) to the co-designing of such technology based on an enactive paradigm it is what can help to integrate outer and inner ecosystems. 5 KEYWORDS: soft and life skills, wise cities, enactive sociology, self-organisations, mindful transformation.

Keywords: soft and life skills, wise cities, enactive sociology, self-reliant organizations, mindful transformation

Session 13 [2]: Degrowth and Digitalisation
Chair: WÄCHTER, Petra – University of Vienna, Austria

Digital commons for degrowth? An empirical case study on a peer production organisation
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Peer production, as a form of organisation where producers contribute freely to advancing a product and making their knowledge freely available to other contributors, has been on the rise since the broad introduction of the Internet. Previous literature of peer production has suggested that designing globally through digital knowledge commons and producing locally through new 3D-printing technologies could contribute to sustainability. This, in connection to the often non-profit orientation of commons-based peer production (CBPP) organisations, has led scholars to argue that CBPP organisations could help to achieve degrowth. However, this link between CBPP and degrowth is still rather weak and calls for further scrutiny, as these organisations do not necessarily have a clear link to reducing matter/energy throughput and are still very much prone to the rebound effect.

The purpose of this paper is to explore whether and how CBPP organisations can contribute to economic degrowth. The focus of the study is on the research question: how are the aims of sufficiency presented in the organisational discourses of peer production? In other words, how does the practitioners’ intension to reduce matter/energy throughput manifest itself in peer production organisations? By employing a degrowth perspective, this empirical study analyses a CBPP organisation in terms that not only going beyond eco-efficiency but also beyond the so-called eco-effectiveness. That is, the study looks at the potential of a sufficiency strategy within the CBPP organisation. The paper builds on two main bodies of literature. The first one is the emerging degrowth theory, including explanations of, as well as debates on, the key concepts such as sufficiency and strong sustainability. The second literature body is peer production. The empirical data was collected by conducting 7 in-depth interviews with people from a CBPP organisation specialising in local renewable energy production. In addition, secondary data of 8 web pages was analysed in the case study.

The findings show that the aims of sufficiency only manifested marginally, if at all, in the discourses of the case organisation. For example, as regards the reduction of matter/energy
throughput, the interviewees only spoke of eco-efficiency as a part the organisational practices. In general, the practitioners considered the mission of the organisation to be mainly humanitarian, despite their focus on producing renewable energy. As a conclusion, this study is inclined to suggest that while digital commons of peer production have some promising theoretical groundings, it does not signify that an organisation will adopt the aim of sufficiency. If peer production is to fulfil its theoretical potential of contributing to degrowth, other changes must also be made within organisations. In particular, this includes complementing the utilisation of digital commons with an explicit organisational aim of reducing the matter/energy throughput. This means that digitalisation, which is has importantly allowed the renaissance of peer production, has to be also scrutinised in a critical light.

**Keywords:** Degrowth, peer production, digital, commons, organisation, renewable energy

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**Cryptocurrency of the degrowth**  
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Money, concretely centrally regulated FIAT currencies are tributary to economic growth. Commodification has become a cultural code that defines human action as well as natural resources. Money is used and globally accepted as a unit of wealth distribution. It is also a great tool of power, created by central banks and big financial corporations to which citizens consciously give away their individual savings and let corporations play the game of creating value (and profit) in money creating transactions and also deciding where to invest the concentrated capital. To transform the society towards Degrowth we need to change the way we use, own, create and interpret money in all its functions (unit of account, store of value, medium of exchange). Most of the money related practices of various initiatives, which aim to change the status quo and which can be also found in Degrowth research, are related either a) to organizing money available in the community or b) creating new community currencies. Concretely, these include ad a) e.g. ethical and community banks, ethical investment and loan platforms or crowdfunding and pooling platforms; ad b) e.g. local and social currencies, LETS, time banks or convertible currencies. In the recent years, we may observe development of these practices in many regions, also due to the development of ICT and digital platforms. Whereas the first mentioned practices have to deal with regulations of central banks, the latter also with their purchasing power as a result of (semi)closed economies they tend to develop. All practices must deal with trust and hesitation of local communities to get involved. The important questions here are whether these practices could eventually perform as a vital set of alternatives capable to support the Degrowth transformation. Could they change the status quo globally? Shall they avoid or incorporate speculators? What role has ICT in these practices and how can it support cooperation? How and shall they transform into offline practices? With the development of blockchain algorithm (decentralized database of transactions) used in cryptocurrencies, the above raised questions are seemingly outdated already. But they are still valid, as will be in this contribution illustrated on the example of FairCoin cryptocurrency, developed by cooperative
initiative FairCoop. Technologically, economically and biophysically, the system designed by FairCoop is based on cooperativism and the commons. It seeks to create diverse infrastructures for its members, such as online market place, legal anchoring, ethical banking and pooling and local currencies’ qualities of a medium of exchange. It aims to redistribute wealth from FIAT currency-based economy to fair economy using cooperation strategy on financial markets. In short, FairCoop aims to create a complex global infrastructure, which could incorporate all the mentioned alternative monetary practices. This ambitious digital innovation could certainly play a role model in Degrowth-oriented research. It opens a research field on e.g. biophysical limits of the blockchain technology and of the economic transactions between the community, on limits of the relative value growth strategy or on trust in global commons.

**Keywords:** cryptocurrency, FairCoin, degrowth, digital commons

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**Digitalization in the Global South: Leapfrogging the development model of the North?**

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Whether and under which conditions modern information and communication technologies (ICTs) and digitalization could contribute to more inclusive, equitable and environmental friendly development in countries of the Global South is increasingly discussed in the literature. Not extensively, but very controversially debated is also the question whether ICTs and digitalization could enable those countries to ‘leapfrog’ the ecologically, socially and economically unsustainable development stages of the earlier industrialized countries and allow them to even reach certain qualities of degrowth societies before early industrialized countries do.

The paper provides a review of the current state of the literature on these subjects and carves out major arguments and counterarguments as well as shortcomings of the debate. The review covers in particular two strands of literature: 1) literature addressing the concept of degrowth in the context of the Global South (including distinct perspectives from the Global South), particularly considering the role of technology in these writings, and 2) the literature that deals with the implications of ICTs for development processes and purposes, usually summarized under the term ICT4D (ICT for development).

Drawing on the findings of the review, this paper argues that in order to better understand if, how and under which conditions ICTs and digitalization could contribute to more inclusive, equitable and environmental friendly modes of economic activity in the Global South one needs to take a closer, systematic look at the technologies underlying the notion of ‘digitalization’. Dissecting this umbrella term and analyzing its parts from a degrowth and post-development perspective could be instrumental in discovering the hidden (or very obvious) asymmetries and inequalities that technologies associated with digitalization entail, but also help to identify potentials and entry points for balancing inequalities. Subsequently, the paper will
present a preliminary classification of technologies and discuss selected examples (such as e.g. blockchain technology).
By providing this framework, the paper aims to enrich the analytical tools to assess the potential implications of ICTs and digitalization. Furthermore, it will briefly discuss how current debates in degrowth and ICT4D literature could mutually benefit and inspire each other.

**Keywords:** ICT4D; degrowth; Global South; post-development; analytical framework

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**Transition of the energy sector - The role of ICT**

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The energy system is of utter importance for everyday practices in modern life. It perpetuates western lifestyles and is incorporated in food provision, mobility, heating and cooling in homes, mobile communication, etc., thereby playing a central role in the production and distribution of products and services. At the same time, a transformation of the current energy system is necessary, given its amplifying impact on global climate change. Although progress is stagnant and a full transformation of the energy system still remains a utopian vision, there is a broad consensus for the need of decarbonising the energy sector.

The aim of this paper is to highlight current dynamics of the energy transition and the role of Information and Communication Technology (ICT) within the normative concept of a degrowth economy. Therefore, an evolutionary-political framework is applied in order to capture and interpret ongoing dynamics of the transition, as well as to elaborate on alignments and contradictories concerning the role of ICT. It is argued that economic change is path-dependent and heavily based on existing institutional arrangements and the economic setting. Over time, the emergence of general purpose technologies (GPTs) facilitates stable energy-technology assemblages in the form of stable punctuated equilibria. Although listings of GPTs are very heterogeneous, there is a consensus on the so called “Big Three”: (1) Information and Communication Technology (ICT, such as microcontroller, computers and the Internet), (2) electricity and (3) steam (Ristuccia, Solomou 2014, p. 5; Ellabban et al. 2014). In this paper it is argued that the ongoing transition of the energy sector is a reconfiguration of the first two GPTs. ICT is being integrated in the production, distribution and consumption of electricity in a Schumpeterian upward complementarity fashion (Schumpeter 1908; Dopfer 2017). Compared to its (currently still) hegemonic fossil-based counterparts, renewables are still facing major disadvantages such as higher costs of energy production, higher intermittency, premature/insufficient energy storage technologies and a deficient electric grid architecture, which was built for centralised energy production and unidirectional flows for energy distribution. New ICTs promise to help overcome these drawbacks by enabling higher coordination and control, both in between non-human objects and with human actors (European Com- mission 2009; 2011). However, the transformative power of ICT in the energy context is still unclear, as well as its socio-economic consequences.
It is the aim of this paper to contribute conceptually to the evolutionary-political literature with a theoretical framework for the current energy transition and a special focus on the role of ICT within a degrowth economy.


**Keywords:** evolutionary economics, evolutionary-political economics, information and communication technology, general purpose technology, energy transition

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**Session 14: Information infrastructures and the digitalisation of science**

Chair: HOMMRICH, Dirk – Institute for Technology Assessment and Systems Analysis, Germany

**Introduction: Information infrastructures and the digitalisation of science**

HOMMRICH, Dirk

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Information technologies, online resources and internet-based networking amongst researchers are an integral part of digital infrastructures for science communication and scholarly community building. While computational enhancement of scientific work processes certainly has just
begun session 14 focuses on the available possibilities for science communication and scholarly community building. Such ICT-based modalities of the present could be call scholarly online systems (SOS). My introduction highlights two facets of information infrastructures, SOS and the digitalisation of science: collaboration on the one hand and future images of scholarly communication on the other.

Like every technology, hardware or software, SOS — no matter if commercial or communitarian — need the support of their community as ‘collective user’. When SOS-teams try to run their systems non-commercially, the connective and affective, mobilising power of informal scholarly online and offline communication and social networking is a central need to keep things going and to motivate people (innovators, promoters, contributors) to commit themselves to the respective SOS and dedicate a part of their time and energy to support the respective infrastructure – and to identify professionally with it and/or its scientific ‘scene’.

Hence, if academic information and communication infrastructures are to succeed as open access or semi-commercialized services operators need knowledge about how to improve collectivitv and dedication both within their reference community and between communities: What is the impact of (and usage of) scholarly and institutional collaborative (inter)action? Assessing the (possible) impact of the digitalisation of science on collaboration could provide a basis for successful scholarly and digitally enhanced scientific community building within ‘open science’. But, in this context – regarding the current state of research about the scholarly use of information infrastructures – there seems to be a blind spot concerning our knowledge about collaboration and cooperation by means of as well as for such digital ways of enhancing researcher’s work. And although ‘we’ already have different types of e-collaboration at our disposal, we’re still called upon to realise that the available samples of concomitant research indicate a lack of findings and of research about collaboration.

At first glimpse it therefore seems to be plausible to consider future images of scholarly communication and scientific community building as a method of assessing in which direction sociotechnical possibilities will develop within academic or specialised knowledge work. In other words, the session may also be understood as a plea for a “vision assessment” (Grunwald) regarding anticipatory dreams and future images which could be suitable subjects for a of scholarly collaboration: Beneath the discourse on open science (which is driven by the digitalisation of science) lurks much interaction but little collaboration by means of and for specialized portals, specialized information services and scholarly i.e. academic networks. Hence, the session also aims at providing the basis to look for future images and to think about them as distorting mirrors of sociotechnical arrangements of today’s scholarly communication and community building.

**Keywords:** Scholarly online systems, networking, collaboration, impact assessment, visioning
Self-archiving and the use of pre-prints in astronomy and mathematics

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In astronomy and mathematics a large share of publications is freely accessible online via disciplinary or subject-specific repositories. Referring to an empirical study of including bibliometrical analysis and in-depth interviews, the contribution examines the role of self-archived manuscripts in the communication system of the two disciplines. The analysis shows that repositories act as a second channel of disseminating research in addition to journals. Moreover, it reconstructs how repositories are being used by authors and readers. In both fields authors even-handedly self-archive their manuscripts in part not only before the publication appears in a journal but even before peer review is completed. This happens for different reasons, including the improvement of accessibility, the protection of priority, and to increase the chances of getting the research published in a journal. Early self-archiving before completion of peer review de facto bypasses the evaluation procedure which is a precondition for trust in published research. Therefore, it is asked whether readers deal with such pre-prints in a specific way, taking their potential non-peer-reviewed nature into account. The reconstruction shows that the usability of self-archived manuscripts results from specific routines among the readers: They interpret contextual information of pre-prints, undertake tests of plausibility, use the author name as a proxy for trust, limit the citation of pre-prints, and distinguish between trustworthy and non-trustworthy components of a pre-print. Thus, the routines of the readers are complementary to the routines of authors and are – to some extent – shaped by epistemic characteristics of the particular field.

Keywords: green open access, information infrastructure, e-science, astronomy, mathematics

One Website, few Scientists, multiple practices: Social Science
Genetic Association Consortium

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The decreasing costs of genotyping and increasing number of individuals providing their genetic and personal information to the numerous biobanks of different forms are driving a change in social sciences, exemplified by the emergence of social science genomics. This field in the making aims to explain using genetic data the phenomena that formerly were exclusively in the “social” realm. I am analyzing this phenomenon with a focus on the main institution, Social Science Genetic Association Consortium (SSGAC), and its activities online and offline. In doing so, I propose that the consortium signals a new mode of doing social sciences, where not only genes enter the scene, but also new practices emerge. From providing frequently asked questions about the consortium’s research articles to publishing the research plans on open
science platforms prior to the research and sharing the data on the website afterwards, the SSGAC is where doing science and science communication converge. Understanding this convergence allows to observe the politics of making the new social science (genomics) and how “going online” is part of the making as well as the boundary making.

**Keywords:** emergence, genomics, social sciences, science communication, open science

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### Physical studios & digital research environments

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Currently, vast amounts of fundings are invested in the development of digital research infrastructures. It has been documented, that especially in the arts and humanities the use of research infrastructures still is comparable low.. On the other hand it is proven fact, that the use of infrastructures increases research output, productivity and innovation, which led to the development of scientific gateways, especially in the sciences. Critically reflecting the technology driven development of current research infrastructures, the author detects a lack of satisfaction when trying to apply research infrastructures into multidisciplinary, innovative, collaborative processes. Mainly, they miss to support methods as well as stay flexible against the dynamics of innovative, creative research processes, trying to involve researchers just at the end of an existing process and when products already developed, e.g. via user involvement, actually rather to disseminate an infrastructure than to build one. Due to this unsatisfactory situation - especially, but not exclusively, in an experimental, (organisational) agile project design setting - , an international European consortium coordi- nated by the Austrian Academy of Sciences developed the concept of an Open Innovation Research Infrastructure (OI-RI) in 2017.

Core ideas of the infrastructure are: OI-RI is applying the liquidity concept on infrastructures. Next to a virtual environment, physical spaces and places are connected; a tight network of exchanging champions and knowledge is established. The OI-RI is aiming to support the implementation of the Knowledge for Development Agenda (2017).

OI-RI aims to stimulate and support the application of open innovation methods and prac- tices in science to build an expert culture based upon openness and trust in value based organisational settings. It builds on the principles of co-design, participation and design thinking, developing infrastructures where, where and how they are needed in certain communities. The OI-RI is a innovation driven infrastructure. Innovation is interpreted socially and technically. It aims to bring together the right persons, knowledge and technologies to solve a question/problem; curiosity driven research as well as challenge driven processes are supported. The OI-Ri is a flexible, “liquid”, steadily developing environment; demonstra- tors are value driven organisational settings within the infrastructure; they are framing a collaborative innovation network. Scenarios are smaller organisational units, building best case examples. The concept was first established on the example of a cultural diversity demonstrator, aiming to connect the European Scientific Academies (AGATE ecosystem). Since then, it has been
applied theoretically to various research areas, such as 1) biodiversity and linguistic diversity; 2) biographies; 3) media arts and 4) Lexicography.

Based on the visual representation the author aims to give a brief overview on the main mechanisms and challenge discussion to improve the concept.

**Keywords:** open innovation in science; impact science; human centered approach; liquidity; methodological infrastructure; hybrid infrastructure
Governing through numbers: the case of vaccination policy
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Vaccination rates are prominent objects of media interest, and estimated likelihood of peaks (of infection rates) and all-time lows (of vaccine uptake) make for regular headlines. This paper explores how these projections are assembled and what practices they rely on. More specifically, this paper reports on early findings regarding the ways in which this vaccination data is collected (or not) and shared (or not) in Austria and the Netherlands in so-called “vaccination registries”. In doing so, this study document the different ways in which notions of public and private health risk is counted and accounted for, documented, captured, and reproduced. Methodologically, we draw on policy documents as well as secondary literature and publicly available visualizations of epidemiological data. Our findings suggest that vaccinations registries first, order state-society relations in particular ways, and, second, reproduce and embody notions of compliance and deviance.

Keywords: vaccination, knowledge, governance, policy, Austria

Online Expert Mediators: A new stakeholder category or problematizing the role of blogs in patient engagement
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Digital technologies have not only been hailed as solutions to various current challenges regarding the delivery of healthcare, but also as conducive to patient engagement. Using Collins and Evans’ concept of interactional expertise, this paper examines the online activities of three people diagnosed with bipolar disorder, who share their insights about this condition on blogs. It argues that by combining medical knowledge with their situated experiences, and by utilizing the affordances of blogs, they have become a new type of stakeholder, the online expert mediator. Collins and Evans’ concept is extended by taking into consideration the role of the medium through which interactional expertise is displayed and by showing that its bi-directional character is more substantial than they had envisaged. To mimic the approach of regular users,
the bloggers were selected using the Google index as a relevance indicator. Data were collected between July 2014 and February 2017 and consist of: bloggers’ posts about the treatment of bipolar disorder; information provided under the “about” rubric of every blog; materials from other online platforms where these bloggers were mentioned. The texts collected, including hyperlinks and images, were analyzed through thematic analysis. The findings indicate that through the knowledge they display and the alliances they forge, these bloggers have successfully carved a place for themselves in the new space made possible by the recent health imperatives and have expanded their influence beyond that of most authors of illness blogs. The rise of this new stakeholder category- the online expert mediator- denotes a possible turn from community activism to highly successful entrepreneurial selves, that is, to exceptional patient figures, who have been able to use various resources and the opportunities and limitations the Internet has made available to become highly influential. Despite views that the Internet would have broad democratizing effects, the findings show that the great standing of online expert mediators is not the result of a rebellious use of this medium, but of a dynamic alliance with ‘traditional’ experts and of a strong media presence. Thus, rather than contributing to opening the field of scientific engagement to more people who lack official credentials, online expert mediators might inadvertently contribute to the refinement of existing hierarchies in the relations between medical professionals and patients. Nevertheless, this new type of stakeholder may also help bridge the digital divide by sharing medical knowledge in an accessible manner, by making people diagnosed and their families aware of the options at their disposal, and by helping them get in touch with support groups and other organizations. This paper thus provides a nuanced perspective on the level of authority and agency that people diagnosed can acquire through digital technologies.

Keywords: patient engagement, interactional expertise, illness blogs, entrepreneurial selves

Dr. Internet – An analysis of the E-Patient, Online search behavior of patients and changes in the doctor-patient interaction

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More and more people search for information on topics of health and disease on the Internet. The impact of this process on the doctor-patient relationship has become a relevant area of research only in recent years. In particular, in Austria there is a lack of knowledge concerning the e-patient, which includes the perspective of the patients as well as the perspective of the doctors and a possible change in the role of the doctor and the sick role. In our research project, we analyzed the following research questions: 1. Why do people use or do not use the Internet in order to gather information about health issues? 2. Does the attitude of a doctor towards e-patients affect the actual contact and the interaction with the patients? 3. Does the increasing amount of online health information lead to a modification of the doctor’s role and the sick role? In addition, our aim was to identify types of search-behavior of patients, to identify and analyze selected aspects of the patients and the doctors view about the doctor-patient
relationship and to develop a typology of doctors’ attitudes towards the e-patient. We conducted 15 qualitative interviews with doctors (general practitioners) in Graz. In addition, we conducted a standardized interview survey. The sample comprises 308 patients of the doctors whom we interviewed before. We collected the data from December 2015 to February 2016. The quantitative analysis showed that online research on health complaints is a widespread phenomenon among patients. Especially younger and higher educated people use the Internet to gather information on topics of health and disease. In addition, a relatively long previous Internet experience and strong confidence in information provided online increase the probability to conduct online searches. Concerning the doctor-patient interaction our analysis showed, that neither patients nor doctors address the online searches about health and in depth support of e-patients about their online research does not take place The qualitative analysis showed that the majority of doctors perceive e-patients as positive or at least not negative. Doctors who often use the internet with the scope of their professional occupation rather take a positive attitude towards e-patients, but the respective attitude of a doctor does not influence how he or she is handling the patients Our analysis showed that event though many patients search the internet for health related information and even though many doctors have a positive or neutral attitude referring to this, there is a lack of communication about the internet based information of the patients. Nevertheless, it is important to discuss a potential changing role of the doctors. On the one hand, their expertise and their expert status is in question. On the other hand, patients seem to be willing to accept the expert status of the doctors.

Keywords: Dr.internet, e-patient, doctor-patient interaction, online search behaviour of patients

Ethics of e-health: Mapping the ethical issues in health care digitization
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Health care is one of the many societal areas which have felt the impact of the fast development and increased presence of information and communication technology (ICT). The transformation of the traditional non-digital understanding of health care into a more modernized ICT-aided (i.e. e-health) represents one of the natural consequences of the digitization process. Health care digitization undoubtedly creates many great benefits for people, the health care system and eventually the economy. This has also been recognized by the European Commission and is clearly visible through its efforts to steer the transformation of health care in the Digital Single Market. In that sense, unlocking and making use of the great potential of the new technology in the domain of health care is an inevitable step which we have to embrace. However, when it comes to technological innovation, one should always bear in mind the fact that technology can represent a double-edged sword. Apart from the many benefits and potentials, there are also risks that go along with it. Therefore, it is necessary to delve into questions such as: To what extent is the digitization of health care in line with the values and principles rooted into the non-digital doctor-patient relationship? What are the implications regarding citizen’s privacy, autonomy, participation, equal access to health services and
resources, solidarity or the notion of consent?
The aim of this paper will be to pinpoint the main ethical issues and challenges that may arise in light of the digitization of the health care sector and also provide recommendations for addressing them. In the paper it will be argued that even though technology does bring numerous benefits for the health care sector, nevertheless, in the long-term these benefits can be easily overshadowed unless ethical issues and principles are also taken into consideration and embedded in the process of designing and using those technologies.

**Keywords:** e-health, ethical issues and challenges, ethical principles, recommendations

**Immaginaries of acceptance**

**LANG, Martina**

**TU Graz, Science, Technology and Society Unit, Austria**

New technologies are subject to imagination. They raise both hopes as well as fears. Promising futures and solutions for pressing societal challenges are important driving forces of technological change. Especially in relation to health care provision, new technological innovations play a central role. Demands are expected to be high in ageing societies and with increasing rates of dementia and chronical illnesses. Yet, digitalization of medicine is also met with apprehensions. These range from privacy issues and loss of autonomy to concerns regarding inequality and marginalization within society. How to address these concerns and how to assess them in relation to new digital health technologies it the core question we address with this paper. We will present a method developed to stimulate focus group discussions on digital health avatars. Our research team has produced video clips showing imaginary applications of such avatars. In such a way focus-group participants are stimulated to think and envision more concretely possible scenarios of how future digital health care technologies might look like. This allows us to obtain in-depth insight into how such imagined futures are assessed by focus group participants. The paper will address the potentials and limitations of this empirical methodology.

**Keywords:** Digital health, health care, methodological aspects, ageing society

**What do we care?**

**WIESER, Bernhard**

**TU Graz, Science, Technology and Society Unit, Austria**

With this paper, we address the desirability of socio-technical futures. Current changes in medical technologies promise new ways of care. This includes diagnosis, treatment, provision and prevention of diseases. First and foremost it is digital technologies which are presented to hold great potentials for better health care. Yet, will their intended users accept these technologies and how is it possible to foresee that? The anticipation of acceptance faces a number of methodological challenges. Predictions of an essentially open and uncertain future are difficult to make. Acceptance can neither be predicted nor guaranteed. It is therefore more
meaningful to ask about the parameters of desirability rather than the likelihood of envisioned futures. In our paper we will analyze different framings of acceptance and try to point out what is often left out in the assessment of socio-technical futures.

**Keywords:** Digital health, health care, body and technologies, methodological aspects

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**Session 16: Diagnostics after the genome: reconfiguring subjectivities and collectivities**

**Chairs:** AARDEN, Erik – University of Vienna, Austria
METZLER, Ingrid – University of Vienna, Austria

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**Treating the Infection: Hepatitis C in Ethnographic Perspective**

LEHNER, Lisa
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The last five years have seen a genuine revolution in Hepatitis C-therapy: New direct-acting antiviral drugs promise to rid the human body of the HC-Virus for a full “cure.” Based on ethnographic research in Austria, I interrogate the effects of this revolution, both material and semiotic, on Hepatitis C-treatment practices and on patients: How is Hepatitis C treated now and what is it treated with, but also, what is Hepatitis C treated as by doctors, insurance companies, governments, and international agencies? And, what are the consequences for patients afflicted with and cured from Hepatitis C? Building on foundational STS-work such as Ludwik Fleck’s (1979), I argue that Hepatitis C and its cure are mutually constituted and co-emergent, allowing me in turn to ask how the cure has been changing the very ontology of Hepatitis C. The targeted precision of the cure enacts Hepatitis C no longer as a chronic disease of the liver demanding life-long care, but instead as an urgent infection located only in the virus. What had long been known as “the silent killer” has turned into a “viral time bomb.” The gradual effects of a chronic disease demanding life-long care have become urgent infections calling for immediate intervention. As such, the Hepatitis C case demonstrates some of lived consequences of what Lakoff and Collier (2008) have called the “emergency modality of intervention.” This shift from chronic to infectious has shifted the ethics of care, addressing patients not as socially situated bodies but as carriers of a viral threat. This transformative moment in Hepatitis C-treatment therefore offers a privileged lens into the ontological politics of disease, which Annemarie Mol (2002) has long urged us to investigate, in critical interaction with patient care and patient subjectivities. Drawing on interviews with afflicted individuals and ethnographic vignettes at a patient advocacy group, I will trace the effects of these reconfigurations in the enactment of disease into the lived experiences of those who are or were infected with Hepatitis C.

