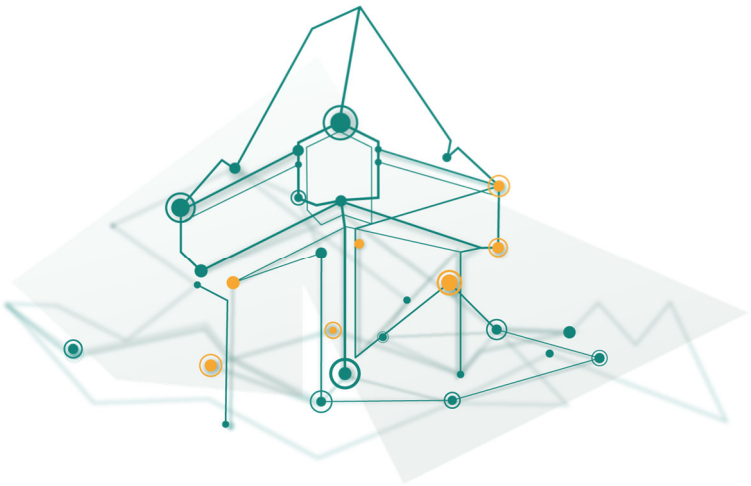
Book of Abstracts

23rd STS Conference Graz 2025

Critical Issues in Science, Technology and Society Studies

5 – 7 May 2025



IAS-STS institute for advanced studies on science, technology and society

STS Science, Technology and Society Unit

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Critical Issues in Science, Technology and Society Studies

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Keynotes

The Rise of a Tech Oligarchy

Kean Birch

York University, Canada

The aim of this lecture is to consider the shifting political contours of a technoscientific capitalism in which a small group of asset-rich social actors has assumed an increasingly prominent political role. This group can be has been characterized as a specifically 'tech oligarchy', representing an elite who have an inordinate say in how to organize technoscientifically our societies, polities, and economies. People like Julie Cohen (2024) point out that the tech oligarchy is constituted by political coordination to defend concentrations of (oligarchic) wealth; or, in my terms, these elites deploy their private assets politically to reinforce the concentration of private control over those and other assets. Centred on high-tech sectors (e.g. digital, artificial intelligence), the tech oligarchy is defined by a tripartite Californian ideology, mode of investment (e.g. venture capital), and monetary governance (e.g. private crypto) that epistemically and ethically legitimates technological innovation as the fount of societal change and productivity. Furthermore, such political coordination entrenches technological innovation as only possible within the ecosystems controlled by a few multinational corporations. The rise of the tech oligarchy rests on a transformation of innovation, which has become (1) increasingly parasitic, designed specifically to extract and entrench wealth; (2) increasingly narrow in its goals, centred on monetary returns and metrics above all else; and (3) increasingly reflexive in the performative pursuit of techno-economic paradigms and cycles to jumpstart a new round of socio-technical productivity. All of these issues highlight the need for intervention into the political economy of technoscience, which science and technology studies can provide.

The limits of experimentation and upscaling in urban climate transitions

Harald Rohracher

Linköping University, Sweden

Pilot projects, experiments, or living labs have increasingly become key tools for governing transformative change in general, and urban energy transitions in particular. Books such as “The Experimental City” (Evans et al., 2016) give witness of these shifts in urban governance in times of multiple crises and grand societal challenges. The idea is to test alternative socio-technical configurations in real-life settings, use them for learning how to do things differently and eventually scale them up to the whole city and beyond. In practice these projects and experiments are ridden by many problems which limit their contribution to urban transitions – they may be isolated from each other, no systematic learning is taking place, they are ‘projectified’ with a focus on short-term outcomes, they are highly situated and contextualised, or they may be captured by incumbent actors. In this talk I will critically analyse some examples of urban experimentation such as the development of positive energy districts or urban smart grid experiments as part of Swedish energy transition efforts. In a further step I will discuss different attempts of governance innovations beyond pilot projects which aim to achieve some level of systemic integration through transformative portfolios, system demonstrators, reflexive monitoring or alternative strategies of scaling.

Answer Engines and Other Communication Partners

Elena Esposito

University of Bologna, Italy

The talk explores the social role and implications of large language models (LLMs) through the lens of media theory. Rather than considering LLMs as advanced forms of artificial intelligence, I will argue that a communication-focused perspective provides a more effective way to interpret their impact on information management in contemporary society and to address the associated ethical and operational challenges. Supported by information management tools such as archives, catalogs, and later search engines, previous communication media expanded the scope of communication, making it possible to reach more, distant, diverse, and possibly anonymous communication partners. LLMs now signify a new phase in the evolution of communication, as they function themselves as communication partners capable of responding autonomously to user queries in a personalized manner. This perspective highlights and explains the capabilities and limitations of various LLM-based chatbots and Retrieval-Augmented Generation (RAG) models, while also addressing issues such as misalignment and hallucinations.

1: Bridging Anticipation and Responsibility in Research and Innovation

Session Chair: Filip Rozborski, TU Berlin, Germany

Session Chair: Christian Dayé, Graz University of Technology, Austria

Session Chair: Gert Goeminne, Ghent University, Belgium

Conceptions of Responsible Innovation and Epistemologies of Future Temporality

Sergio Urueña[1,2]

[1]University of the Basque Country UPV/EHU, Spain; [2]University of Twente, The Netherlands

The Anthropocene has introduced complex challenges, including the climate crisis, geopolitical conflicts, social inequality, and resource depletion. In response, societal actors are designing innovation policies, normative frameworks (e.g., Responsible (Research) and Innovation, RRI/RI), and processes to transition toward sustainable and responsible futures.

Efforts to shape these transitions find their optimal implementation window in the present but are often grounded in representations of the future. Proponents of responsible and sustainable socio-technical realities rely on both implicit and formal normative visions of the future, as well as formal methods to identify and assess which futures are most (un)feasible, (im)plausible, or (un)desirable, and to determine pathways for achieving or avoiding them. If anticipation involves creating, mobilizing, and utilizing representations of the future to inform and guide current actions (Miller, 2018), then the imperatives for responsible socio-technical transitions and transformations are inherently anticipatory in nature. The governance of sustainable socio-technical transitions and transformations is marked by anticipatory processes that intertwine the use of futures with efforts to shape the future (Konrad et al., 2016; Mayo et al., 2024).

However, the key issue lies not in simply recognizing the anticipatory nature of "responsible" and "sustainable" transformations but in examining the characteristics of these anticipations—such as their modalities and directionalities—and how they shape and are shaped by the politics of anticipation (Urueña, 2022, 2024): What forms can this anticipatory character take? What spaces and gradients of problematization of current realities does each form of using the future enable or constrain, and how do these modulate the range of potential transformations envisioned as (im)plausible or (un)desirable? Whose alternatives are being considered? How is this interconnected with—i.e., how does it conform to and is modulated by—the prevailing conceptions of "responsibility" and "sustainability"? This requires recognizing and critically analyzing the co-construction of futures and their performativity (Fuller & Loogma, 2009).

This contribution, drawing on literature from Science and Technology Studies and Anticipation and Futures Studies, offers a theoretical investigation into the intricate relationships between (i) broad conceptions of responsible future-making in the context of responsible innovation, (ii) specific forms of formal engagements with the future required for their enactments, and (iii) the spaces of problematization that these uses of the future enable or constrain. The research

question addressed is: How do different conceptions of responsible future-making interrelate with different approaches to and uses of the future, and what kinds of problematizations do these approaches and uses enable or constrain? Fundamentally, I argue that societal actors' understandings and enactments of responsibility demand specific engagements with and mobilizations of (future) temporality. These engagements, in turn, enable or constrain the problematization of certain aspects of current world-making practices and dynamics, embedding and reproducing particular modes of social ordering.

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Can engineers take more into account? A psychoanalytic take on socio-technical integration research

Gert Goeminne

Ghent University, Belgium

Research trajectories are given direction in the absence of a seMled view on the end point. In researching what they do not yet know, engineers can be seen to anticipate the future. What do they thereby take into account? Can they anticipate in a more responsible way?

This paper offers a psychoanalytic perspective on a recent socio-technical integration research (STIR) study involving chemical engineers. STIR involves embedding a social scientist in an R&D laboratory tocollaboratively explore the social fabric of ongoing research through repeated, semi-structured dialogues. While the original goal of STIR is merely to ‘probe’ the reflexive capacity of engineers, its practice demonstrates potential for fostering new pathways to more responsible innovation (Fisher, 2006; Gjefsen et al., 2014).

At this juncture, where reflexivity about one's own position intersects with the anticipation of new possibilities, this paper explores parallels with psychoanalytic theory and praxis. In psychoanalysis, analyst and analysand engage in structured interaction to map an individual's narrative anchorage in their environment and render it actionable. Likewise, STIR can be seen as a kind of 'talking cure' (cf. Dulsster, 2022; Fink, 1997), where structured dialogue brings underlying assumptions to the surface and fosters new ways of thinking. This paper further explores this parallel by identifying three key dynamics of STIR that resonate with psychoanalytic praxis:

• 'There is more to know' serves as a foundational principle in both psychoanalysis and STIR, fostering a process of hysterization—cultivating an auto-centred curiosity within the engineer.

• The psychoanalytic notion of the 'subject supposed to know' helps explain the social scientist's role in STIR—not as an external expert, but as someone who provokes a process of hysterization, fostering reflexivity in the engineer.

• This hysterization process brings the subjective dimension of chemical engineering into play, opening a space for engineers to expand what they take into account in their anticipatory work. However, much like the unconscious, this space tends to close swidly.

These points are illustrated through vigneMes from our recent STIR study with chemical engineers.

With this contribution, I aim to spark a dialogue between Responsible Innovation scholarship and psychoanalysis. Recent interest within RI in affect, emotions, and feelings (Smolka et al., 2021; Hillersdal et al., 2020) underscores how the subjective dimension of science and innovation is increasingly put at the forefront of interdisciplinary, transformative approaches. Psychoanalysis, precisely at this intersection, has an essential yet contestable contribution to make.

Anticipation, Ethics, and Responsibility as Cognitive and Epistemological Foundations of Disciplines

Marija Brajdić Vuković, Ivan Tranfić

Institute for Social Research Zagreb, Croatia

This paper examines how Croatian scientists from diverse disciplinary backgrounds construct and narrate responsible futures in science and technology at personal, disciplinary, and societal levels. Framed within the sociology of expectations, as articulated by Borup et al. (2006), we highlight how expectations bridge technical and social boundaries, intertwining visions of the future with both dimensions. Expectations are crucial for connecting the inner and outer worlds of techno-scientific communities, acting as the "missing link" in understanding their dynamics.

In our analysis, we also draw on future studies approaches (Fuller et al., 2024), holding that (a) a sense of the future is necessary to act responsibly in the present; (b) images of the future

contain clues about what it means to be responsible; and (c) these images guide present actions.

The study is part of the project “Social Responsibility and Professional Ethics of Croatian Scientists - RESETH” (2023–2027) and employs a phenomenological approach using in-depth, phenomenologically based interviewing (Seidman, 2006). This method combines life-history interviewing (Bertaux, 1981) with focused, in-depth interviewing informed by phenomenological assumptions, particularly those of Alfred Schutz (1967). Conducted in three stages, the interviews (a) situate participants' experiences in context, (b) reconstruct the details of those experiences, and (c) explore the meanings attributed to them. Semi-structured interviews were conducted with 48 Croatian scientists from natural, social, technical, and biomedical disciplines, focusing on their past and present experiences with social responsibility and ethics, as well as their reflections on future expectations.

Based on their narratives, we demonstrate how disciplinary backgrounds shape cognitive and epistemological frameworks for envisioning the future. Key themes include temporal perspectives, questions of scale, the complexity and interconnectedness of socio-technical problems, and the challenges of complicity and impurity. We discuss how specific disciplinary habituses influence the capacity to think responsibly, highlighting unique challenges and opportunities for fostering ethical and socially responsible science.

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Understanding Validation as Valuation as a Basis for Anticipatory Governance of Genetics Technologies for Security and Justice

Matthias Wienroth

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Since the emergence of direct-to-consumer genetic testing services and a plethora of state, research, and commercial biorepositories from the 2000s onwards, together with emerging Big Data capacities, we can observe a significant step change in the way that biometric data, including DNA, are produced, used, and legitimised in security and justice contexts. Arguably, this step change needs to be seen in the context of technological adoption into practice taking place while the specific and wider impacts of technology uses are often unknown. Technologies are used in an experimental way, the laboratory extends well into the social, political, economic, and operational spaces of society. Many emerging biometric technologies are deployed for forensic and surveillance purposes by security and justice actors, at times subject to the erroneous impression that these technologies are fully formed, comprehensively tested, and ready to be used effectively and efficiently in security and justice contexts. However, in most cases some form of validation is missing.

Validation, so E.J. Rykiel, is a "process that results in an explicit statement about the behavior of a model." Within this understanding, acceptance criteria need to be established before testing commences to set benchmarks and enable comparison. Recent scholarship in the forensic, legal, and social sciences has reaffirmed concern that many of the forensic (and surveillance) methods currently in use are not adequately validated or evaluated for use in the criminal justice system, indicating a lack of accountable and responsible practice affecting not only those working with data and information derived from such technologies (e.g. investigators, prosecutors, judges, juries), but also those with vested interests in responsible use of biometric data including victims and their families, and persons and communities of interest as well as suspects based on their belonging to certain risk categories derived from biometric data analysis.

Validation operates as a legitimiser for technology uses – based on testing models – and is drawn on to justify the adoption of new and emerging technologies into societal practices. However, I argue that, often, existing validation processes are too narrowly focused and siloed to enable comprehensive understanding of the behaviour of technologies in specific applications. The case I am making here is for forensic genetics, specifically, and biometric technologies more widely, as they are imagined for the contexts of security and criminal justice. I embed this argument in my proposal that we need to understand validation better.

Therefore, in this paper I address the valuations taking place in the process of technology development and testing, arguing that validation processes in these practices can be understood as – ethical and practical, but also commercial and policy – value negotiation and attribution. On the basis of this analysis, I propose a deliberative framework for a comprehensive anticipatory governance approach to using DNA and other biometric data, based on three necessarily interlinked types of technology 'validation': scientific, operational, and societal. In making this argument, I explore three practice-informed values and forensic technology validation approaches, combining normative and practice-oriented considerations via three values of responsibility in innovation – Reliability, Utility, LEgitimacy (RULE) – which

provide currency to the criteria of anticipation, inclusion, institutional reflexivity, and responsiveness (AIRR) within the context of deliberative democracy.

Literature:

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The interrelation between responsibilities and anticipation in (socio-technical aspects of) the Energy transition

Sietske Veenman, Maria Kaufmann, Kyra de Korte

Radboud University, The Netherlands

Societal transformations for sustainability, such as the energy transition, often allocate a pivotal role to technology and technological innovations. At the same time, these transitions are deeply societal and raise complex questions about responsibility and justice. This paper explores how anticipation of futures is shaped by, and (re)shapes the distribution of responsibilities and how this process can reproduce injustices. The paper focuses on the Dutch energy transition as an empirical focus of a social-technical change.

Conceptually, the paper combines two strands of literature, which – to our knowledge – have only marginally empirically been linked before. First, the study uses the typology of the academic field of justice and responsibility, which includes role, remedial, beneficiary, capacity, and membership responsibilities. By using this framework, the paper analyzes how different forms of responsibility are practiced and negotiated in the Dutch energy transition. Second, it uses concepts from future studies, namely the making and using of futures. The making of futures refers to present actions shaping future outcomes, while the use of futures reflects how expectations and visions motivate these actions. Important concepts hereby are expected futures, which represent a extrapolation of existing trends into future; and desired futures, which represent a normative goal. By focusing on technology in Dutch energy transition, this paper analyzes how anticipated futures influence, and are influenced by, the allocation and perception of responsibilities among stakeholders.

The study analysis the expectations and (perceived) responsibilities in the Dutch energy transition, by doing qualitative, open-ended and in-depth interviews, providing rich, detailed insights into participants', perspectives, and contexts of the actors involved. Interviewees have been, amongst others, grid operators, governmental organisations such as municipalities, non-governmental organisations, energy cooperations, companies producing energy displays and producing digital tools to monitor and arrange the energy use in a home, energy coaches. By

doing interviews we aim to understand the meaning and nuance of the expectations of technology and the allocation of responsibilities.