**Keywords:** viral disease, care, ontological politics, pharmaceuticals, biopolitics
“We all carry something”: reconfiguring genetic identities and reproductive risk prevention through expanded carrier screening
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„Expanded carrier screening“ or ECS is a novel genetic diagnostics which has emerged since 2010 and has been made possible both by the Human Genome Project (HGP) and new genetic technologies such as Next-Generation Sequencing (NGS). Currently, ECS is almost exclusively offered by commercial laboratories as a “direct-to-consumer” (DTC) test; it aims at informing couples in reproductive age whether or not both partners unknowingly are carriers of the genetic variation for the same recessively inheritable condition. If so, each child of the couple has a 25-percent chance of inheriting the variation from both parents and being affected by the disorder. Carrier screening is not new, since the first tests had been developed in the 1970s for single conditions which were relatively frequent in ethnically defined “risk groups”. What is new, however, is the fact that due to HGP and NGS several hundreds of recessive variations can be screened for in one single and relatively inexpensive test. Therefore, since almost all humans are assumed to be carriers of at least one such variation, all individuals and couples, even those without any family history of genetic disease, become the target group of ECS, thus creating a huge market. This is nicely expressed by a marketing slogan of one of the commercial ECS providers: “We all carry something – which is why we all need carrier screening”. While expanded carrier screening can be done also during pregnancy, many medical researchers as well as ethicists recommend to undergo it before conception and pregnancy („preconceptionally“ or in „pre-pregnancy“). These expert groups argue that in case of a positive result the so-called carrier couple would have more “reproductive options” (such as preimplantation genetic diagnosis, gamete donation or adoption) before than during pregnancy in order to prevent the birth of an affected child.

ECS is characterized, therefore, by a threefold expansive dynamics: first, the extension of the target group to the whole population; second, the temporal expansion of reproductive responsibility and risk prevention to “pre-pregnancy”; thirdly, a dramatic broadening of the scope of preconceptional/prenatal prevention to hundreds of conditions, many of them being mild, treatable and late-onset.

In the paper, it will be shown, based on empirical examples from websites of ECS providers, how new genetic identities and subjectivities are created, subtly called for and generalized in the process of establishing ECS. Among these identities are the responsible “pre-pregnant” woman, the well-informed carrier and the rational carrier couple. In addition, if it is seriously aimed at performing ECS prior to pregnancy, new organizational arrangements are required, for instance in order to motivate a large number of young adults to undergo screening “in time” or to reduce the number of “unplanned” pregnancies. While to date it can hardly be anticipated to what extent these new identities will actually be adopted or the organizational structures be accomplished, ECS nevertheless has the potential to substantially transform and reconfigure current practices of reproductive risk prevention.

**Keywords:** carrier screening, genetic identities, reproductive risk, prevention, direct-to-consumer test
Genetic diagnosis: risks and perspectives
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AMEU - ISH, Italy (1), former researcher at Italian National Research Council (2)

Whole genome sequencing is a promising new powerful help in diagnosis of rare diseases and at-present-not-diagnosable genetic conditions, for which clinicians may conjecture a correlation between genetic mutations and disease, but do not have clear evidence to support their hypothesis. Even if scientists and researchers are extremely excited about new findings that are made possible by the whole genome sequencing, there are still progresses to be made: as an example, it would be really important to understand the precise functions of genes composing the human genome and their genetic variants in order to detect which ones might be benignant, pathogenic or without an explicit significance for the health of the subject. Let us focus our attention on the case of breast and ovarian cancer. Genomics changed the way in which these diseases are diagnosed, treated and managed. Genetic data used for diagnosis need to be discussed between the patient, her physicians and a team of skilled professionals. The patient’s family is usually involved in the discussion, particularly when genetic variants have been inherited from her parents and can be transmitted to her children. The presence of a mutation in genes might increase the risk factor to develop a cancer, and since this risk might be shared among people in the same family, a personalized prevention/treatment for the patient only is not enough: the health of the whole family has to be taken care of. What exactly does it mean “increasing the risk to get a cancer”? When in a genome are present some harmful genetic variants, such as in the case of genetic variants of genes BRCA1 and BRCA2, related to breast cancer and ovarian cancer, the risk factor to get a cancer becomes high. What can a patient do? We try to analyse the problem through the critical discussion of Angelina Jolie’s case and her choice of a surgical preventive treatment. We will then approach the discussion about the extent to which the concepts of health and disease are re-shaped by genomics, and which language and communication strategies are needed in order to help individuals develop their personal responsibility and make it more fitted to the challenges of genomics.

Keywords: genomics, risk factors, language, communication, responsibility

Reimaging care? The emergence of cell free fetal DNA testing in Austria
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University of Vienna

This paper explores the emergence of cell free fetal DNA testing in practice over the past five years in the city of Vienna (Austria). Cell free fetal DNA testing - or cfDNA testing for short - is a fairly new practice that capitalizes on the presence of short segments of fetal DNA ("cell free fetal DNA"), which are shed from the placenta, in a pregnant woman’s blood, where they circulate next to her own cell free DNA. Sequencing technologies can help to transform this into
fairly robust information about the genome of a fetus. Since 2011, when first clinical tests have been introduced in the United States and in China, such tests have travelled quickly around the globe, triggering a debate in which various actors puzzled through and also powered over the question for which job this test was the right tool, and how it ought to be implemented in practice. This paper explores how this question has been preliminary answered in Vienna. It asks how cfDNA testing was adopted in practice, what kind of visions and values have been coproduced in this adoption process, as well as who had a voice in this debate. The paper, first, zooms into spaces in which cfDNA testing was adopted, showing that the tests were adopted differently in these “mini-worlds,” or “worlds of care.” Second, zooming out from these spaces, the paper argues that despite their notable differences, these are not “worlds apart” but mutually-dependent elements of a “moral economy of care,” that share responsibilities in the ordering of pregnancies and unborn human life, and, while doing so, also articulate visions on what good care is and how it ought to be performed in practice. Actors from these worlds have also helped to stabilize a preliminary consensus on what cfDNA testing was and how it ought to be used, envisioning cfDNA testing as a helpful aid on to first-trimester-screening-or as a newer way to do an old job.

**Keywords:** prenatal testing, emergence, genome

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**Precision medicine and its ‘Infrastructures of Solidarity’. Probing the social contract in US and EU precision medicine initiatives**

Dr. AARDEN, Erik, VAN HOYWEGHEN, Ine
University of Vienna, Austria (1), Katholieke Universiteit Leuven, Belgium (2)

In recent decades, an ageing population, spiraling health care costs and the rise of chronic diseases have driven health care systems in the West into crisis. For many policy makers, the solution for this crisis resides in a new vision of digital health, also called ‘precision medicine’ or ‘personalized medicine’ (PM). This vision promises health care to be more tailored to the individual with new opportunities for biotechnology industries. On a global scale, a ‘race for innovation’ between nations has begun to set off for the building of personalized medicine (PM) infrastructures. In this paper I articulate the mobilization of solidarity in this race for economic competitiveness in PM initiatives. Drawing on a comparative analysis of PM initiatives in the US and Europe, I empirically probe this through teasing out, first, the social values imbued in these PM initiatives for the recruitment of participants and data sharing. Next, I analyze the role of ‘infrastructures of solidarity’ in delivering PM products and services. Finally, I probe the latter through an investigation of two European-based PM initiatives (in France and the UK). My findings reveal how the potential of personalized medicine depends on widespread ‘collectivizing’ efforts and infrastructures. Most notably, I show how in these PM initiatives, solidarity is not merely an imaginary or discourse formed by our fellow-citizens but is materialized and performed in and through social infrastructures of health care delivery. Accordingly, I trace how the successfulness of these PM initiatives depends on the availability of societal institutes that work as trust-generating ‘infrastructures of solidarity’ in guaranteeing that
for those who enroll in PM infrastructures, treatment and access to care will be provided. I finish the paper by a reflection on these conditions for enrollment into PM and what this entails for citizenship in the era of personalized medicine and the new ‘social contract’ that is envisioned and constituted.

**Keywords:** precision medicine, infrastructures, solidarity, Europe, United States

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Session 17: Microbial living in the time of antimicrobial resistance

Chairs: BRIVES, Charlotte – CNRS -National Center for Scientific Research, France, REST, Matthäus – Max Planck Institute for the Science of Human History, Germany, SARIOLA, Salla – University of Turku, Finland

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**Jordan’s vanishing dairying cultures, or: How to build a culture bank?**

**REST, Matthäus**

Max Planck Institute for the Science of Human History, Germany

Over 10,000 years ago, humans, ruminants and microbes started to establish forms of multi-species milk collectives that have been co-evolving ever since through cultivation, lactation and fermentation. Today, the humans, livestock breeds and microbial strains - the peasant life forms - that have sustained each other through milk face an existential threat from agribusiness and the pharmaceutical industry through industrialized farming and the proliferation of antibiotic agents. While for millennia, microbes were the precondition for preserving milk, in industrial dairy production, they have suddenly turned into the main threat to raw milk as commodity. This has severe ramifications on the biopolitics of dairy farming. Today, the vitality of milk has been reframed as perishability keeping farmers in extreme dependence on dairy corporations that guarantee regular collection only in exchange for highly restrictive contracts. Furthermore, the necessity to milk high-yield dairy cows at least twice daily makes unionization very difficult. At the same time, we witness a dramatic decrease in the diversity of lactic acid bacteria and livestock breeds wherever industrial farming has taken hold while the global dairy cow population can be considered in a severe health crisis with increasing numbers of cows testing positive for antibiotic resistant pathogens. This paper engages a case study based in Jordan where traditional milk production is in severe threat. Working with Bedouin herders, our interdisciplinary research team documents their culture of dairying and helps to preserve their dairying cultures for future generations. One main aim of the research project is to work towards the establishment of a culture bank for peasant dairying microbes. Translating between local knowledge and western science presents me with the opportunity to reflect on the
methodological implications of collaborating with peasants, archaeologists, and geneticists and what it means for all of us - differently and collectively - to live with microbes.

**Keywords:** fermentation, milk, Jordan, microbes, peasants

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**Bacteriophage viruses, or how to live in the ruins of antibiotic therapy**

BRIVES, Charlotte

CNRS - National Center for Scientific Research, France

Bacteriophages are viruses that have bacteria as their hosts. Bacteriophages-bacteria relationships are highly specific, and the two entities have a very long story of co-evolution. Discovered a century ago, and rapidly used as therapeutic agents to treat human bacterial infections, bacteriophages were nevertheless eclipsed by the massive rise of antibiotics from the 1940s onward in Western countries, while gaining in popularity in Poland, Russia and Georgia, where they continue to be used. Today, faced with the major public health problem of antimicrobial resistance, considered the scourge of the 21st century by the WHO, and by the lack of new antibiotic molecules, some scientists and physicians are attempting to rekindle and develop therapeutic phages, encountering considerable difficulties along the way. Based on an analysis of scientific literature, interviews with researchers and doctors, and observations of meetings and symposia on phage therapy, this presentation focuses on the different agencies bacteriophage viruses may have, depending on the assemblages in which they are involved. Often caught between a rock and a hard place, considered either as a remedy or as a poison (but never as a pharmakon), we will see that they are generally trapped in an ahistorical and naturalist narrative. Considered as drugs, they must meet the same criteria, and demonstrate their efficiency through the same devices as those used for antibiotics, even though they do not have the same mode of action. Reduced to their viral condition, they lose their therapeutic competence, equated as they are to the plagues and morbidity inflicted by viruses that target human beings. It is only by locating them in the networks of relationships in and by which they exist, by taking them seriously, applying to them the same interest we give bacteria and other microbes, that they can teach us something quite different. The presentation then traces the way researchers and physicians are actively challenging dominant sociocultural narratives about our becoming with microbes. As such they are engaged in the production of a new narrative about humans, viruses and bacteria, a complex story that invites us to rethink our relationships with microbes, the environment and living things more widely.

**Keywords:** viruses, therapy, environment, Evidence-Based Medicine, AMR
The public life of microbes
DELGADO, Ana
TIK Centre for Technology, Innovation and Culture, Norway

In the last decades, there has been an explosion of DIY and makers spaces as well as other forms of crowd sourced and low-cost grassroots initiatives that have engaged with research on a number of issues of common concern, from climate change to the ‘open’ production of drugs such as insulin. This talk explores the various ways in which ‘anti-biotic resistance’, a recalcitrant public issue, is being taken care of in an out of the institutions. Drawing on conceptual discussions on infrastructures developed in STS and anthropology, this presentation looks at the work of ‘infrastructuring’ performed by different communities: Institutional scientists, DIY and makers groups, or just citizens. What old and new forms of living with microbes come together with this work of infrastructuring?

Keywords: Publics, infrastructuring, microbes

Where species meet: an ethnography of a bacterial vaccine trial in Benin
SARIOLA, Salla
University of Turku, Finland

The rise of anti-microbial resistance has pushed for various forms of new health care technologies that aim to circumvent the use of antibiotics. This paper explores a vaccine study in Benin, West Africa, that aims to prevent bacteria-borne diarrhoea and the development of drug resistant strains. The vaccine is a new technology in the post-antibiotic era that follows the logic that as diarrhoea presents a risk for acquiring AMR, preventing diarrhoea protects also from acquiring AMR.

The paper analyses encounters between Northern European tourists, who double-act as participants in the vaccine trial, with local populations of Grand Popo. As part of the vaccine trial, the tourist-cum-research volunteers spend two weeks in the region chosen for its moderate levels of infectious diseases and antimicrobial resistance as well as historical, cultural significance. While holiday-making in Benin, these study participants become exposed to various new bacteria; some fall ill with diarrhoea, while other don’t. In this encounter, social and microbial cultures meet and mingle.

Based on ethnographic research conducted in 2017-2018, paper seeks to understand how all those involved in the trial understand microbes and anti-microbial resistance. Their experiences in the vaccine study reveal the different modes of discussing, embodying, embracing, and resisting encounters with the local, both human and microbial. The paper discusses the shifting ways the tourists embody and discuss their bodily contours and assumed embodied integrity, porousness and fragility in relation to the local environment, for example via the experience of diarrhoea.

Keywords: AMR, ethnography, vaccines
Locating resistance: Microbial knowledges from the Black Queen Hypothesis to the innovation ecosystem
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What does it mean to become “resistant”? Resistance, as a word, denotes power. The power to deflect adversity, refuse to comply, integrate with, or become something else. Resistance can be a disruptor to a system, a tool to manifest change, or, in particular contexts, a threat. In microbial worlds, resistance is the response to selective pressures such as antibiotic environments. To understand microbial resistance scientists are acting as multispecies ethnographers seeking to narrate microbial worlds. As a metaphor for understanding this process the “Black Queen Hypothesis” (Morris et al, 2012), premised on the logics of the card game, Hearts, offers a reductive evolutionary explanation to the complex interactions within microbial communities. In this theory diversity is the key to the agility of the community and survival is based not an individual species evolution but on dependencies and the “leaky genetic resources” which become “public goods”. In the study of the resistome, scientists are thinking with the Black Queen metaphor as they seek to understand mechanisms and practices used by microbial communities to resist the various perturbations that elicit the deployment of specific genes encoding resistance. While this knowledge is key in devising “next-generation” antibiotics it also travels from the lab to do work in other spaces, such as in agricultural biotechnology where “harnessing the power of microbes” is posited as the third green revolution.

In fall of 2017, I spent three months in the American Midwest conducting an ethnographic study of science practices, cultures of expertise, and occurrences of knowledge transfer on the topic of human-microbe relations and antimicrobial resistance. My primary site was an academic functional metagenomics lab that studies the resistome. The crux of the work done at this lab was on the bioengineering of “kill switches” into model E.coli bacteria, that when introduced into other biotas would overwhelm the community with genetic material, designed to out persist resistance through abundance.

From the starting point of the resistome, I traced commercialization pathways from the lab into industry through participant observation and open-ended interviews with scientists and agronomists at an agricultural biotech company producing microbial product lines for use in industrial agriculture. I also interviewed scientists involved in bioentrepreneurial spin-off companies that link academic and industry spaces in an “innovation ecosystem” of scientific knowledge provisioning.

The collection of techniques, materials, and people with expertise, as well as the capitalist endeavors to commercialize products, are as much a part of anti-microbial resistance as the microbial organisms. In this way, the resistant microbes become an actant connecting other networks of academic, industry, and entrepreneurial processes.

In this paper presentation, I will borrow from the “Black Queen Hypothesis” to tell the story of antimicrobial resistance as a microbial technology that has become more than just a threat to human flourishing. By drawing on ethnographic data and relevant theory, I will describe how
microbial resistance within scientific and biotech spaces, connected within an innovation ecosystem, becomes a potential pathway from the dystopian future imaginaries where medicine has failed, adequate food cannot be produced, and global economies have collapsed.

**Keywords:** antimicrobial resistance, biotech imaginaries, human-microbe relations, innovation

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**Session 19: Criteria for bioeconomy**

Chair: LIEBERT, Wolfgang – BOKU, Austria

**Introduction to the criteria for bioeconomy of the BOKU**

LIEBERT, Wolfgang  
BOKU, Austria

**A needs based approach to assess the social-ecological efficiency of strategies in the bioeconomy**

OMANN, Ines, DE SCHUTTER, Liesbeth  
Vienna University of Economics and Business, Austria

Bioeconomy is emerging as the promise of low carbon pathways based on renewable resources. In doing so, the bioeconomy expands its role from being merely a food supplier towards an integrated supplier of biobased inputs for a wide range of products in the economy, which may contribute to employment, knowledge and innovation as well as development in both rural and urban societies. Biomass, however, is largely limited by either the amount of land or by the amount of (synthetic) inputs to increase yields. Hence, next to food provisioning, increasing use of biomass for non-food purposes challenges important other functions of land resources, such as biodiversity conservation, water purification and carbon sequestration. As humanity fundamentally depends on the provisioning of these life sustaining functions, bioeconomy pathways need to respect both environmental boundaries (safe pathways) and contribute to wellbeing in society (just pathways). To raise stakeholders’ awareness and capacities to act responsibly in the complex problem environment of a bioeconomy, Max-Neef’s Human Scale Development Approach (HSDA) has been applied in multi-stakeholder workshops in urban and rural contexts in Austria. By developing a common, needs-based language and understanding of the multiple roles and functions of a bioeconomy, stakeholders become aware of the bioeconomy strategies they apply to fulfil their needs. Analysis of the strategies in a structured matrix reveals a significant variance in ‘social-ecological efficiency’ of applied bioeconomy strategies, i.e. the amount of resources and/or environmental impact related to the fulfilment of one or multiple human needs at the individual level. By developing strategies in a future
bioeconomy ("the bioeconomy we need"), stakeholders become aware of potential development opportunities and transformation necessities related to (un)safe and (un)just pathways in the social and ecological context of the bioeconomy.

**Keywords:** bioeconomy, human needs, safe and just pathways, rural development, sustainable production and consumption

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**Bioeconomy as a topic of public interest – fostering knowledge, critical discourse and understanding**

JUDITH, Feichtinger, SCHRAMMEL, Maria
Centre for Social Innovation, Austria

Bioeconomy is very complex; it continuously evolves and is differently interpreted as it addresses a broad range of actors, sectors and activity fields. Even though bioeconomy will affect not only economy, agriculture, industry and land-use but also societal challenges, society, and with that every individual person, a knowledge gap prevails and only few awareness is exiting at all. The concept together with circular economy is not well-known among European citizens due to a general lack of information or a lack of information sources tailored to the general public. But not only the broad public and consumers exhibits a knowledge deficit. Knowledge sharing in or between policy, research, education and business is still in a very early stage of development. To close this gap and in order to support landing a sustainable and circular bioeconomy, the BLOOM project tries to foster knowledge, exchange, learning, engagement and connections particularly between state actors, industry, business, civil society and the broad public. To respond to specific regional needs, activities shall be anchored firmly at regional and local level engaging in structured and coherent communication on bioeconomy research and innovation results and activities. Consequently, the BLOOM project elaborates five regional hubs in Spain, Netherlands, Austria, Poland and Finland to co-create and develop particular strategies and tools for science communication of bioeconomy. Different topics such as forestry, bio-plastics or agriculture and food will be critically examined with multi-stakeholder groups in these regions. Benefits, challenges, barriers but also risks will be discussed and materials will be developed in the respective regions, to communicate the topic to the general public, to stakeholders but also to formal education. The ethics platform of the University of Natural Resources and Life Sciences (BOKU) has drafted a paper with the title “Ethical criteria for bioeconomy”, formulating scientific-technological, socio-economic and methodological criteria. These criteria aim to call scientists and other stakeholders’ attention to the sustainability goals which have to be combined with bioeconomy objectives. In our presentation we will discuss the challenge of science communication to the broader public and other target groups in the field of bioeconomy and show possible ways, challenges and barriers to achieve an inclusion of ethical criteria and the sustainability goals in these activities. We will discuss which standards will be crucial to be reflected in outreach and formal education and which standards bioeconomy outreach material has to follow to meet environmental, societal and economical requirements and to be accepted by the public.

**Keywords:** bioeconomy, outreach, ethical standards, science communication, education
Gene drives are genetic elements that are able to spread their genetic information faster than Mendel’s Principles of Heredity permit, according to which a trait can be passed on to at most half of the offspring. In laboratory experiments with gene drives, almost 100% of the offspring were converted to genetically modified organisms (GMO). When organisms have a short generation time like insects, then already after a few months, a large part of the population could have a new property transmitted by the gene drive. In particular, very invasive gene drives may be able to impose properties on entire populations that would otherwise not spread. In many potential applications, gene drives should be used as a kind of self-propagating delete-function: For example, if the property mediated through the drive is that the male or female offspring are infertile, then sooner or later the entire population may disappear. Under consideration are varying applications from the destruction of mosquito species to the control of pesticide-resistant weeds or the elimination of invasive species such as rats and mice. Financed by private investments and public funds, an increasing number of research groups are working on gene drives. So far, they have not yet been released, but the discussion is gaining momentum. The development of new gene drive variants is closely linked to the upswing that genome editing methods have taken by the recent use of CRISPR-Cas gene scissors. Progress is also evident in the semantics chosen by the participating researchers: Since the use of CRISPR-Cas, Gene Drives are called a ‘mutagenic chain reaction’.

Compared to previous GMOs, gene drives collide with basic principles in the regulation of GMO releases due to their inherent property to spread in wild populations. The potential use of this new quality represents a revolution in the handling of GMOs. The current regulation of the release of GMOs assumes that for specific periods of time a certain amount of GMOs will be released in a particular region. However, with gene drives a technology arises whose innermost principle lies in exceeding these limits: the transformation of wild organisms. So far, gene drives prove to be only partially successful in laboratory approaches. One of the main hurdles is the ability of organisms to change their genetic code. In addition, it is still unclear whether gene drives are manageable at all. Due to their inherent tendency to spread, a loss of control is by far more probable than with common GMOs. Uncertainty concerning the potential consequences within ecosystems is growing with the spread of artificially induced changes. Technology assessment therefore refers to an increasing ‘ignorance’ associated with
such powerful technologies.
A broad social debate is urgently needed to clarify the issues associated with the use of Gene Drives. Their range and their potential consequences are too significant to remain disregarded. This contribution serves as an introduction into the field of gene drives. It explains the qualitative difference that genetic engineering has reached with this technology and gives a brief overview of current approaches and intended applications. Furthermore, an approach of technology characterization is presented which helps to estimate the potential power and the corresponding extent of non-knowledge associated with gene drive systems.

Keywords: gene drive, CRISPR-Cas, mutagenic chain reaction, GMO, self-propagation

A world without mosquitos? Communication aspects on one of the latest techniques
DIEKÄMPER, Julia
Museum für Naturkunde, Berlin, Germany

There is - traditionally - not much consensus concerning gene technology. Instead every new development provokes a variety of ethical, legal and social questions with a conglery of possible answers. However, at this point the discussion about new methods of genome editing does not differ much from former debates. Nevertheless a new trend can be observed, which seems to unite the regulatory and the scientific side. Both recommend to involve the public at an early stage in the discussions about relevant developments and key questions. At least that is what the numerous opinions and statements say. The creation of new spaces of deliberation and calls for public participation in political decision-making processes of new technologies have become widespread in recent years. So the question is why should the public be involved? What differentiates genome editing for example from astrophysics?
In my talk I will have a closer look at different possibilities of participation on the occasion of genome editing. The question of gene drives should be the central issue here. This is what the example of the research project GenomELECTION at the Museum für Naturkunde (Museum of Natural Science) in Berlin/ Germany serves me for. In this sense I will ask why a place like a Museum of Natural Science can be fructify. In comparison of different narrative strategies and formats I will present very first projects findings and take them as a starting point to reflect on main discursive patterns.

Keywords: gene drive, genome editing, science communication, participation
Technology Characterization of Gene Drives
FRIEß, Johannes, GIESE, Bernd, VON GLEICH, Arnim
University of Bremen, Germany (1) BOKU Vienna, Austria (2) University of Bremen, Germany (3)

Within the field of genetic engineering the Gene Drive technology represents a new quality with regard to its depth of intervention. Due to their irreversibility and the intended self-propagation, the spatio-temporal range of Gene Drive applications incorporate yet unseen possible consequences and threads for ecosystems, ecosystem services as well as the whole ecosphere. Therefore these new techniques demand a precautionary assessment of expectable benefits and risks. A prospective assessment of Gene Drives begins with its first step the ‘technology characterization’ and aims at identifying ‘reasons for concern’.

For this purpose various techniques of Self-Propagating Artificial Genetic Elements (SPAGEs), which include Gene Drive techniques, are characterized. Technology characterization aims at identifying reasons for concern with the help of criteria like ‘intensity and depth of intervention’ (resulting in high technological power and a high range of exposure), ‘reliability’ and ‘options and limitations of countermeasures’ in case of failure. Following the hypothesis that the application of technologies with a remarkable power and range of exposure ‘produces’ non-knowledge up to ignorance about possible consequences, an estimation of the hazard and exposure potential is possible as well as an assessment of the dimensions and qualities of non-knowledge combined with it.

The intensity of intervention serves as a quantitative aspect, which considers the two factors of mass and frequency of intervention. In the context of Gene Drives it characterizes the necessary number of releases and the amount of GMOs per release. In contrast, the depth of intervention is meant to evaluate the quality of the technology’s power and range. For SPAGEs in general, the depth of intervention is much higher than for population control approaches which are not based on genetic modifications. SPAGEs constitute a manipulation of the very basis of organisms, their genetic characteristics and thus produce high power and high range (because of self-propagation). The spatio-temporal range as consequence of depth of intervention describes the potential consequences of a Gene Drive with regard to exposure, considering its lasting persistence in a population as well as the range with which it could spread across populations. And it considers the possibility of either intended or unintended spread of a Gene Drive across multiple populations or into other species (invasiveness).

Reliability describes the probability of failure of the technology with regard to its intended use. The criterion ‘options and limitations of countermeasures’ deals with the question whether and how a failed Gene Drive and/or its effects can be reversed and how feasible these measures are. For some SPAGE technologies it is claimed that they can be somewhat remedied. But such an endeavor would not really reverse the damage done.

Prospective technology characterization serves as a source of knowledge for precautionary action and a mitigation of risks up to an appropriate design of the technology in the earliest phases of research and innovation even when possible applications are still unknown. The characterization of SPAGE technologies discloses remarkable differences in this technological...
CRISPR/Cas9 based gene drives for fighting malaria: aspects of prospective technology assessment
LIEBERT, Wolfgang
BOKU Vienna, Austria

Session 21: Expanding the biosphere: Critical issues for biotechnology, from lab benches to low-earth orbit

Chairs: MALI, Franc – University of Ljubljana, Slovenia
VIDMAR, Matjaž – University of Edinburgh, United Kingdom

Measuring the Europeanization of the Anti-GM Movement. Evidence from Five EU Countries
SEIFERT, Franz
Independent Researcher, Vienna, Austria

This study investigates the Europeanization of the anti-GM movement. Drawing on a quantitative protest event analysis that covers the period from 1995 to 2009 in Austria, France, Germany, Spain, and the UK, as well as in the sub-, supra- and transnational sphere (N = 1,865), it compares four pathways to Europeanization—domestication, externalization, supranationalization, and transnational pressure. It explains the relative prominence of these pathways by a general theory of movement behaviour based on transaction costs and contextual opportunities and the specifics of EU's GM policy domain, and it examines alternatives to these standard predictions. While Europeanization is presented as multi-level process entailing national, sub-, supra- and transnational arenas, nation states remain the key arenas of movement Europeanization which is reinforced by the contentious character of the GM policy domain. While grassroots actors show a certain tendency towards transnational activism, only well-resourced, professional actors exploit opportunities at all levels.
A new innovation and product development paradigm has emerged linking academic research, entrepreneurial and corporate R&D and the wider society by creating so called “Living Laboratories”. These are geographically bounded regions particularly suitable for intensive systemic research on the relationship between the technology advancement, the natural environment and the wider society.

At the same time, the Space Industry is in a time of transition, from the “classical” to the so called “New Space” era. From cheapening of base technologies to miniaturisation and creation of satellite constellations, to a more open and accessible satellite data, new geo-information services, enabled through Space assets, are being developed at an accelerated rate.

Where these two paradigm shifts meet is often in research and applications of natural environment monitoring and advanced data analytics, which has led to a series of applications in the agricultural (agri-food and forestry) sector. Specifically, this “bird-eye” view is enabling a completely unprecedented amount of resources management and planning as well as scrutiny of environmental conditions, agricultural practices and their impact on food systems, though quality of data might be contested.

This paper explores this new agenda, its structural significance and the nuanced changes it is bringing to the way in which we develop understanding of the natural environment, and the exciting opportunities it affords to users and regulators. Additionally, it reviews the emergence of new innovation networks and the reconfiguration of new product development processes (NPD) in the next generation Space Industry in Scotland, which is at the forefront of the Living Labs and New Space “revolutions”.

Keywords: innovation, space, environment, monitoring, data
cultivation area of over 8000 Ha in 2008, steadily declining since then until zero in 2017. Comprehensive research into socio-economical and environmental impacts of its cultivation and processing is needed. This research addresses the issue from Czech GM maize farmers’ perspective. I investigate premises and promises bound to the insect resistant bt maize MON810 against the reality of its cultivation in the Czech Republic. In this paper I will present results of semi-structured interviews with most of the Czech farmers growing GM maize in 2015 and questionnaires answered by Czech farmers who grew GM maize between 2005 and 2016. I test how assumptions embedded in the risk assessment and benefits claimed by the GM maize seed producer correspond to the agricultural practice. The GMO Panel of the European Food Safety Authority supposes besides other things that farmers can compare GM and conventional production locally and historically; that farmers are able to notice potential unforeseen adverse effects and report them to the GM seed patent holder or state authorities; that farmers sow so-called refuges consisting of conventional maize; that farmers are educated in the GM production matters; that a co-existence of GM and conventional production is possible. Preliminary results based on semi-structured interviews and questionnaires indicate that not each assumption at the basis of MON810 authorisation in the EU holds true in the practice. For example, one of the tools of the mandatory general surveillance, farmer questionnaire developed and distributed by Monsanto cannot provide reliable information on potential adverse effects. Similarly, at least some of the benefits of the GM maize cultivation claimed by the patent holder are questionable, e.g. easy manipulation; reduction of insecticide use; time saving; lowering unit production costs. Further results relate to what benefits do see Czech growers of GM maize in its cultivation and what attitudes they have to GM crops in general. Qualitative analysis of interviews with Czech GM farmers shows that they accept GM crops based on their experience (satisfaction and conviction of no harm) and assumptions (bt sprays used in organic agriculture, long experience of no adverse effects worldwide). Farmers perceive that there is currently no alternative to GMOs and generally frame GMOs as a progress and means of sustainable development necessary for feeding the world that is beneficial for the environment. At the same time they express concerns about rising herbicide resistant weeds and about unknown long-term effects of GM crop cultivation.

Keywords: GM crop, bt maize, farmers, assumptions, promises

Why the future progress of modern biotechnology depends on well-informed policy decisions: the need to find the balance between research openness and policy control

MALI, Franc, OLOFSSON, Jennie
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In the article “What’s coming up in 2018” (Science, January 4, 2018), Science’s news staff predicts the specific events of research and policy that are likely to feature the news in the year of 2018. Fifteen events are mentioned, in different scientific areas, to attract the interest of the
wider expert, and public audience. In the area of biotechnology, the decision of the European Union’s Court of how to regulate crops modified with CRISPR/Cas techniques will be accepted. This decision will be crucial to the future course of genome editing science, in itself an issue that for a long time has been in a legal limbo stage. Our paper will introduce some reasons for why the recent tremendous progress of biotechnology, especially the newest revolutionary innovations in CRISPR genome editing technology, might possibly face a slowdown. The starting-point is two parallel factors that could have negative effects on further development and application of genome editing techniques. On the one hand, we see that the extremely lucrative and short-term profit orientation of some actors, which insist on strict use of intellectual property right (IPR) regimes in the most advanced parts of biotechnology (i.e. synthetic biology) might lead to a dead-end. Today’s various stakeholders do not like to waste time to monopolize this groundbreaking technology and to capitalize it on the huge market. However, increased patent disputes among those stakeholders who is the owner of CRISPR technology appear to have long-range harmful effects on the further progress of this revolutionary technology. We will draw on the most recent cases of “interference” proceedings at the patent offices to present trends like these. On the other hand, the increasing requirement of various stakeholders to treat the CRISPR technology in the same way as former genetic engineering – something that implies strict (trans)national legal regulations – are also not the best promise for the further progress of biotechnology. Here, we will use some cases to present that the “regulatory logic” which is not necessarily the same as the “scientific logic” did make a lot of unnecessary obstacles. Although the crucial stakeholders dealing with genome editing technologies agree that these new technologies are necessary to meet the challenges of global changes such as population growth and climate change, the practical policy solution does not always follow this direction. Our paper argues that the real challenge for today’s biotechnology is to find the right balance between providing sufficient research openness and sufficient policy control.

Keywords: genome editing, CRISPR, patent disputes, commercialization of biotechnology, legal regulation

Whose values, whose science? The role of regulatory science in maintaining scientific controversies in animal feeding studies

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Alpen-Adria Universität Klagenfurt, Austria (1-2), LIS Consult (3), TU Graz, Austria (4)

Some animal toxicity studies, of potential relevance to regulatory science (science conducted for regulatory purposes), trigger controversies among scientists as well as among other stakeholders, sometimes even engulfing the public at large. They often seem complex, persistent, and difficult to resolve. Values (apparent in science when compromises between competing views and interests are negotiated/achieved) seem to play a role but the relationship between facts and values is often not well understood. Nonetheless values can affect the interpretation of scientific facts to the point that different experts assessing the same facts would come with different conclusions. When addressing scientific controversies decision-makers, and
their expert advisors, generally believe that they should focus solely on scientific considerations, which are supposedly value-free. Yet we argue that value-based issues are present within and alongside scientific considerations in the regulatory responses (study assessments and further decisions) to such controversial studies. We apply our analysis to three case studies: genetically modified organisms and the Seralini study, aspartame and the Ramazzini study and bisphenol A and the Stump study. The findings are used as a basis for developing policy recommendations. 

**Keywords:** scientific controversy, values, regulatory responses
In the wind ridden peninsula of Scoraig in the Scottish Highlands, Hugh Piggott and other members of the local community have been building small wind turbines to electrify their rural cottages since the early 1980s, when they first arrived there as young environmentalists who looked for a simpler and lower environmental impact lifestyle. The windmills they built were assembled from reused materials sourced at the local scrapyard, and their practical engineering skills were developed while repairing farming equipment, fencing live stock and building boats. Their ability to produce small, but vital, amounts of electricity for lighting and radio, was the driving force to gradually develop, over the next two decades, a robust and efficient small wind turbine design that could be made locally with simple tools and local materials. The small wind turbine design manuals and the practical hands-on construction courses offered by Hugh Piggott, have inspired many others to build their own turbines and to form construction groups around the world, in order to provide energy access to rural communities especially in the Global South. The global network of ‘Wind Empowerment’, which consists of more than 40 organizations based on all continents, currently uses and develops these designs, while having built and installed among its members more than 1000 locally manufactured small wind turbines all over the world.

The authors, with both engineering and STS backgrounds, use an ethnographic action research approach to immerse themselves in the grassroots technological networks of small wind turbine builders, endeavoring on a journey to experience the fluidity (De Laet and Mol, 2000) of an open source locally manufactured wind turbine and study its co-production from surrounding agents, such as precarious wind patterns, self-built tools, recycled and up-cycled materials, basic electricity needs and the unique design styles and temperaments of each individual builder. By revisiting the human scale design and socio-technical imaginary of the Radical Technology movement of the ‘70s (Harper et al., 1976) and its more recent revival in the digitization era, the
Design Global Manufacture Local movement (Kostakis et al., 2016) where desktop manufacturing meets the ‘benchtop’ of crafts men and women (Sennett, 2009) in a multitude of urban Maker Spaces and rural Farm Hacks, the authors attempt to sketch the concept of a ‘Makeshift Engineering’ design process, with the aim of approaching sustainability through resilience and the ability of a practical engineering arrangement to adapt to continuous changes – or more commonly to ‘go with the flow’. The makeshift engineers encountered in this journey design artifacts by mobilizing the user communities, by putting science to service and performing ‘high-science yet low-tech’ experiments (Werrett, 2013), by exercising a kind of frugality in making the most out of available materials, by cultivating skills in maintenance and repair while tweaking and tinkering with the machines, and by sharing the ‘recipes’ of their open designs with their social networks. The design culture that emerges out of this research, sees its artifacts as works-in-progress (unlike commercial products which are considered complete, fully functional and universal in their use) with a focus on the local, and encompassing the uncertain while becoming of a fluid and humble nature.

It is in this sense that the wind turbines of the Scoraig peninsula, grow out of their environment in an organic relationship to the social, the material and the natural. They are a patchwork of seemingly random assemblages of parts and of queer aesthetics, yet all of which are an outcome of function. The local residents enjoy tinkering and tweaking these technical arrangements, which essentially undergo constant ‘mutations’ for a better adaption to the local environment and for a more reliable electricity source. But the locals also value and enjoy this ‘Makeshift Engineering’ process, which in essence is a path towards mastering the craft of wind turbine building.

References:

Keywords: makeshift engineering, adaptive design, resilience, small wind turbines, local manufacturing, design global manufacture local (glocal)
"Crafted mobility": STS lens on transport design in the Russian Arctic
KRAVCHUK, Svetlana, HYYSALO, Sampsa, AKIMENKO, Daria
Ural State University of Architecture and Art, Russia, (1) Aalto University, Finland (2) University of Lapland, Finland (3)

Among different living environments, remote Arctic territories present a unique setting where, throughout the history of human presence, challenges of nature have encouraged a strong reliance on technology and evoked a creative response to understand and overcome those challenges. This may require adapting the application of technology for the setting at hand, modifying or improving the objects, or engaging in thoroughgoing design and manufacturing activities locally in order to make the technology fully adequate and appropriate. Through field encounters (2006-2018) various expressions of people’s technological creativity inspired by severe environment were discovered: the concept of “proximal design” (Usenyuk et al., 2016) encompassed not only users’ ability to adjust, repair and redesign their machines, but the very ability to create entirely new kinds of technology and, eventually, to come up with enduring design principles without the participation of design professionals. While the emerging domain of Arctic design has recognized the significance of traditional artifacts, technologies, and practices, this study has revealed the lack of professional awareness of, as Latour (2008) expressed it, many controversies as well as many contradicting stakeholders that appear with any designed object. To fill this gap and to capture changes in the configuration of Arctic technology and related design activities, the design research toolkit was complemented with a sociological approach to the study of the interrelationships of producers and users of technology as well as technology and society, so-called “Biographies of Technologies and Practices” (BoTP) (Hyysalo, 2010). This approach continues the line of historical-sociological approaches to the study of technology, such as the social construction of technology (SCOT) and geographical construction of technology (G-COT). In the course of our presentation we introduce three thematic “stories of mobility” to discuss different kinds of technologies historically significant in this area: - remotely designed heavy vehicles and their adaptions; - a self-built new class of off-road machines; and - traditional sleds of Arctic indigenous inhabitants. Finally, we discuss sustainability implications of emerging forms of user-initiated innovations in the Arctic with reference to the growing influx of people and technologies, mixing cultures and climate change.

Keywords: Arctic, User practices, Proximal Design, Biography of technologies
Biophilic product design: A bio-inspired approach to user preferences

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The vicious cycle that we have caused by our consumption patterns and artificial world breaks the cycle of nature. This distortive cycle can be summarized as: the developments in science and technology - new consumption patterns - ecological issues - new technologies in order to solve the ecological problems - newer consumption patterns - more ecological issues, etc. We can’t and shouldn’t ignore the place of the artificial surroundings and artifacts in our lives. This proposal suggests searching the ways of affecting the consumption patterns by bio-approaches which target more sustainable solutions.

Bio-inspired approaches are rising in the fields of design and engineering. We can be inspired by nature in the way we produce and recycle, the material which we use, the form that we give but the most important part of it may be missing: the user behavior. The products have their own life cycle in this artificial world and the usage phase can be the longest part of some products. A product which was produced through the sustainability concerns may not be sustained because of using it in an unsustainable way. That would be a two-sided issue to be solved. One is raising awareness among the people; the other one is the guidance of products to be used in a more sensible way. The latter is the focal point of this study. Janine Benyus who is the first biomimic that comes to mind might have implied that kind of approach when she talks about ‘mimicking the nature holistically’ (Benyus, 1997/2002). This proposal focuses on the concept of biophilia as a bio-inspired approach to the user preferences. Biophilia is defined by Edward O. Wilson as “the innate tendency to focus on life and lifelike processes” (Wilson, 1984). It was issued in architectural and urban design as an evolutionary tendency which can affect the people to prefer biophilic places based on the savanna hypothesis. (Heerwagen, 2011). The Biophilic design may be employed to lead the user behaviors in order to be adapted to the natural cycle. What is asserted here is to search biophilic features that direct the users subliminally by appealing to their evolutionary and natural tendencies through the affordance and the signifiers of the products. This is suggested as a bio-inspired solution for the missing link of the sustainable cycle of the products.

The chart of ‘Elements and Attributes of Biophilic Design’ was created by Stephen Kellert for architectural and urban design (Kellert, 2008). In this study, a set of interviews was held with industrial designers through a product pool in order to frame this chart into the product design. To propound the biophilic features of products is very significant to understand if they are effective on the user motivations. Those features can be used to trigger the sustainable behaviors since the humans appropriate the artifacts as the way they domesticate the animals and plants (Panzar, 1997). Since nature and culture are co-evolving and interwoven (Wilson, 1998) the user approaches should be evolving accordingly.

Digital technologies and short-term temporalities. On the framing of
digital technologies in Swedish popular media

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This presentation engages in the ways in which digital technologies are framed within Swedish popular media. Focus is particularly on the increasingly rapid consumption patterns of digital technologies and the short-term temporalities (see for comparison Adam 1998; Nixon 2011; Fortun 2014; Fitz-Henry 2017) that underlie these consumption patterns. Previous research has acknowledged industrialization and, what has been referred to as natural, or turbo, capitalism as constitutive to the creation of short-term temporalities, and this presentation adds to this, the notion of media. Investigating reviews and consumer advices of digital technologies in Swedish popular media, it is evident that computers, televisions, smart phones, cell phones, laptops and tablets are framed, not only as commodities and consumer goods, but as consumable goods, something that also implies their status as disposable. This however, remains under the radar, together with the geographically dispersed processes of managing digital technologies as they turn obsolete, the long-term processes of decomposition, as well as the toxins that are discharged in and through their physical remnants, and subsequently pollute ground, and surface water. This presentation argues that popular media representations of digital technologies matter, not only in the ways people imagine and use digital technologies, but also the way in which we think (or choose not to think) about their afterlife. Clearly, the afterlife of digital technologies is part of another temporality than the market-driven urge for the latest mobile phone model, the fastest computer, the thinnest flat screen, and/or the one with the highest resolution. The seemingly simple acts of exchange however, say little or nothing about the environmental impacts that follow. As the name implies, consumable electronics appeals to short-term temporalities; they are made to be consumed, and more importantly, disposed of when replaced by newer models. In sum, the agenda-setting function of popular media contributes to reinforcing the discrepancy, and hierarchization between different temporalities, something that is most perturbing, particularly in relation to digital technologies.

Keywords: Swedish popular media, digital technologies, temporalities, obsolescence, afterlife
Session 23 (2): STS – Design – Sustainability
Chair: EGGER, Stefanie – Alpen-Adria Universität Klagenfurt, Austria

Open Design and Innovation for Sustainability
TISCHNER, Ursula
FH JOANNEUM Graz, Austria

Design and Innovation can be strong drivers and play important roles to achieve radically more sustainable production-consumption systems and life styles. However, today very often the design disciplines are still rather part of the problem, than part of the solution, as they still support the throwaway society and over consumption of products and services that are not really supporting good and sustainable ways of living.

Often this is due to the fact that the clients that commission and pay designers and their services are still in the old cradle to grave mindset focusing mainly on short term profits and earning their income by selling “stuff” that is produced using precious resources, only used for a short period of time if at all, and then goes down the drain or in the dump or incinerator.

What is missing is a business model and income model for designers that allow them to do the sensible projects that are good for people and the planet and allow them to cooperate and invest their time and energy in solving real problems for real people and systems in need.

The new realms of crowd sourcing, crowd funding, and peer to peer open source design and production are really interesting in this respect as they enable creative people to define the real relevant problems and start with real needs, to team up in project groups to create really radical solutions, and to gather the funding to implement these solutions, e.g. in start up companies or other new business models – or with existing companies and initiatives.

This presentation will summarize the state of the art of open crowd based innovation and funding schemes and introduce www.innonatives.com an open innovation platform, that focusses purely on design and innovation for sustainability. The potential of these kinds of new methods and tools for Designers and their effects will be discussed.

Keywords: design, sustainability, open innovation, crowd-sourcing

The importance of the positive footprint as mental model of for Circular Design
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In the definition of the Circular Design by the Ellen MacArthur Foundation they stress the importance of changing the way products are designed for the success of the circular economy in Europe. At the FH Salzburg, a broader understanding of Circular Design was developed, complementing the new design strategy with the consideration of the impact of social changes
like open source or sharing economy on design and a focus on the positive footprint and core ecological concepts to gain a broader systemic perspective.

A change of mindset is needed first to come up with circular design product innovations in own projects. It is important to develop a circular, integrated thinking to develop new innovative approaches. The positive footprint is discussed here as the important different mental model that inspires creativity in student projects. The idea of improving product design in a way that positive sustainability-related effects of the product or interlinked business activities for human society and the environment was first formulated in the Cradle to Cradle design concept. This is a different approach than reducing the negative footprint, as common in EcoDesign. The positive footprint is especially important to bring in social aspects and biodiversity. It is discussed in the literature that the kind of mental model with which a designer approaches his task makes a prominent difference in results.

Research at the FH Salzburg has shown that it is especially difficult to grasp this concept of “be beneficial” and incorporate it into the design projects. In teaching Circular Design, different reception of the concept of the positive footprint by the students, depending on their previous knowledge in sustainable design, was noticeable.

In this contribution, several tools to teach the positive footprint are discussed as well as results, on the basis of student lectures given to newcomers in sustainable design and students with prior knowledge in Ecodesign in comparison. The findings suggest that new students in the field more easily use this mental framework to come up with interesting sustainable design solutions.

**Keywords:** sustainability, Ecodesign

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**Design patterns for future commons**

GRÜNDL, Harald, FINEDER, Martina, REITSTÄTTER, Luise

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In the light of the changing labor market this presentation radically rethinks design practice by drawing on the knowledge culture and forms of interaction of commons. With the help of case studies, that either leverage the resource of knowledge to protect and share natural common goods or share knowledge to foster social production, new design principles – “Design Patterns for Future Commons” are developed. The cases include *MakerNurse*, apertus® AXIOM, *WikiHouse, Open Source Bionic Hand, Faircap Open Water Filter*.

The research was funded by a grant of the Austrian Council.

Dr. habil. Harald Gruendl is designer, design theorist and curator. He is the founder of the IDRV - Institute of Design Research Vienna and managing partner at EOOS Design. He teaches design theory as well as design practice at several national and international universities, bridging design theory and practice. 2015 and 2017 he was guest curator of the Vienna Biennale. With the IDRV he edited and co-authored the book “Tools for the Design Revolution” (Niggli 2014).

Dr. Martina Fineder is a design researcher and cultural scientist. As a team member of the Institute of Design Research Vienna she headed the research project „Commons as thinking and
innovation strategy in design”. She works at the Academy of Fine Arts in Vienna, heading the research project “City Country Child – An Intergenerational Ethnography on Rural Images of Longing”. She teaches design theory and history at several national and international universities. Martina is one of the initiators of the Victor J. Papanek Foundation.

Dr. Luise Reitstätter is a cultural scientist with a doctorate in sociology and cultural studies. Her main research interests are visual and material culture analysis, museology and exhibition studies, as well as qualitative methods in empirical research. Having worked in the international art field for prominent institutions such as documenta 12 or the Austrian Pavilion at the Venice Biennial 2008 and 2008, she gradually shifted her work focus to the academic field maintaining a strong practice orientation. Recent collaborative projects include the Autumn School “Approaching the 3S. The Spatial, the Social, and the Sensorium”; the research and development project “personal.curator” on technology assisted art education; and the research and education project “Say it Simple. Say it Loud. Easy-to-Read Language as a Key to the Museum.” She also published a monograph on the exhibition as a potential sphere of action (“Die Ausstellung verhandeln”, transcript, 2015).

**Keywords:** Design, patterns, commons
Innovation in the Scottish space sector: Changing paradigms of technology, environment and users’ involvement

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Environmental monitoring from Space is a fast growing innovation area, with significant numbers of new products and services being launched. This innovativeness is built upon a significant change in the Space Industry itself, on one hand, by cheapening and miniaturisation of space technology, and on the other hand, by an increasing openness and accessibility of public space data. These changes are often referred to as an industry transition towards “New Space” and Scotland in particular is becoming widely known as a “New Space hub”, with leading upstream and downstream New Space companies emerging over the past ten years.

The findings of my research so far are showing that the New Space industry has brought about a new innovation paradigm, with a loosely co-joined vertical value chain being integrated in a dynamic (eco)system of players, which are more agile to respond to new customers and markets and who have largely adapted the New Product Development process to address these new opportunities. Crucially, the New Space firms’ partners are far more concentrated in public and academic sector, with increasing demand for environmental monitoring data in particular.

In order to achieve this, the SMEs have had to adapt their organisational structure to such mode of working by simultaneously flattening the firms' hierarchical structure as well as formalise the NPD process. This paper is outlining preliminary findings from an in-depth study based on a two-fold enquiry into the innovation networks and the direct effect they have on new product development (NPD) in Scottish Space Sector firms, specifically small and medium sized enterprises (SMEs). This is carried out by combined ethnographic/ biographical study of the NPD process as a series of “innovation moments”, and using Social Network Analysis (SNA) to map out the innovation network(s) and explore various players’ roles.

Keywords: innovation, networks, space, data, public
Public sector organisations, innovation and transformative governance: The case of the plus-energy-office-tower of the TU Vienna

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Public procurement promoting innovation has been increasingly recognized as a policy issue. It is inspired by notions such as “demand-side innovation policy” and “innovation policy for transformative change” (e.g. Edler/Georghiou 2007, Aschhoff/Sofka 2009, OECD 2014, EC 2016), Weber/Rohracher 2012, Schot/Steinmüller 2016, Geels et al. 2016; EC/ICLEI 2016; Chataway et al. 2017; Schot/Steinmueller 2017). By the example of the “plus-energy-office-tower” of the Technical University of Vienna (TU Vienna) it will be shown how the University as a public sector organisation combined its own mission with the overall societal challenge of climate change. That is, how the university has been able to optimize between its overall mission-related needs, specific user needs, investment needs and major societal challenges within a given innovation policy and regulatory framework. In this framing the TU Vienna has been able to benefit from the combined use of technology push and demand pull instruments and to consider thus policy mixes rather than single policy instruments. Due to the innovativeness of the project, even framework conditions in the form of standards and regulations have been challenged. Therefore, the realisation of the “plus-energy-office-tower” can be seen as an exemplifying element of an overall ongoing system transformation aiming at addressing social and environmental challenges.