Tentatively, the analysis shows expected futures about technology in the energy transitions influence the division of responsibilities, and vice versa. In terms of critical futurists, they colonize the future. The co-evolvement of expectations and responsibility allocation create a lock-in effect and reinforces existing power dynamics that limits the emergence of alternative societal discourses on energy transitions. For example, the focus on role responsibilities within the process of introducing technology as solution for the energy transition, reinforces the existing status quo. This process colonizes the future and reproduces injustices, as only the futures of a select group of actors are realized.

This paper contributes to the literature on anticipation and responsibility by highlighting how the interaction between responsibility and anticipation of the future undermine just transitions. This paper shows that envisioning technical futures does not take place in a vacuum, but that existing lock-ins and expectations of the future influence what future is being envisioned. Therefore, the paper enriches the discussion on how anticipation and responsibility co-evolve, and shows how science and technological projects within the energy transitions use implicit envisioned futures and assess their implications for responsibility allocation in a societal context.

Responsible Futuring: Recent Experiences with the Futures Wheel as a Didactical Method

Filip Rozborski[1,2], Paula De Pablos Sanz[1], Christian Dayé[1]

[1]Graz University of Technology, Austria; [2]Maastricht University, The Netherlands

Futures Wheels have been utilized widely in future studies as well as in more managerial practice to explore possible first, second, and even third-order consequences of (more or less) hypothetical future events. Yet, it is also a fruitful and easy-to-implement method to get students to engage with collaborative thinking about possible futures.

In this proposed presentation, we will share experiences gained from the application of the Futures Wheel in distinct academic environments: an elective course at the European University of Technology and an international assembly of European engineering students. In both contexts, we introduced scenarios that showcased potential technological innovations across various fields and were tasked to examine the possible consequences collaboratively. Furthermore, we engaged in a discussion regarding responsibilities associated with either facilitating or mitigating future outcomes.

Furthermore, we present the initial stages of our analysis of the more than fifty Futures Wheels we have collected. We explore perceptions of responsibility: what is regarded as problematic, who is identified as being affected, and who is considered responsible. Although we do not claim generalizability, the extensive qualitative data at our disposal enables us to delineate how young Europeans are likely to approach these questions.

2: What's next? Challenges of Digital Research Practices, Academic Communication and Shared Research Infrastructures put into Perspective

Session Chair: Nathalie Schwichtenberg, German Centre for Higher Education Research and Science Studies (DZHW), Germany

Session Chair: Judith Hartstein, German Centre for Higher Education Research and Science Studies (DZHW), Germany

Identifying mechanisms to support trust in research practices & the trustworthiness of infrastructures

Katharina Flicker[1], Susanne Blumesberger[2], Marie Czuray[1], Andreas Rauber[1], Miguel Rey Mazon[3], Bernd Saurugger[1], Stefan Reichmann[3]

[1]Vienna University of Technology, Austria; [2]University of Vienna, Austria; [3]Graz University of Technology, Austria

Purpose

The complexity of today's data processing pipeline leads to questioning trust in complex research processes and their results. The starting point of our considerations are attributes of trust as they are discussed in philosophy. We move on to contemplate which of them can be applied in research, whether and how they differ and how they affect (digital) research practices, the sharing and reuse of data, tools, services and open-source software, quality indicators and the use of (shared) infrastructures. This forms the basis for designing focused investigations to identify mechanisms that need to be created or integrated in research infrastructures to support trust.

Previous research

The concept of trust has long been discussed in philosophy controversially, meaning that there are many definitions of trust (McLeod 2021. Stanford Encyclopedia). In this case, trust is being examined in the context of research, including its processes, results, and infrastructures, as part of evidence-based knowledge production. Thus, trust needs to be justified and supported by evidence.

There is literature on trust in areas such as organizations, data, and technologies. With the growing amount of data, questions about how trust can enhance its value arise in everyday life (Pink et al. 2018: https://doi.org/10.1177/2053951718756685). The relationship between trust in technology and its subsequent use is gaining significant attention. Studies explore how trust influences the use of ChatGPT among adults in the US (Choudhury et al. 2023: https://doi.org/10.2196/47184) or how privacy concerns and trust in currency affect individuals' willingness to adopt Central Bank Digital Currency (Tronnier et al. 2022: https://doi.org/10.1016/j.elerap.2022.101158). An example of the dual nature of these

approaches can be found in the automotive industry (Kopetz 2022: https://doi.org/10.1007/978-3-031-22337-2_4), alongside the critical consideration of end-user perceptions (Nastjuk et al. 2020). Further studies examine trust as a prerequisite for the acceptance of digital infrastructures (Flicker et al. 2024: https://doi.org/10.2218/ijdc.v18i1.921) as well as the discrepancy of actual (as opposed to ideal) Open Science practices based on the necessities of research continuity (Reichmann 2023: https://doi.org/10.1177/03063127231156862).

Methods

Two exploratory approaches were followed. First, a survey was launched among Data Scientists to determine factors that impact trust and quality indicators regarding shared and re-used open-source software. Second, twelve semi-structured interviews on research practices and trust in data (quality) with researchers across a variety of disciplines were conducted. They were recorded, transcribed and analysed via inductive categorization. ATLAS.ti supported the analysis.

Results

Trust is linked to quality management as well as to institutions, and (peer-reviewed) journals. In other words, reputation matters. This leads to questions about how a reputation of being trustworthy can be built and maintained. Results suggest that one way is to honour codes of ethics in terms of handling research data and results.

Regarding the sharing of data, tools, services and open-source software, the survey among data scientists suggested a discrepancy between ideal and actual research practices: Many stated that quality checks should be conducted before re-use, failed to live up to that ideal and decided to trust quality indicators such as documentation. Definitions of documentation, however, differ. The interview analysis supports this finding.

Regarding infrastructures, this leads to questions about e.g. how peer review processes can be improved, or how processes facilitating quality and trustworthiness can be integrated or even applied to artifacts such as code and data. Here, the relevance of rules and regulations including obligatory standards was mentioned. Inevitably, this leads to questions of monitoring compliance and potential consequences in case of violation.

Overall, the results provide a solid basis for designing focused follow-up studies to elicit mechanisms, processes, and human factors increasing both trust and trustworthiness when developing, deploying and operating research infrastructures.

Public communication and role conflicts – The Change of Scholarly Identity through Public Communication Expectations

Nathalie Schwichtenberg

German Centre for Higher Education Research and Science Studies (DZHW), Germany

In the context of ecological, medical, and societal challenges, communication of scientific knowledge is becoming increasingly important. Accordingly, there is a growing public demand for accessible scientific knowledge. Addressing this demand presents a significant challenge for researchers, particularly regarding new digital communication channels and their established communication formats in contrast to traditional forms of scholarly communication. This new situation for science and society leads to conflicts in which scientific knowledge is publicly negotiated (cf. Bogner 2021). Due to the dynamics of social media and online comment sections of news portals, this public negotiation is becoming increasingly contentious (Kaiser 2017, Scheufele & Krause 2019).

This study aims to investigate how researchers handle these novel conflicts. How and in which journalistic and digital arenas do researchers communicate considering public expectations? Does this new communicative demand alter their perception of their own scholarly identity? And does this, in turn, potentially impact their scientific practice? We will explore these questions through a combination of digital discourse analysis and qualitative interviews. With an analysis of recent cases of publicly debated knowledge conflicts (e.g., energy transition, gender studies, wars) we aim to generate a corpus of media contributions for analysis and to identify affected research fields and potential interview partners. In addition, we would like to use this approach to select two discourse events and define study periods for reading comments on digital channels and social platforms. The analysis of this public discourse, in combination with the discourse analysis of journalistic formats and the qualitative interviews, should help answer the questions posed.

The focus of the panel presentation will be on the presentation of method triangulation, which will be illustrated by initial empirical results by then. We are particularly looking forward to a lively discussion on the proposed approach and suggestions for the implementation and interpretation of the data.

Literature:

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Open science, living documents and the reification of scientific facts

Alexander Schniedermann

German Centre for Higher Education Research and Science Studies (DZHW), Germany

Scientific facts change. They are challenged, rejected, outdated and updated, or forgotten for decades. These dynamics and continuities have been studied by scholars of science studies in relation to notions of scientific processes, scientific progress or the approximation of truth (Xylander & Nordmann 2021). At the same time, the idea of fixed and certifiable pieces of scientific fact is deeply rooted in the academic communication system and its evaluation regimes. Today, the journal article has become the ultimate goal of any research project that wants to be considered a success. It seems that there are two different and apparently unrelated levels: One where scientific facts can be captured in books and PDFs, and another where books and documents can be juxtaposed in a continuous and dynamic stream of scientific progress.

Recent trends in scholarly communication and the reporting of scientific facts, however, challenge this distinction. New types of documents such as protocols, preprints and data papers are opening up previously closed research processes. Living documents, such as living systematic reviews, living dissertations, or on-demand output from large language models, challenge the idea of fixed bits of knowledge altogether. Even worse, AI-based tools promise to update the results of evidence syntheses as new data become available. It seems that this side of open science is not just about speeding up the production and publication of scientific results. Rather, it challenges the very idea of what constitutes an individual and original contribution.

How can we ensure that we are discussing the same knowledge when reports and findings can change almost instantly? How can we witness progress when the knowledge of the past is already being lost today? In this talk, I would like to approach these and other questions from a theoretical perspective. I will present two novel forms of dynamic publishing practices and discuss their epistemic implications against the idea of process epistemology, which originates from the philosophy of biology (e.g. Dupre and Leonelli 2022).

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Xylander, C. von, & Nordmann, A. (Eds.). (2022). Vollendete Tatsachen: Vom endgültig Vorläufigen und vorläufig Endgültigen in der Wissenschaft. transcript. https://doi.org/10.14361/9783839425428.

Imaginary Access Without Limits

Michaela Th. Mayrhofer

BBMRI-ERIC, Austria

Health data is simultaneously a resource for health care and health research. Health data is a potent source for data economies of both the public and private sector, but also an object, if not agent defining, inscribing, redefining and challenging attributions of FAIR, fair or open science. In the health sector, data infrastructures gain a new meaning through recent technological developments, political initiatives and legislative frameworks (eg. AI act, EHDS). All the initiatives have in common that the want to govern the flow of data for a specific purpose. The ambitious initiative of the establishment of a European Health Data Space, for instance, distinguishes 'primary' (health data) from 'secondary use' (health research). What it does share with traditional data infrastructures are questions of governance, accountability, interoperability and acceptance by a broad group of stakeholders such as patients and citizens or health care providers and researchers. Ultimately, what needs to be explored are questions of power and access. Who has the decision-making power to define what is and what is not moved across which (less geographical) borders? How do those boarders or boundaries look like across health research or the health care sector? What potentiality is inscribed in this "border control"? Is control over data an imaginary? Who in the end can exercise which form of control?

Narratives of transparency: How do commercial and non-commercial providers justify research analytics?

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In the light of Open Science (OS), digital infrastructures for the production of research analytics have significantly increased (Krüger & Petersohn, 2023). By means of datafication (van Dijck, 2014) of research practices and advances in data processing, it is possible to create more accurate and elaborate (meta)data on academic performance. In this context, a new organizational field has emerged that designs, develops, and provides these infrastructures while aiming at making information on research transparent.

This field encompasses commercial providers, such as Clarivate, Elsevier and Digital Science, but also non-commercial organizations such as CrossRef, ORCID, or OurResearch have emerged. Both follow the same aspirations, namely, to produce as much information as possible on research practice and outcomes for various users. Contrary to the big enterprises, non-commercial organizations seek to provide open databases and infrastructures advocating for open access to research information (Barcelona Declaration on Open Research Information et al., 2024).

So far, the literature has approached this field in different ways considering the utilization of such services by different user groups (Krüger & Petersohn, 2023; Plantin & Thomer, 2023) as well as potential impacts and threats for science and research (Fecher et al., 2024; Ma, 2023). Both strands of research highlight that scientific values and research autonomy are challenged through increasing datafication and commercialization of science. However, research focusing on the provider organizations is still scarce. In an academic landscape where the use of research analytics constantly spreads, it is important to illuminate the organizational field that decides upon how and which information can be drawn from them as they develop and design the ways how data is generated, processed and made not only accessible but also assessable.

To shed light on this field, we conducted 22 semi-structured expert interviews with the providers of research analytics. The analysis builds on the concept of transparency (Flyverbom, 2019) highlighting that transparency does not only mean open access to more information but that it also makes behavior measurable and actors accountable. By carving out different *narratives of transparency* that justify the need for data on research practices, we seek to outline different understandings of transparency and the ways how it affects scientific practice. Finally, our results indicate differences and similarities of commercial and non-commercial providers while contributing to the ongoing debate on open access and transparency of data.

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Rethinking effective S&T communication towards community-building in Open Science Research Infrastructures: the FOSSR case study

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In the age of Open Science, research communication within open Research Infrastructures (RIs) must evolve beyond traditional dissemination models. Rather than merely transferring knowledge, communication should serve as an enabling mechanism for community-building, ensuring long-term engagement with research outputs. Open RIs depend on active and engaged communities to achieve their mission of collecting, curating, and sharing research data. Without sustained interaction between researchers, policymakers, stakeholder groups, and the public, infrastructures risk becoming static repositories rather than dynamic spaces for knowledge exchange. Furthermore, the estensive use of digital platforms – potential enablers of Open Science – may as well foster inclusivity or reinforce exclusivity (Grand et al., 2015). In addition, the diversity of epistemic cultures (Knorr-Cetina, 1999) belonging to all the disciplinary and transdisciplinary actors engaging with Open Science and Research Infrastructures necesitates a sustained effort of adaptation and care.

This paper explores how research infrastructures can foster collaborative, participatory, and sustainable Open Science. We present the conceptual design and mid-term outcomes of the communication strategy developed for the NRRP-funded FOSSR (Fostering Open Science in Social Science Research) Research Infrastructure, demonstrating how communication can be reframed as a structural function rather than an auxiliary activity.

Unlike Deficit or Strategic Models of Science Communication (Nisbet & Markowitz, 2016), which focus on disseminating knowledge, this approach prioritizes building quality relationships around shared knowledge. FOSSR's communication strategy is designed to enable long-term participation and interaction, going beyond conventional dissemination. It needs dialogic practices that engage stakeholders in mutual knowledge exchange and openness to influence (Molas-Gallart & Tang, 2011); it anchors the choice of communicative practices and objectives in community-building and strengthening networks. Additionally, it identifies the tools, skills, and organizational changes needed to support an overall redefinition of the traditional roles assigned to communication within research projects.

The work, which draws on insights from researchers and practitioners involved in the communication and engagement activities of the FOSSR project, contributes to bridging the gap between theory and practice in science communication and seeks to define a transition model for communication strategies in complex sociotechnical platforms such as Research Infrastructures. The reflection draws from existing Science and Technology communication frameworks, transformative research and education, and organizational studies. These fields increasingly emphasize including social actors in the scientific process in order enhance scientific citizenship (Bucchi & Neresini, 2008), ensure social impact (Bornmann, 2012), support project longevity (Nowotny et al., 2001), and strengthen decision-making (Ravetz & Funtowicz, 1999).

By examining FOSSR's communication strategy, this paper contributes to ongoing discussions about the evolving role of communication in Open Research Infrastructures. It argues that the

overall community-buillding strategy must move beyond knowledge transfer to actively shaping collaborative research environments. This shift is critical for ensuring the sustainability, inclusivity, and long-term impact of Open RIs.