Keywords: Demand-side innovation policy; transformative change; public procurement; energy

Proactive STS View to Public Procurement for Innovation

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Introduction: Public procurement for innovation (PPI) has been developed and practiced as a demand-side innovation policy over the last decade. PPI not only help stimulate innovation but also could drive procurements towards a problem-solving and functional agenda (Edquist et al., 2015). In this regard, Edquist (2017) has recently conceptualised functional procurement as a newly categorised innovation-related procurement in contrast to pre-commercial, catalytic and direct innovation procurement. But, what about possible (or should-be) interplays of STS studies and functional procurement when approaching environmental problems that are of considerable societal, cultural, inclusiveness and sustainability impacts?

Purpose: This paper takes preliminary steps in adopting a proactive STS view to public procurement for innovation (PPI), and more specifically to functional procurement. The paper’s cases include environmental procurements where are primarily treated as technical but that are of considerable societal, cultural, inclusiveness and sustainability impacts, such as water management systems, dam construction and water transfer projects.
Methodology: As an interventionist research, the authors have participated in the national project for revitalisation of Urumieh Lake of Iran for the last two years, with an ethnography phase followed by a technical solution phase. It has retrospectively been asked by the participant observers (researchers) that how such a disastrous situation of the lake and water management system could be prevented in previous public procurements and dam construction projects? Therefore, the research is case study, normative, interventionist and retrospectively based on non-practices. Additionally, there is an ongoing practice which could shed some more light on operationalisation of the suggestion.

Case: While it was articulated that public procurement for innovation (PPI), and more specifically functional procurement, had been able to provide a solution and prevent the water crises in Iran, it was also hypothesized that the main shortcoming was the lack of a proactive STS approach to the problem. By proactiveness, it is meant that STS view should proactively get engaged with environmental procurements of significant socio-technical impacts, even when there seems no problem yet. In this sense, inclusiveness of a seemingly-technical environmental procurement should not be confined to technical and engineering communities such as suppliers, procurer and users, but also open to other stakeholders and experts, particularly STS specialists.

Results: Early incorporation of STS view into environmental PPI and functional procurement, where no socio-technical or cultural challenges are felt yet, may be a solution to prevent further crises with exaggerated adverse impacts on the society. It should be noted that there is an ongoing practice under which it has complementarily been hypothesized that a STS view mainly functions as closing off some socially or sustainably undesirable solutions in procurements, rather than opening some up.

Keywords: STS View, Functional Procurement, Public Procurement for Innovation (PPI), Environmental Procurements
STREAM: Towards Low-Carbon Energy and Mobility Systems

Session 25 (1): Smart energy systems innovation: What do we learn from niche experiments?

Chairs: ORNETZEDER, Michael – Austrian Academy of Sciences, Austria
SUSCHEK-BERGER, Jürgen – IFZ Graz, Austria

The role of energy flexibility for a low carbon energy system: Large-scale versus small-scale measures
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Targets for the emission of greenhouse gases require the decarbonisation of energy systems. This requires not only the conversion of today’s energy supply system towards sustainable or cyclic energy carriers. It also means the transition from a demand oriented towards a supply oriented system. There are two main mechanisms to achieve this goal: energy storage and demand shifting. Both of them can be done on large-scale and small-scale. Large-scale energy storage like large-scale production requires large-scale investment and centralized decision channels. This would mean that the classical separation between consumers and producers continues. On the other hand small-scale energy storage, e. g. using the building mass or decentralized hot water tanks require little new infrastructure but more communication, control, and more digitalization, and promote the transition towards a prosumer energy system.

The same holds true for demand shifting, which can be done on the industrial/community level, as well as on the level of individuals, households or small companies. Both large-scale and small-scale solutions are being investigated in different working groups consisting of scientists in industrialized countries. Moreover, both types of solutions are under demonstration in different R&D projects and front runner experiments.

One important question is about whether to force large-scale or small-scale solutions. An important perspective is the question of economic efficiency. Another is what impact the transition to small-scale solutions has on our society and economy, and also which groups of stakeholders are motivated to act.

Regarding economic efficiency, it is not enough to look at cost effectiveness overall, but also what kind of investments are needed, if they can be carried by communities and individuals, or only large companies or the state. A related question is who will benefit from potential financial gains. While economic gains can be a motivator, is is important to communicate the potential gains in order to get behavioral responses. Small-scale solutions also have the potential to
involve and inform people, and enhancing „smarter“ behaviors, e.g. reducing peak-loads, but also saving energy more efficiently by being more informed. In this work we will review specific projects (concluded, potential and planned) on both large-scale and small scale, addressing challenges, chances and problems, and compare advantages and drawbacks of both solution types.

**Keywords:** energy, low carbon, energy flexibility, demand side, energy storage, energy efficiency

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**Local demonstration projects for energy efficient cold supply and their contribution to niche development**

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The refrigeration sector is predicted to rise substantially worldwide in the upcoming years. This will create a corresponding rise of energy demand, if no countermeasures are implemented. One of these measures is a fortified dissemination of more energy efficient technologies and systems. In my talk, I will present results of interviews with stakeholders from demonstration projects in which innovative, more energy efficient, absorption chillers are tested and optimized. These so-called “field tests” consist of larger properties (office buildings, consumer market, hospital, server cooling, laboratories, etc.) with central cooling. The interviews were conducted in the scope of a socio-technical research, which aimed at identification of drivers and barriers of a fortified market dissemination of innovative absorption chillers and was based on approaches from science and technology studies (multi-level perspective, innovation studies). Interview partners were representatives of facility managements, planners, energy suppliers (contractors), and researchers. The interviews focused on interviewees’ experiences during the planning, installation and launching process of the refrigeration systems. They were analysed with regard to the following questions: - Which socio-technical factors influence the quality of installed cold systems in the considered demonstration projects? How does their interplay with regime conditions influence procedures and outcomes? - To what extent do these projects work as drivers of change? How do they contribute to alignment of expectations, network building, and learning?

**Keywords:** multi-level-perspective, technological innovation, refrigeration, absorption chiller innovations, energy efficiency, field test installations, local demonstration projects, factors of influence, interviews
“As we don’t know much about it, it’s dangerous to touch it”: digital technologies in the transition to sustainable energy systems
HORTA, Ana, GROSS, Matthias
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Digital technologies have been considered a crucial feature in the transition to a sustainable energy system. Their increasing integration in appliances, services or energy grids is considered key to enhance energy efficiency through remote control and automation, as well as by allowing utilities to adjust to energy demand in real-time through smart meters. Information and communication technologies are also expected to enhance a more active role of consumers, including as “prosumers” of renewable energy. However, this transition poses many challenges, the need to engage individuals being one of them. Since the growing pervasiveness of these technologies raises questions regarding privacy and individual rights, and its possible consequences are difficult to foresee, increasing acceptance and adoption of digital technologies are uncertain. Moreover, although digital technologies may empower citizens, their complexity is likely to enlarge the divide between groups with and without the skills to use them. Individuals’ knowledge is a critical issue, which has been considered even more important than access to technology. Research on the forms of knowledge that affect individuals’ dispositions to interact with information and communication technologies is therefore needed. In accordance with recent strands of research which emphasize the need to investigate forms of knowledge that go beyond traditional sociological standpoints, this presentation explores how individuals deal with these technologies in their everyday life and, in particular, how they deal with what they do not know, do not want to know, know how to do but cannot explain, as well as what their collective understandings are. By presenting several empirical examples of different forms of knowledge and non-knowledge of digital technologies, this presentation seeks to contribute to understanding how interactions with these technologies take the forms they do in order to shed light on the challenges that may hinder the transition to a sustainable energy system.

**Keywords:** ICT use, energy consumption, knowledge, non-knowledge

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Community Energy Storage: Towards a responsible innovation dynamics
VAN OOST, Ellen, VAN DER WINDT, Henny, KOIRALA, Binod
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Community-based, local sustainable energy collectives play an important role in the transition towards a sustainable, inclusive society. How can local oriented energy innovations developed and implemented in such a way that they enable and enhance the transformative capacity of these local collectives? In our study we focus in particular on the socio-technical dynamics of innovative local storage of energy. Storage of energy produced from renewable resources is seen as a crucial asset of a future stable and reliable energy system. New sustainable forms of local energy storage and smart micro-grids could possibly enhance the transformative role of
local energy collectives, yet a careful alignment of technical, demand and political articulation of these new technologies will be required to realize a successful uptake in local collectives. Our research project focuses on the articulation of two Dutch promising energy storage innovations, the sea-salt battery of Dr Ten and thermal energy storage system of Ecovat. The sea-salt battery promises a sustainable, clean, and relatively cheap storage of electricity produced by renewable sources during the day. This system can be applied on the level of households. Ecovat stores thermal energy in an innovative way and aims to bridge seasonal differences in thermal energy demand. This storage system functions at the level of neighborhoods. Both innovative storage technologies are currently developed at the level of working prototypes. In our research project we study and assess the real time dynamics of local energy initiatives that are currently in the process to implement on of these local storage innovation.

In this contribution we will present two cases in The Netherlands: Wageningen Benedenbuurt aiming to implement an Ecovat for sustainable district heating, and Heeten Gridflex, a community that develops a local smart grid with seasalt batteries as storage. The analysis includes the articulation of stakeholder engagements, articulation of normative positions, opportunities and limitations. In our presentation we will reflect on the processes of reflexive social learning in aligning technical, demand and cultural articulation as a form of responsible innovation in the sustainable local energy storage technologies.

**Keywords:** Community Energy Storage, social learning, responsible innovation

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**Decentralized Energy Supply for Informal Settlements in African Cities: The Case of Ethiopia**

HÖLTL, Andrea, BERGER, Tania, BATES, Romana
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Ethiopia is rapidly urbanising at a projected annual growth rate of 3.8% for the next 15 years. Similar to other urban areas in developing countries, major issues in Ethiopia include a high level of income inequality, lack of formal employment opportunities and deeply rooted poverty, tenure insecurity, poor infrastructure (e.g. lack of adequate access to water and sanitation), and limited access to electricity and energy. Frequently settlers end up in impoverished urban squatters and slums which do not offer them even the most basic infrastructure and hence lack to provide them with the perspectives they came for. Onward migration to far off destinations such as the EU member states thus often remains as sole option for those caught in such urban poverty traps. Although the issue of informal urban settlements is not new to the context of Ethiopian cities the current rapid urban growth rates are exposing urban rental markets as well as infrastructure and energy supply to considerable pressure. The paper investigates the respective situation in three cities of Ethiopia, Addis Abeba, Gondar and Mekelle, and demonstrates some best practice examples. It is shown that the rural-urban transaction results in urban communities experiencing changes in their interactions with built environment resulting from changes in their housing typologies and neighbourhood. This experience can be captured and anyalzed through mapping energy transition of housing units or households related, e.g. to

90
changes in housing types or lifestyle. In the context of Ethiopian cities, energy production and distribution has been highly centralized under state entities and the scope for exploring local/business driven and decentralized systems has been limited. Such transitions can be stirred towards sustainability and the United Nations’ Sustainable Development Goals if collective identification and structuring of issues along with collective envisioning of future is provoked or facilitated by the project.

**Keywords:** informal settlements, best practice, decentralised energy solutions, ethiopia, urbanisation, africa, renewable energy

Session 25 (2): Smart energy systems innovation: What do we learn from niche experiments?

Chairs: ORNETZEDER, Michael – Austrian Academy of Sciences, Austria
SUSCHEK-BERGER, Jürgen – IFZ Graz, Austria

**Exploring post-carbon futures through participatory input-output modelling**

CERNY, Martin, KIMMICH, Christian, KERSCHNER, Christian, HUBACEK, Klaus
Masaryk University, Czech Republic (1-4), University of Maryland, United States (4)

Revealing potential paths to a post-carbon future requires qualified estimates of future trajectories in particular areas of the socio-economic system, especially regarding available technologies, infrastructure and labor demand. The focus of our research is to identify implications of the post-carbon transformation (inspired by European Union’s energy roadmap and its goal to cut greenhouse gas emissions by 80–95% by 2050), in order to gain a better understanding of the system and guide our choices and actions at the present. The approach should propose a stakeholder-supported, evidence-based decision support system for economic, social, and biophysical impact assessments of the post-carbon transition. Our contribution will focus on methodological challenges that need to be addressed when coming up with such research design.

The transformation process requires understanding interconnections between developments in various economic sectors. We focus on modelling changes in the sector of electricity production (i.e. replacing fossil fuels with renewable energy sources), based on a participatory process bringing together technology-oriented experts (with qualified estimates of future organizational and technological changes intended support the transition towards a low-carbon economy) and policy-oriented experts (identifying possible political and economic accelerators and obstacles) with niche experience in implementing steps towards post-carbon economy. Their estimations will be translated into the logic of alternative input-output models for 2050, representing the
structural effects of different transformation paths and underlying scenarios.

To build future input-output tables, it is necessary to focus on the technical coefficients for intermediate inputs. This means asking the experts about expected developments of specific features of the renewable energy sector up to 2050. Translating the answers into the input-output logic is done via inserting new sub-sectors – renewable (solar and wind) energy based production of electricity as part of an aggregate electricity sector, specifically, the “Electricity, Gas and Water Supply” sector from World Input-Output Database. We use the Open Access World Input-Output Database, which provides linkages for 40+ sectors. The sectoral disaggregation is based on input cost shares (i.e. proportions between various material, labour and other inputs necessary to construct, operate and maintain renewable energy sources) of wind and solar energy production.

During the participatory modelling, we look for answers to questions regarding estimations of:

• Lifespan of renewable (solar and wind) energy producing devices;
• Share between capital costs (costs necessary for construction) and variable costs (costs of operation and maintenance) and its expected developments;
• Developments in prices of inputs; etc.

We also propose to look at the satellite accounts, namely the labour demand for each renewable energy concerning construction, operation, and maintenance, and the land requirements. A potential extension could also include material requirements for the construction of renewables.

**Keywords:** input-output analysis, low-carbon economy, low-carbon transformation, participatory modelling, renewable energy sources, stakeholders

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**Back to the future – A scenario-backcasting case study**

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Transitions to more sustainable and carbon neutral (energy) systems is a challenging undertake. The urgency of those transitions is internationally well documented and acknowledged by the scientific community. Nevertheless, the implementation of sustainable and carbon neutral (energy) systems clearly lacks behind, due to existing path dependencies, uncertainties etc. Niche experiments and pilot projects can facilitate the transitions, as they establish a protected experimental arena. This contribution is based on experiences derived from of a Backcasting activity, which took place in a small municipality with 13,000 inhabitants in Austria. The activity was part of a nationally funded Smart City project and should help to identify feasible transition paths. In a Backcasting process normative scenarios of the future are developed and related implications are explored. Backcasting is a participative method in which main actor groups (policy-maker, stakeholder, experts, citizens) relate a long-term desirable future with the present situation. The participants discuss and define urgencies (When?) and responsibilities (Who?). It helps the actors to set priorities, in order to manage a transition process in a structured way. In the present case three different energy related scenarios for the year 2036 have been developed. Based on these normative pictures of the future the participants of the workshop thought gradually working their way from the future to the present, keeping in mind, that time is
limited and priorities have to be set. This step by step deconstruction allowed them to end up with relevant actions for the near future. In our presentation we will report on selected results, provide insights into the method and discuss methodological challenges. Furthermore, we will discuss to which extent such participatory scenario building activities can fulfil the requirement of a strategic transition management tool.

**Keywords:** Participative Backcasting, Transition Management, Smart City, Pilot Project

Modifying driving practices for a sustainable mobility through technology: relevant ambition or technocratic illusion? The case of an experimentation in Anor (Hauts-de-France)

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Peri-urbanization has long been perceived as an anti-ecological development of the city. Car dependency, destruction of agricultural lands, erosion of natural areas are the symbol of the peri-urban development’s high environmental footprint. However, the progressive awareness of the sustainable development potentials of low-density areas (local food network, sustainable rainwater management, etc.) tend to improve the image of peri-urban areas in the academic and political discourses. Although these considerations, mobility remains the main environmental issue of these territories. Indeed, due to the dispersion of services and the trips they are constrained to accomplish in their daily life, the slightest increase in the cost of energy affects the peri-urban inhabitants. Then, economic and ecological reasons explain the progressive emergence of carpooling and proactive policies to make the mobility more sustainable in peri-urban areas.

In this paper, I will present some results of a research about an experimentation called My Anor My Mobility. This experimentation relies on a partnership between the peri-urban town of Anor in the Hauts-de-France and WeNow, a Parisian startup that proposes a digital coaching for eco-driving. Through the installation of a small box in individual cars, drivers receive information on their driving habits (fuel consumption, CO2 production, etc.). This information is daily or weekly sent to the driver via a phone application, accompanied by advices in order to bring him/her to adopt eco-driving practices. The aim of this experimentation is to give the opportunity to 175 households to try the eco-driving box and then to bring individuals to change their driving behaviors and to transform their mobility. Based on interviews with box users and political actors, this paper aims at showing how this socio-technical innovation change (or not) driving and mobility behaviors. The research is inspired by the multi-level perspective (Geels, 2002), which is a fruitful theoretical framework for analyzing the transformation of a mobility system. However, as some scholars have argued, this approach fails to take into account the role of agents and the relations of power (Farla and al., 2008) and give too much importance to technology (Schwanen, 2017). Hence, I take into account territorial and political issues, socio-economic characteristics, residential trajectories and inhabitants’ perception of sustainable development in order to understand the diverse uses of this innovation (resistance, appropriation, playful approach, misappropriation, alternative uses). That is a way to show how
this innovation manage (or not) to drive behaviors and the socio-technical regime (in this case: the mobility system, involving political, territorial, cultural, social issues) towards a more sustainable form. Finally, this paper reveals the importance to take into account « systems of practices » (Watson, 2012) in the development of a socio-technical innovation in order to impulse a real transition.


**Keywords:** eco-driving practices, socio-technical innovation, sustainable mobility, transition, peri-urban areas

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**Car sharing – a feasible way to a low-carbon mobility system?**

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This paper focuses on car sharing as a potentially transformative innovation that may contribute to a more energy efficient and low-carbon mobility system. By combining approaches from the study of socio-technical transitions and social practice theories, it seeks to provide new insights into how innovative technologies and practices are used and their potential impacts. The paper discusses the following research question:

“How can car sharing contribute to a decarbonisation of the road transport system and to a low-carbon mobility system?”

Moving from an unsustainable mobility system towards one that is more resource-efficient and carbon neutral is a key challenge in the years ahead. The decarbonisation of road transport is particularly important in urban areas, where the prevalence of cars results in substantial CO2 emissions, air pollution, noise, congestion, and energy use; all of which threatens to make cities less productive, liveable and attractive. Given that car sharing has been shown to reduce vehicle holdings as well as vehicle kilometres travelled, it may improve resource efficiency, alleviate pressures on physical infrastructures (e.g. roads, parking), reduce pollution and promote accessibility.

Systemic mobility challenges are often perceived as being technical in nature. Accordingly, technological innovations (hybrid and electric vehicles, biofuels, hydrogen fuel cells, etc.) are regarded as the best means to achieve efficiency and sustainability. It is likely, however, that the deep structural changes associated with a systemic transition would also involve non-technological or organisational innovations. Although spurred by new mobile technologies and applications, car sharing is primarily related to non-technical innovations focusing on changing mobility practices, new markets and new forms of cooperation and business models. The paper
combines a systems-level approach of socio-technical transitions with a micro-level perspective based on social practice theories. Transition research often applies a multi-level perspective (MLP), which argues that systemic change comes about through interacting processes within and between three analytical levels - niches, regimes and landscapes. Structural changes often occur when a radical novelty develops in the protected niche space and is able to challenge the dominant rules and practices of the regime. Although car sharing is an emerging mobility option in most urban markets, this paper considers whether it could represent such a radical niche-innovation with transformative potential.

Social practice theories are particularly useful for analysing routinized activities that are embedded in various social contexts. Understanding changes in individuals’ everyday routines and behaviour can inform discussions on broader systemic transitions. In this way, we use socio-technical system theories and practice theories in a complementary manner.

The paper utilises desktop studies and in-depth interviews with car sharing operators, users and potential users from ongoing projects. It draws on both system and practice theory to derive theoretical and practical insights regarding car sharing as a potential pathway to a more sustainable mobility system. Preliminary results indicate that car sharing can influence changes in established (private car-dependent) mobility practices at the household level.

**Keywords:** car sharing, low-carbon mobility system, socio-technical transitions

**Lessons from the first e-mobility fleet in Austria**

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Austria is definitely not a forerunner of sustainable mobility. However, there is one small province which is among the leading e-mobility regions in Europe. This province, Vorarlberg, has became the first pioneer-testing site in the country more than ten years ago and since then the region launched a series of initiatives and projects towards sustainable mobility. One of the more recent initiatives was about the transition of a company fleet from conventional cars to all-electric vehicles. Within a short period of time the company not only replaced most of its conventional vehicles it also did set up a publicly accessible fast charging station in close cooperation with the local ESCO. Our presentation reports on this successful implementation of a first e-mobility fleet in Austria and examines the roles of different kinds of users in this local transition process. The findings are based on a case study approach to collect empirical data using interviews representatives from the local ESCO, intermediary and end users, as well as observations gathered in site visits in the main areas of the Vorarlberg region where e-mobility services are being diffused. The findings highlight the importance of addressing different roles of users in a clear defined company context. Users do not only function as customers, but play a multifaceted role as they use e-vehicles for job purposes and privately, run the company fleet, share efforts to organise a smooth charging routine, cooperate with the local ESCO and function as a charging station provider and promoter of e-mobility.

**Keywords:** E-mobility, car fleet, user involvement, case study
Session 26: Governing by tension or use: RES in transition and the role of communities of citizens and users

Chair: IVANOV, Martin – IAS-STS, Graz, Austria

Co-designing sustainable energy transition at community scale: self-sufficiency as a challenge for central and southern Italy

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The transition to a low carbon future requires procedural and substantial knowledge to inform a sustainable transformation of the physical environment. Renewable energy technologies and associated interventions have already started to give rise to new energy landscapes, some of which cannot be considered sustainable. The systemic and trans-disciplinary approach to energy transition that is being pursued across the world requires that ecosystem services (ES) are included effectively in planning and design processes. This can help to balance the renewable energy target with landscape quality. In order to be considered sustainable, interventions must not cause critical trade-offs between the provision of renewable energy and the supply of other ES. In the first part of this contribution a framework for the co-design of sustainable energy landscapes at community scale is introduced. The approach is illustrated by means of a case study in the Netherlands that the authors conducted in 2014. Results show that stakeholder questionnaires and participatory mapping are key techniques to balance renewable energy provision with other ES. In the second part the contribution analyzes the Italian governance on the transition toward renewable energy sources. The aim is to examine what is the role of decentralized means of renewable energy production in the last Italian National Energy Action Plan 2017. Results show that centralized renewable energy initiatives continue to face opposition by Italian communities of the central and southern regions, civil associations, nature and heritage managers and others due to concerns over trade-offs between the renewable energy supply and the other ES. This happens because Italian communities do not recognize top-down installed renewable energy technologies as part of their landscape and related identity and economy. This can be avoided by implementing an energy transition based on bottom-up rather than centralized top-down initiatives., but governance lacks in addressing such initiatives. The European Strategy and Policy Analysis System 2015 (ESPAS) remarks the relevance of promoting the access by local groups to decentralized means of renewable energy production by encouraging the emergence of cooperative structures for the production of renewable energy. The transition should be more decentralized, promoting the energy self-sufficiency of local communities. Cooperative local renewable energy organizations (LREOs) are increasing in Europe, and appear a promising tool for sustainable energy transition also in Italy, where some municipalities of the northern regions already proclaimed an energy self-sufficiency. A framework for the co-design of sustainable energy landscapes as introduced in the first part of this contribution can be a relevant tool to implement LREOs initiatives.

**Keywords:** community energy landscape
Beyond Tensions: Governance, Local Movements and the Energy Transitions in the Greek Islands

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The aim of the present paper is to study the debates, tensions and acts of activism over large scale exploitation of the wind potential of the Greek islands as part of a process of energy transition in the Aegean islands. The questions to be addressed are: What have been the role of local movements in framing and configuring energy transitions in Greece? How the dynamics of activism patterns can be transformed to patterns of deliberation and democratic governance of energy transitions? Since early 90s in Greece there was carried out a transformation of its energy regime. This transition was indicated by EU directive and country’s obligations for liberalization of its electricity market. Further, global concern of environmental changes - mostly because of the greenhouse effect – guided the international community to the Rio Earth Summit on 1992, through which came the Agenda 21. Thus, in a national level, a number of changes in the regulative framework contributed to states’ turn to renewable energy technologies, deregulation and liberalization of the energy regimes. Regime’s de-alignment allowed the entrance of many new actors that operated in the RES technologies. Principally large-scale wind farms were installed initially in the continental Greece. Thus, from the 106.8 MW installed wind capacity at 1999, the sector emerged to 237.1 MW at 2000 and 293 MW two years later. In the case of Aegean islands there were the pressure for a transformation was more intensive of their electrical systems due to high average operational cost of these plants. Thus, in those cases policy makers planned a transition to RET since late 80s that it was never achieved. Since the end of 2000s many large companies of the energy sector manifested interest for installation of wind farms in insular areas. At 2010 new regulations that allowed faster and easier processes of installation in big investments gave the “green light” for investments of huge wind parks to the Aegean islands. A large number of projects for the construction of wind farms were introduced at that time. One of the projects that it was proposed was that of Iberdrola –Rokas Inc. in three North East Aegean islands. According to this project there were going to be installed 28 wind farms of total capacity of 706 MW in three islands. The project contained the electrical interconnection between the three islands, but also a connection with continental Greece. Similar grandiose schemes existed for the Island of Skyros and most importantly that of Crete. By reviewing conflicting cases of opposition of wind farming in the North-East Aegean, the island of Crete and that of Skyros we shall study the dynamics of public engagement and debates. Understanding the strategy and the potential of questioning technocratic approach to the energy planning we shall try to suggest the way that civil society engagement and deliberation can proceed beyond tensions. We shall integrate the contingent and local characteristics of specific cases in the context of contemporary theories and models of transition governance (i.e Meadowcroft, 2007; Stirling et al., 2007). Nowadays, exogenous of the regime pressures drag up the transition requirement. In this manner, EU directives about CO2 emissions in autonomous electrical systems’ oblige for an energy transition in many of them since 2030. Thus, these pressures and requirements obligate an energy transition in the islands as in the case of the island of Chios, during next decade. We shall study the intentions, visions and the dynamics of
civil society, other local actors, as well as of key national players. Comparisons with cases from the European North (i.e. the island of Samso, Sweden) will be addressed to understand the particularities, the enabling elements or the drawbacks in the Greek case. In this context we shall argue for the importance of mediating institutions and actors to act as entanglers in the making of the transition and in transforming activist mobilization and grass roots movements to ecological expertise substantial for increasing the regime capacities in securing sustainable transitions. The paper will be based on original archival sources, reports, analysis of the daily press and the local press or publications produced by the social movements.

**Keywords:** RES, Greece, social movements, governance, transition

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**Local resistances and governing by tensions by introducing renewable energies in Bulgaria (2006-2017)**

**IVANOV, Martin**

IAS-STS, Graz, Austria

Recently the transition community discovered the role of the end-users (and the demand-side) (Ornetzeder 2010), which together with the management of the supply-side is part of the successful governance of the transition process towards sustainable development. Focusing on understanding of the processes of co-construction of society and RE technologies (Taylor 1995), both as governance and as perceptions of the communities as end-users and/or as citizens, from the perspective of South Europe (in the Bulgarian case Bu) should enhance the transition studies and the current debates. Four cases of the introduction of renewable energies in Bulgaria will be presented. The first case reveals the construction of PV plants (approximately 300 small installations) in rural areas with the aid of the European Agricultural Fund for Rural Development (EAFRD) subsidies in the period between 2011-2012, thus receiving double state aid from the feed-in tariffs and the EU fund. The second case studies the installation of wind parks in environmental protected area on the Black sea coast part of the NATURA 2000 network. In 2016, the European Court of Justice decided on a claim of local NGOs that Bulgaria violated three European directives by introducing them. The third case is on introducing small-hydro plants and the claims of communities and environmental organizations of destroying natural habitats and illegal use of common (scarce) water resources. The fourth case is of local community resistance in the village of Trud (South Bulgaria) against newly build plant for utilizing biomass from the region claiming of air pollution, noise and road infrastructure damages through the new facility. The four cases will be discussed on the background of the general governance of the energy sector in the last 29 years with its path-dependencies and state capture tendencies.

**Keywords:** RES, governance, local communities, resistances
Community-based renewable energy prosumerism within a steady-state economy: reconfiguring energy consumption and production systems across national landscapes

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The development and progressive uptake of integrated community energy systems (ICESs) has started to reorganise centralised local energy systems into distributed energy resources engaging local communities and economies by ensuring energy self-provision, while simultaneously providing essential supporting services to the larger energy system. Specifically, community-owned, cooperative-based prosumer groups (CCPGs) have the potential to provide sustainable, reliable, flexible and locally-owned renewable energy sources to households with similar energy demand and consumption profiles, by interconnecting prosumers via decentralised, smart energy systems.

Potential benefits of CCPGs at the household level include grid reliability, cost-efficiency, flexibility (access and demand), resource ownership, self-sufficiency, and increased ROI (enhanced profitability). From a local governance level perspective, CCPGs enhance resource ownership, drive carbon neutrality (via increased share of renewables in the energy mix), and foster the development of local economies. At the national level, potential benefits comprise energy security, increased employment, low-carbon economic development and the achievement of national energy targets while enhancing the renewable energy transition. Simultaneously, several technical, socio-economic and institutional barriers at the household, local and national level are still challenging the mass-scale adoption of community-based renewable energy consumption and production. These include, among others, energy storage capacity, intermittency of local renewable energy systems generation and demand response, high upfront investment costs, low community engagement and mobilisation, and regulatory barriers as well as exiguous political support. Many of these barriers can be successfully addressed/overcome by steady state economic policies (originally introduced by H. Daly in the 1980s) that sustain a stable, mildly fluctuating economy within the carrying capacity of natural ecosystems. By decoupling fiscal and trade levers from economic growth, cap-auctioning trading systems, and enforcing the internalisation of environmental costs (negative externalities), steady state economic policies have the potential, scope and scale needed to catalyse systemic changes driving the sustainable consumption and of renewable energy. Taking the above-mentioned context as the starting point/reference scenario of our analysis, our research will focus on: what specific steady-state economic policies can potentially address some of the socio-economic and institutional barriers previously identified; how can such policies provide adequate institutional and economic incentives to catalyse the widespread adoption of CCPGs in order to facilitate a systemic transition towards sustainable modes of renewable energy consumption and production.

Our research will be based on the “socio-technical systems framework” approach (initially coined by E. Trist and F. Emery in the 1960s), focusing our analysis on how social processes and institutional structures interact with technological innovations within coupled socioeconomic-environmental systems in order to catalyse system-wide changes via community-based renewable energy prosumerism. Specifically, our analysis will be conducted
through a mixed-method approach involving both qualitative and quantitative methods. These are: 1. An in-depth literature review on community-based energy projects across Europe (both CCPGs and others) to identify the most relevant technical, socio-economic and institutional incentives, benefits and barriers of ICESs. 2. In-person interviews with different stakeholders participating in, affected by, and/or supervising/regulating the development, implementation and adoption of CCPGs. 3. A theoretical quantitative analysis comparing selected steady state economic policies addressing the identified institutional and socioeconomic barriers. 4. A scenario analysis exploring how the identified steady state economic policies can potentially catalyse the widespread adoption of CCPGs.

**Keywords:** system change, whole system reconfiguration, Community-based renewable energy prosumerism, steady-state economy

Is energy efficiency the panacea for energy poverty? – Evidence from Austria and Macedonia

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In the light of EU’s decarbonization endeavors, the key instruments to enforce these low-carbon policies are renewable energy and energy efficiency. Undoubtedly this grand transition requires changes in many aspects, such as at socio-economic, technological, and societal level. Households are one of the key actors to play part in this transition; however there is a general concern that the energy transition will leave out energy vulnerable households. Energy efficiency has been generally considered as the ultimate measure to address energy poverty; the latter defined as inability to satisfy the household’s energy needs. Households affected by energy poverty should be able to get more affordable energy services after installing energy efficiency measures since these measures will reduce the energy demand creating financial savings. However, households in energy poverty already consume less than the average energy spent by a household, and try to spend as less funds as possible on energy. In this line, it would be very difficult for energy poor households to invest in energy efficiency, showcasing a huge gap between the proposed solution and the issue of energy poverty itself.

The energy poverty scholarship is rather scarce on a comprehensive from-issue-to-solution-path knowledge and on challenges to alleviating energy poverty, especially in a comparative manner by taking two different countries as case studies. The aim of this paper is to discuss the policies for alleviating energy poverty and their applicability based on Austria and Macedonia, countries with different levels of living standard and social and energy systems. The paper will show the main indicators of energy poverty, strategies households undertake to minimize their energy use and the relevant policies to reduce energy poverty in the respective countries. The main focus is discussing whether energy efficiency measures have addressed and could address energy poverty in the selected countries. This will shed light on the steps needed to fill the gap from issue (energy poverty) to its proposed solution (energy efficiency). This, it will complete the existing literature with new empirically-based knowledge about preventing energy
poverty and addressing energy vulnerability in a European context. In the long run, it is about the need and the policies to make the EU-led energy transition more inclusive and sustainable. **Keywords:** energy poverty, energy efficiency, Austria, Macedonia
STREAM: Sustainable Food Systems

Session 28: Moving from thinking in silos to thinking in systems
Chairs: LARSEN, Morten, HANSEN, Mette Weinreich – Aalborg University, Denmark

Chicken and the Egg – Have (Danish) organic food consumption and production contributed to a new more holistic understanding of sustainable agriculture?
LARSEN, Morten, HANSEN, Mette Weinreich, KRISTENSEN, Niels
Aalborg University, Denmark (1,2), Umeå University, Sweden (3)

There are indications that organic food and its production has become an important point of departure when addressing issues of critical consumption and sustainable agriculture, both positively and negatively, for Danish consumers, who have, one of the, highest organic food consumption rates in the world.

The main aim of the presentation is, therefore, to illustrate and illuminate what effects and changes the rise of organic food production and consumption have had on the process of moving from thinking in “silo to system” among general food consumers in relation to food (production) generally.

This presentation will primarily synthesize results from the last twenty years of research into organic food consumers and perceptions of organic production. The presentation will take its departure in Danish consumers but will include international literature/examples as well. Some empirical data/examples from own research will also contribute to the presentation.

Keywords: Organic food consumption, food systems, change, sustainability, perceptions

Towards Sustainable Food Systems – A Case Study from Graz Region
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The Smart Food Grid Graz Project aims to contribute to the achievement of the Sustainable Development Goals by addressing the production and consumption of food, starting with the vision, that until 2030 30% of the food consumed is produced in the region of 30km around Graz. In order to give an overview on the whole food system and it’s main actors a multi-stakeholder approach was applied to create a roadmap, that depicts possible pathways to
realize the common vision. Besides the Roadmap one of the main results of the stakeholder process was the consultation and activation of a wide range of important actors within the whole food system.

**The roadmapping process:** The possible solutions depicted in the roadmap are the results of an interdisciplinary roadmapping process with expert workshops, in which the results of 48 stakeholder interviews from the regional food system and national and international good practice examples have been clustered. The frame of the roadmap shows all important actor-groups from farm to fork and the most important actor-groups in society. The time frame is set around the common vision of the project to reach at least 30% self-sufficiency rate in the main food-product groups until 2030. The region is set within the boundaries of 30km around Graz, which includes seven districts.

**Self Sufficiency and Sustainability challenges:** The status quo in the region around Graz shows a rich and diverse food system, that faces some threats when it comes to sustainability issues such as land use, farmer’s income and access to environmentally friendly produced food for all citizens. While there’s a decline in arable land for human consumption, the trend goes to growing populations in cities and decline in rural areas. In order to achieve the goal of 30% self-sufficiency until 2030, there are many sustainability parameters, that cannot be addressed by simply producing regionally. The available statistics show that the main food groups have already a self-sufficiency rate of more than 30% except for grains and vegetables. The main challenges to reach a higher level of self-sufficiency are on the one side the lack of available data that gives insights into the sustainability of the current production and consumption. On the other side unhealthy dietary habits need to be addressed in order to raise the consumption of healthy food.

**Possible Pathways towards a sustainable food system:** The roadmap combines technological innovations that use digital tools like metafinders as well as social innovations like food councils can be implemented in pilot projects by local stakeholders. To face these challenges and implement the promising measures, that have been pointed out, a key issue is the cooperation of top-down and bottom-up measures. This need for cooperation is addressed by most paths in the big picture of the roadmap, and two of them have the potential to bring all important stakeholders from farm to fork together to cooperate towards a common goal.

**Keywords:** Roadmapping, Stakeholder Process, Smart Food City, Regional Food, Sustainable Development Goals

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**New food pathways? Municipal developments towards sustainable food strategies**

HANSEN, Mette Weinreich, KRISTENSEN, Niels Heine, LARSEN, Morten Hedegaard

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In many years the Danish food system has been dominated by the productivistic paradigm in food production characterized by high input and high yield farming for a bulk world market. This has also been reflected in the way food production has been governed politically and regulatory both nationally and locally. The policies has for many years been promoting large farms and
monoculture while smaller productions has been less in focus. Farmers and food producers in general have mainly been producing to a large and anonymous market via large corporations and retailers, or to a bulk world market. And the role in local societies have not been seen as an asset or a platform for changing the production or discussing a more local or sustainable production form. Even organic production - which have been gaining more market shares and hectares in the last 20-30 years are for some parts also influenced by the same way of thinning in larger entities and anonymous markets. In many years the dominating perspective in municipalities have not been to see food as a driver for change. Only a few mainly urban municipalities, with Copenhagen as dominating actor, has been discussing e.g. public food as a platform for more locally produced organic food. Former research has also described a rural community that have put sustainability and food on the agenda due to a mayor with specific interest in this (Lejre municipality).

A recent pilot study shows the general landscape of the food strategies in Denmark (Realdania report, 2017.) All 98 Danish municipalities have been asked in a survey whether they have a strategy for food policies. The report there show a more rich picture where several municipalities all over Denmark are working on actively having a strategy for food production and food experiences in their region. Several municipalities shows an interest in food as a policy driver and not only cities but also rural areas seems to have an interest in working with sustainability and food networks as an arena for creating stronger local identities. This presentation will give a view of the recent developments and draw in some cases that might show another way of thinking public policies and pathways for changing the food systems from the municipal perspective.

**Keywords:** municipal food strategies, sustainability, new pathways, local public identities
An unloved actor – An Ethnographic study on the role of packaging at retailer level
SATTLEGGER, Lukas
ISOE – Institute for Social-Ecological Research, Frankfurt am Main, Germany

Expending shelf life, presenting product information or defining logistical units – packaging is a crucial actor in modern supermarkets. By providing examples from an ethnographic study in an Austrian supermarket, the presentation highlights some of the roles packaging is playing at the marketplace. Importantly, packagings are not isolated actors but they interact and interplay with human actors in the market. Supermarkets form the stage for diverse interactions between humans and artefacts: Packaging predefine purchasing quantities and thereby support consumers in calculating prices, it assists shop assistants in distinguishing between different products and it allows food manufactures to talk to the final consumer. Packaging does not only mediate between humans and products but also between physical foodstuff and logistical data. Via barcodes and numbers packaging is an important hybrid, facilitating the synchronisation of physical and virtual stock movement.

The consideration of packaging as active element in markets brings also new perspectives on packaging reduction strategies. In comparing the supermarket study with observations in a German zero waste store, I will highlight some of the challenges that result from the attempt to kick out packaging’s from the market. Who is performing the actions which are normally done by packaging? Are the roles adopted by other actors, are they just left out, or is a totally different order emerging? What hinders or fosters innovations like zero waste stores to take a root in the mainstream food supply chain? Answering such questions, can help to target questions of system transformations at a larger level.

Keywords: Ethnography, Practice Theory, Plastic Packaging, Markets, Materiality
Opportunities for packaging waste reduction in the food retail value chain through zero waste stores
GOLDKORN, Frederic, KRÖGER, Melanie
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In the past few years the negative consequences of plastic waste have increasingly become recognized and publicly discussed. Throughout Europe projects and initiatives are started to reduce the amount of waste creation by consumption. Within the so called “Zero Waste” movement approaches towards the reduction of individual waste creation are particularly popular and the foundation of so called “unpacked stores” has strongly contributed to the growing public attention the topic receives. Those stores counter the rising levels of packaging waste with a business model where disposable packaging is widely avoided. Despite currently only serving a niche market the concept has the potential of fostering the ecological transformation of processes in the food retail sector. However, the omission of packaging poses a set of challenges throughout the value chain in compensating the functions of packaging. Particularly relevant for the establishment of the concept in the mainstream food system are two factors: changing procurement and supply processes throughout the entire value chain as well as changing customer behavior towards a more sustainable form of consumption. These strategic challenges can be analyzed using Porter’s model of the “five competitive forces” (Porter, 1979; Porter Michael E, 2008) and specifically the bargaining power of suppliers and customers.

A high level of bargaining power of suppliers generally means that they are able to limit a markets profitability by charging high prices or other means. Additionally a high bargaining power of suppliers compared to the stores leads to reduced possibilities to influence the processes on the supplier side and specifically the packaging throughout the value chain. While supplier power on the conventional German food-market is relatively low due to strong centralization and the dominance of four retailers who hold a market share of 85% (Pressemeldung des Bundeskartellamts vom 14.02.2011) the organic market might look different. Especially with respect to the low buyer power of single unpackaged stores the supplier power might be considerably stronger. At the launch of the first stores in 2014 the desired packaging materials and packaging sizes were rarely available. The comparatively low demand provided low incentives for suppliers to change their mode of packaging. The dissemination of the concept through the foundation of new stores and adoption by retail chains provides first incentives for suppliers to change those practices due to increased demand.

The further dissemination is, however, closely tied to the willingness of customers to adopt new “unpacked” shopping routines and potentially give up on a certain level of convenience. With a wide range of available substitutes to unpackaged products (such as bioplastics or plastic free packages) it will be increasingly difficult to leave the niche of ecologically sensitive customers and convince the mainstream customer of the additional value provided. While a further adoption of the concept in retail by other players might generally be desired the question must be raised whether or not the adoption comes at the cost of losing the values the unpackaged stores were founded upon and might harm those stores by adopting their value proposition.

**Keywords:** zero waste; waste prevention; food retail; organic food retail; packaging free
Students’ knowledge and attitude towards plastic fruit packaging
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Plastic packaging waste has increased from 1.5 million tons to 3.0 million tons by over 200% in
the last 20 years in Germany causing marine debris and environmental littering. Plastic fruit
packaging is a known driver for this problem. Reasons for this increase of plastic fruit packaging
waste are among others smaller packaging sizes, and the consumer demand of a thick and rigid
packaging. Furthermore, it often substitutes cardboard packaging because it has a cheaper
price and better material properties. Fruit packaging has many different functions like e.g.
labelling and protection. However, it is only in some cases (e.g. protection of raspberries or
labelling of organic fruit) necessary, when the use of the packaging to portion the food is not
considered. Besides that, many consumers, especially the younger generation, claim that they
don’t like plastic fruit packaging. Still, supermarkets and other contributors sell their fruit in
plastic packaging (e.g. a box with a lid, foil, bags). Against this background, the aim of this
research is to get to know the attitude towards plastic fruit packaging and the environmental
attitude of younger consumers. Furthermore, the knowledge regarding plastic fruit packaging
and its waste is taken into account. Students were selected as the target group because they
have, worldwide but especially in Europe, a positive environmental attitude. They are also likely
to have a more environmental-friendly attitude towards plastic fruit packaging. To answer these
questions an online survey was conducted to explore students’ knowledge of, and attitude
towards, plastic fruit packaging. The sample size contains more than 1.000 respondents who
study at universities in Bavaria. (Bavaria is a state within Germany).
The result of the survey will be presented at the conference.

Keywords: plastic fruit packaging, attitude towards plastic fruit packaging, environmental
attitude, knowledge of plastic fruit packaging

Food waste measurement and prevention in Hungarian households
DOMA, Eszter, SZAKOS Dávid, KASZA, Gyula, SZABÓ-BÓDI, Barbara,
BOGNÁR Lajos
National Food Chain Safety Office, Budapest, Hungary

About one third of the food produced worldwide becomes food waste. Waste is generated in the
whole food chain from agricultural production to households. A significant difference can be
observed between developed and developing countries in this regard: developing countries
waste more at the initial phases of the food chain, while in developed countries the behaviour of
the households is the most important sector where unnecessary amounts of food is disposed.
In our study, we will present the results of an empirical data collection conducted in 100
Hungarian households in 2016. The weight and volume of food waste was measured for a whole
week’s period according to clusters (avoidable, unavoidable and possibly avoidable food waste) and different types (meals, bakery products, fruits, vegetables, dairy products etc.). Data collection methodology was following the EU-FUSIONS technical recommendation. By extrapolation of the results, we have found that an average consumer generates 68 kg food waste a year, of which 49% would be avoidable. The most frequent food items disposed were: meals, bakery products, fruit and vegetables. The analysis covered also the way of the disposed food. We may conclude that about the half of communal waste is derived from food, but a share of this amount is reused as compost material or feed.

In case of some demographic categories different wastage levels were observed. It was also confirmed that income has effect on food waste production that varies by foodstuff categories. Based on the results, a communication and education campaign has been elaborated, with a special focus on primary schools.

The research was co-funded by European Union’s LIFE (L’Instrument Financier pour l’Environnement) programme (Identification number: LIFE15 GIE/HU/001048) and the National Food Chain Safety Office of Hungary.

**Keywords:** food waste, sustainable consumption, household economics, consumer behaviour, food chain

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**Zero waste stores as attempt to reduce packaging and food waste**

REINDL, Sarah

Das Gramm – Zero Waste Store, Graz, Austria

It wasn’t our original idea to open up a zero waste grocery store. But once we’ve heard of the idea it seemed so logical yet simple that we just had to give it a try to start one in Graz. The idea is simple – selling groceries without single-use packaging and offering the possibility to everyone who wants to cut back on packaging waste to bring their own containers for food like rice, cereals, pasta, spices, coffee, etc. Liquids like milk, yoghurt and beer are sold in glass bottles and containers for which the customer pays a small deposit. Fruits and vegetables are sold as one is used to from regular supermarkets – loose and unpackaged as nature intended them. But what is more, we not only encourage a packaging waste reduction but also a food waste reduction as we are offering the customers to buy small amounts from foods, which are normally pre-packaged and where often times parts go to waste (e.g. onions, carrots, garlic, potatoes). The second measure we’re taking to reduce food waste is that we’re taking all the fruits and vegetables that don’t look so good anymore and turn them into delicious dishes (see [fb.com/dasgramm](http://fb.com/dasgramm)).

Regarding the selection of producers and wholesalers it’s our main priority to get the desired products in the preferred container (no plastic, big quantities, if possible reusable). The smaller the supplier, the more options we have regarding that containers. With some we have a completely zero waste deal, where they deliver the products in buckets which are washed by us and returned at the next delivery. In Germany, the cooperative of zero waste stores are currently in talks with one big German wholesaler to switch to reusable containers for dry goods and
imported products.
We’re also working with Unisapon, a company from Vorarlberg which are selling detergents in a modular way (so you can create detergents from a few ingredients for all your needs), based on concentrates (no unnecessary water is being transported around) and they’re taking back the empty containers. Those empty containers have to be shipped back to Vorarlberg, but it’s still a very resource saving way of selling cleaning products.
In my presentation I will highlight our way to deal with three important challenges for zero waste stores: a) setting up the shop including sustainable business model, b) finding suppliers for packaging free groceries, and c) building long-lasting consumer ties.
**Keywords:** Packaging Free, Zero Waste, Sustainable Food Distribution, Retailer Innovations

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**Resource consumption of alternative food distribution networks like community supported agriculture and foodcoops**

STEINWENDER, David
Transition Activist, Graz, Austria

Over the last ten years Community Supported Agriculture (CSA) and food-coops (food cooperatives) emerged as a new kind of food provision scheme in Austria focussing on direct producer-consumer-relations and addressing self-determination as well as empowerment of consumers and farmers in regard to how food is produced and distributed.1 Whereas – basically – a CSA is a model, where consumer gather as a community to finance (a part of) the expenses of a farm over a period (mostly a year), share (financial) risk and gain a share of the harvest in return, a food-coop consists of a self-organized consumer group that orders products according to their wishes and requirements directly from farmers or other small or medium-sized enterprises or cooperatives in the food sector. Both schemes are referred to produce organic food that is distributed regionally. In addition, both schemes support community activities that go beyond the common relation of producers and consumers: food in exchange of money – though not every CSA or food-coop realizes activities to increase the social bonding of the group. The motivation to become part of such a food provision scheme is different. Main reasons comprise ecological production and sustainability aspects.

In this context, the avoidance and reduction resource of consumption in the form of food waste or packaging is one important issue within these two food provision schemes. On the one hand it can be argued that by these direct producer-consumer-relationships the necessity of packaging can be questioned and can actually be reduced. Further, these schemes convey the notion of authenticity in which freshness of the products is guaranteed in a period, when consumers are over-strained by advertisement, complex information and labeling systems in order to buy ethical and sustainable products from conventional food provision schemes. On the other hand some aspects can be discussed that do not necessarily support the idea of social and ecological sustainability of these schemes: a) whether these initiatives are eco-efficient in total or whether rebound effects occur (in terms of packaging, transport, etc.) – considering single initiatives or trials of up-scaling of these schemes from niche to regime; b) how such initiatives
contribute to individual behavior change considering the usage of packaging or the wastage of food in households; and c) how such initiatives are limited to certain societal groups (e.g. white middle class phenomenon). The latter can also be discussed in the context of mainstreaming.

**Keywords:** Community Supported Agriculture, Transition Initiatives, Food Sovereignty, Consumer Cooperatives

Session 29 [2]: Reducing resource consumption in food distribution systems – research and practice in an transdisciplinary discussion

**Chairs:** KRAMM, Johanna, SATTELEGER, Lukas – ISOE - Institute for Social-Ecological Research, Frankfurt am Main, Germany

World Café Discussions: Towards a More Sustainable Food Distribution System

**Table 1:** “The Role of consumers in supply chain transformations” (moderated by David Steinwender)

**Table 2:** “Non-conflicting strategies for packaging and food waste reduction along the supply chain” (moderated by Lukas Sattlegger)

**Table 3:** “Upscaling niche innovations and bottom up transformation of supply chains” (moderated by Sarah Reindl)

**Table 4:** “Transdisciplinarity and collaborations between science and practice” (moderated by Johanna Kramm)
Imaging a maritime terroir – The North Sea Cheese

OSTROWSKI, Kasper
Aarhus University, Denmark

This paper tries to come to terms with how the imagery of a Danish speciality cheese partake in the metrological work and processes of singularization – the merger of intrinsic and extrinsic factors into one gestalt (Gade 2004: 865).

An unembellished cheese does not convey much information about itself. Some distinctions are readily available: size, category or class and to some degree age, for example. A connoisseur might be able to recognize and name the specific cheese type. But when it comes to less obvious attributes such as place of origin, style, producer or content, consumers rely heavily on names and packaging – written words and imagery. In order to make any absent, invisible or somehow hidden qualities of a certain product re-presented along with the product, packaging skills are required (Grasseni 2003). Thus, the conglomerate of a cheese includes the imaging, naming, portioning, wrapping and labelling of it: “The characteristics of a good [product or produce] are not properties which already exist and on which information simply has to be produced so that everyone can be aware of them. Their definition or, in other words, their objectification, implies specific metrological work” (Callon, Méadel, and Rabeharisoa 2002: 198-99).

In this narrative, I unwrap an emblematic cheese entitled ‘The North Sea Cheese’. I follow the career of this terroir product and investigate how it seems to have made a robust geographical claim. Through imagery, but also naming and salty translations, Thise (the producer) have managed to include the North Sea in their cheese and thus evoked a coastal terroir; They have re-enacted the sea not only as a place, but also as a terroir exempt from the usual dependency on soil and tradition.