3: Navigating the Challenges of Research Ethics in the Age of Emerging Technologies

Session Chair: Claudia Monika Brändle, Karlsruhe Institute of Technology, Germany

Session Chair: Maria Maia, Karlsruhe Institute of Technology, Germany

Weaving the Web in the 21st century: exploring the value of stakeholder participation in the development of an open web search technology

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Bruno Latour's *Weaving together a story of technology* constructs a full description of innovation, exposing how the landscape of human actions flow without constraints, as 'powerless engineers to domination' and with the process so complete that it has become invisible (1990, p. 111). By 'predicting the path' and making the steps visible, along with opening and closing the 'black box at certain intervals,' new narratives can be created about the development of an innovation (1990, p. 111;113). If artifacts do indeed have politics (Winner, 1980), then the [innovation] process and political relationships of technological artifacts 'might have been [designed] otherwise' or another world might have been attainable (Bijker and Law, 1992, p. 8). However, Winner's critique falls short in acknowledging the dynamic aspects of evolving and changing sociotechnological systems through interaction (Jasanoff, 2020, p. 31-32). Therefore, critical STS could consider the role of human intermediaries and social actors – a collaborator, a worker, a participant – or, stakeholders, who all engage in 'interpreting the meaning of technological artifacts' and play an important role in determining how technology becomes a 'legitimate object of political struggle' (Feenberg, 2017, p. 5).

This paper focuses on the key stakeholders who are engaged with the ethical review process of a technological artifact— an open web index (OWI) based on European values and jurisdiction (https://openwebsearch.eu). In tandem to the technological and legal development of the distributed infrastructure, a Working Group Ethics (WGE), consisting of university researchers, computer programmers and people from civil society, monitors the technical development of the web index by focussing on interactions and by investigating ethical concerns and risks. Some of the outcomes include generating a 'Risk Assessment Survey,' which will be answered by all programmers developing applications for the OWI and a 'values

compass' for open internet search. This 'ethical framework' (Openness, Transparency, Trustworthiness, Privacy, Responsibility and Accountability, Simplicity and Usability, Diversity, Sustainability, Reliability, Safety and Security) encompasses the ethical and technical considerations, including the OWI's protocols, standards and software as well as its data collection and storage, data organization, data analysis and search services. Part of the ethical framework, the WGE also designed a 'value matrix' which proposed a series of questions: Who are the stakeholders of the value? Who are the affected groups? What does the value mean to the stakeholder and affected groups?

By investigating political concerns, socio-technical issues and by applying 'ethics-by-design' approaches (Nussbaumer, Pope and Neville 2023), multiple stakeholders from a range of sectors (representatives of civil society, academics, engineers and industry) all determine how the open web index and potential search engines can become the 'legitimate object of political struggle', i.e. how participation, design and usage of web search can be shaped. The results show the politics of the related stakeholders (society, content creators, third party developers and users) and regulation through visual diagrams and interactive software. Various ethical concerns come to the fore regarding web technology as well as the stakeholders who will contribute to the 'Risk Assessment Survey,' an ethical review process that fosters effective collaborations to generate ethical oversight. Moreover, by presenting how a range of social actors participate in web development, the paper contributes to an enhanced understanding of STS socio-technical imaginaries of a critical technology (Jasanoff, 2020). It elucidates how a 'values compass' of an open infrastructure will instantiate European (digital) sovereignty for navigating and searching the web, simultaneously challenging 'world capitalism's accumulative and extractive ethos' (Leheudé 2024, p. 7).

Rethinking Responsibility in Research and Innovation: Navigating Paradoxes in Complex Projects When Implementing Equality Measures

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As large-scale research and innovation (RI) projects become more interdisciplinary and multinational, integrating Equality, Diversity, and Inclusion (EDI) principles become a challenges aspect of responsible research governance. EDI implementation is often constrained by paradoxical tensions—competing stakeholder priorities, regulatory mismatches across institutions, and the challenge of balancing standardisation with contextual flexibility. These tensions raise fundamental questions about how responsibility for inclusion is conceptualised, negotiated, and enacted within research ecosystems.

This paper applies complexity and paradox theory to explore how RI projects can better anticipate and integrate EDI considerations beyond compliance-driven frameworks. Using the **Human Brain Project (HBP)** as a case study, we analyse the governance mechanisms, leadership practices, and institutional dynamics that shape EDI implementation in large-scale collaborations. Our mixed-methods approach—including document analysis, surveys, and

focus groups—reveals critical tensions such as the **difference paradox** (standardisation vs. flexibility), the **identity paradox** (individual vs. collective research priorities), and the **temporal paradox** (short-term reporting vs. long-term cultural change).

We argue that **anticipatory governance** must incorporate reflexive, adaptive strategies for EDI integration, recognising paradoxes not as barriers but as catalysts for systemic change. By rethinking **who holds responsibility for fostering inclusion and how these responsibilities are enacted**, this presentation contributes to the broader discourse on responsible research and innovation (RRI). Our findings offer actionable insights for policymakers, funding agencies, and project leaders seeking to embed EDI into the governance structures of complex research ecosystems.

Participatory and Performative AI Agent Simulations for Public Engagement in AI Governance

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As AI technologies increasingly mediate decision-making in law, governance, and public policy, traditional ethics review processes struggle to anticipate emerging risks and account for the evolving agency of AI-driven systems. This paper introduces AI agent-to-agent simulations as an experimental method for exploring ethical dilemmas before they become entrenched in policy and practice (example of what we do https://agentsim.streamlit.app/). Via workshops, participants define AI agents to represent diverse stakeholders, such as regulators, civil society, industry, and the public, then release them into simulated deliberations where they negotiate policy trade-offs, ethical conflicts, and regulatory interventions in real-time.

This approach raises urgent ethical and epistemic challenges: What does it mean to grant AI systems agency in deliberative spaces? How do synthetic stakeholders influence perceptions of risk, responsibility, and governance? Can AI-mediated negotiations expose ethical blind spots in regulatory processes before real-world implementation? By embedding such AI sandboxes within ethics review processes, these workshops offer a performative and participatory ethics approach, moving beyond static oversight mechanisms to a more adaptive, iterative, and publicly engaged model of governance. In the paper, we will discuss case studies where AI agents simulated disinformation campaigns, regulatory conflicts, and contested AI governance decisions, engaging ethicists, policymakers, and researchers in stress-testing governance models through interactive experimentation. By treating AI not just as an object of regulation but as a participant in ethical deliberation, this method reframes the role of research ethics in AI governance, fostering a hybrid public sphere where policy, ethics, and AI agency evolve through continuous negotiation and critique.

Data ethics And Research Integrity for Trustworthy Neurotechnology

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In the context of science and innovation policies both data-supported innovation and the storage, (re-)use and valorization of (research) data are associated with many opportunities (Science International 2015; RfII – Rat für Informationsinfrastrukturen 2022). There are mission-oriented aimssuch as open science, open data and open innovation, but also rather market-driven concepts, and in both conceptual approaches there exist accompanying ELSA of (new and emerging) technologies and data. In both approaches from data creation and collection to analysis, storage, sharing, and reuse, ethical considerations and integrity of data management are vital for trustworthy research outcomes and responsible innovations. Each stage of the data life cycle requires adherence to ethical standards. For this aim, strengthening collaborative efforts between scientists and (data) infrastructure people is crucial to advancing research practices that prioritize transparency, foster data reusability, and enhance the overall quality, reliability, and societal impact of research, thereby fostering that responsible innovation practices and global standards are met. (CODATA Data Ethics Working Group et al. 2024) Neurotechnology, a fast growing sector of medical technology, encompasses tools and systems designed to monitor, diagnose, or intervene in the nervous system, with applications ranging from treating neurological disorders to enhancing brain function. This includes addressing ethical challenges in the design, implementation, and societal integration to ensure their safe, inclusive and equitable use. (Coenen and Stieglitz 2021) The presentation considers the UNESCO Recommendation on Open Science, which was adopted in 2021 (UNESCO 2021), as well as the forthcoming UNESCO Recommendation on the Ethics of Neurotechnology, scheduled for adoption in fall 2025. This UNESCO Recommendation on the Ethics of Neurotechnology (UNESCO 2024, REN) aims to deliver an “holistic, multicultural, multidisciplinary, pluralistic framework of interdependent values, principles, and actions that can guide societies in dealing responsibly with the impacts of neurotechnology on human beings, societies, and the environments and ecosystems” (p. 2). The REN can be used to explore the complexity of ethical issues in health and medical technology and addresses a broad range of multilevel-oriented measures to establish a comprehensive ecosystem, including IT systems and data (ethics) policies for neurotechnology.

The aim of the talk is to identify shared principles and key aspects that bridge the domains of data ethics and research integrity in both recommendations, offering a pathway to the responsible development and application of trustworthy neurotechnology which can inform STS scholars and infrastructure practitioners alike.

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Knowledge requirements of research ethics committees with a view to integrating ethics into research and technology development

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The ethics review process serves as a significant mechanism for integrating ethical considerations into the development of emerging technologies. This process involves the ex-ante review of research proposals and projects to ensure ethical compliance, through institutional bodies known as research ethics committees (RECs) in the European context. Historically rooted in biomedical research, RECs possess considerable expertise in evaluating biomedical questions and methodologies. However, they are often less equipped to address the unique ethical challenges posed by research involving or developing emerging technologies. Addressing these gaps necessitates an understanding of the training needs of REC members in evaluating these novel ethical concerns. The presentation will share the findings of a large-scale, pan-European survey that collected 261 responses from REC members and ethics experts. The online survey, designed with both closed and open-ended questions, aimed to identify training gaps and prioritise areas of need. The survey also sought to determine the relative training needs of different technologies and application areas, capturing both quantitative and qualitative data for analysis.

Given the well-established and institutionalised status of RECs on an international level, they are well-positioned to play a prominent role in the integration of ethical considerations into scientific research and technology development. Key findings emerged from the research relate to the significant demand for training focused on broad technology families and application contexts, as opposed to specific technologies or use cases. The findings of the research call for a reflection on the relationship between emerging technology, application, issues these may raise, and the values that underpin the ethics review. Understanding the current state, including knowledge gaps in REC processes, can thus inform responsible innovation practices. The presentation will highlight important ways in which the integration of ethics in technology development can be improved.

4: At the intersection of action research, systems thinking and transition studies – creating spaces for transformative change

Session Chair: Katharina Biely, VITO Flemish Institute for Technological Research, Belgium

Session Chair: Erik Laes, VITO Flemish Institute for Technological Research, Belgium

Co-creating systemic knowledge about energy infrastructure acceptance

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Systems thinking enables us to better understand complex interactions. In acceptance research on energy transition and related infrastructure projects, we often see only the tip of the iceberg because we overemphasise individual factors and their effects in our search for linear causal effects. In order to understand a multi-causal and complex phenomenon such as acceptance, we need a more systemic perspective and methodology that takes into account the complex interplay of acceptance factors (Meadows 2008).

Acceptance research distinguishes between public and social acceptance. The former deals with the general approval or rejection of a technology or infrastructure, while social acceptance focuses on local, group and community-oriented connections and contexts (Wolsink 2018). Our contribution to local acceptance research is based on these place-based factors and builds on existing studies that have already identified a variety of factors that influence social acceptance, such as the degree of landscape change, perceived procedural justice,

opportunities for participation, and proximity to residential development (see Wüstenhagen et al. 2007; Zoellner et al. 2008; Devine-Wright and Batel 2013).

We assume that these acceptance factors interact in a dynamic and sometimes circular way to form locally specific factor constellations. In these constellations, moderating and indirect influences have an important impact on the formation of acceptance in the context of infrastructure projects. In our integrative and context-sensitive model, we aim to combine previous approaches to acceptance research with a systems perspective and participatory research methods in order to uncover these complex systemic mechanisms behind acceptance formation processes.

To this end, we develop two case studies from the German electricity grid expansion by combining qualitative research methods with the participatory system mapping approach (see Barbrook-Johnson and Penn 2021). In a first step, we develop an understanding of the relevant acceptance factors through a qualitative content analysis of media coverage, documents, interviews and observation protocols. In joint workshops with representatives of the responsible Transmission System Operator (TSO), we then develop Causal Loop Diagrams (CLD), which we use to map the constellation of acceptance factors in the affected communities. The co-creation of the CLDs ensures that the relevant experience and expertise of the TSO staff is incorporated into the understanding of the acceptance formation process. The joint reflection on systemic modes of action based on illustrative CLDs supports practitioners in their decisions, e.g. by clearly identifying leverage points for effective acceptance building or by identifying feedback loops that promote or inhibit conflict escalation.

Our approach offers a new perspective on acceptance by distinguishing between direct and indirect influencing factors and by considering the relational links between them. With its inherent systemic perspective, we hope our approach can promote energy transition and sustainable transformation.

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Advancing Sustainability Transformations: Applying Action Research to Shift from Scarcity and Surplus to Abundance

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Grassroots initiatives addressing sustainability challenges are uniquely positioned to foster transformative change, yet their potential is often underutilized without tailored socio-technical support (Engelbutzeder et al. 2024). This contribution examines how combining action research, systems thinking, and transition studies can enable the design of socio-technical systems that empower grassroots initiatives in advancing sustainable food systems. Drawing from insights (Engelbutzeder et al. 2023a und 2023b) in the Foodsharing.de community in Siegen, Germany, the research reveals the complex interplay of community values, socio-technical practices, and sustainability ambitions.

Using an action-oriented research approach, this study collaborates with grassroots stakeholders to co-create solutions for surplus food redistribution and food resource sharing. The process engaged participants in iterative cycles of observation, intervention, and reflection, uncovering the socio-cultural dynamics and technological needs of these communities. Action research provided a participatory framework for addressing immediate operational challenges while building capacity for broader systemic change.

Central to these efforts was the negotiation of fairness (Engelbutzeder et al. 2023a), particularly in ensuring that socio-technical solutions aligned with community values and did not inadvertently impose external priorities. This study underscores the importance of avoiding a "technology dumping" approach, where researchers enforce solutions they perceive as optimal without considering local needs and dynamics. Instead, face-to-face negotiations emerged as critical for fostering trust, facilitating community-building, and enabling participatory decision-making. These interactions allowed stakeholders to articulate their needs and collaboratively shape technological interventions, ensuring both relevance and legitimacy.

The research applies systems thinking to explore the interconnectedness of practices within food sharing and resource sharing systems (Engelbutzeder et al. 2023b). It identifies root causes of inefficiencies and barriers to sustainability, including the fragmentation of community networks and technological adoption gaps. These insights informed the design of digital artifacts, such as the Foodsharing.de platform and Telegram groups, to strengthen coordination, community engagement, and shared responsibility.

Insights from transition studies frame the findings within the broader context of sustainability transformations. The study (Engelbutzeder et al. 2023b) highlights the transition from food sharing, focused on redistributing surplus, to food resource sharing, which integrates practices like growing, harvesting, and cooking into community life. This shift represents a move from scarcity and surplus management toward abundance, which in this context refers to fostering a community-oriented cycle of food practices that emphasize resource regeneration, self-sufficiency, and shared prosperity. Abundance is not merely the presence of excess but a holistic approach where all community members collaboratively ensure access to resources while promoting ecological sustainability. This transition aligns with normative goals of

promoting abundance and ecological sustainability, emphasizing the co-evolution of social practices and technological infrastructures.

By navigating the tensions between the interventionist orientation of sustainability transformations and the critical, descriptive stance of Science and Technology Studies (STS), this work contributes to the understanding of socio-technical change in grassroots contexts. It demonstrates how the collaborative development of socio-technical systems can bridge gaps between local practices and global sustainability ambitions, offering pathways for scaling impact without compromising community autonomy.

This research's empirical contributions showcase how participatory methods and systemic perspectives can foster community resilience, enhance resource efficiency, and challenge traditional consumption paradigms. The findings call for further integration of action research, systems thinking, and transition studies to address complex socio-technical challenges and advance grassroots-driven sustainability transformations.

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A Nexus Approach: Connecting Action research, systems thinking and Transition Theory

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It is well established that modern societies need to become more sustainable. This requires a transformation in many areas of modern societies to reduce resource production and consumption in absolute terms. The transformation needed is not limited to one area and, thus, requires overcoming siloed approaches to tackle sustainability challenges. Instead, interdisciplinarity and the use of a systems perspective can help to address the complexity of the sustainability transformation. The character of many sustainability challenges (i.e., urgency, high stakes, uncertainty) also calls for close collaboration with stakeholders. Treating the sustainability challenge merely as a technological or market problem might also be insufficient, calling for knowledge plurality. Integrating diverse knowledge can be facilitated by action research (amongst others). Accordingly, sustainability transformations might require the combination of action research and systems thinking.