Keywords: Imagery, cheese, North Sea, salt, terroir
Meeting and eating the animal  
ERMANN, Ulrich, BRUCKNER, Heide  
University of Graz, Austria

Meat consumers demand information about the origin of meat products. The origin refers not only to the place of production and processing, but it also implies the animals’ life and death, the conditions under which livestock are reared and slaughtered. In rarely any other market do we face such strong contradictions between the demand for visibility and transparency (due to anxieties about diseases and ethical concerns over issues of animal welfare) on the one hand and efforts to dissociate the commodity from its production context (and make the origin invisible) on the other hand. Therefore, our research question arises from the expansion of transparency and traceability schemes to connect consumers to the origin of meat products, and the simultaneous disconnecting of consumption and production contexts. There is an increase in meat labels, farm tours, and visible animal bodies, while at the same time consumers largely unknow and forget about the animal lives that become meat. Using examples of pork and beef in Austria, we approach this tension through a STS perspective, asking how the promotion of meat products creates value by cutting ties between humans, meat and animals. We thus show how the performance of transparency connects and disconnects meat (and meat eaters) and animals at the same time.

Keywords: more-than-human geographies, animals, food, meat, consumption, (in)visibility, (in)transparency

Playing a serious game to visualize the social dimension of cetacean bycatch  
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In the public eye, bycatch of marine mammals is one of the main negative externalities of commercial fisheries on marine biodiversity. Therefore, this interaction between the marine fauna and the fishing activity is relatively well-known for a phenomenon taking place under the sea surface and miles offshore. Since the end 1960’s, it has been documented in scientific publications as well as press articles, first in the United States and then worldwide. However, strong discrepancies regarding bycatch estimations of common dolphins in the Bay of Biscay (France) have recently questioned the depiction/translation process. The controversy concerns the relevance of observation instruments currently implemented to visualize the phenomenon. Thus, bycatch estimations for common dolphins vary between 550 (observer-based estimate) and 4700 (stranding-based estimate) per year in the area depending on the methodological choice. Based on this observation, we decided to deconstruct what is often seen as an overlapping usage between fisheries and marine mammals that simply needs to be reduced. At first, we question the available instruments to observe and depict the impact of fishing activities on biodiversity and more particularly on small cetaceans. Hence, we analyze scientific practices to represent small cetacean bycatch by using the Actor-Network Theory. Secondly, we examine
how these practices can be integrated in a wider network in order to visualize the social dimension of interactions between fisheries and small cetaceans. Therefore, we rely on companion modelling and the use of serious games. Consequently, we describe the participative device we have created and implemented. Made of a computer model and a role play, it aims at recording actors’ strategies regarding the visualization of the interaction. To represent scientists’ point of view on small cetacean bycatch, we conducted interviews with twenty-two stakeholders and supplemented it with one year and a half of participant observation within a team of marine ecologists and biologists. Thereafter, the device was implemented for the first time in November 2016 during a three hours workshop with a group of six marine biologists. On this occasion, players’ strategic behaviors were observed using an observation grid based on public management literature. During the workshop, players discussed the technical aspects of instruments observing bycatch but also behaved strategically. For instance, they suggested the use of a new instrument: onboard cameras. The fact that this instrument had not been modeled meant that players had to rely solely on the prior knowledge of the instrument to pursue the game. Mobilizing prior knowledge is one of the strategies we were looking for. Thus, these results show the relevance of role playing games to visualize actors’ perceptions on instruments in the case of small cetacean bycatch. Consequently, our research contributes to improve the observation of interaction between fisheries and small cetaceans but also reveal their social dimension. To conclude, from our perspective, this approach is well suited to draw attention to the withdrawn parts of food systems especially since it could be seen as a first step to build prospective scenarios and involve a large audience.

**Keywords:** Serious games, instruments, fisheries, bycatch, translation

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**Imaging bio(in)secure aqua- and agriculture situations**

**MADSEN, Linda**

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Drawing on multi-sited field studies on sites of aqua- and agriculture (Madsen 2016 and Madsen 2017 respectively) this paper discusses the role of images, models and tables in (de-)positioning food and feed systems within broader socio-ecological situations (Hinchliffe, Allen and Carter 2017). It addresses questions such as: How does images, models and tables contribute to enacting sites of agri-and aquaculture as bio-secure or -insecure? How may sustainability and security relate? How can we understand the socio-material con-texts (Asdal and Moser 2012) within which images, models and tables work (Freedberg 1989)? Furthermore, by addressing how images, models and tables contribute to the ordering (Law 2004) - and thereby to inclusion and to disarticulation (Moser 2008) - of what come to count as matters of concern (Latour 2004) in regards to safe, secure and sustainable food systems, this paper does also trigger critical reflection on how to think about the relation between, on the one hand, exclusion, suppression and marginalization and, on the other and often as opposed to, inclusion and empowerment.

**Keywords:** aquaculture, agriculture, biosecurity, feminist techno-science, situations
Session 31: Understanding, monitoring, evaluating and assessing the impacts of RRI

Chairs: WICHER, Magdalena, IHS, Austria
WOOLLEY, Richard – Universitat Politècnica de València, Spain

**Conceptualising and observing the evolution of societal benefits from RRI**

WOOLLEY, Richard, RÀFOLS, Ismael
Universitat Politècnica de València, Spain

Responsible Research and Innovation (RRI) proposes a normative remodeling of the contract between science, research, and innovation (R&I) and society. A number of different conceptualisations of RRI exist, which promise an R&I system that is more aware of, reflexive about, and responsive to, society’s needs and expectations. More recently attempts have been made to capture data on the outputs, outcomes and impacts of RRI using a versatile mix of quite standard and more innovative data points and metrics (MoRRI project). However, there is also a growing interest in the longer-term evolution of emergent social, democratic, and economic benefits associated with RRI. This paper seeks to define RRI benefits in broad conceptual terms. It borrows from the state-of-the-art literature on research evaluation to approach RRI benefits from a process perspective. It describes a number of pathways to RRI benefits that emerge from the integration of actors and the implementation of participatory processes in R&I. The paper finishes by discussing the challenge of establishing an ‘RRI Observatory’, based on a dual focus on monitoring the evolution of pathways to RRI benefits at different levels of social organising, and on supporting new modes of assessing the alignment of science, research, and innovation with societal needs and values.

**Keywords:** RRI benefits, pathways, public value, responsible metrics.

**RRI evaluation in practice: the specific case of NANO2ALL**

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The need for inclusive deliberation on social and ethical implications of emerging technologies is increasingly being recognized in the European Union. To this end, the European Commission has embraced and promoted the concept of Responsible Research and Innovation (RRI). As a
governance framework, RRI emphasizes collective responsibility for the future. The idea is that research and innovation processes that are more inclusive, anticipative, reflexive and responsive will produce outcomes that are more acceptable, sustainable and desirable. Over the years, the European Commission has funded a wide range of projects that experimented with putting RRI into practice. NANO2ALL is one of those projects. With its cross-European multi-stakeholder dialogue approach the 3.5-year project aspires to enhance mutual learning between actors in the field of nanotechnology, and to increase the responsiveness of nanotechnology R&I toward societal needs, concerns and values. Now that a large part of NANO2ALL’s activities has taken place, the question rises what the impact has been of these undertakings.

In this session, we would like to introduce the concrete case of the NANO2ALL project and critically reflect on how we, as project partners, have evaluated and made sense of its impacts. In the project, several actions have taken place to monitor and evaluate the RRI outcomes of the multi-stakeholder dialogues. Observations have been made of the dialogue events, interviews have been carried out with the organizers and facilitators, and participant experiences have been collected through online and offline surveys. We found that the gathered data allowed us to reflect on the project’s contribution to various RRI aspects, such as: inclusivity, reflection and mutual learning processes during the dialogue sessions, and capacity building through networking. However, broader impacts, such as increased responsiveness of the nanotechnology R&I system, remained more difficult to assess, while they are key to what RRI is actually about.

We believe it is valuable to share our RRI evaluation experiences with colleagues in the field who developed RRI evaluation frameworks. We would like to discuss questions, such as: To what extent is it possible for EU-funded RRI projects like ours to evaluate their impact in broad terms as “increased responsiveness of the R&I system?” And can these kinds of impacts reasonably be expected of such projects? By introducing a specific RRI project case in this conference track, we believe we can enrich and deepen the discussion on RRI evaluation frameworks and practices.

**Keywords:** Responsible Research and Innovation, impact assessment, project experiences, critical reflection

**SASS Project: a multidisciplinary approach to implement Responsible Research and Innovation in a Sustainable Food Systems**

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University of Milano - Bicocca, Italy (1), European Centre for Development Policy Management - ECDPM (2)

The aim of SASS Project (Sustainable Agri-food Systems Strategies) is to create knowledge, policy dialogue and partnerships contributing to more sustainable food systems in Sub Saharan Africa, namely in Kenya and Tanzania. This region is increasingly and particularly exposed to many stressors affecting the sustainability of local food systems, such as demographic
pressure, urbanization, climate change and conflict. The SASS project will contribute, together with local stakeholders, to identify and support existing and potential sustainable practices in local food systems, such as diversifying farms and farming land-sapes, optimizing biodiversity by stimulating interactions between different species, and better integrating indigenous species with more commercially supported crops, as part of holistic strategies to build long-term fertility, healthy agro-ecosystems and secure livelihoods. During the first phase, using multi-disciplinary approaches, the SASS project will investigate African local food systems in three locations, to better characterize them and define the main challenges and constraints from an environmental, economic and social sustainability perspective. The continuous interactions between researchers with different backgrounds and the participatory approach will make it possible to identify concrete intervention strategies and policy recommendations in the second phase of the project. The SASS project will apply the RRI (Responsible Research and Innovation) approach for inclusive and sustainable food systems research and innovation. Therefore, the different stakeholders (the local, regional and international institutional stakeholders and also all the actors of the food system, from local farmers to consumers) will be involved in all the phases of the project, for increased effectiveness and uptake of the research. The RRI analysis has been applied to rural and urban developing farming systems, and also to developed agro-industrial systems that are currently facing a crisis due to resources shortages and socio-economic constraints, among other issues. The RRI approach implies that societal actors work together during the whole research and innovation process, in order to better align the research process but also the outcomes, in particular in terms of policy recommendations and institutional change, with the values, needs and expectations of the communities and societies.

**Keywords:** RRI approach, Food system analysis, Sustainability, Policy dialogue

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**Evaluating and Monitoring RRI in Research Technology Organisations – Experiences and Challenges from the EU Project JERRI**

**WICHER, Magdalena, FRANKUS, Elisabeth**

IHS, Austria

As the concept of RRI is (still) very vague and ambiguous, it is challenging to define criteria for evaluating and monitoring RRI in research projects. Within the European funded project JERRI – Joint Efforts for Responsible Research and Innovation – the Institute of Advanced Studies (IHS) took over the part of leading an independent work package “Monitoring” for monitoring and evaluating the process of implementing RRI within research organisations. Aim of JERRI is to make a substantial contribution to deeply institutionalise practices and attitudes of RRI in a transition process (which is covering the five RRI dimensions) within the two largest European Research and Technology Organisations (RTOs), the German Fraunhofer Gesellschaft (FhG) and the Netherlands Organisation of Applied Scientific Research (TNO). The presentation will give a short overview of the monitoring and evaluation concept. The concept was designed to conduct a formative evaluation for continuous feedback of and back to the process of JERRI and a summative evaluation to assess the outputs and impacts of the project and its activities.
The focus of the talk however will lie on interim results and characteristics of the evaluation and monitoring process and how this needs to be aligned to the situations at and organizational frameworks of the organisations involved. Challenges such as language barriers, handling of sensitive matters or access to certain groups within the organisations are barriers that were anticipated from the beginning, but within the implementation of the project it comes to truth that the original plans for, e.g. collecting data, are simply not possible to fulfil because of institutional policies or personal and institutional resistance – towards the implementation of certain RRI principles and/or the monitoring thereon. What does it need to implement RRI within research, technology and innovation institutions? Which challenges need to be taken into account, which barriers can be anticipated and how can implementation and monitoring plans be designed and adapted in a way to be applicable for all who are willing to join the way of responsible research and innovation? How much RRI is really lying behind such plans and how can these be institutionalised? The presenters will share their results and solutions how to meet these tasks and would like to get in discussion with others who are willing to share their experience in monitoring and evaluating RRI.

**Keywords:** RRI, monitoring and evaluating RRI, research technology organisations, institutional and organizational context, monitoring institutional change, implementation of RRI

**Session 31/32: Innovative support structures for the implementation of RRI in practice**

Chairs: KARNER, Sandra – IFZ Graz, Austria
MARSCHALEK, Ilse – Centre for Social Innovation, Austria
WICHER, Magdalena – IHS, Austria

**Social Labs - Experiencing RRI in practice**

UNTERFRAUNER, Elisabeth, SCHRAMMEL, Maria, MARSCHALEK, Ilse
Centre for Social Innovation, Austria

The European project NewHoRRIZon aims at supporting RRI through a broader uptake in funding programme lines. Furthermore, raising RRI awareness and mainstreaming RRI best practices are at its core. Additionally NewHoRRIZon will create a sustainable RRI Network and RRI Ambassador Programme. All over Europe 18 Social Labs have been established to address the diverse topics of H2020. Social Labs are about passionate ideas. The Social Lab concept originates from Zaid Hassan’s inspiring book “The Social Labs Revolution” (2014). It has been adapted for the use in NewHoRRIZon. It is a cutting-edge methodology for addressing complex socio-technical challenges in a co-creation process together with a broad range of stakeholders.
The methodology used within NewHoRRIzon is based on Kolb’s circular model of the experiential learning with its four stages that feed into each other: Concrete Experience (doing / having an experience), Reflective Observation (reviewing / reflecting on the experience), Abstract Conceptualization (concluding / learning from the experience), and Active Experimentation (planning / trying out what you have learnt). In the Social Labs a multi stakeholder group comes together to discuss the current stage of RRI implementation in their field. Within 3 years they develop RRI pilot actions in their respective organizations with the aim to put RRI into practice and feed the results back into the development of storylines and narratives. The presentation provides insights into the status of RRI in the programme lines “Research Infrastructure” and “Secure, Clean and Efficient Energy”. Based on desktop research and Interviews with 40 representative stakeholders we will share how the RRI keys are reflected in the programme lines as well as in the RRI highest flagged projects. Furthermore we will discuss the procedure of the Social Labs with first experiences in its practical implementation.

**Keywords:** RRI, Social Lab, Experiential Learning

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**‘RRI-Werkstätte’ – supporting the co-creation of RRI**

**KARNER, Sandra**

IFZ Graz, Austria

Within the H2020 project FoTRRIS we developed and tested a method for the co-creation of RRI project concepts, and we established so called ‘co-RRI competence cells’. The se competence cells conceptualise and facilitate processes through which both, formal and informal knowledge actors from research, policy, civil society, and the business sector co-design and implement transdisciplinary RRI projects. One of these competence cells is institutionalised as an RRI-unit at the IFZ – Interdisciplinary Research Center for Technology, Work and Culture in Graz, Austria. The IFZ RRI unit represents a service as well as a research unit, which does not only support and implement co-RRI activities, but which also evaluates and analyses related processes.

The presentation will give insights into the specific methodological approach, which was tested within the FoTRRIS project, and which will be applied and further developed for co-RRI processes facilitated and implemented by the IFZ RRI-unit. The methodological framework is based on the MISC (Mapping innovation on a Sustainability Curve) methodology, and it comprises several steps: definition of the system goal in terms of function, identification of relevant actors, systems mapping (MISC), analysis of lock-ins and leverages, joint visioning and finally the RRI project conceptualisation.

**Keywords:** RRI in practice, support structure, capacity building
Building emotional capacity: understanding and supporting an underdeveloped dimension of RRI
GRIMPE, Barbara
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RRI scholarship has largely overlooked the analytical importance of emotions across policy and practices. Despite many good intentions, RRI to date has a cognitivist and rationalist bias, which shows perhaps most clearly in the key principle ‘reflexivity’, but indirectly also in other key principles such as ‘anticipation’ and ‘participation’ (Stilgoe et al. 2013). After having exemplified some of these cognitivist and rationalist tendencies in RRI I shall provide examples for the ways in which emotions are a crucial component of RRI in both theory and practice. Also, I shall argue that we need to watch out for emotions, and how these ‘work’, across multiple levels, i.e. from micro interactionist to macro governance levels (Fisher/Rip 2013). This leads to the conclusion that RRI needs emotion-oriented support structures. This means, amongst other things, capacity building among RRI scholars themselves. For instance, RRI scholarship will need to consider more systematically STS expertise on the embodiment of (tacit) knowledge and ignorance (e.g. Salter et al. 2017) and interdisciplinary scholarship around the notion of emotional labour or trust work (e.g. Hochschild 1985; Strauss 1985; Frevert 2010).

References:

Keywords: Responsible Research and Innovation; emotions; capacity building
Developing more transparent and inclusive stakeholder involvement in the governance of science and innovation
STRÄHLE, Michael, URBAN, Christine
Wissenschaftsladen Wien - Science Shop Vienna, Austria

Policy makers and researchers engage with stakeholders to increase legitimacy of research and innovation governance and to address societal challenges. It is expected that involving stakeholders, end-users, consumers or citizens at large makes research and innovation governance more democratic by making it more inclusive. It is hoped that such procedures improve the probability of arriving at more “real” solutions to societal problems. There are open questions as to whether stakeholder involvement lives up to its promise, either in a policy or research context, because the engagement processes could – and, deliberately or not, sometimes do - result in serving particular interests.

The authors coordinated an international stakeholder involvement on research programming on food and health in connection with environmental and social sustainability. In 13 countries stakeholder consultations targeted mainly public authorities, civil society organisations, business organisations, and research funding and research performing organisations. At the time of these consultations they were the largest coordinated stakeholder involvement process in science policy by scenario workshops so far.

Still there are no widely accepted and sufficiently legitimated formats for stakeholder involvement in science policy. It was one of the objectives to address some weaknesses of stakeholder involvement at all stages, from the setting up to the implementation through to documentation as much transparency as possible was maintained. The authors will present lessons learned and show what has been done to make stakeholder involvement more transparent, initiatives that have worked out well and others that failed. The presentation will conclude with suggestions for improving such engagement activities, naming research needs on stakeholder involvement, and reflections on how the status quo of stakeholder involvement influences democratic European research and innovation governance.

Keywords: participatory governance; open sciences; RRI; public engagement; transparency
In search of support structures for RRI: Finding InSPIRation in the science shop movement

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Responsible research and innovation (RRI) claims to be a new way for understanding and implementing research, so that the research and innovation (R&I) system can provide better answers to social and environmental challenges. It stresses the importance of science-society interactions, collaboration and co-creation. Science shop activities share these principles; they directly address societal challenges and are carried out in collaboration and/or co-creation with societal actors. Therefore, we believe that the analysis of science shop activities, the structures that enable or hinder their success in the current R&I systems is highly relevant for the RRI discourse.

Present paper is based on the results of the InSPIRES (H2020-SwafS-2016-1) project. As part of the project we carried out approximately 80 interviews with established and emerging science shops and other community-based research initiatives across and beyond Europe. InSPIRES claims that science shops have been good at coming into existence but not so good at sustaining. Therefore, it is vital to identify models, inspiration and desirable future paths for the science shops.

Our specific aim in this paper is to understand various institutional contexts and framework conditions and to assess scenarios (pathways) for further development. In the interviews we attempted to learn about science shop at its best. For this purpose, we applied the approach of “appreciative Inquiry”. This allowed us to identify leverages; solutions and possibilities that may be useful and serve as an inspiration. We believe these finding provide meaningful contribution to the quest of present session, namely to identify “support structures for the implementation of RRI in practice”.

Keywords: Science Shop, RRI, support structures, InSPIRES

Embedding the principle of responsible research and innovation (RRI) in the process of technology assessment (TA)

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The terms of responsible development, responsible research and responsible innovation have been used over the last years to an increasing extent. These terms are highly integrative because they cover issues of engineering ethics, participation, technology assessment, anticipatory governance and science ethics (cf. Grunwald, Armin, 2011). No need to mention further in details the impotency of RRI concept worldwide and specifically in Europe, where already done by many others concern researchers.

Developing structure for implementing RRI principle in practice need additional resources by means of sufficient funds and time, for both, researchers and non-research actors, and on the other hand it also needs appropriate competencies and skills. But, In particular a cooperation of
applied ethics addressing the moral dimension, philosophy of science taking care of the epistemic dimension and social science (STS) researching the social and political dimension as well as governance issues is needed parts of this cooperation and integration have already been achieved in the field of Technology Assessment (TA)(cf. Grunwald, Armin, 2011). In other word, part of RRI concept has already been achieved in TA process because it considering all aspects related to science and technology (Technical, Societal, political and embedded business aspect) (cf. TAMI report 2004).

However, TA process rely mainly on TA practitioner/expert as a main actor who applying suitable TA methods such as Delphi, experts meeting and etc. to achieve the expected impact of TA process [1) Rising knowledge about the technology; or/and 2) for mining attitude/opinion; or/and 3) Initializing action)] (cf. TAMI report 2004). Furthermore, TA project normally start after raising a big debate about certain technology, where such technology may already reached high level of technology transfer process or even already existed in the market. Rely mainly on one actor (TA practitioners) and starting the TA project in delay are not complying actions with RRI process.

For embedding the all principle of RRI inside TA process instead of part of it, the current review presents option and initiative to set up RRI structures by 1) re-structure the al- ready existing TA institutions to engage TA practitioners along with other societal actors (researchers, citizens, policy makers, business, third sector organizations, etc) as a represen- tative members of their institutions work together during early stage of R&D process and 2) practicing common evaluating scheme with aim to implement the concept of RRI in practice. Thereby re-structure of existing TA institutions and practicing common evaluating schemes between the involved representative members of societal actors gives the opportunity to:

- Build new structured RRI organization at minimum required resources/costs, where all TA institutions are already existed and all societal actors to be involved inside it already supported by their related institutions.
- Permanent direct meeting between all actors, where each actor can be considered as a bridge between his institutions and other actors’ institutions providing excellent media of communication.
- Practicing common evaluating scheme, where the representative actors able to demonstrate all their interested criteria and understand the interested criteria of other actors to find the relationship between them and finally proceed to initializing suitable actions regarding the developed technology that meet April 18, 2018 Page 5717th Annual S . . . / Report of Abstracts Embedding the principle of res . . .

the interest of the majority.
- Implementing the concept of information society in practice by using clear, simple digital common evaluating scheme, where the societal representative actors able to communicate efficiently between them inside the proposed re-structured TA institutions as well as with their related institutions and its members.

Modifying the existing structure of TA intuitions is a feasible and essential step to embed the RRI principle in TA process as well as implementing it in practice. However, it is highly recommend for further review and development to proposed common evaluating scheme in order to increase its accuracy and efficiency. It is also suggested that technology Assessment process as well as information society will increasingly be incorporated into process of scientific and technological research and innovation process which requires to build national /regional/international consortiums entities of TA as suggested having department for each essential field of the
technology for example, energy, mobility, health and etc. . . where each departments engaging representative members of societal actors. In addition, the proposed restructured TA institutions to be organized in horizontal structure instead of the hierarchical one in order to increase the transparency and overcome any prospective corruptions.

The concern department and its societal actors of TA national intuitions in Europe can meet regularly under the umbrella of EPTA in order to enhance the relationships and communication between them and encourage for implementing RRI concept in practice in all EPTA members, where it is unreasonable to implement such concept in one or few European countries only. Implementing the RRI concept under EPTA may lead to prospective collaboration in different aspects (TA, Society, political, business) between its members that may finally give the opportunity and facilitate the process to open new markets between the countries based on actual needs of all societal actors (Based on RRI concept). References


Keywords: RRI, social actors, re- structure TA institutions, Common evaluating scheme, Consortiums

Supporting the development of responsible innovation capabilities in companies
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The discourse on responsible (research and) innovation used to mostly revolve around publicly funded projects and research and innovation governance (Blok and Lemmens 2015, Scholten and van der Duin 2015). Businesses have only recently entered the arena of responsible innovation research. First empirical studies (Auer and Jarmai 2018, Chatfield et al. 2017) and conceptual contributions (Stahl et al. 2017, van de Poel et al. 2017, Flipse et al. 2015) investigate different aspects of responsible innovation in a business context. Some of the most pressing questions concern the necessary motivations, capabilities and resources to usefully implement responsible innovation in practice.

Capabilities are a key component of the resource based view on innovation, which emphasizes business capabilities and assets as important intangible resources of business performance (Teece et al. 1997). While assets can be understood as 'what the firm has', capabilities describe 'what the firm does' (Halme and Korpela 2014: 549). The resource based view has been successfully applied to study factors that influence innovation in business (Halme and Korpela 2014, Galende and de la Fuente 2003).

The proposed contribution will identify capabilities in businesses that are vital to the development of responsible innovation and apply the resource based view to describe and
compare two approaches to supporting the development of responsible innovation practices that are currently being applied and tested in the on-going Horizon 2020 “COMPASS” project.


Keywords: Responsible innovation; business innovation; innovation capabilities; resource based view

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STREAM: General STS Topics

Session 33 (1): Technical standardisation and STS
Chair: JAKOBS, Kai, RWTH Aachen University, Germany

The normative evaluation of Negative Emission Technologies
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Due to their global scale and potential impacts on public health, land use and biodiversity, Negative Emission Technologies (NETs) put forward important long-term ethical concerns about their influence on the earth-systems and non-human nature, the relation to mitigation and adaptation efforts, as well as questions of procedural, distributive and corrective justice on the global and intergenerational level. These questions are not only relevant from a philosophical point of view, but also because they inform the public formulation of the relevant ecological and social norms and policies, developed in response to the problems of climate change and approaches to address them adequately. However, it is not clear how these normative problems can be captured by standards, already existing or in need for development. The paper will suggest, that a first step towards such standards is the development of a normative evaluative framework based on interdisciplinary research of potential negative as well as positive impacts of different NETs. Such a framework would need to consist of an enumeration and definition of the issues to be investigated, as well as criteria and indicators that show how well or badly certain options meet different standards. It seems reasonable not to detach our normative assessment from technological, natural, political, and economic aspects, but to integrate it into an interdisciplinary evaluation process. In the paper I will give an outline of an evaluative framework starting with the consideration of impacts (including effects, costs and unintended consequences), proceeding towards questions of control, feasibility and sustainability, and ending with the assessment of the distribution of costs, benefits and risks based on Shared Socioeconomic Pathways (SSPs) and the Sustainable Development Goals (SDGs). The aim of such an evaluative framework is not to create new knowledge, but rather to summarize, organize, and interpret existing knowledge to support our deliberation about NETs. Beside the basic structure of such an evaluative framework I will also highlight three critical aspects for the normative assessment of NETs. First, we face considerable uncertainties in our impact analyses and economic models in current evaluations of NETs. Not only are these technologies, or at least forms of their potential large-scale implementation, in an early research and development stage, every evaluation of the future deployment of NETs needs also to be based on specific climate and policy scenarios. Second, in order to evaluate the produced data we need indicators that show how well or badly a certain option or set of options meet(s) certain goals, criteria or standards. Which goals we take into account and which criteria/standards we develop cannot be determined by science. This process rests on value judgments that are either formulated by
experts or are the result of social/political processes – or a combination of both. Third, the use of the SDGs already indicates that from a normative perspective we are not only interested in the impacts and questions of feasibility and controllability, but also in those concerning distribution and decision-making. Our evaluation framework, therefore, needs to be linked to issues of distributive justice, including social, global and intergenerational aspects as well as questions of compensatory and procedural justice.