Action research is a practice to achieve social change and is thus implicitly connected to the facilitation of transformation processes. Furthermore, action research often requires adopting a systems perspective, connecting the practice to the research field of systems science. Despite this implicit connection, the explicit combination of the three approaches could help to further facilitate synergies and capitalize on their strengths.

Action research was explored for science, technology and society education. Apart from this, the STS literature does not provide explicit accounts on action research. Instead, the STS literature focuses on transdisciplinarity, which is similar but not the same as action research. By explicitly focusing on action research, this paper provides a novel contribution to STS literature.

A team within a Flemish research institute engages in transformation research, integrating systems thinking and action research. While the team integrates these three aspects, the tools and methods used vary from case to case. Thus, depending on the respective case, tools and methods are selected to best facilitate a mutual learning process. Within the context of action research, the team draws from different transition concepts (e.g., multi-level perspective, system change, x-curve, etc.) and system thinking tools (e.g., causal-loop diagrams, value-actor network mapping).

Using two case studies, this paper outlines how the research team integrates transformation research, systems thinking and action research. One project takes place in the context of the energy transition and focuses on energy communities. The other project revolves around repairing small household electronics and is thus connected to the transition towards the circular economy.

The cases illustrate the power of combining the three approaches as they facilitate learning and the formulation of actions to address the identified challenges. However, due to resource constraints (time and money) collaboration with stakeholders is often not extended till after the implementation of identified actions. This, in turn limits the mutual learning and transformation potential of the projects.

The Social Learning Promise: A Critical Look at Participative Workshops in Sustainability Science

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Workshops have been embraced as a methodological panacea in sustainability science for fostering transformative engagement, knowledge co-creation, systems thinking and mutual learning among diverse actors. Among these processes, social learning is the most frequently cited concept. It made it even into methodological handbooks within the sustainability science field, stating that participative methods are ideal for fostering social learning. However, it

remains conceptually unanchored and in praxis is often assumed rather than empirically demonstrated. This research addresses this gap by critically examining the role of social learning in sustainability science. We then explore how co-production workshops can foster social learning among participants.

To investigate this, we employ a mixed-method approach, using audio- and video-recorded participatory workshops, questionnaires, and semi-structured reflexive interviews to systematically capture learning dynamics. Our case study focuses on resilience-thinking workshops with disaster risk reduction (DRR) actors, whom we identified through system-wide actor mapping. While the theme of socio-ecological resilience serves as a common basis for discussion and as an intervention in the field of disaster risk reduction, the focus on learning brings a critical perspective to the processes during the workshops and their subsequent outcomes. We develop and apply a framework for assessing social learning processes within workshops, which we compare with the data from the reflections with our participants.

Preliminary findings suggest that while individual learning outcomes were significant and workshops influenced the DRR sector, evidence of shared perspective shifts as a key element of social learning was lacking. This indicates potential for social learning rather than its full realization.

Our research contributes to the understanding of how transdisciplinary approaches can drive sustainability transformations and improve the assessment of social learning while breaking down disciplinary assumptions. We advocate for workshops designed to actively facilitate learning processes while cautioning against assuming they occur by default. Developing such an understanding could enhance how sustainability science researchers and practitioners design and evaluate participatory workshops. Beyond this, we emphasize the need for STS research to further investigate the transformative potential of participatory workshops within sustainability science.

5: From ‘Responsible’ to ‘Values-Based’ - A New Standardisation Paradigm?!

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Session Chair: Vladislav Fomin, Vilnius University, Lithuania

Session Chair: Andrea Fried, Linköping University, Sweden

Session Chair: Olia Kanevskaia, Utrecht University, The Netherlands

Session Chair: Paul-Moritz Wiegmann, TU Eindhoven, The Netherlands

Smart Systems’ Standardisation - Beyond the Technical

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At least at first glance, ICT standards setting appears to be a purely technical activity. Experts from telecommunication engineering and from various computer science fields meet, discuss alternatives and eventually come up with a good technical solution. Frequently, economic interests of the respective employers will also play an important role. And in many cases this ‘technology-centric’ scenario will indeed be adequate – the nuts and bolts of a new specification of an Ethernet cable, for example, will hardly have any ramifications beyond the technical ones.

Things look very different for smart systems, though. They will eventually collect and process unprecedented volumes of information, including personal data. At the very least, adequate measures to render impossible any misuse of these data and to guarantee their privacy will need to be in place. This, in turn, implies that legal and regulatory issues will come into play. Moreover, smart systems hold the promise of making energy supply, traffic and production more environmentally friendly and cities more liveable. That is, sustainability aspects will need to be considered as well during the standardisation process. Finally, and given the massive effects smart systems are likely to have on (almost) all aspects or our lives, societal and, not least, cultural aspects will also need to be taken into account.

The above suggests that for the standardisation of smart systems technical expertise (commonly referred to as ‘expert knowledge’) will have to be complemented by both ‘domain knowledge’ and by what has frequently – and quite derogatorily – been termed ‘lay knowledge’. The former identifies the non-technical knowledge from domains that may either affect the technology in question or that can identify any potential undesired side-effects (e.g. technology assessment, sociology, philosophy, jurisprudence). The latter is the kind of knowledge to be contributed by e.g. the general public (or perhaps their representatives). They all will (have to) be of equal value.

Of course, such broader participation will also cause problems. For one, it will be extremely difficult, yet crucial, to actually mobilise the general public for day-to-day standardisation activities (see e.g. [Graz & Hauert, 2019]). Here, inadequate awareness, along with the lack of necessary resources (specifically time and money), will have to be overcome. Finally, and in order to get the Standards Setting Organisations (SSOs) on board, the current process should not be modified too much.

The presentation will discuss the above in more detail and will also propose a modified standards setting process that should at least lower the barriers to the general public's participation. This will include a brief discussion of how to raise their awareness of the importance of standards and show that active contributions to the process also represent a form of 'applied co-determination'.

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Innovating Standardisation Education: The EDU4Standards.eu Value-Based Approach

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Standardisation education is indispensable in equipping standardisation professionals and the wider standardisation community with the knowledge and skills needed to better identify, understand and incorporate technological and societal developments into standardisation activities and thus keep pace with innovation trends. However, current standardisation education is challenged by fragmentation and a lack of consideration of interdisciplinary aspects and a broader range of values affected by the growing complexity of technology. To bridge this gap, a comprehensive and well-structured framework is needed that goes beyond the values that have traditionally prevailed in the standardisation community, such as safety, security or interoperability, thus ensuring that standardisation education meets the needs of a rapidly changing world. At the same time, this framework should also be adaptable to different educational levels and learning environments, including both formal and non-formal education.

The aim of this contribution is to share the findings from the Horizon Europe *EDU4Standards.eu project* and to propose a structured solution to address these challenges. In the *EDU4Standards.eu* project, 17 partners from 11 EU Member States are developing and testing a new "Innovative Teaching Concept of Standardisation" (ITCoS) in several pilots. The aim of the ITCoS is to connect industrial and societal dimensions while embedding responsible, human-centred standardisation and EU core values in the standards development process (Edu4Standards.eu GA*)*. The basis of the ITCoS is an Intended Learning Outcomes (ILOs) Framework that focuses on European values and EU interests, in particular green, digital and gender aspects. The ILOs framework defines learning outcomes for all levels

of formal education, from early childhood to doctoral studies, as well as for non-formal education, while embedding value considerations at each stage of the learning process. In addition, the ILOs framework builds on well-established educational frameworks such as the European Qualifications Framework (EQF), the International Standard Classification of Education (ISCED) and Bloom's Taxonomy. The work on the ITCoS is further enriched by the identification, mapping and analysis of existing teaching content, teaching methodologies and gaps in standardisation education against the ILOs Framework. A further important aspect of the ITCoS is the EDU4Standards.eu Teachers' Support Tool, which should support teachers in preparing their standardisation courses by providing examples of key topics, concepts, support material and good practice. Finally, a four-level hierarchical framework model for curricula development and implementation (Framework Model of ITCoS) will be presented as one of the elements of the ITCoS. The Framework Model serves as a foundation for the development, implementation and evaluation of teaching pilots to be carried out in the second project year, as well as for the development of policy recommendations.

This contribution will explore the rationale behind the proposed framework, its key components and the implications for educators, policymakers and industry from a pedagogical, ethical and legal perspective.

Standardization and Implementation Challenges of Digital Identity Architectures: Bridging Policy and Technology

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Digital identity systems are at the core of modern technological infrastructures, facilitating secure authentication and access to digital services. However, the standardization and implementation of digital identity architectures remain highly fragmented, particularly in the transition toward decentralized models. This research explores the interplay between technological advancements, regulatory frameworks, and the standardization of digital identity systems, with a particular focus on verifiable credentials and selective disclosure technologies. By examining the gaps in current standardization efforts and the barriers to widespread adoption, this study aims to provide a clearer path toward interoperable and trusted digital identity ecosystems.

The study reviews international standardization efforts led by organizations such as the W3C, IEEE, and regional initiatives like the EU Digital Identity Wallet. Additionally, it examines the role of grassroots movements such as the Internet Identity Workshop (IIW) in shaping emerging identity standards. By analyzing the varying approaches to digital identity in different regulatory environments, this research identifies key barriers such as interoperability issues, governance complexities, and the lack of uniform legal frameworks. Public-sector-driven identity schemes (e.g., Japan's My Number system, the EU's eIDAS framework) and private-sector initiatives (e.g., self-sovereign identity models) are compared to assess their strengths, weaknesses, and alignment with standardization efforts.

A qualitative approach is adopted, utilizing policy document analysis, expert interviews, and case studies to identify the key factors affecting the adoption and scalability of digital identity solutions. The research finds that despite growing global interest in decentralized identity architectures, significant challenges remain in areas such as technical interoperability, legal compliance, and ethical considerations. Furthermore, the study explores how different stakeholders—governments, technology developers, and standardization bodies—interact and negotiate competing interests, influencing the pace and direction of digital identity standardization.

One of the central findings of this research is the tension between security and privacy in digital identity architectures. While verifiable credentials and selective disclosure technologies offer enhanced user control over personal data, regulatory inconsistencies and differing interpretations of data protection laws hinder broader adoption. Ethical concerns regarding user autonomy, surveillance risks, and potential misuse of digital identities further complicate the implementation process. These challenges underscore the need for a more coherent and coordinated approach to digital identity standardization that balances security, privacy, and usability.

This research contributes to the ongoing discourse by proposing strategic pathways for enhancing interoperability, trust, and regulatory alignment in digital identity ecosystems. It advocates for a multi-stakeholder approach that integrates technical innovation with robust governance frameworks. Policymakers and industry stakeholders must collaborate to establish guidelines that address both technological advancements and societal concerns. By fostering greater alignment between regulatory policies and emerging identity standards, this study aims to support the development of digital identity infrastructures that are both resilient and inclusive. Through these efforts, the broader vision of secure, user-centric, and widely accepted digital identity solutions can be realized.

6: Why have medical ethics documents gained more traction than those for data ethics? The Declaration of Taipei as both a lens for and object of study

Session Chair: Jonathan Edward LoTempio Jr, University of Pennsylvania, United States of America

Session Chair: Chase Alexander Yakaboski, Harvard University, United States of America

Session Chair: Helmut Hönigmayer, Institute for Advanced Studies, Austria

Session Chair: Shauna Marie Stack, Independent Researcher, Austria

Session Chair: Magdalena Wicher, Vienna Science and Technology Fund, Austria

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Ethical and legal frameworks shore up an uncertain future of EU-US research data flows

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The free flow of human biomedical data between the EU and US has been a hallmark of research collaboration in the post-cold war internet age. However, the continued future of this free flow is not guaranteed in the face of potential transatlantic decoupling and the weakened postwar order. More immediately, differing conceptualizations of the right to privacy, and more specifically, the right to control over data present challenges to continued collaboration.

In this manuscript, we consider whether, in light of particular cases of political and legal data management, the Declaration of Taipei can serve to strengthen the foundation upon which international collaboration rests: data sharing. Given these examples of systems working either to promote legal compatibility and data flow or instances of tensions, we propose enhancements to the Declaration of Taipei to draw clear distinctions between legal and policy frameworks around the physical materials of biomedical research, biospecimens, and those legal and ethical policy instruments. which interact with the digital materials of the biomedical research enterprise.

1) Data Privacy Framework: policy harmonization through international action

With the future of US firms' ability to work within the common European market, the Biden administration issued an executive order clarifying the rights and protections of European citizens from signals intelligence gathering. This resulted in an Adequacy decision from the European Commission which established that personal data could flow, generally speaking, through US firms. In support of firms, the US Department of Commerce created a Certification Mechanism wherein Commerce provides information for firms to self-certify and publicly show their compliance. Once opted in, this commitment is enforceable by US domestic law. We

further probe this ecosystem of transnational executive action and transparent compliance is probed for generalities.

2) INSDC: Field-specific collaboration in the International Nucleotide Data Sharing Consortium

As one of the longest standing fora for international sharing of biological data, the INSDC has pioneered the movement and backup of data between the EU, US, and Japan. It is further mirrored by China, who are not a full member. This case can be considered grassroots, as it is not supported by executive or legislative government action, but rather the organs of government (NIH, EBI, DDBJ) executing their functions expertly. This offloading of international collaboration to participants in data production and sharing provides another model to promote data flows.

3) European Health Data Space: where medical and research ethics meet

The EHDS is designed to give individuals control of their personal health data it also aims at facilitating data sharing for the purpose of providing healthcare services across the EU. The purpose of realizing a single (European) market for electronic health record systems, is to enable the EU to realize the full potential of secure exchange, use and re-use of health data for the benefit of patients, researchers, innovators and regulators. Balancing patient rights with data access for R&I actors and allowing Member States to create full opt-out options may hinder the creation of a unified Health Data Space. Therefore, the EHDS, which seeks to balance individual rights and public interest, serves as a case for the challenges for the free flow of health data.

From our cases, we seek generalizable actions that individuals in the research space and policy makers can use to facilitate their work together. These general recommendations largely fit within the DoT, but could be used to hone the ethics language around international data sharing. Specifically, they anticipate some challenges in discussing the movement of digital and physical research assets in the same conceptual framework. Taken together, these case studies provide immediately actionable information for any future revisions to the DoT.

Governance success as a maximal negotiation of values

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Soft law instruments (Hagemann et al. 2018), such as medical ethics guidelines, have historically mediated between research and social values, shaping fields like medicine by offering widely applicable ethical principles. Yet, in the digital era, similar instruments for data ethics, such as the Declaration of Taipei, have struggled to gain comparable traction. This paper argues that the growing specialization and siloing within and or between ethics, science and technology fields has narrowed the focus of their respective ethics documents, reducing their broader societal relevance and uptake. This presents major obstacles to relevance in an era marked by innovation-first problem solving.

Unlike the more traceable efficacy of past medical ethics frameworks like the Declaration of Helsinki, contemporary ethics instruments aim to impinge on increasingly fragmented research and innovation landscapes. This shift has important implications for the development of ethical guidelines in order to maximize their ability to meaningfully mediate between diverse domains of scientific activity, innovation and social values writ large.

Drawing on a case study of sciencepreneurship in neurotechnology, we examine the disconnect between neuroethics guidelines and the perspectives of frontier actors. For instance, while ARIA's neurotechnology funding programs seek to accelerate neurotechnological innovation, they make no reference to major neuroethics frameworks. While we would not say ‘they have no ethics’, or ‘they are doing unethical work’, it is not clear what ethical tradition is guiding their innovation. This omission underscores a critical tension: ethics documents often hail from only one corner of increasingly dynamic and sophisticated scientific landscapes.

The provocation of this paper is twofold: first, that ethics documents are acts of mediation and second, their efficacy depends on their ability to engage the widest possible range of relevant stakeholders. Both aspects, mediation and efficacy, require first taking stock of who is has been traditionally included. From this standpoint, we can begin to ask what constitutes adequate initiation, widening, coordination, maintenance, and reimagination of how resources should be allocated to sustain the development of an ethics document. Given that ethicists and innovators do not typically share the same set of institutional incentives or foundational practices, we need stronger, more pragmatic, not idealistic negotiations of ethical standards at the intersection of science and society as it is, not as we hope it to be.

By situating the Declaration of Taipei within this context, the paper explores whether current soft law practices entrench professional boundaries and inadvertently exclude key voices and perspectives. To remain relevant, ethics frameworks must navigate not only the complexities of innovation but also the evolving scale and scope of scientific and innovation institutions.

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Quantifying the Impact of Broader Impact Statements in AI/ML Research Venues

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In 2017, the foundational transformer paper that brought artificial intelligence (AI) into the mainstream and gave rise to large language models (LLMs) was introduced at the Neural Information Processing Systems (NeurIPS) conference. Despite its transformative impact on daily life, this work was published before NeurIPS required broader impact statements or ethics checklists. Could the authors have anticipated the societal ramifications of their research when the paper's primary focus was machine translation? This question underscores the challenges AI and machine learning (ML) researchers face in assessing the ethical implications of their work.

This study analyzes the top 23 AI/ML conferences and journals (ranked by h5-index) to evaluate the field's current state of ethics integration. Among these venues, only two require broader impact statements, while eight encourage them without enforcement and 18 mandate adherence to a general code of ethics. No significant correlation (p-value = 0.0606, U = 86.5) was found between a venue's prominence (higher h5-index) and its requirements or encouragement for broader impact statements. This finding raises concerns, as one might expect the most impactful research venues to prioritize the societal impact of their work. We hypothesize that researchers often provide only superficial or vague ethical claims, which leads venue organizers to question the necessity of mandatory broader impact statements.

An analysis of broader impact statements from NeurIPS and ICML (the two venues currently requiring an ethics or broader impact analysis) supports this hypothesis. At NeurIPS, where only an ethics checklist is mandated, "Not Applicable" is the most common response. This reflects a missed opportunity for meaningful engagement. Researchers often perceive these requirements as a chore, raising questions about their utility and effectiveness. If these statements fail to foster genuine reflection, should they even be required? Addressing these questions is critical to improving the integration of ethics into AI/ML research in a way that is meaningful and practical.

This study highlights the need for collaboration between AI/ML researchers and ethics experts. Drawing inspiration from frameworks like the Declaration of Taipei, which emphasizes privacy, data governance, and fair use, we propose developing practical tools or frameworks to guide researchers in creating more substantive broader impact statements. These tools could also encourage more venues to require their inclusion while reducing the burden on researchers, many of whom are not trained ethicists. Aligning AI/ML ethics with established data ethics standards can help foster a more informed and proactive research culture.

The goal of this session is to discuss actionable strategies for improving the quality and relevance of broader impact statements. By fostering collaboration between researchers and ethicists, we aim to examine how ethical considerations are integrated into AI/ML research, ensuring that they translate effectively from theory into practice and achieve their intended impact.

Phishing for solutions to our ethical obligation of data storage

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The Declaration of Taipei, addressing biomedical data governance, has yet to achieve the widespread recognition enjoyed by its predecessor, the Declaration of Helsinki. The Helsinki document garnered significant global uptake in the wake of the Holocaust, a period marked by profound human rights abuses that catalyzed a collective commitment to safeguarding the dignity and autonomy of research participants. In contrast, the absence of a similarly catastrophic catalyst in the realm of biomedical data breach or misuse has resulted in a muted response to the Declaration of Taipei. Recent years have shown however that these breaches are becoming more common.

A key principle of the Taipei declaration, the right to withdraw consent and have personal biomedical data removed from research databases reflects an ethical motive to ensure patient sovereignty of their data. However, its implementation necessitates retaining identifiable metadata to facilitate data removal. This linkage between sensitive biomedical information and personal identifiers creates an inherent vulnerability. Historical instances—such as the 2023 23andMe breach, which exploited outdated user passwords to re-link anonymized genetic data to individual identities—demonstrate that the very measures intended to protect individual autonomy can inadvertently amplify the risks associated with data breaches. The potential for malicious actors to exploit stored metadata not only compromises personal privacy but may also lead to irreversible damage, particularly in contexts where re-identification is possible.

Given these challenges, it may be ethically advantageous to reconsider the automatic right to data removal. By adopting a policy framework where data, once consented and anonymized, is rendered immutable, the linkage between metadata and personal identifiers could be severed, thereby eliminating a significant attack vector for hackers. Such an approach, while counterintuitive to traditional notions of participant autonomy, could ultimately enhance data security and protect against the increasingly sophisticated methods employed by cybercriminals.

Taipei, Brussels, Washington: US and EU data flow polices as a test for the Declaration of Tapei

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The Declaration of Taipei, first adopted by the World Medical Association (WMA) in 2002 and revised in 2016, aims to provide ethical guidelines for the use of health databases and biobanks by researchers, physicians, and other users. The WMA acknowledges both the incredible opportunities that access to such powerful data resources provides and the significant risks that it poses, noting the potential for political misuse of health database and biobank resources. The Declaration of Taipei seeks to carefully balance the rights of individuals contributing their data with the potential benefits to human health and the scientific enterprise.

In recent years, policymakers in the European Union and the United States have taken different approaches in pursuit of this balance between facilitating access to health data for researchers, physicians, and others, while guarding against various types of risk. US policymakers have become increasingly concerned with the risks posed by the misuse of sensitive personal data, such as genomic data, by certain other governments, in particular the People's Republic of China. In February 2024, President Biden issued an executive order (EO) blocking access to "bulk sensitive personal data" of US citizens, including health data and human genomic data, by certain foreign governments such as China on the grounds that their access to this sensitive health data "constitutes an unusual and extraordinary threat" to US national security.

The February 2024 EO reflects a wider trend within the US policy landscape, as policymakers have increasing sought to limit access to databases containing sensitive health data on national security grounds. A recent piece of US legislation, the BIOSECURE Act, would prohibit recipients of US federal funds from using equipment or services from any "biotechnology company of concern" that is under the control of a "foreign adversary", namely China, on the grounds that the research and multiomic data collection activities of these companies would threaten US national security. While the bill has not yet become law, it has received bipartisan political support. Similarly, a 2018 law instructs US government agencies to block on national security grounds foreign investments that may result in governments or other foreign entities gaining access to the personally identifiable information, including genetic information, of US citizens.

The EU's approach, in contrast, centres concerns related to the rights of individuals participating in research and healthcare activities to privacy and confidentiality. The General Data Protection Regulation (GDPR) and the Data Governance Act (DGA), among others, contain rules governing the treatment of sensitive health data, with an eye towards both facilitating the legitimate use of this data for research and protecting individual's rights to privacy. The new European Health Data Space seeks to build upon these rules and guidelines by providing a framework for the use of health data for "research, innovation, policy-making, and regulatory activities" in the public interest, balanced against the imperative to protect patients' rights.

This approach is generally consistent with the guidelines of the Declaration of Taipei, acknowledging both the potential benefits to the public and the risks to individuals stemming from use of health databases and biobanks. In contrast, the US approach is overly focused on

national security and guarding against risk of political misuse of data, often at the expense of the benefits that greater access to health data may bring. While neither the EU nor the US significantly derogates from the guidelines outlined in the Declaration of Taipei, trends in US policymaking towards limiting access to health data may imperil broad sharing of these crucial tools and are a reality that global stakeholders with an interest in broad data sharing should not ignore.

The Declaration of Taipei and the Struggle Over Professional Control of Medical Ethics

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The Declaration of Taipei is only now attracting serious attention as it is incorporated by reference into the 2024 Declaration of Helsinki. The delayed attention to requirements concerning biological material and re-identifiable data is partly explicable due to both the post-World War II decline of overt interest in eugenic-related data collection and the corresponding intensification of interest in what might be called whole body experiments following the Holocaust as disclosed during the trial of Nazi doctors and bureaucrats in 1946-47. What posterity refers to as the Nuremberg Code as rendered by the trial court was received as a challenge by the World Medical Association to physician control of medical ethics, resulting in a decade-long struggle to formulate the first draft of the Declaration. However, until its most recent version the Declaration has not directly addressed the challenges of biological material and data, perhaps reflecting the vexed history of eugenics.

Open-Ended Consent for Future Health Record Research in the United States and Europe

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Biobanks and researchers in both the United States and Europe often obtain consent for participants' future health records. Such practices can result in the unlimited disclosure of individually identifiable, sensitive health information and raise important concerns about health privacy.

7: Addressing the ongoing challenge of responsibility in science and technology after the political demise of "Responsible Research and Innovation" (RRI)

Session Chair: Erich Griessler, Institute for Advanced Studies, Austria

Session Chair: Elisabeth Frankus, Institute for Advanced Studies, Austria

Session Chair: Robert Braun, Institute for Advanced Studies, Austria

Session Chair: Johannes Starkbaum, Institute for Advanced Studies, Austria

Connecting FSTS and Human-Centred Design: A Pathway to Practical Implementation for Practitioners

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Since the 1980s, feminist researchers undertook great efforts to integrate gender considerations into Human-Computer Interaction (HCI) design processes. Despite the significant scholarly contributions made in this area, there remains a notable scarcity of publications that provide concrete, actionable guidance for practitioners. Much of the existing literature tends to focus on broad frameworks or abstract recommendations regarding research attitudes, rather than offering specific guidelines that can be readily applied in practice.

The German Institute for Standardization has developed a comprehensive set of guidelines for various design processes. Among these is the European norm, *Ergonomics of Human-System Interaction Part 210: Human-Centred Design for Interactive Systems*. This guideline offers detailed recommendations on how to effectively implement a human-centred design process, serving as a valuable resource for practitioners.

In our recent research, we undertook a comparative analysis of several guidelines that address the integration of gender dimensions into HCI design processes. Through this analysis, we identified four recurring motifs that emerged across the guidelines: 1) a normative design attitude, 2) the body, 3) social constitution and environmental design, and 4) action and interaction. Each of these motifs in turn encompasses several facets that allows for a more differentiated understanding of the implication and ways of application of a truly feminist design.

The primary aim of this publication is to translate these identified motifs into actionable strategies for practitioners. We assert that the effective application of said motifs within a design process necessitates a participatory approach, engaging diverse stakeholders in the design journey. To facilitate this, we propose a series of reflective questions tailored to each facet of the identified motifs. These questions are strategically aligned with the six steps outlined in the German Institute for Standardization's human-centred design guideline.

The reflective questions serve as prompts for critical thinking and discussion among design teams, encouraging them to consider the implications of their design choices on diverse user groups. This participatory approach not only enriches the design process but also ensures that the resulting products and systems are more inclusive and responsive to the needs of all users. This way, we succeeded to provide a first draw of a specific design guideline, that can be provided to designers to follow during a design process.

We conclude this contribution by addressing the limitations of the applicability of our proposed design steps, paving the way for future research to refine and enhance the formulation of the guidelines. Ultimately, our goal is to empower practitioners with the tools and insights necessary to create more equitable and inclusive design solutions that reflect the diverse experiences and needs of users. Through this work, we hope to advance the discourse on feminist design principles and their relevance in contemporary HCI practices, paving the way for a more inclusive future in technology design.

Responsible Innovation Ecosystems? Realist, Critical and Pragmatist Perspectives

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Most of the rapidly growing literature on innovation ecosystems adopts a realist perspective. Informed by management and strategy research, the concept is thought to capture existing business, industry, institutional, and regional forms of organization, which are assumed to promote market-oriented value creation. Recently, critical and pragmatists perspectives have illuminated the political blind spots of realist innovation ecosystem literature.

Critical scholars, many of them informed by Science & Technology Studies, approach innovation ecosystems as social constructs which are discursively deployed to reach specific ends, for example to naturalize the proliferation of economic thinking (Murray 2024), obscure the inequalities produced by a traveling ‘best-practice’ ecosystem model (Pfotenhauer and Jasanoff 2017) and advance incumbent interests in university-industry-government-public interactions (Laurent and Violle 2024).

Taking inspiration from both realist and critical perspectives, pragmatist researchers emphasize that science shapes the empirical phenomenon under study, which creates opportunities for engaged social scientists to steer the emergence and governance of innovation ecosystems. Their action-oriented research, rooted in Responsible Innovation and Technology Assessment, aims to democratize science and technology by promoting “responsible” (Stahl 2022) and “transformative” (Könnölä et al. 2021) innovation ecosystem governance. To this end, they approach innovation ecosystems as metaphors helpful for understanding and navigating a range of pragmatic challenges whilst reflexively engaging with the politics underpinning the metaphor’s use.

In this talk, we will provide an overview of existing literature on innovation ecosystems, while challenging dominant assumptions and highlighting blind spots. Moreover, we will outline

avenues for research at the intersection of realist, critical, and pragmatist perspectives. We will elaborate on one of these avenues by drawing on our research on a nascent semiconductor innovation ecosystem in the Rhenish area in Germany. The area is in the process of re-inventing its social, cultural, and economic identity as it is undergoing a structural change process while exnovating lignite mining. Against this backdrop, the emergence of a semiconductor innovation ecosystem, which promises to facilitate a regional shift from 'rustbelt' to 'brainbelt', acquires socio-political significance. To both analyze this process of emergence and contribute to its governance, we combine realist, critical, and pragmatist perspectives.

We draw on our conceptual work on "responsible innovation ecosystem governance" (Smolka and Böschen 2023) and our empirical research on "transformative innovation ecosystems" (Neudert et al. 2024) to highlight the relevance of Responsible Innovation approaches to the governance of socio-technical system transformations, such as regional structural change. In turn, we seek to advance Responsible Innovation research by drawing on (eco)systems thinking.

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Understanding the behavioural dimension of Responsible Research and Innovation to foster its implementation

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Responsible Research and Innovation (RRI) seeks to align research and innovation processes with societal values, ethical considerations and stakeholder needs. Guided by the principles of inclusion, anticipation, reflexivity and responsiveness, RRI aims to foster stakeholder engagement, anticipate unintended consequences, challenge underlying assumptions and adapt research directions accordingly (Owen et al., 2013; Stilgoe et al., 2013).

While significant efforts have been made to develop tools and methods to facilitate the practical implementation of RRI in both academia (e.g., Tassone et al., 2018) and industry (e.g., Lubberink et al., 2017), challenges persist. An ongoing discussion focus on the appropriate level (micro, meso or macro level) of a promising RRI implementation (Kuzma and Roberts, 2018; Stahl et al., 2024). However, the individual behavioural dimension of researchers remains underexplored despite its crucial role in successful RRI adoption (Shelley-Egan et al., 2018).

Consequently, this research focuses on the individual level of RRI behaviour, defined as the observable and unobservable actions of researchers striving to make research and innovation more responsible. By bridging this gap, we contribute to the ongoing discussion on RRI implementation by emphasising the need to understand and support individual behavioural change. To achieve this, we applied the COM-B model of behaviour change (comprising capability, opportunity and motivation) to investigate inclusive and anticipatory behaviours and their drivers among agri-food researchers in Germany.

Our findings reveal that researchers in agri-food science most frequently engage in stakeholder inclusion, followed by anticipating environmental impacts, with anticipating social impacts occurring less frequently. A cluster analysis identifies two distinct behavioural patterns, primarily differentiated by the extent of anticipatory behaviours. Factors influencing these patterns include motivational drivers, such as perceiving RRI as part of the professional role, being enthusiastic to integrate RRI in own research practices and social influences such as organisational culture and discipline-specific norms. These results underscore the importance of individual-level capabilities, opportunities and motivations in foster RRI behaviour.

In conclusion, this research highlights the critical role of individual behaviour of researchers in advancing RRI implementation across all levels. By introducing a behavioural lens to RRI, we contribute a novel perspective that intersects with key themes in Science and Technology Studies (STS). Ultimately, we contribute to the broader STS goal of understanding and shaping the dynamic relationship between science, technology and society.

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Repositioning Responsible Research and Innovation in a Changing Global Landscape

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This contribution addresses challenges of Responsible Research and Innovation (RRI) we identify as crucial in the face of complex and interlinked global crises—including climate change, biodiversity loss, economic instability, and democratic backsliding—while acknowledging the diminished political traction of the concept of RRI in recent years.