**Keywords:** Negative Emission Technologies; normative evaluation; Sustainable Development Goals; justice; Shared Socioeconomic Pathways

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**Interdisciplinary Research in Law and Forensic Science: a model for paradigm change from ‘silos’ to systems?**

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Previous commentators have tended to view law and forensic science as operating in discrete silos. The research paradigm has therefore tended to concentrate on the negotiations between the two professions, the allocation of epistemic responsibility, the performance of ‘boundary work’, or the temporary creation of ‘hybrid sets’. Lawless and Williams, for example, are typical in positing that the legal and forensic fields ‘combine in a mutually constitutive relationship to (in)form a mode of production of scientific commodities purchased by the police in support of criminal justice objectives.’

These approaches tend to be founded on a belief that improved communication, and a shared understanding of the respective capabilities, and needs, of both forensic science and criminal justice, may enhance the co-production of knowledge. However, the results of empirical research into the UK’s streamlined forensic reporting scheme appear to confound this ‘contest and communication’ narrative. SFR signals an almost complete co-option of scientific processes by the criminal justice system, the concomitant loss of interpretative forensic expertise, and the avoidance of the allocation of epistemic responsibility. It is argued that this instrumental approach to forensic reporting is a result of the disruption, and restructuring, of the forensic profession. Further, that the application of legal norms and rationality to forensic science may be better understood through the lens of legal autopoiesis, and the structural coupling of competing subsystems. The presentation closes by considering the implications across other areas of STS research.

**Keywords:** Autopoiesis, STS, Forensic Science, Interdisciplinarity
International information systems security management standards (IISSMS) are essential to keep the informational economy running and to minimize cyber risks and associated economic losses of companies. The European Union works on a number of fronts to promote cyber resilience across the Member States. Previous investigations have underlined a limited scope of research published with regard to the impact of cyber crimes, which is investigated by applying the scientific literature analysis and surveys. Another problem is a limited financial budget - small and medium sized business (SMEs) often cannot afford adoption of ISO/IEC 27000-series and other IISSMS (Barlette & Fomin, 2008). At the backdrop of extant research discussing the high adoption cost of IISSMS to SMEs, there is a lack of research and consensus on what are the costs incurred by cyber crimes or deviant behavior of company employees in the context of poor or non-existent information systems security management standards in organization. Analysis of cybercrime costs can help companies better understand the tradeoffs in adoption vs. non-adoption of IISSMS. Several prior studies reported on a challenge to provide estimates on the cost of cybercrimes and related deviant behavior. According to Cardenas et al. (2009), researchers tend not to consider how cyber attacks affect the physical world because of limitations of control systems and technical challenges. Gol and Abur (2013) also add that state estimators are vulnerable to any existing critical measurements since their errors cannot be detected. Cavusoglu et al. (2004) assume that it is impossible to measure intangible costs and many companies underestimate the costs of security breaches. For this reason, the estimation of incidence reported by the CSI and FBI survey is much lower than the real price after cybercrimes. This work will report on in-depth research on cybercrime costs by analysing the information from selected online materials by using literature review and statistical analysis. The findings will corroborate on various surveys from independent IT companies, governmental and non-governmental institutions, as well as Google Trends data identify and systematize the impact of cyber attacks. Descriptive statistics lead to unique contributions since the analysis of reports of independent IT firms and cyber security institutes as well as scientific publications and working papers broaden our understanding of the analysis of cybercrime and its effect focusing on computer worms, viruses and other malware. By manipulating the number of critical measurements, the interested parties can bias results of the state estimation without being detected due to the lack of scientific publications and continuous research in this field. This study must provide useful insights for SMEs, IS security professionals and policy makers for decision making on risk control of cyber security. Better knowledge on cybercrime costs should lead to more informed decisions on IISSMS adoption.

**Keywords:** ISO27000, cybercrime costs, cyber attack, OLS regression
Laying ground for responsible standardisation for robotic law
FOMIN, Vladislav, AMILIAVICIUS, Darius, ASTROMSKIS, Paulius
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Intelligent technologies have become an integral part of contemporary society. The Fourth Industrial Revolution brings a promise to further push the boundaries of the how much society’s dependant on interactions with technologies. While we expect advancements in technological development support the positive development of business and private affairs, there are also grey areas where there is a lack of social, ethical, or legal norms for technologies which are already in use or which are foreseen to be introduced in the nearest future. On the scale from the widespread ethical and legal aspects of digital piracy, to existential threats of Artificial Intelligence, as voiced by Stewen Hawkins, the global technology standardisation institution comes under pressure for incorporation of social responsibility norms to technology standards. Development of Artificial Intelligence (AI) caters to the growth of autonomous and robotic technologies at the service of society. Sustainable model of development of AI into different domains of social and business life, however, require introduction of new institutional frameworks and policies, as well as new approaches to the development of technology standards, which are to safeguard socially responsible, legal, and ethical uses of technology in society. The recent efforts by European Commission, such as RoboLaw study and call for studying the economic impact of standards, indicate that there is a need for urgent action in defining new regulatory directions for new technologies entering our society. Technical realization of such concepts as Cyber-Human Systems and Robot Law, for example, may well be technologically feasible today, but requires a systematic evaluation of privacy vs. control, ethics vs. economics concerns, among other. The global arena for technology development today cannot easily accommodate the non-technological concerns when preparing and introducing technology standards, which will be laying ground for the new generations of “technologies-in-society”. Standardization practices must be revised to address those issues. As the interaction between people and technologies is becoming increasingly all-inclusive and complex, the areas of interaction of ethical and technology domains in technology standardization have to be delineated for specific application areas. In this paper we will lay the ground for research on Robotic Law – the paper will enlist questions and issues related to technology standardization for AI in the national legal system. The issues related to implementation of ethical norms for intelligent technologies have not been systematically addressed yet. Technology standards will be needed to develop national and international digital infrastructures for legal/law affairs. Those standards will shape the new regulatory models for law and societal practices. The research challenge is how to conceptualize and systematically evaluate the role of technology standards in shaping advances of AI or other advanced technologies, where well-being of society is not compromised and where fundamental
social values and rights are not violated.

**Keywords:** responsible standardisation, robotic law, artificial intelligence, digital infrastructure, well-being, society

How to measure air pollution? Technical standardisation and data infrastructure in smog measurement (the case of Poland)

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High level of suspended particulates (PM10 and PM2.5) makes Polish air quality one of the worst in Europe. This is mainly related to the fact, that Polish individual energy consumption is based mainly on coal. Although the problem exists for quite long time now (since the 90s), it became a subject of public concern only recently. Citizens in big Polish cities started to pay more attention to air quality. Numbers of NGOs exclusively concerned with the problem (so-called Smog Alerts) have been created. NGOs not only direct the attention of policy makers, local politicians and public institution to poor air quality, but they also create alternative data infrastructure. This infrastructure consists on sensors and mobile applications (that makes the data easy to obtain by regular users). Recently the smog problem started to be the subject of private sector interest. Many companies sell simple sensors that can be used in home environment or create its own infrastructure and collect data in Polish cities. The latter are used by big web portals, that show information about air quality to millions of viewers every day. The question arises, what are the relations of different actors (public institutions, NGOs and private companies) involved with the air pollution controversy? To collect accurate and reliable data on suspended particulates it is necessary to calibrate measuring infrastructure and to standardize the way data will be indexed. On the level of technical standardisation and data infrastructure there are serious discrepancies between aforementioned stakeholders. Each one of them uses different sensors and devices, adopts different legal norms, uses different analytical standards and different methods of data visualisation. It can cause many social consequences – e.g. private sector scales are simpler than those used by public institutions and makes its data more visually attractive, so their data has far more social range despite its lack of accuracy. In our paper we want to: 1) show the differences in the ways that data are collected and standardize by different stakeholders; 2) consider how those differences affect the possibilities of cooperation between stakeholders. Our research project is based on field research. The main part of the research are in-depth interviews conducted with representatives of inspectorates of environmental protection, NGOs and private sector.

**Keywords:** air pollution, smog, sensors, infrastructure, standardisation
Standardisation and "good science"
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In a recent book on controversies on stem cell research in the US, Charis Thompson argues that emerging biotechnological practices are always already enmeshed with ethics, as they are results of complex social negotiation and organization involving multiple commitments (cf. Thompson 2013). These commitments are often reflected in and not the least governed by standards and regulations. This paper explores how regulations and standards have emerged in the context of animal experimentation, and how they have taken part in establishing laboratory animal science as "good science".

Drawing upon feminist STS and material-semiotics, the paper explores particularly three points:

1. How standardization in this context can be viewed as material and rhetorical tool for ensuring ethical commitments to animal welfare and scientific reliability, and as such, sustain public controversy surrounding animal experimentation.
2. How standardization evokes certain forms of response-abilities (Haraway 2008; Davies, forthcoming STHV 2018), but curtail others.
3. How standardization in laboratory animal science needs to involve (also) other standards than what is currently made to matter in human-animal interface in the life sciences. In relation to these points, the paper discusses how STS perspectives are particularly useful for investigating the ethics, or valuation strategies, that are integral to certain forms of technological development and standardisation.

Keywords: standardisation, good science, laboratory animal science, STS, ethics

Innovation by standard? How the EN13201 failed to enhance the LED "revolution" in lighting
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In recent years, innovation researchers have highlighted the positive demand-side effects of standardisation. This paper tests this claim by exploring the practical relevance of the European standard for road lighting (EN13201) in the context of a disruptive technological innovation, the so-called LED “revolution” in lighting. In 2010, light-emitting diodes were still fraught with uncertainty. In theory, the standard should have facilitated the public procurement of the innovation. However in practice, its positive demand-side effects were flawed. The qualitative analysis of LED projects shows that ignorance and misunderstandings prevailed on the demand-side and hampered the catalytic potential of the EN 13201. As a result, newly installed LED technology led to complaints and environmental rebound effects. Based on this evidence, the paper concludes with a critical qualitative assessment of standardisation for innovation.

Keywords: disruptive innovation, standardisation, public procurement, LED lighting
Lyndon LaRouche as an “economist” (the “greatest of the 20th century” according to his supporters), Alain Soral as a “sociologist”, Edward Epstein as a “medical examiner” or Richard Gage as a “civil engineering expert”, this communication aims to demonstrate how incompetency and alterscience are turned into political resources by some leading conspiracy theorists. Without any legitimate competencies or diplomas in the field they claimed to be experts, they manage to challenge established and academic knowledge and organize new standards of legitimation particularly through the Internet. “Official” truth, knowledge, social or hard sciences and institutions are presented as forgeries, covers-up or dissimulations operated by the hidden hand of the so-called conspirators: Jews, Illuminati, governments, elites, Freemasons, etc. Consequently, if science is wrong and manipulated nothing can be trust but the hypothesis of a large scale conspiracy led by evil elites or evil others in witch science is a tool for their unlawful domination. Not only is it necessary not to trust scientific paradigms but it is also required to create new ones based on direct observations, good or common sense and minimal education. A perfect recent conspiracy-based example has just been given by President Trump’s tweet making a confusion between cold and snowy weather and global warming. “In the East, it could be the COLDEST New Year’s Eve on record. Perhaps we could use a little bit of that good old Global Warming” he wrote (12/29/2017). Starting from there, I will argue thought many examples from different fields (civil engineering, economics, social sciences, climatology or vaccines) how some social actors with a certain charisma develop strategies to contest established knowledge in both an anti-intellectual and populist perspectives. To enlighten this phenomenon I will use the analogy/structural homology between “detectives” (Boltanski 2012) or “citizens sleuths” (Olmsted 2009, 2011) whom lead investigations without any official mandates and policemen as the incarnation the legal-rational domination of the State. They are all engaged in a competition where detectives always win thanks to their special capacities, skills and “tricks”. The rejection of science and established knowledge let those actors to acquire a higher legitimacy not only in the conspiracy theories field but also, for instance, in politics where challenging deep-rooted structures and divides constitutes a huge resource for originally outsiders whatever they are professional conspiracy theorist or not. I will also stress that in the economic field is a case for juicy profits and incomes. Finally, I will show that this competition to challenge established knowledge and science turns conspiracy theorist into “rival-associates”: each one trying to improve his/her own position by ridiculing or mocking other theories not through science but through his own alterscience witch
In Germany, the academic subject of gender studies has been attacked recently not only by right-wing movements, parties, and masculinists, but also by fellow-members of the scientific community. Representatives of different fields deny gender studies the belonging to science and accuse Gender scientists of corruption and the infiltration of universities. The critics argue that gender studies are worthless and, in addition, they insinuate that the field has a political agenda which aims for the re-education of people towards “unisex persons” and a totalitarian society. Now, who are those critics? Which are the argumentation figures and rhetoric strategies they employ to defame Gender Studies? From which epistemological viewpoints do they speak? Who is assaulted, and how do the attacked scientists cope with the accusations against them? How are gender-critical positions discussed within the accordant scientific associations? Which power of interpretation do the critics of gender studies have inside of academia as well as outside, e.g. in political and media discussions or in everyday-life discourses, given the fact that academics are ascribed high authority and the scientific discourse level works as a “superstructure” (Gehlen 1957), i.e. as an instance of final justification? How are the critics connected to other groups of societal actors? Which role does the depreciation of Gender Studies play for other socio-political theme complexes and contested fields such as the liberalization of gender relations, gender mainstreaming, or migration? And how is the intra-academic fight against Gender Studies connected to historical emancipation efforts as well as to current antifeminist movements? I want to explore these questions on the basis of a discourse analysis (following Jaeger 2009) of statements of scientists who criticize Gender Studies, as well as an analysis of their reception in conservative-right-wing media, theme-centred interviews (Witzel 2000, Schorn 2000) with gender researchers who have been attacked, expert interviews with representatives of scientific associations, and participant observations at events of conservative/right wing groups and movements. My talk presents results from the interdisciplinary project “Crisis of gender relations? Antifeminism as a threat to social integration” (REVERSE), funded by the Federal Ministry of Education and Science and conducted at the Centre for Gender Studies of Philipps-University, Marburg (Germany).

Keywords: gender studies, antifeminism, disputes in science, public debates
Hacking Citizens and Their Communication Problems. Ethnographic insights on participatory and project thresholds at citizen hackathons
MÜLLER, Peter
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Staging hackathons is a prosperous trend, growing into all sorts of fields, diversifying their means and ends, therefore addressing all kinds of professionals, laymen and stakeholders. For my PhD project, I have undertaken ethnographies of several types of hackathons, including civic ones. I want to share, present and discuss my findings in the context of particular citizen hackathon properties and problems with the STS community.

What are these citizen hackathons? Driven by city administrations’ e-government depart- ments, open data movements and/or ‘open knowledge labs’, a specific, yet multifaceted, type of event emerges: Citizen hackathons. Citizen hackathons are designed as local, civic and/or political events. They usually mix characteristics of hackathons/makerthons (i.e. playfully tinkering with software/devices, citizen science (e.g. independent, decentralized pollution measurement) and bar camps (i.e. casual information and discussion). This specific arrangement of civic exchange, hacking and making is held together by their local, political center: to provide a democratic place where citizens can organize themselves towards their local, civic and political issues; like articulating their interests and implementing or initializing civic projects (e.g. public databases, apps for local citizens and tourists, or digital democratic feedback tools). Hence, they address both the (local) hacking scene and (laymen) citizen/activists. Ideal imaginaries of civic hackathons are, independent of their particular goals, the construction of powerful collectives and strategies to support the democratic, civic shaping of cities as hometowns and to increase the civic influence on local authorities and other actors of public importance, e.g. local transportation companies.

Regardless of the support (e.g. by e-government agents, data activists) citizen hackathons enjoy, they have their own, particular issues and constraints. Since citizen hackathons are often hosted or supported by e-government agents.,) However, citizen hackathons suffer from several constraints: The civic hacking communities, although rhetorically inclusive, are often virtually exclusive and thus struggle to accomplish a significant outreach. Citizen hackathons that have an own tradition and regularity tend to result in rather closed groups with only few newcomers taking part occasionally. Also, their outcomes are mostly ephemeral project drafts. Stable projects usually exist independent from civic hackathons and use these events for further inspirations and as an (yet relatively ineffective) opportunity to raise publicity. Eventually, the degrees of freedom at citizen hackathons produce a special, remarkable environment for civic, democratic exchange and information but fail at getting tangible regarding actual project work, which is also partially displaced by stakeholders who use those events rather for political profiling.

Nevertheless, citizen hackathons harbor great potential for local, democratic participation in the design of infrastructures and policy. In order to release this potential, an analytical overview of particular citizen hackathon practices and their problems of closedness and attaining project resilience/sustainability is demanded. Undergirded with selected episodes of my ethnographic experiences, I illustrate how an empirically informed STS perspective can provide citizen
hackathon organizers with guidance concerning planning, outreach and implementation. Furthermore, which diplomatic strategies for such collaborations are especially productive must be discussed.

**Keywords:** Citizen Hackathons, Democracy, Participation, Collaboration

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**Session 35: The fabulous world of STS research**

**Chair:** HOFSTÄTTER, Birgit – AG Queer STS, Austria, MENZEL-BERGER, Thomas – IZA, Austria, THALER, Anita – IFZ Graz, Austria

STS research happens not only in classical academic contexts, within the logic of tenure track careers or third party financed projects at universities and research institutions. Usually, STS research does not require labs or expensive equipment, and it can be done from home or mobile offices. Desk research and forming reflective arguments are some of the central parts of our discipline. What can and should be discussed within a framework of neoliberal university regimes, as a critique of precarious academic positions and lack of social science research funding, can and should be also discussed considering the context of different living and working practices.

In our understanding, STS research exists outside classic academic arrangements as well. Its theories and methods can be applied in the work of NGOs, cultural movements, or art projects. We start our workshop with input presentations about a ‘research state of mind’, how research contents and conditions can change living practices, and how an unconditional basic income could influence research.

Our inputs serve as food for thought for further discussions in an interactive setting and we invite especially STS researchers with ‘alternative careers’ and/or precarious jobs to share their experiences and perspectives.

**Keywords:** workshop, research policy, STS research

World Café Discussions: Alternative STS research careers and experiences outside the classic academic context:

**Table 1:** „A research state of mind“ – about doing STS research without a job in academia
(Input and moderation: HOFSTÄTTER, Birgit)

**Table 2:** „My ideal work week“ – questioning the overtime-work ideal in academia
(Input and moderation: MENZEL-BERGER, Thomas)

**Table 3:** „How an RRI project changed my life“ – about living an alternative STS career
(Input and moderation: THALER, Anita)
Session 37: Public engagement with new and emerging technologies
Chair: FAUTZ, Camilo – Karlsruhe Institute of Technology, Germany
SEIFERT, Franz – Independent Researcher, Vienna, Austria

Understanding the political dynamics and science-society relations in democracy conflicts with a citizen science approach
PALFINGER, Thomas (1), WAGNER, Isabella (2), MAIR, Sebastian (1)
Austrian Academy of Sciences, Austria (1), Centre for Social Innovation, Austria (2)

A growing variety of experts and stakeholders try to influence the political decision-making process, while uncertainty of decision-making rises (Schuppert and Voskuhle 2008). This means political systems are transforming, and general principals of decision-making in (western) democracies are in question. There are tendencies of representative democracies being questioned by citizens as satisfaction with political processes is decreasing and distrust in the capability of political systems to govern complexity in is rising (Geissel 2009: 52). Democratic systems are torn in the tension between growing numbers of citizen seeking for more participation and the trend of officials seeking for more expert knowledge in decision-making (Hysing 2013).

Additionally the traditional image of science as an authority that provides reliable, objective knowledge gets seriously challenged by the public due to competing expert opinions, the questionable scientific assessment of risk and the threatening potential of scientific innovations (Innterarity 2012). Politicians in turn must cope with differing scientific studies, strongly engaged citizens who claim to have own expertise or refer to opposing scientific results, while being under pressure making the right decision. For this reason, the number of documented democracy conflicts is rising. While some get big and attract a lot of publicity, most of them stay local and therefore invisible. Nevertheless, these local conflicts have the potential to influence large political agendas, such as the energy transition, as windmills or solar plants have to be built somewhere. Today little is known about the processes and mechanisms to consolidate conflicting information and this lack of knowledge may cause societal disadvantages.

We want to present an approach that makes it possible to collect these local conflicts and to examine the role of scientific knowledge within them. Additionally, the question on what the role of social sciences to untangle the conflicts and to support informed decision making can be explored. This approach makes use of the possibilities for public participation in science, also known as citizen science. A virtual platform performs as a central mediator for engaged citizens and decision makers. In a first step the focus on geographically mapped conflicts around infrastructural issues is being laid. With this approach seeks to help gaining insights on science-society relations and political dynamics for science and technology studies, political science and complex systems science that can be later extended along topics and geography.

Decision-making in Repository Siting Procedures – Democratic and Societal Challenges for Nuclear Waste Governance

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The necessity to build high-level radioactive waste (HLW) repositories is acute in all states that use nuclear energy, but up-to now there is none worldwide. Only Finland already located a position to build up a HLW repository. Siting procedures are doubly complex (Hocke and Kuppler 2015), first in technological sense and second in terms of political and social matters. A prerequisite is that siting procedures meet the requirements of democracies of the 21st century. This means that it has to be taken into account that societies are plural and fragmented that hamper interest aggregation. As a result, new challenges evolve with regard to the ability of current representative democratic decision-making structures to make robust decisions which reach acceptability. Participation is currently a key term in politics, science and society with regard to solving complex planning problems. Concerning nuclear waste disposal there exist several regulations and recommendations, both, international and national; those include participation as an important variable for successful siting procedures. On international level the IAEA (International Atomic Energy Agency) and EURATOM (European Atomic Energy Community) give recommendations and regulations which then might be transferred into national law. In consideration the German history of nuclear waste disposal, participation is a very much discussed issue. This realization is e.g. reflected in the new steps towards participatory decision-making on radioactive waste governance in Germany with the Commission on the Disposal of High-Level-Waste and the Repository Site Selection Act (StandAG). Participatory elements like the National Accompanying Board (in German: Nationales Begleitgremium) of the new site selection process and the proposal of implementation of regional conferences have their role in informing the interested public and to formulate its own statements in terms of a consultation process (BMJV 2017). Such participatory processes are challenged in two ways: first, in respect of the representative democracy model to ensure equality and legitimacy in decision-making. Second, regarding expectations of various societal actors on participation processes as opportunity not only to take part and get informed, but also to be involved in the decision-making process and have a say. My interest therefore is: What kind of challenges are there in integrating participatory elements in democratic decision-making?
making? Representative democracy has specific characteristics and ranks participation rather low. However, late modern societies with high educational standards and a high individualization display changed attitudes towards decision-making. Individuals wish to become partners of political-decision-making (Bohman 2012; Lietzmann 2016). Based on a review of the literature between the years 2009 and 2017, assumptions will be made towards the need of participation as an element for establishing a decision-making process regarded as fair and acceptable. Current developments in the new site selection process are analyzed in respect of participation. To this end my hypothesis is that firstly the new site selection process for a waste repository in Germany lacks true participatory elements required to meet the important democratic criterion of equality. And second, a lack of equality indicates that there is a need for change of democratic decision-making procedures to re-establish legitimacy.

**Keywords:** energy policy; participation; infrastructure planning; deliberation; democracy

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**Deconstructing assumptions about science, society and democracy in PE exercises**

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Since roughly 15 years nanotechnology development has been an issue for public engagement in many European countries. Affected by the previous GMO controversy, policy makers, scientists, and companies try to find new ways to deal with public’s attitudes and perspectives. As different critics of the use of PE show, PE can be used for highly different purposes and evaluations of PE exercises vary depending on the normative criteria applied. In my presentation I will compare how publics are constructed in different PE settings on nanotechnology in France, Germany and UK. By relying on evaluation criteria from Rowe and Frewer (2004), I will explore how publics and engagement processes are constructed in terms of ascribed skills to engaged publics (Bauer et. al. 2009; Wynne; Collins and Evans 2002) as well as in terms of intentions (Fiorino 1990; Stirling 2007) and democratic conceptions (Renn and Schweizer 2009) that sponsors and organisers implicitly or explicitly associate with individual engagement exercises. That means that PE exercises will be taken as a phenomenon that can be deconstructed as an entanglement of different more or less reflected intentions and assumptions of sponsors and organisers. As the deconstruction of different PE exercises will show, they are composed in highly different ways and always can be criticised from one or another perspective. But deconstruction also shows that in most cases the construction of a specific public in a specific exercise is consistend in itself, if we take it as an expression of the sponsors’ and organisers’ assumptions about skills of laypeople as well as their conception of science policy and democracy. That means that evaluations of PE exercises should not only be used to criticise sponsors and organisers from a normativ perspective, but also to unfold the different assumptions, convictions, and motivations that lie behind single exercises and form the more overarching conditions for science and society relations in a given society. The results of the comparison among the three countries shall be used to reflect about the impact of political,
cultural, institutional etc. context factors affecting the construction and use of engaged publics for different implicit and explicit purposes of the sponsor.