Specifically, we will: (i) Present diverse perspectives on the redefinition of RRI in response to geopolitical shifts and the politicization of science, examining how economic incentives and mission-oriented research agendas influence its evolution. (ii) Explore governance and institutionalization challenges in RRI, bringing together insights on the inadequacies of current governance frameworks in addressing emerging technologies, such as artificial intelligence (AI), and the necessity of confidence-building measures at a global level. (iii) Discuss public engagement and inclusivity in RRI, synthesizing perspectives on barriers to participation for marginalized groups—such as rural populations, the elderly, and communities in the Global South—and the importance of systemic and life-cycle approaches in impact assessments.

One major theme is the redefinition of RRI in response to geopolitical shifts and the increasing politicization of science. This touches upon the question how RRI can be strategically repositioned by aligning it with economic incentives, particularly within mission-oriented

research agendas. The role of the private sector in fostering responsible innovation will be examined, emphasizing the diversity of actors—ranging from small firms to multinational corporations—and their varying motivations for engaging with RRI.

Another central issue we see is the governance and institutionalization of RRI. We reflect on the inadequacies of current governance frameworks in addressing emerging technologies, such as AI, and explore the risks associated with AI governance gaps.

Public engagement and inclusivity also emerge as a critical discussion point. While public engagement is a foundational element of RRI, challenges persist, particularly in ensuring equitable participation. Barriers remain for marginalized groups, including rural populations, elderly individuals, and communities in the Global South. The discussion underscores the need to expand traditional impact assessments by incorporating systemic and life-cycle approaches and incentivizing open science practices within academia.

This paper aims to contribute to the current debate about the challenges and opportunities for RRI in today’s global landscape.

Next to current literature this contribution builds on insights from the REINFORCING Open and Responsible Research and Innovation (ORRI) Forum, held in Vienna on October 7–8, 2024. This event convened 86 experts from 28 countries, representing academia, industry, civil society, and international organizations.

Reflective learning is where responsible innovation begins

Michael Ornetzeder

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Back in 2016, Arie Rip argued that the future of RRI in Horizon 2020 and its successor is not assured, although there are certainly opportunities and the overall context may be favourable. Today we know he was right. However, what social scientists and humanities scholars should always try to do, Rip argued, is to make innovation processes reflexive, or at least to create reflexive moments. A few years ago, when we set out to develop an RRI framework with practitioners in a transnational research project on Positive Energy Districts (PEDs), we encountered a great deal of reluctance. Apart from the social scientists in the project team, no one else was interested. The list of arguments against RRI was long. So we decided to try a different strategy. We asked practitioners if they wanted to learn from their own and others' experiences. Nobody had anything to say against it, everyone wanted to understand and learn more. We remembered Rip's criticism and developed a method to initiate second-order learning processes jointly with the practitioners. We called the approach Moments of Reflection. In the presentation we will look at the specific context of PEDs, present the methodology and discuss our experiences with it in practice. We will also discuss whether such a low-threshold form of reflection might be suitable for other innovation contexts.

GAIA Women*s Garden: taking an intersectional approach in transformative research on biodiversity relevant decision-making

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As part of the transdisciplinary case study “Biodiverse Edible City” within the Horizon Europe project PLANET4B, a community garden was established by and for women*[1] on the edge of the Eggenlend neighbourhood in Graz, Austria. The overall aim of PLANET4B is to understand better decisions that can affect biodiversity, explored in different contexts with 11 case studies, all using the concept of intersectionality[2] to address social injustices in these decision-making processes. The Graz-based case study is contextualised at the intersection of food justice and inequalities in access to urban green spaces and their use as community gardens.

International studies consistently show that poverty is the primary cause of food insecurity. (Van Breemen 2014[3]; Swinnen 2015[4]). During times of economic hardship, households experiencing or at risk of poverty often adjust their food budgets to cover other essential costs. This typically reduces the variety and nutritional quality of their diets to save money (Van Breemen 2014). These poverty-driven dietary choices not only affect the health of individuals but also have broader implications for climate and biodiversity. In Austria, women aged over 18 represent one of the largest groups of materially and socially disadvantaged individuals (Statistics Austria 2023[5]). Additionally, people with a migrant background are more likely to face poverty or social exclusion compared to those born in Austria (OECD/European Commission 2023[6]). Against this background, and building on the concept of intersectionality, we decided to work in the Graz-based case study with a group of women*, who are potentially exposed to multiple discrimination: women* with a history of migration, single mothers* and retired women* living alone, as these are among the people most at risk of poverty and exclusion (Statistik Austria 2023).

These findings on the social dimensions of poverty, the link to food insecurity, and the role of community gardens in urban areas formed the basis for our case study: a green space in the city of Graz, which was initially dedicated to the construction of a cable car base station, was transformed by 15 women* into a biodiverse edible garden.

The garden should provide women* with a space free from systemic oppression, where patriarchal values of competition, performance, and selflessness no longer dominate. Over time, the garden became a space for co-creation and empowerment – a „brave space“ (Arao & Clemens 2013[7]). The engaged women took a central role in the process of co-creating their own space, and they gained knowledge, skills and confidence to further continue the garden self-organised beyond the project run.

Our contribution will present the results from the currently ongoing ‘Systematisation of Experience’ (Eizaguirre et al., 2008[8]; Herout & Schmid, 2015[9]), which represents a critical reflection of this transformative research intervention.

[1] We understand the word women* as being inclusive for all people (sometimes) identifying as women. We don’t want to hold on to the binary system but as for many garden participants

the queer approach of a non-binary gender system is quite new and not applicable to them, so we decided to use this term.

8: Socio-technical Insights into the Development and Impact of Smart Cities

Session Chair: Jürgen Suschek-Berger, IFZ, Austria

Digital city and disaster twins – towards a critical understanding of cybernetic governance

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Digital City Twins, also referred to as Urban Digital Twins or Smart City Digital Twins, are a new, rapidly spreading phenomenon in digital urbanism. Since the late 2010s, the digital twin (DT) concept has been promoted in the context of smart cities and urban management. Today, there is a discourse explosion about digital city twins in the literature and a growing number of DT projects of cities, regions, or urban infrastructures around the world. A particular variant are disaster DTs to prepare cities or regions for emergencies such as pandemics, floods, storms, or terrorist attacks.

There is no agreed definition of a DT and what distinguishes it from 3D models, simulations, digital dashboards and other digital management technologies. Based on the literature on city and disaster DTs, complemented by an analysis of selected white papers, the paper discusses the challenges of the digital city twin phenomenon for critical STS analysis. It starts from the conceptual distinction between digital models, shadows and twins (Fuller et al. 2020) according to which the latter differs from the former by an automated two-way real-time data flow between a physical and a digital object. Today, very few, if any, urban DT projects fulfil this criterion. Nevertheless, the idea deserves closer examination. Critical analyses in STS and related fields have provided key insights and perspectives for understanding and analysing digital models, shadows and twins alike. Key points are the critique of techno-solutionism, reductionism, and epistemological realism, and the emphasis on the selectivity and performativity of these digital objects (Kitchin et al. 2014; Korenhof et al. 2021). These points need be considered with regard to DTs as well, but they do not quite capture the question of what, if anything, is new and distinct about them. I suggest to understand city and disaster DTs as manifestations of a cybernetic twinning dispositif, that connects technologies of knowing and technologies of governing, managing and steering, and possibly also technologies of citizenship. It enacts a cybernetic mode of governing and knowing that to some extent escapes the critique of epistemological realism and requires a different type of critique. Cybernetic governance is not

so much characterised by hierarchically imposed, centralised control and preselected values and priorities as by ideas of systemic self-regulation, -organization, -adaptation, and -improvement. Nor does it necessarily reduce quality to quantity, ignore human needs, views and emotions, or claim to provide a neutral representation of reality. The adequate metaphor is the organism, rather than the mirror (Tomko/Winter 2019).

Critical questions, then, are not only who exercises control, whose interests are served, and whether the twin offers opportunities for user participation – although these questions remain important – but also what actually is "the system" that is meant to regulate, adapt and improve itself? At what costs? What is the meaning of self-regulation, -improvement and -adaptation here? When and why is it considered successful? What, if any, is the role of political deliberation, contestation and conflict within automated systemic self-organization?

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Negotiating Social and Environmental Sustainability in Vienna's Housing Sector: Perspectives from Collaborative and Social Housing

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This study investigates how the housing sector in Vienna navigates the intersection of social justice and environmental sustainability, particularly in the context of the global urban housing crisis and the imperative to remain within "planetary boundaries." Through the lens of collaborative housing and new social housing projects, my post-doctoral research explores the everyday negotiations and decision-making processes that address the potential conflict between social and ecological objectives. The research focuses on two key questions: (1) How do various actors, including experts, institutions, and residents, conceptualize and operationalize social and environmental sustainability in Vienna's housing practices? (2) What role do collaborative and social housing models play in shaping innovative, equitable, and ecologically sustainable housing futures? Preliminary findings reveal that these negotiations involve contested imaginaries of minimum social thresholds and ecological limits, influenced by diverse stakeholder perspectives and infrastructural constraints. Employing approaches from urban assemblage theory and science and technology studies (STS), the study highlights

the co-production of sustainability discourses and practices at multiple scales, from policy design to everyday living arrangements. This research aims to advance STS discussions by providing empirical insights into how urban housing systems mediate between competing priorities and by offering conceptual tools for understanding the socio-material dynamics of sustainability transitions in housing. Ultimately, the project seeks to inform both theoretical debates and practical strategies for creating just and sustainable urban futures.

Rethinking Ethics and Inclusion of Urban Innovation Pilots in the 'Pilot Society'

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The growing reliance on piloting as an instrument of innovation governance has led to the emergence of what Ryghaug and Skjølsvold (2021) term the "pilot society"—a paradigm where testing, iterating, and scaling technological solutions increasingly shape social and urban life. While piloting is often framed as a neutral or even progressive means of fostering inclusive innovation, this paper problematizes the structural constraints and ethical tensions embedded in the piloting paradigm, particularly when innovation pilots are expected to engage with marginalized or vulnerable communities of our cities.

Our inquiry is grounded in the CommuniCity project, a Horizon Europe funded initiative that sought to facilitate 100 tech-driven pilots across European cities. Initially tasked with developing an Ethics and Intersectional Inclusivity Framework to guide the piloting process, we soon realized that ethical challenges were not limited to the individual pilots themselves but were deeply entangled with the conditions of challenge formation — the phase where urban needs are identified and framed for pilot-based intervention. By zooming into this stage, we observed how existing policy imperatives, funding structures, and institutional logic shaped what kinds of challenges were seen as legitimate and solvable through piloting. In turn, this raised broader concerns about the role of piloting in reinforcing tech-driven innovation and the risk of further marginalizing groups whose needs do not align with the parameters of innovation discourse.

Theoretically, the paper draws on responsible research and innovation (RRI), critical pedagogy, and feminist participatory approaches to analyze the tensions between reflexivity, inclusion, and the structural constraints of pilot-led innovation. Empirically, we present findings from three European cities, where challenge formation unfolded in distinct ways—ranging from participatory co-definition of challenges to more top-down, administrative problem-framing approaches. We highlight how different institutional arrangements and the project design influenced the ability of pilot initiatives to engage meaningfully with marginalized communities, challenge dominant technological imaginaries, and foster more inclusive urban innovation. From the 100 pilots we can discern both 1) wonderful examples where considerate problem co-solvers from tech designers to members of a marginalised group themselves get to truly understand what is at stake in the pilot for all involved and

2) ethically worrisome situations from individual pilots but also from certain meetings within the Horizon project consortium, making us doubtful about the future of the approach.

The setting where innovation pilots are carried out involving marginalized or vulnerable communities require a lot of time for learning-by-doing and reflection, and cannot rely only on good intentions, however sincere they were.

Our analysis contributes to critical debates on the politics of piloting by emphasizing the importance of framing, participation, and power relations in ethical innovation. While piloting is increasingly positioned as a flexible and responsive mechanism for addressing societal challenges – in the pilot society – we call for a more deliberate and accountable approach to piloting: one that does not merely tweak processes for inclusivity but fundamentally questions the conditions under which piloting operates.

9: Sustainability and AI: Addressing a complex relationship

Session Chair: Daniel Houben, Landshut University of Applied Sciences, Germany

Session Chair: Bianca Prietl, University of Basel, Switzerland

Digital Sustainability in Social Work - A STS Perspective

Daniel Houben

Landshut University of Applied Sciences, Germany

This theoretical exploration investigates the intricate co-production of digitalization and sustainability within social work contexts. Drawing on Crawford's (2021) and Taffel's (2023) critical analyses of AI and sustainability, I examine how digital technologies simultaneously enable and complicate sustainable social work practices. Through the theoretical lenses of Jasanoff's co-production framework and Puig de la Bellacasa's (2011) care ethics, I interrogate the complex interplay between technological transformation and sustainability practices in social services, particularly focusing on the implications for professional-client relationships and social justice.

The theoretical framework unfolds across three interconnected dimensions: First, I analyze the co-production of knowledge and practice in social work settings, examining how algorithmic knowledge systems reconfigure understandings of sustainability in client interventions and community work. Drawing on Suchman's situated action theory, I explore how digital practices emerge within specific social work contexts, fundamentally transforming traditional helping

relationships. Second, extending Floridi & Mazzi's (2023) analysis, I critically examine power relations and care dynamics, investigating who or what becomes "cared for" in digital sustainability initiatives and how marginalization processes manifest in digitalized social work. This encompasses a nuanced analysis of how digital tools reshape access to social services and transform professional-client relationships. Third, through Cielemęcka & Daigle's (2019) more-than-human framework, I consider digital infrastructures as active agents in sustainability practices, exploring their ecological impacts within social service organizations. The presentation engages directly with the conference themes through a social work lens, asking: How do social work practices co-produce sustainability through digital technologies? What power dynamics emerge in the digital transformation of social services? How do care ethics and more-than-human perspectives illuminate digital sustainability in social work? Which actors and perspectives become marginalized in digital sustainability initiatives? This theoretical investigation advances our understanding of digitalization's paradoxical effects on sustainable social work practices, particularly examining how digital tools reconfigure core principles of social justice and human dignity. Following Sætra (2023), I analyze how technologies simultaneously promote environmental and social goals while generating new forms of inequality in service delivery. My conceptual analysis maps the theoretical intersections between digitalization and sustainability within social work contexts, illuminating how STS concepts reveal the transformation of helping relationships through digital mediation. The contribution enriches theoretical discourse on AI's role in sustainability transitions and critical analyses of social service digitalization. Social work's unique positioning at the nexus of individual support and systemic change provides a crucial lens for examining sustainability-digitalization tensions. Building on Ozaki, Shaw & Dodgson (2013), I examine co-production processes in sustainability initiatives, focusing on power relations and care practices in social work settings, including the implications of digital case management systems and AI-supported decision-making tools.

This presentation advances the development of nuanced theoretical frameworks for understanding the complex relationship between digitalization, sustainability, and social work practice. By examining how digital transformations affect core social work values while considering ecological impacts, I contribute to a deeper understanding of sustainable practices in digitally mediated helping contexts, emphasizing the critical intersection of technological innovation and social justice.

Enacting sustainability with AI. A queer-ecofeminist and new materialist engagement

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This paper proposes a *queer-ecofeminist and new materialist reflection* of the ways that sustainability is enacted with AI(-technologies). It aims to contribute to a "careful engagement" (Maria Puig de la Bellacasa 2011) with current sociotechnical developments that is informed by queer-feminist perspectives on the entanglements of technoscience, materiality and power in more-than-human worlds.

Starting point of this engagement are the ambivalent voices that either call upon AI-technologies as a means to achieve more sustainable futures or problematize AI-technologies for impeding developments towards more sustainability and/or being unsustainable themselves. To enrich our understanding of *how* sustainability and AI(-technologies) are (not) "coproduced" (Ozaki, Shaw & Dodgson 2013), the paper proceeds in three steps: (1) The concept of "sustainability" is itself critically revisited through the lens of queer-ecofeminist and new materialist perspectives (e.g. Cielemęcka & Daigle). These perspectives challenge the belief in (technoscientific) progress, growth, technological optimism and human exceptionalism, fundamental to mainstream notions of sustainability, and instead call for considering the material and power relations that form the basis for the (alleged) enactment of sustainability with AI and its (un-)intended effects for human and non-human, animated and non-animated beings. (2) The paper attends precisely to the material and power relations embedded in current efforts to develop, circulate and employ AI-technologies (see e.g. Crawford 2021) in order to "generate care" for them (Puig de la Bellacasa 2011) and allow for a critical assessment of the limits of enacting sustainability with AI(-technologies). (3) Based on exemplary case studies, the paper reconstructs how sustainability is enacted material-semiotically with AI in politics, industry and science, asking

what is understood as un/sustainable, how is sustainability to be brought about and what role does AI play in these efforts;

whom and what is cared for in the name of sustainability, and who and what is neglected or marginalized in this quest for sustainability?

To conclude, the paper will "speculatively" (Puig de la Bellacasa 2011) delineate avenues for 'sustainable' futures with/out AI that hold 'better worlds' (Haraway 1988) which are more livable for all beings on the planet.

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Uncovering the Directionality of Innovation in Artificial Intelligence (AI) in Energy Transition: A Global Perspective using patent analysis

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Background

The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment report titled ‘Climate Change 2022: Impacts, Adaptation, and Vulnerability’ warned the global community that there is a small window of opportunity for climate action to keep within a safe operating space for humanity by limiting the increase of global temperature to 1.5 degree Celsius above pre-industrial levels (IPCC, 2023). Decarbonisation of energy systems in application domains such as power, transportation, buildings, and other energy-intensive sectors across the world is critical for meeting this objective (Rogge et al., 2017).

Artificial Intelligence (AI) is increasingly considered a potentially disruptive technology that promises solutions to accelerate the pace of energy transition and enable transformative outcomes. According to the experts from the World Economic Forum, AI may enable rapid decarbonisation, for instance, through rapid improvements in micro-grids or by balancing the demand and supply of fluctuating energy sources (World Economic Forum, 2021).

However, there is a lack of empirical evidence regarding the interaction between AI innovation and the energy transition, which is sometimes referred to as the Twin Transition. The Twin Transition framing is becoming increasingly important for understanding the relationship between green and digital transitions and the role of digital technologies in reducing carbon emissions and combating climate change (Diodato et al., 2023). Moreover, it is crucial to understand the evolution of knowledge generation of AI across major energy intensive sectors including power, transportation, buildings and industry. Additionally, mapping the actors who are taking a leading role in AI innovation for energy transitions and the geographical distribution of this innovation is essential, because this will provide critical insight into the social and spatial dynamics of AI innovation.

Therefore, the key research question that will be explored in this paper is how and where have patented technological innovations related to AI and energy transition co-evolved, which actors are involved, and what does this tell us about the directionality of the Twin Transition.

Technological development and patent analysis

Scholars argue that technological development is shaped by societal factors, such as economic factors (Wiebe E. Bijker et al., 2012). Economic goals and restrictions related to innovation shape the direction in which technology develops. However, others argue that technology development is 'selective in technology space,' which means that of all the possible directions that technology could have taken, only a few tend to be realised (Verspagen, 2005).

Measuring technological innovation is challenging, and patent statistics are widely used as a proxy to analyse and measure innovations (Nagaoka et al., 2010). The seminal work by Jaffe, A.B. et al (1993) laid the foundation for using patent citations as a proxy for technological knowledge flows and innovation interrelatedness which was helpful in mapping technological trajectories.

Methodology

Hummon and Dereian were the first to propose Main Path Analysis (MPA) as a method to understand the directionality of technological change in the discovery of DNA by looking at the network between citations of scientific publications (Hummon & Dereian, 1989). Since then the method has evolved and several scholars have applied it to analyse the patent citation and their networks to analyse technological trajectories of several innovations like fuel cells, blockchain (Bhatt et al., 2023; Han et al., 2024; Verspagen, 2005). To undertake the analysis, patent data from the European Patent Office database (PATSTAT) filed between 2000 and 2023 will be used.

Preliminary results

The preliminary results from the ongoing analysis of patent data indicates that the impact of AI on energy transition technologies has increased exponentially in the past two decades. Moreover, the most substantial advancement driven by innovation in AI has been observed in the power and transportation sectors.

Developing Environmental Awareness and Sustainability Transitions Using Artificial Intelligence

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Despite the Paris Agreement and a global consensus on net zero, carbon emissions continue to rise (Liu, Deng, Davis and Ciais, 2024). The global failure to implement the agreement and avert the climate crisis is due, at least in part, to the legacy framing of the human-nature relationship as a binary, in which the importance of nature is ignored, and natural resources are destructively extracted rather than used sustainably (Swilling, 2019). Net zero will require a universal reframing of this relationship from its present binary to more kincentric approach (Walwyn, 2023), initiated by a greater awareness of the environment and how the latter is impacted by human activity. In this paper, we describe the use of the precaution adoption

process model (Weinstein, Sandman and Blalock, 2008) and a coaching chatbot (Vici) to develop such an awareness and propose alternatives to the dominant perspectives on the human-nature relationship (Terblanche, Molyn, De Haan and Nilsson, 2022). The project is the first step towards a broader goal of using Vici to guide a process of transformative learning and the adoption of more sustainable practices. We argue that artificial intelligence coaching can make an important contribution to breaking the present impasse in human behavioural change and enable sustainability transitions.

Climate Knowledge Twin Timescape: Making Futures by Controversies and Consensus

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As Hurricane Milton bore down on the cities of southern Florida in October 2024, a surge of urgent weather alerts began to flash across the screens of BBC Weather app users throughout Great Britain. Graphics showed estimated wind speeds of 13,508mph in London and 5,293mph in Rome, and temperatures of 404°C in Nottingham, 384°C in New York and 378°C in in Sydney (1). Shortly after, the BBC reassured the users with apologies: there was a fault with its weather app and website, due to a problem with a third party supplier that led to incorrect forecasts of hurricane force winds and extreme temperatures in the UK and across the globe. After all, the reputational damage of the uchronic apocalypse was ultimately much less severe for the BBC than the path of destruction left by Hurricane Milton (2). The scale of error and the gulf between the lived experience of people and data in the BBC data glitch was big enough to provoke several clarification requests as soon as it happened, and that also allowed a quick response to correct it.

For the purpose of this paper, the vignette above serves as a vivid example of the knowledge frictions produced when downscaling global climate science into market solutions for users. Dealing with large amounts of data from different sources and third parties can produce errors that may not be immediately visible and yet could reinforce path dependency and be exposed to various kinds of blindness (Stehle and Kitchin 2019). As these insights inform decision making, blindness of this kind could have serious consequences in how we address climate challenges.

The paper examines globalized and localized approaches to climate knowledge supported by digitalization to critically address the “goal-oriented backcasting” methodology proposed by the “Twin Transition” (Muench et al. 2022). In particular, I will confront the climate knowledge built through the “vast machine” of data, models and simulations allowing to project life on the planet in the next decades and centuries (Edwards 2010) with the Climate Intelligence (CLINT) solutions offered by digital companies to govern the transition towards climate neutrality in cities and regions (Colona 2023).

What happens when climate knowledge is produced from sources that are not designed to generate climate knowledge? What happens when these tools are managed by corporate platforms and sold to accelerate decision making to achieve climate neutrality? What is the

relationship between global climate knowledge and such tailored urban services? What are the temporal implications of their adoption?

To understand the relationship between climate science and CLINT, the paper adopts a partially speculative, partially empirical approach due to the difficulty in directly studying CLINT solutions in real-world settings. The inquiry includes consulting three advanced AI language models on differences and similarities between the vast machine and CLINT.

Based on my results, I argue that there is a shift in climate knowledge from a “consensus within controversy” peculiar to the vast machine, to a knowledge produced through a “controversy within consensus” peculiar to CLINT. Controversy within consensus is at the core of what I call the “twin timescape”, where different futures and versions of statecraft and knowledge could be produced and coexist by correlation.

(1) https://www.bbc.co.uk/news/articles/c0kjrp2rngzo

(2) https://www.nytimes.com/2024/10/10/weather/hurricane-milton-damage-florida.html

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The Sustainability Myth of AI: Progress and Unintended Outcomes

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Artificial Intelligence (AI) is frequently championed as a transformative force for advancing sustainability. Through innovations in resource optimization, disaster management, and climate action, AI has demonstrated significant potential for addressing environmental challenges. It is often surrounded by an aura of sustainability, celebrated for improving energy efficiency and enhancing our capacity to tackle climate-related issues. However, the environmental, social, and ethical implications of AI's deployment often remain critically underexplored. One of the most pressing concerns lies in the energy-intensive processes required to train and deploy advanced AI models. Like Lacoste et al. (2019) present in their paper, a single training run of an AI system can emit very different amounts of GHG depending upon in which region of the world it is performed. This disparity underscores the unequal carbon footprints of AI-driven sustainability initiatives, particularly in the context of the global North-South divide. Countries in the Global North often benefit from cleaner energy supplies,

while nations in the Global South face disproportionately higher environmental costs. Moreover, technological developments in AI usage for increased efficiency, e.g. in the energy sector, have contributed to the idea that AI used for sustainability is not automatically sustainable. As Van Wynsberghe (2021) argues, this is not the case.

Furthermore, the priorities of AI research and development often lean toward enhancing performance accuracy rather than improving energy efficiency (Cowls et al., 2021). This imbalance contributes to the escalating environmental footprint of AI technologies. Such trends risk creating a modern-day Jevons Paradox: as systems become more efficient, their overall resource consumption paradoxically increases due to expanded usage. Microsoft CEO Satya Nadella (2025) has currently acknowledged this contradiction, emphasizing the need to reconsider how AI innovation aligns with environmental goals.

Beyond its environmental impacts, the unchecked deployment of AI raises critical concerns about equity. This paper argues that without systemic interventions, AI could reinforce the very inequities it seeks to mitigate.

To fully realize AI's potential as a sustainable tool, it is essential to adopt a systemic and interdisciplinary approach. This includes prioritizing research into energy-efficient AI models, establishing regulatory frameworks to mitigate environmental and social costs, and ensuring equitable access to AI technologies globally. Transparency, fairness, and accountability must underpin the design and deployment of AI to align it with broader sustainability objectives.

This paper uses literature study to explore the research on unintended consequences of the usage of AI. In consequence it calls for a critical and balanced perspective on the role of AI in sustainability. By addressing its unintended consequences, AI can evolve into a responsible tool for fostering ecological resilience and equitable development, contributing meaningfully to the challenges of the Anthropocene era.

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11: Let’s get digital! Using computational methods for STS research

Session Chair: Roman Prunč, Graz University of Technology, Austria

Towards Workflow Support for STS Research on Digital Data

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Research in Science and Technology Studies (STS) can benefit from the availability of digital data, such as that gathered from various media channels. Media can serve both as a source for research questions and as a space for investigating them. The heterogeneity in the characteristics and modalities of data gathered from media, along with the potentially vast amount of available data, calls for the adoption of dedicated computational approaches to assist research activities. STS research can, for instance, benefit significantly from advances in Information Retrieval (IR) and Natural Language Processing (NLP), while also presenting novel challenges for these fields. As for IR, STS research activities may include searching for relevant documents in which qualitative and/or quantitative analyses are conducted. However, search is only one of the necessary tactics to achieve the final objective. Research activities are complex and typically require structured workflows consisting of multiple steps that combine qualitative and quantitative approaches. This is, for example, the case in Digital Humanities or Digital Social Science Research, where interdisciplinary workflows can be particularly beneficial. As pointed out by recent works in IR --- "Advancing the Search Frontier with AI Agents" by White, R. W., Communications of the ACM, 67(9) --- supporting research tasks remains an open challenge. In the context of STS research, it would be highly valuable to support complex interdisciplinary workflows that can be fully or partially automated. Given the nature of these tasks, human involvement remains crucial, necessitating the support of diverse types of interactions. In this talk, we will focus on some of these challenges and explore how useful workflows can be fully or partially automated within a software platform explicitly designed for STS researchers. Particular attention will be paid to methods aimed at addressing research questions where the temporal dimension is crucial. We will examine various approaches for word and theme representations specifically designed for longitudinal corpora and discuss their potential applications in STS research, particularly in the context of workflows for addressing complex tasks.

Epistemological and methodological implications of "following the object" as a research strategy: analysing radicalization processes as an effect of coercive vaccination policies

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That objects play a fundamental role within the social relationships is today highly recognized within the Science and Technology Studies (STS) field, mainly thanks to the Actor-Network Theory (ANT).

Considering the relevance of the objects, the dictum “follow the actor” - another distinctive proposal coming from ANT – can be also interpreted as “follow the object”, i.e. a methodological invitation that has been mostly used within ethnographical studies in the STS field.

However, what does it mean to apply the FTO strategy and what advantages does it offer are issues that remain still debated. Moreover, the increase of digitalization processes added new aspects to be taken into account; for example, what does it changes if, instead of applying the FTO strategy within the framework of ethnographic research, it is utilized using large digital datasets?

After briefly introducing the theoretical frame of the FTO strategy and discussing its main methodological implications, we propose to test it addressing a specific research question, namely whether the introduction of coercive vaccination policies in Italy produces radicalization effects in the population. The object chosen to be followed within Facebook public pages and groups (P/G) is the docu-film “Vaxxed*:* From Cover-Up to Catastrophe”, directed by Andrew Wakefield, a former doctor and anti-vaccine activist, first released in 2016. Then the sequel “Vaxxed II: The People's Truth”, produced by Robert F. Kennedy Jr., the controversial American politician from the Kennedy family who has become known for his anti-vaccine and conspiracy theorist positions, has been also followed as it prolonged the presence of the same object in the networks of pro-vaccine choice communities.

They became soon an integral part of the vaccine hesitancy debate for over a decade, representing one of its foundational theses, namely the alleged correlation between vaccines and autism, despite this claim having been repeatedly discredited by scientific institutions. The period considered ranges hence from 2015 until 2022, and it has been therefore including the Covid-19 pandemic and the related public debate on mandatory vaccination. The timespan has been divided into three periods: before the release of Vaxxed (from 01-01-2015 to 31-03-2016), between Vaxxed and Vaxxed II (from 01-04-2016 to 05-09-2019, hence including the public debate about “Lorenzin’s decree”), and after the release of Vaxxed II (from 06-09-2019 to 31-01-2022, therefore including the Covid-19 pandemic and the related public debate on mandatory vaccination). This subdivision allowed to analyze the possible shifts of P/Gs from one community to another and therefore any radicalization processes attributable to the introduction of coercive vaccination policies.

Potential radicalization effects will be observed as shifts of the compositions of online communities interested in vaccination topics from more neutral positions towards more

extreme opposition to health institutions and their vaccination policies, including those inspired by conspiracy theories.

To highlight the potential advantages offered by the FTO strategy, we will also compare it with a more conventional approach centered on human actors, such as those identified on Italian social media by the hashtag #novax.

Our research demonstrates that, on one hand, coercive vaccination policies tend to generate processes of radicalization; on the other hand, that such effects are more effectively analyzable when adopting the FTO strategy rather than a more conventional approach focused on human actors.

12: Societal impact of digital credentials in education and vocational training

Session Chair: Alexander Nussbaumer, Graz University of Technology, Austria

Session Chair: Carlos Alario Hoyos, Universidad Carlos III de Madrid, Spain

Session Chair: Miguel Morales Chan, Galileo University, Guatemala

Session Chair: Christian Guetl, Graz University of Technology, Austria

Session Chair: Rocael Hernandez, Galileo University, Guatemala

Session Abstract

In this session the societal impact of digital credentials on people undergoing education or vocational training are presented and discussed. Digital credentials are representations of achievements, skills and competences that are typically stored and transmitted in digital formats. They are equivalent to paper documents, tangible tokens, or other haptic objects issued by a trusted party. Digital credentials refer to a wide range of qualification sizes and types, such as small courses on a specific topic or a larger learning programme. They can be used in formal, non-formal, or informal settings, such as for certifying university programs or vocational training courses.

Digital credentials constitute an emerging technology with new possibilities and advantages for the involved parties in several use cases. In the vocational sector, recipients of digital credentials can use them to demonstrate further training activities and qualifications in the job or while seeing a new job. In the long run this also serves the lifelong learning initiatives, as qualification activities can be better documented.