**Keywords:** public engagement; nano; science and democracy

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**Participatory Development of a SMART Renovation Concept**

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**Introduction** This study aims to develop a general guideline for SMART renovation possibilities of participatory designed residential buildings in Austria built in the 1960-1980s. SMART hereby means the integration of a holistic perspective (inclusive, renewable energies, e-mobility...) in the urban context. The development of the guideline will be exemplarily performed in the Terrassenhaussiedlung in Graz/Austria - one of these participatory designed residential buildings- and then be objectified for transmission to comparable residencies. **Theoretical background** An ideal design process uses at least one of the several existing participatory design approaches, which differ in methodology but all emphasize the importance of including all people concerned or relevant samples of these (Dieckmann, & Schuemer, 1998). Involving people in the design and planning process of built environments improves acceptance and identification with the environment (Eisenkolb, & Richter, 2008) which should also hold true for renovation processes. **Methods** The Terrassenhaussiedlung that will be the test bed in this study, consists of more than 500 units and more than 1,100 residents. As the sample, all residents will be addressed. Over the course of half a year, various modern participation techniques like online participation, questionnaires, Living Labs, etc. will be employed to collect residents’ SMART renovation expectations and needs in terms of renewable energy, collective use of green and open spaces, urban mobility and residency’s communication infrastructure. Also, expert’s perspective on renovation processes of similar building structures from other countries will be collected. **Results** The collected data from the residents will be aggregated into a guideline for the SMART renovation of the Terrassenhaussiedlung. Integrating the experts’ perspective and insights on similar renovation processes, the guideline will be interpolated for further participatory designed residential buildings in Austria. **References** Dieckmann, F. & Schuemer, R. (1998). Communication between involved groups. In F. Dieckmann, et al. (Eds.), Psychologie und gebaute Umwelt. Darmstadt: Institut für Wohnen und Umwelt. Eisenkolb, L., & Richter, P.G. (2008). User oriented planning and design of built environments. In P.G. Richter (Ed.), Architekturpsychologie. Lengerich: Pabst Science Publisher. **Keywords:** social housing; renovation; participation; modernization; housing research; citizen; Brutalism
Postersession

Modest contemplations in the public sphere of walking and eating
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One of the expressed conference goals is to examine two related strands of thought: “how algorithms co-shape work, creativity and [other aspects of digital life]” and “how algorithms are outcomes of social actions.” We look at algorithms as social actions created as expressions of social action in order to examine social actions. In designing, when computation is seen as a tool for solving design problems--social or otherwise--the algorithm becomes a way to shape the problem and solutions.

We describe a social problem--human behavior on the street in the metropolis--in order to gain more insight into how the sidewalk functions or is used. Any aspect of human behavior in the city that is known or understood facilitates programming the context in which the behavior happens--sidewalk width, stop light, benches, trash receptacles, sidewalk level changes, etc. The street is one of the key spaces of public life. It plays a central role in modern life and encounters which happen in it contribute to the quality of social and personal life. It is a space worth probing in its multiple spheres of being and usage.

Our algorithm for an agent-based model was shaped out of the social behavior of people, indicated by a completed survey about eating while walking in the street. Thus we explored an existential nexus--where walking, eating, pleasure, social interaction, and more, converge. In the survey, participants (n = 103) scored ten theoretical factors as instigators of eating while walking in the street. Each item was scored on an 11-point scale: zero (no influence), 10 (absolute effect of factor).

In the agent-based model, one agent parameter was walking speed, a state variable which was random-normally distributed. Another agent parameter was a likelihood-to-eat score, a composite of scores on theoretical factors. Survey scores on each factor were aggregated into an indicator and scores as agent state variables were random-normally distributed around the indicator. If an agent’s composite score generated by these factors exceeded a threshold, then the agent became an eater. If the threshold was not exceeded, the agent maintained a noneater status and continued on its way. The threshold was fashioned around a one-mile visual observational field run on a business/commercial urban street during which proportion of eaters against noneaters was recorded. We derived an emergent condition around the social-psychological concept of social facilitation. Encounter with an eater and repeated encounters with eaters gradually increased likelihood-to-eat score.

In the current paper, we compare results with an earlier design which employed means of factors to define center of distribution for random-normal assignment of factor scores. In the current iteration, we use multiple regression to estimate a center, reasoning that factors tend to work in consonance with one another. We centered our analyses around model variables: proximity of eater, street density and proportion of eaters on the street. Results show an effect of
social facilitation upon the particular behavior of interest. Using the computer as a tool—and algorithms dedicated to causes/problems—enables us to anticipate social action.

**Keywords:** technology, modelling, public space, social facilitation, street

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**Gendered representation of pleasure in robotics and construction of human and robot intimacy**  
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Technology assisted intimacy is being served by products of constructed images of female and masculine pleasure, with a range of robots and digital tools. Almost half of the respondents imagined sex with robots a commonplace in 50 years according to a YouGov survey. Fembots (female sexual robots) represent an idealtype created for a range of masculinities, while women lack of such an integral humanoid creature. We also know, that for sexual minorities virtual is a safe space (Kinsey 2017). Implications of sexual robots in the society are raising numerous concerns in the context of gender power relations, intimacy, human-robot interaction, and abuse of robots, as well as producers shifting toward creating robots that may harm, or evoke abusive behavior of users practiced on real humans as a consequence. Samantha (by Syntheo Amato) was sitting on a couch at the Ars Electronica exhibit in Linz, and there was no Syntheo, no male sexual robot by her side. The third day, when left alone with the visitors, she was sexually harassed and groped so hardly, that she was sent to be repaired. Fembots are being designed with a mediatized body of porn and fantasy shapes. Startups create them following some wider ethical and social norms focusing on exclusively human and adult images, however concerns are being raised by the behavior of consumers in response to their personalities created by algorythms. Frigid fembots are designed to be raped, and ‘gentle’ ones may end up like Samantha. The relationship of humans and humanoid robots, that react, sense and respond to feelings, is also being romantically pictured, and robots are designed to be amicable. Moreover, open source design of a brain of a robot allows for wider creation of needs.

The above questions are engaged through the analysis of expectations and frustrations expressed on online discussion groups and other open-web sources adopting the methodological approach of qualitative netnography. The research design allows examining the discourse of the participants in a natural, non-controlled environment. The presence of the researcher had no influence on the results, bypassing problems regarding biases experienced during individual or couple interviews.

**Keywords:** human and machine interaction, intimacy, gender, tech-enabled sex culture
Animal testing in biomedical research – A socioscientific issue at school
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Animal testing in biomedical research is subject of often very emotional and intense discussions between proponents and opponents. An immanent part is the moral dilemma of a decision between costs to animals against human benefits. European Legislation (Directive 2010/63/EU) and its national implementation have yet again fuelled discussions. Animal testing in biomedical research is not explicitly mentioned in the Austrian high-school curriculum for biology. Nevertheless, the curriculum generally stipulates that students should learn to apply their knowledge and justify their point of view in social discourse. In this regard, the topic animal testing provides opportunities to be integrated in biology teaching and foster not only methodological competence (i.e. knowledge about research methods) but include broader social and ethical aspects this methodology implies. We will outline teachers' strategies to deal with this issue in class and challenges they are experiencing thereby. We will furthermore provide insights into the perception of high-school students towards animal testing in research: their attitudes, their feeling of ambivalence, and their learning interests. We conclude with suggestions on how to best integrate socioscientific issues like animal testing in class and reflect on current teaching practices.

Keywords: animal testing, teaching, socioscientific issues, science education

Computer-based digital deviance: analysis of cybercrime costs
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International information systems security management standards (IISSMS) are essential to keep the informational economy running and to minimize cyber risks and associated economic losses of companies. The European Union works on a number of fronts to promote cyber resilience across the Member States. Previous investigations have underlined a limited scope of research published with regard to the impact of cyber crimes, which is investigated by applying the scientific literature analysis and surveys. Another problem is a limited financial budge - small and medium sized business (SMEs) often cannot afford adoption of ISO/IEC 27000-series and other IISSMS (Barlette & Fomin, 2008). At the backdrop of extant research discussing the high adoption cost of IISSMS to SMEs, there is a lack of research and concensus on what are the costs incurred by cyber crimes or deviant behavior of company employees in the context of poor or non-existent information systems security management standards in organization. Analysis of cybercrime costs can help companies better understand the tradeoffs in adoption vs. non-adoption of IISSMS. Several prior studies reported on a challenge to provide estimates on the cost of cybercrimes and related deviant behaviour. According to Cardenas et al. (2009), researchers tend not to consider how cyber attacks affect the physical world because of limitations of control systems and technical challenges. Gol and Abur (2013) also add that state
estimators are vulnerable to any existing critical measurements since their errors cannot be detected. Cavusoglu et al. (2004) assume that it is impossible to measure intangible costs and many companies underestimate the costs of security breaches. For this reason, the estimation of incidence reported by the CSI and FBI survey is much lower than the real price after cybercrimes. This work will report on in-depth research on cybercrime costs by analysing the information from selected online materials by using literature review and statistical analysis. The findings will corroborate on various surveys from independent IT companies, governmental and non-governmental institutions, as well as Google Trends data identify and systematize the impact of cyber attacks. Descriptive statistics lead to unique contributions since the analysis of reports of independent IT firms and cyber security institutes as well as scientific publications and working papers broaden our understanding of the analysis of cybercrime and its effect focusing on computer worms, viruses and other malware. By manipulating the number of critical measurements, the interested parties can bias results of the state estimation without being detected due to the lack of scientific publications and continuous research in this field. This study must provide useful insights for SMEs, IS security professionals and policy makers for decision making on risk control of cyber security. Better knowledge on cybercrime costs should lead to more informed decisions on IISSMS adoption.

**Keywords:** ISO27000, cybercrime costs, cyber attack, OLS regression

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**On Standardised UAV Localisation and Tracking Systems in Smart Cities**

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In the near future, more than two thirds of the world’s population is expected to be living in cities and hence, with the aim of being proactive and finding innovative and sustainable solutions, governments have made smart cities one of their priority areas of research. Smart cities are sustainable, inclusive and prosperous greener cities that foster enabling smart Information and Communication Technologies (smart ICT) like Internet-of-Things (IoT), cloud computing and big data to facilitate services such as mobility, governance, utility and energy management. As these services depend heavily on data collected by sensors, Unmanned Aerial Vehicles (UAVs) have quickly become one of the promising IoT devices for smart cities thanks to their mobility, agility and customizability of onboard sensors. UAVs found use in a wide array of applications expanding beyond military to more commercial ones, ranging from monitoring, surveillance, mapping to parcel delivery and more demanding applications that require UAVs to operate in heterogeneous swarms in a shared low-altitude airspace over populated cities.

However, as the number of UAVs continues to grow and as their sensing, actuation, communication and control capabilities become increasingly sophisticated, UAV deployment in smart cities is faced with a set of fundamental challenges in their safe operation and management. These challenges emphasize the need for establishing globally-harmonised regulations and internationally-agreed-upon technical standards to govern the rapid technological advance-
ments, as well as ensure a fair economy by encouraging market competition and lowering barriers to entry for newcomers.

As various Standardisation Development Organisations (SDOs) recently recognised the need, importance and potential of such regulations, most have established dedicated working groups addressing UAVs. However, most current SDO committees focus on aspects such as vehicle categorisation, specifications and operational procedures, but one usually overlooked elementary topic is UAV localisation. Due to its importance and close relation to other technical subsystems, the lack of a resilient, scalable and efficient standardised UAV localisation and tracking system is one of the main obstructing barriers hindering the integration and interoperability of UAV swarms in smart cities and hence impeding the realisation of their vast application benefits.

In this work, we focus on studying the fundamental technical requirements, specifications and functions of such UAV localisation and tracking system, and explore its relationship to and importance in 1) optimising path planning, flight scheduling and utilising shared airspace, 2) collision avoidance and conflict resolution in highly populated residential areas and 3) addressing privacy and data protection concerns that could arise from UAV monitoring and surveillance applications. Furthermore, for each of the three aspects, we analyse current SDOs efforts such as those put forth by EASA, EUCARe WG73 and ISO TC20/SC16 on UAV systems, ISO JTC1/SC41 on IoT and related technologies and ISO JTC1/SC27, EU Directive 95/46 EC and GDPR on security, privacy and data protection, in order to identify and prioritise future research questions in relation to UAV localisation, aiming to make a contribution towards narrowing the gap between research and existing technical standards by encouraging multi-mode standardisation.

This research was conducted in collaboration with ILNAS - the Institut Luxem-bourgeois de la Normalisation, de l’Accréditation, de la Sécurité et qualité des produits et services (ILNAS) under the authority of the Minister of Economy, Luxembourg.

Keywords: UAV, Localisation, Internet-of-Things, Technical Standardisation, Smart Cities

A Standardized Broker Model in Smart Cities
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As urban residents are expected to represent more than 60 per cent of the world’s population by 2050, the current developments and interests in the “Smart City” concept are essential to enable the successful transition to this new era. This paradigm relies on the integration of emerging Information and Communication Technologies (ICT), such as the Internet of Things (IoT), Cloud Computing, Big Data to manage assets and resources efficiently while facilitating the planning, construction, management and smart services within cities. While smart cities aim to enhance the quality, performance and interactivity of urban services at reduced cost, their realisation is faced by many regulatory and technical challenges. Among these challenges, is the integration of renewable energy resources to the utility system of smart cities motivated by the increasing
climate change concerns. Adding further to its complexity, is the challenge of incorporating multiple renewable energy retailers in the same region each with their own pricing strategies due to the lack of a standardized metering indicator and billing system. These challenges create a need for an intelligent and standardized cloud-based energy broker to satisfying the end-user requests, and minimize expenses by efficiently selecting the most suitable energy retailer.

In our work, a particular focus is raised towards the optimization of such energy brokering service which is motivated by the orchestration of a brokering role aiming to improve user experience and interaction with smart city services. Hence our main contribution is proposing a standardized intelligent broker model with smart trading strategies to cope with the dynamics and complexity of the energy retail market, while allocating energy resources based on end-users' demands. This is achieved through the following steps: 1) studying a complete model of the broker service and involved parties within the exposed framework. 2) proposing a multi-objective heuristic to provide a dynamic optimization of the grid operations and resources, with full cyber-security, within the boundaries of the city. 3) analyzing the gaps among industry practices, market requirements and current technical standardization efforts at ISO/IEC JTC 1 / SC 38 (Cloud Computing and distributed platform) in order to pave the way to establishing standards in metering indicators and billing principles for cloud services this while keeping in mind privacy and data protection risks and regulations enforced by ISO JT1/SC 27 and EU General Data Protection Regulation effective May 2018. This research was conducted in collaboration with ILNAS - the Institut Luxem- bourgeois de la Normalisation, de l’Accréditation, de la Sécurité et qualité des produits et services (ILNAS) under the authority of the Minister of Economy, Luxembourg.

**Keywords:** Smart Cities, Broker, Pricing Strategy, Technical Standardisation, Cloud Service

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**A Sustainable Solution? Arguments for Renewables in the Hungarian Nuclear Energy Debate**

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The paper examines the types of arguments in selected Hungarian discourses about renewable and nuclear energy. The objective of the National Energy Strategy is to decrease the ratio of fossil energy production by increasing renewables and to maintain the ratio of nuclear energy by the expansion of the country’s only nuclear power plant since the currently operating reactors need to be shut down in the next decade. In the controversy surrounding the expansion, the extent to which renewable and nuclear energy production can be considered sustainable is a relevant ethical aspect. We analyze articles from the following participants of the debate: the Hungarian Government and the green political party called LMP, both of which made energy politics part of their political campaign; Greenpeace, the environmental protectionist organization; and two scientific organizations, the Hungarian Academy of Sciences and Energy Club, an NGO turned policy institute committed to promoting renewable energy sources. The Government follows the National Energy Strategy in which the ratio of renewables is 16-20%. LMP, Greenpeace and Energy Club argue that the country needs to rely more on them instead
of building new reactors. Articles published on their official websites were chosen beginning from the acceptance of the National Energy Strategy in 2011 until 2017. In our previous research, we identified themes of arguments by which discussion participants convey their standpoints (topoi) about the expansion. We expected the actors to argue about safety concerns and the environmental effects. However, results showed that the cost-effectiveness of the expansion, prospective electricity prices, Russia’s involvement and the public’s taking part in the decision-making process were the main considerations in the debate. The paper builds on the above mentioned topoi analysis and examines the arguments pro and contra renewables. Similarly to the results of our previous research about nuclear energy, renewables are discussed in terms of economic and financial considerations. The Government argues that renewables are more expensive and uncompetitive compared to nuclear energy, and cannot guarantee the country’s supply security. LMP, Greenpeace and Energy Club argue that renewables are less expensive to invest in and sustain, safer in terms of energy supply based on their decentralized and flexible structure, and that the investment in the expansion takes away financial sources. The Hungarian Academy of Sciences presents a balanced argumentation by accounting for both the risks and the benefits of renewable energy sources. We categorized the concern for sustainability as an argumentative move within the topos of ethics. Parties argue whether nuclear energy can be considered sustainable or it is only renewable energy sources that reconcile with the concept of sustainable development. We examine the various aspects of the concept of sustainability (social, environmental, economical) and analyze how these aspects are presented in the argumentation of the selected actors. Ultimately, all of them employ the term ‘sustainable’ in a manner that does not reflect the complexity of the concept, but works only as a rhetorical device.

Keywords: sustainable energy technologies, argumentation, topos analysis, political discourse, scientific discourse

The construction of DNA profiling evidence within public and private models of forensic service provision
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Forensic science provision in the United Kingdom has undergone significant, but uneven, development during recent years. In England and Wales, forensic scientific expertise is now delivered by way of a commercial market, whilst similar provision in Scotland, and Northern Ireland, remains within the public sector. These changes are the result of processes of economic rationalization, which have affected all parts of the United Kingdom. As a result of these innovations, police forces (and other forensic ‘customers’) have become increasingly concerned with measuring economic value. Forensic science providers, for their part, have been tasked with maintaining a high-quality service - which conforms to the overarching regulations - whilst helping to deliver ‘Swift and Sure Justice’. Research by Daemmrich (1998), Williams (2010), and Lawless (2011) suggests that these economic, and regulatory, developments have had a significant impact within the field of forensic DNA analysis,
and may affect the way in which expert DNA evidence is constructed. Their studies explore the tensions between science, law and governance, and raise questions about the construction of expert evidence, and about the changing role of forensic DNA experts within the criminal justice system. This research project builds upon these prior studies, addressing the need for further interdisciplinary socio-legal research into the changing nature of forensic expertise. The study explores the impact that public policy, and organizational developments, have had on the routine practices of forensic DNA experts. It focusses on the practice of forensic expertise, enacted in the construction of both analytical, and evaluative, reports. The purpose of this qualitative study - the first of its kind - is to gain a clearer understanding of the ways in which providers have responded to policy-driven structural changes, and to assess the practical effects of resulting adaptations. It also attempts to identify examples of best practice, whilst highlighting significant trends, problems and opportunities. The project has uncovered valuable data, demonstrating that high standards of DNA reporting and evaluation are being maintained in relation to serious crime. Such results support orthodox assumptions about the role of forensic expertise – Jasanoff (1995; 2002). However, the ways in which 'volume' crime cases are dealt with raises more interesting questions. Certain trends are identified, across all jurisdictions, which may constitute a cause for concern: in particular, a markedly instrumental approach to the construction of forensic DNA evidence. A major source of concern is the introduction of 'Streamlined Forensic Reporting', which is ambivalent towards scientific expertise, and which limits the amount of contextual information available to the courts. Such developments carry the potential to impact on the quality of expert opinion, and may even subvert the courts’ ability to arrive at sound determinations on questions of fact.

Keywords: Science & Technology Studies (STS), Forensic Science, DNA, Evidence, Autopoiesis

**Potentials of Augmented Reality for human resource development**

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The technological advances through digitization in the area of cyber-physical systems, sensors, actuators and so on provide the basis for a new form of life. Numerous studies have shown that the increasing digitization is affecting society as well as business and industry. Targeting the future of work, digitization will lead to a redesign of jobs, particularly in the manufacturing industry. Direct activities in production are replaced by indirect tasks. In the future, it will no longer be necessary to calibrate and monitor machines on site, but control them by the use of digital systems. Production planning and control will be possible regardless of the location. Interface functions will therefore become increasingly important. This is accompanied by the question of how companies will deal with these changing circumstances. In particular, how could companies support their employees in a way that they are able to perform highly under those new working requirements. Increasing the level of digitization represents a comprehensive
change process, which represents an highly emotional process. To successfully set up a change process, the whole company needs to develop an awareness for Industry 4.0 and create a wide acceptance among the employees. The reorganization of the work processes requires a holistic approach, which is part of the responsibility of both management and the employee. The work organization, the climate, the work environment and the work itself must be adapted to the conditions of the digitization.

In this perspective, lifelong learning and the ability to improve the individual competences self-organized are getting even more important. However, this is not only the task of the employees. The company rather has the responsibility to provide the appropriate framework. There are many different possibilities in the literature. When selecting, the requirements associated with digitization must be considered.

Thus, human resource development must increase flexibility in terms of time and place, and should be characterized by shorter reaction times. This leads to new further development instruments, especially for on demand training. In order to realize this training method, different technologies can be used.

In regard to that, this paper gives an overview about human resource development in general and in this respect how on demand training could be provided by using augmented reality. Therefore, firstly both on demand training and the technology augmented reality are described within the context of digitization. Secondly, this paper gives some recommendations on how augmented reality could be implemented in order to enable on demand training.

**Keywords:** digitization, augmented reality, human resource development

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**Potential visual pollution caused by objects using renewable energy sources. Comparison of visual impact assessment criteria for various types of objects using renewable energy sources taken into account in selected methods**

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Facilities related to the use of renewable energy sources (RES) are often perceived as negatively affecting landscape physiognomy. Often locations with the best conditions for the introduction of these facilities overlap with areas that are considered to be particularly valuable in terms of nature or culture, characterized by high visual values of the landscape. The introduction of these objects not far from the housing development also causes numerous conflicts with residents, e.g. due to the visual changes they cause. For various types of objects using RES, these changes may have different character and scale of impact on landscape physiognomy. The type of landscape to which such objects are introduced also has an influence on their visual impact assessments.

The aim of the research was to check what features of a facility that uses renewable energy and what features of the landscape to which it is to be introduced may affect its visual pollution, and also which features may cause its visual value to increase. The tests consisted of two stages. In the first stage, the methods and criteria described in the literature used in the assessment of the
impact of a given object on the visual landscape have been compared. These methods and criteria have been compiled for different types of renewable energy objects. As a result, a comparison was created, containing the features of RES objects that may have a negative or positive effect on the assessment of the landscape’s physiognomy after the introduction of a given object. In the second stage, the criteria were checked for selected objects. The research results indicate that both the object that uses RES, as well as its relationship with the surrounding environment, play an important role in assessing its visual impact. The following are also important: the distance from which an observer can see the object, the contrast between the object and its surroundings, its size and shape in relation to the surroundings. The research also indicated that for each type of facility that uses renewable energy, visual pollution may be determined by a different set of specific features. The test results may be useful in indicating ways to minimize visual pollution.

**Keywords:** visual pollution, landscape physiognomy, renewable energy sources

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**Digital methods and collaborative empirical work**

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As digitalization spreads, research too is more and more mediated through digital technology (Berry 2012, 1). Digital devices are used to stabilize e.g. ethnographic research by creating digital video, audio and text files and sharing them through digital libraries. This requires reflexive as well as constructive strategies for dealing with such kinds of digital inscriptions. In this talk digitalization is seen as an opportunity by treating digital technology as site the researcher can actively interfere in, thereby shaping methods for the stabilization and distribution of empirical work.

Research focused on socio-material practices has to deal with the challenge to reassemble practices that are spatially and temporally distributed but still associated as networks through various mediators. Teil/Latour point out that this challenge is insufficiently addressed by the use of simple qualitative or quantitative methods: “Such studies are not at ease either with quantitative methods — which do not follow the network faithfully enough — or with simple ethnographic descriptions (case studies) — which do not enable one to tie a given case study to any other” (Teil/Latour 1995, 2). They argue for digital methods that are able to aggregate data from local sites into larger networks. Latours interest in digital methods resulted in the foundation of the SciencesPo médialab in 2009 (Venturini et al. 2017, 1). In this laboratory most recently the digital platform http://modesofexistence.org/ has been developed as part of the “An inquiry into the modes of existence” (AIME) project. The platform was designed to enable researchers to share empirical data and associate them with contents of an introductory report.

In this talk I want to focus on two aspects of such tools: Collaborative empirical work and relational data structures like network graphs. By drawing on the work of Latour/médialab and others, I want to discuss the idea of collaboration in empirical research as well as possibilities for the use of digital data structures to store and depict empirical results as networks. Some thoughts on this regard shall be shared and put to discussion: What is the meaning of relationality in digital data structures in comparison to theoretical relationality? By what means
and procedures can researchers collaborate on digital platforms when pursuing similar research interests? How can publicly and collaboratively used data structures provide interfaces for non-researchers as part of Citizen Science projects? In which ways are such digital inscriptions affecting empirical work?


**Keywords:** Digital Methods, Relationality, Collaborative empirical work

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**Strategic Use of International University Rankings’ Results for RRI Reflexive Governance**

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International rankings of universities have attracted increasing attention, which usually leads to promotional and casual use of their results by academia’s managers. But, they are a valuable ready source of internationally comparable information to build up monitoring and evaluation (M&E) systems in academia to further pursue reflexive governance of research, innovation and education.

In this regard, Sharif University of Technology has started responsible use of rankings’ results two years ago, firstly by establishing The Department for Planning and Assessment of Research and Technology (DPART), secondly by strategic selection of 7 relevant rankings to be monitored regularly, thirdly by strategic selection and categorisation of the indicators of the rankings into five dimensions of research and publication, education, industry collaboration, international collaboration and international outlook, fourthly by using the analyses for evidence-based policy making and for better understanding of and reforming current policies, and finally as a core element of a larger M&E system. The initiative has explicitly determined rankings cannot provide reliable insight.

So far, publishing a dozen of reports on the status of the university in international rankings has provided a comparative consistent picture of its trend, strengths and weaknesses across different rankings. Consequently, it has put an end to casual debates and remarks which in turn has built a baseline for consensus within the university, and also for responsible outreach toward stakeholders. It also resulted in a more evidence-based policymaking. In brief, it is suggested that rankings of higher institutions could provide ready, free and comparable information to build up the core of a customized M&E system for the ultimate goal of good reflexive governance of RRI, provided that academia managers are aware of rankings’ appropriate usage and limitations.

**Keywords:** RRI Reflexive Governance, International University Rankings, Strategic Use of Rankings