Beside these obvious benefits, digital credentials might have a deeper impact on people and society, which needs closer attention especially in terms of its relation to the job market. In a

situation where acquiring formal education is difficult for several reasons (e.g. high educational costs or social inequalities), digital credentials may help acquire qualifications by collecting certificates step-by-step. On the other hand, there is also a danger of shifting responsibility of further education from companies to employees.

A focus of this session is on the discussion of initiatives to establish digital credentials in Guatemala including potential societal impacts. This will be done in the context of the Erasmus+ research project EcoCredGT (www.ecocredgt.org) that brings together partners from Guatemala, Spain, and Austria, in order to pilot an infrastructure of digital credentials in Guatemala. The project aims to build capacities in Vocational Education and Training Institutions towards a digital credentials ecosystem that can have a positive impact on promoting employability.

The Session is structured in three parts. First, an overview of the piloting plan is given by representatives of the research project from all participating countries: Carlos Delgado Kloos (Charles III University of Madrid), Héctor Amado-Salvatierra (Universidad Galileo, Guatemala), Eduardo Véliz (Kinal Fondation, Guatemala), and Chiara Rußß-Baumann (TU Graz). These presentations include information about the current situation in Guatemala, how digital credentials are planned to be introduced, and potential societal benefits and issues. Second, in a panel the presented pilot plan is discussed regarding its societal impact and potential risks, as well as societal differences between emerging and developed countries. The panel is moderated by Carlos Delagado Kloos and includes Carlos Alario-Hoyos (Charles III University of Madrid) and Héctor Amado-Salvatierra. Furthermore, two STS experts join the panel, which are Christian Dayé (TU Graz) and one further person. Finally, there will be a general discussion with the conference audience on both the technical implementation and societal aspects.

13: The Future of Digital Humanism: Towards a critical post-post-Humanism?

Session Chair: Erich Prem, Association of Digital Humanism, Austria

Session Chair: Katja Mayer, University of Vienna, Austria

Against digital post-post humanism: from homo mensura to the good digital life

Erich Prem

Association of Digital Humanism, Austria

Criticising humanism and the Enlightenment gained popularity among scholars over the last few decades. This includes that humanism perpetuated an exclusionary hierarchy overly focused on mankind, that it was a Eurocentric program purporting opinions of white males, and that it became an instrument of domination delegitimizing other views. Even for those critical of this critique, it is historically important and a relevant motivation for humanists to move towards a more relational, pluralistic view of existence and ethics. However, simply applying the same type of critique to the digital humanism movement that we are experiencing today falls short of several considerations that I would like to highlight in support of the claim that a digital post-post-humanism is not required.

Firstly, on humanism: It is correct that just like humanists, digital humanists emphasize human dignity and autonomy as indispensable in fostering ethical frameworks and human rights. They are, however, less focused on rationality as this is not part of the central claims in the debate. Often based on a humane perspective, digital humanists are likely to embrace a broader, more emotional and embodied perspective of humans.

Although digital humanism focuses on humans, it is not exclusionary. It roots in *homo mensura* when it takes humans as the measure of IT design, but there is no intrinsic claim about the human superiority. Rather, it concerns the inferiority of many IT systems.

Furthermore, look beyond the name! Digital Humanism cannot be reduced to just another humanism as most of digital humanism concerns the societal level rather than the level of the individual. Digital humanism has argued that many detrimental effects of information technology arise from its focus on the individual. Digital humanism has made the point that the strong focus on man-machine (sic!) relations eliminates societal and, hence, democratic perspectives. Getting society back into the picture, furthering democracy and social innovation is a key objective of digital humanists.

Current anti-humanist critique is too abstract: It should start from the actual situation of digital society today, not from a theoretical construct of humanism that has been called a caricature of humanism. It must first acknowledge the anti-humanism of today's information technology and the practical impact on both individuals and society.

Change requires agents of change: we can invite, trigger, listen, and engage in a diverse and international debate, but we should not perform cultural appropriation in the sense that Anglo-European digital humanists prescribe an interpretation of a critical digital post-humanism globally. We therefore need those non-Anglo-Europeans to stand up and participate. Better support for them is needed, but we shall not speak on their behalf. Such debates may also lead to disagreement and differences for which we need to be prepared.

In philosophical debates, we have a responsibility to carefully weigh the arguments. This means that even where a critique of humanism is justified it does not necessarily mean to throw out the baby with the bathwater. Digital humanism provides a common foundation for addressing injustice, and a concept enabling global solidarity and cooperation. This is a practical political argument much more than a philosophical aspiration. Today's 'critical post-humanism' strives for a global perspective, emphasizes diversity, and environmental sustainability (Prem 2024) or even a regenerative view that links regeneration with human dignity and AI (Thun-Hohenstein 2024). It aims to achieve human flourishing and a digital good life in an inclusive debate and a discussion that points beyond just the human. It is the only realistic alternative to the digital anti-humanism of today.

Re-Situating Digital Humanism: Feminist Epistemology, Critical Posthumanism, and STS Scholarship

Katja Mayer[1,2]

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Digital humanism aspires to address the societal and ethical challenges of the digital age by centering human values, democracy, and justice (Nida Rümelin & Weidenfeld 2022). Yet, it remains puzzling that this discourse pays little attention to feminist epistemology and critical Science and Technology Studies (STS) scholarship—fields that offer profound insights into the interplay of power, knowledge, and technology (Draude 2023). Feminist epistemology, as articulated by Donna Haraway (1988) and Sandra Harding (1991), emphasizes situated knowledge, reflexivity, and intersectionality, offering tools to interrogate the universalist assumptions embedded in traditional humanism. Similarly, critical STS scholarship, such as Langdon Winner's (1980) analysis of the politics of artifacts and Sheila Jasanoff's (2005) exploration of sociotechnical imaginaries, demonstrates how technologies are deeply entangled with systems of power and governance.

By sidelining these perspectives, digital humanism often reproduces abstract ideals that fail to account for the lived realities of marginalized groups. As Safiya Umoja Noble (2018) and Virginia Eubanks (2018) illustrate, technologies are far from neutral; they reinforce systemic inequalities and amplify existing hierarchies. Ignoring these critiques risks digital humanism becoming detached from the very struggles it seeks to address. Engaging with feminist and STS insights would ground digital humanism in relational and intersectional frameworks, amplifying its capacity to foster justice and equity in technology design and governance.

Widening the lens of digital humanism beyond human exceptionalism and towards critical posthumanism is particularly vital in times of extreme politics, where technologies deepen social divides and authoritarian tendencies (Braidotti, 2013). Following Judith Butler's (2004) concept of resignification, digital humanism can be reimagined as an inclusive, critical framework that centers justice, diversity, and relationality. This resignified digital humanism can indeed serve as a convergence point for diverse critical voices, fostering collective resistance to sociotechnical injustices and advancing a more equitable digital future.

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Trust and Manipulation in Generative AI: A Digital Humanist Perspective

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In our talk, we address the evolving dynamics of trust and manipulation in the context of generative artificial intelligence (AI) and situate our analysis within the principles of digital humanism. We focus on the critical transition from deterministic, linear technologies to probabilistic systems, such as large language models (LLMs), and the implications of this transition for our trust in technology.

Traditionally, trust in technology has been based on a deterministic model, where inputs lead more or less linearly to secure outcomes, providing a sense of reliability. While this framework could be appropriate for linear technologies, it is not appropriate for generative AI, which works with probabilistic models that generate plausible narratives rather than truths or facts. The fundamental difference lies in the nature of the output: deterministic systems aim for accuracy and reproducibility, whereas generative AI produces content that is contingent and context-dependent, prioritising coherence over factuality.

We argue that this misplaced extension of trust to probabilistic technologies not only distorts our understanding of their capabilities but also amplifies vulnerabilities to manipulation and disinformation. The ability of generative AI to create indistinguishable content undermines users' epistemic agency – their capacity to critically assess and form knowledge. This erosion of agency is particularly concerning as it favours the spread of false information and manipulative interactions, jeopardising personal autonomy and democratic decision-making processes, especially when we consider that political beliefs formation occurs on social media platforms.

However, recognising the manipulation potential of generative AI also opens a window for critical reflection. This awareness can act as a catalyst to re-evaluate our entire relationship with technology. Rather than promoting blind trust or blanket scepticism, we advocate a more nuanced engagement that emphasises critical awareness and considered interaction. This approach is in line with the principles of digital humanism, which emphasises the importance of understanding technology not merely as a tool, but as a cultural and ethical phenomenon that shapes and is shaped by human values.

In practice, this approach requires the development of new frameworks that emphasise the functioning of AI systems and ensure that users can understand how and why AI produces certain outputs. By making these processes more understandable, we can empower individuals to engage with technology in a more informed and reflective way. Ultimately, promoting digital literacy is crucial when it comes to equipping users with skills they need to navigate the complex AI-driven environments so that they can make more informed decisions and critically evaluate the information they encounter.

Our presentation will be structured in three parts. First, we will examine the misplaced extension of trust to probabilistic technologies. In doing so, we will focus on how generative AI challenges traditional notions of reliability, trust, and confidence by creating "stories" rather than stating facts. Secondly, we will look at manipulation and disinformation and highlight the risks these technologies pose in spreading falsehoods and influencing users. Finally, we will

apply the perspective of digital humanism to the promotion of digital literacy in order to encourage a more critical understanding and conscious interaction with these technologies and their outputs.

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Redefining Digital Humanism: Beyond Regulation in the Era of Tech Feudalism

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Digital humanism, as currently conceptualized, often operates within a neoliberal framework that emphasizes market regulation to address the dominance of tech monopolies. This approach reflects the broader ideological alignment between technology policy and economic liberalization, as critiqued by Sheila Jasanoff and Philip Mirowski, which restricts the role of the state to safeguarding market dynamics while promoting innovation through private capital. Such narratives, rooted in the belief that societal progress stems from entrepreneurial activity, have repeatedly failed to deliver equitable societal benefits (Mazzucato, 2018).

The digital economy exemplifies these failures. The dominance of U.S.-based tech giants has ushered in an era of "Techno Feudalism," marked by the concentration of wealth and power in the hands of a small, predominantly male elite (Durand, 2024). This power dynamic undermines global equity and democracy, exacerbating environmental degradation and social inequalities. The emergence of artificial intelligence further intensifies these issues, as its development relies on vast computational resources, creating "winner-takes-all" dynamics that privilege resource-rich ecosystems like Silicon Valley (Srnicek, 2017; Buchanan, 2022). These trends reflect the systemic inequities inherent in platform capitalism and the privatization of knowledge infrastructures (Bowker & Star, 1999).

Efforts to compete with these monopolies through additional private investment have proven ineffective and undesirable. Redistributing the concentration of tech wealth geographically, while leaving the underlying structures of digital capitalism intact, only perpetuates the vulnerabilities of the system (Cohen, 2019). In my position statement, I argue for a reimagined role of the state, informed by STS perspectives on governance and co-production (Jasanoff, 2004). Critical digital services—such as open-access large language models and public social networks—should be treated as public infrastructure under democratic control (FEPS, 2024, Rikap, 2024). These initiatives, developed through public investment, must serve the collective good rather than private profit motives, aligning with broader societal goals (Morozov. (2024).

A redefined digital humanism must move beyond regulatory measures to engage with the structural underpinnings of "Techno Feudalism." Drawing on STS scholarship on infrastructure activism (Collier, 2011) and participatory governance (Epstein, 1996), I advocate for a paradigm shift that prioritizes human welfare, redistributes power, and fosters collective action. By addressing these systemic inequities, societies can ensure that the transformative potential of the digital economy benefits all, advancing a truly inclusive digital future.

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Nature in the Age of Digitalisation: A Plea for More Digital Humanism

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New technologies, such as artificial intelligence, are ubiquitous, yet there is a push towards developing human-like intelligence, raising concerns about whether AI will replace human autonomy and decision-making (Fuchs, 2022, p. 2). Beyond this concern, another issue emerges: the vast energy and resources required for AI systems, exacerbated by a growing user base (Brevini, 2022; Saenko, 2023). While digital humanism addresses the autonomy concern, the environmental impact of AI remains a challenge.

Digital humanism offers an alternative to anti-humanist technology by exploring human-machine differences and promoting humanist values, ethics, and agency in tech development (Barberi et al., 2021; Schmoelz, 2020). Its goal is to ensure AI serves human-centered objectives. Critics argue that digital humanism risks anthropocentrism and neglects environmental impacts (Coeckelbergh, 2024). Therefore, post-humanistic critique propose a relational perspective on human-machine interactions and introduce the concept of care (Prem, 2024). The focus on care allows the introduction of “a mandate for technology to protect people and environment” (Prem, 2024, p. 4).

However, the question we raise in this contribution is if the concern for environmental protection really stems from a post-humanist perspective or still centres the human? We have a twofold approach to this question:

Logical speaking, the claim is that a truly post-humanist perspective would see nature as an end in itself that would require protection even at the expense of human well-being; however, as humans, we ultimately remain at the centre of our argumentation for environmental protection. A digital humanist perspective regarding the environment does not mean an encouragement to bend nature to human goals or exploit it for technological development but offers an alternative to investigate nature and humanity in accordance with each other and to protect natural resources to ensure human wellbeing.

Regarding the history of ideas, we set out that the rationalisation of nature stems from the enlightenment and is enmeshed with humanism without acknowledging the crucial discontinuation of humanism in the enlightenment. Horkheimer and Adorno name their critique

in the dialectics of *enlightenment* (Horkheimer & Adorno, 1969) and not in the dialectics of humanism for good reasons as mechanistic thinking and consequentially a materialistic world view that sees the human as part of the nature has unfolded during the Enlightenment. Thereby, the original humanist motive of emancipation was at least partially overridden(Hutterer, 1998, p. 98). The humanistic modesty with which the laws of nature were given validity only within the respective question and for strictly limited areas was abandoned (Heisenberg, 1962, p. 90) and the topos of the exploitation of nature – and in a mechanistic worldview of nature consequently also of the human – was core to the Enlightenment.

As the first discussion of humanism in the modern age has started with the criticism of New Humanism (Humboldt) and led humanism in a socially critical and existentialist direction(Hutterer, 1998, p. 87), we suggest that the second discussion of humanism in the modern age has started with digital humanism (Doueihi, 2011; Nida-Rümelin & Weidenfeld, 2018; Schmoelz, 2020; Werthner et al., 2019) and post-humanistic criticism (Braidotti, 2013; Coeckelbergh, 2024; Prem, 2024) and leads to a renewal of humanistic theory (Braidotti, 2013; Goodley et al., 2020; Schmoelz, 2023) and to deepening practical digital humanism (Krause, 2023) in the digital age.

14: Digital Privacy: Technical Solutions for Social Problems?

Session Chair: Roman Prunč, Graz University of Technology, Austria

Session Chair: Bernhard Wieser, Graz University of Technology, Austria

Session Chair: Christian Dayé, Graz University of Technology, Austria

Session Chair: Lea Demelius, Graz University of Technology, Austria

Session Chair: Andreas Trügler, Graz University of Technology, Austria

Health Data Circulation in France: between public interest and PETs

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CNRS, France

Within the healthcare system, the promises of Privacy-enhancing technologies (PETs) have attracted a lot of attention to the point, in France, where personal health data cannot be used for anything other than care if it is not protected by PETs. This movement toward looking more closely at “data circulation – privacy-friendly” solutions has emerged about ten years ago in a context where the State was willing to help health data circulation for medical research. Indeed, in France, the most important health data bases are operated by the State and have the benefit of being comprehensive in terms of population. Such very large databases can be very instructive for research as they allow for instance for retrospective studies on drugs’ usage or to test new hypothesis on pathologies’ determinants (Mercier, 2020). Building on the *big data* approach to medical research and the idea that health data can help to achieve precision medicine, the State opted to open its health data bases branding it the “French treasure” and the “French Asset”. In a bidding war with other States that were willing to open their data bases for research as well, the French government even opted to move fast and even to brand it access services in English, creating the *Health Data Hub*, a French agency in charge of the system. In order to obtain support in doing so the government kept putting forward the use of PETs to protect the health data at stake and to focus on the public interest aspect of sharing health data for research purposes.

This presentation will address this recent movement toward health data circulation in France and how it has built upon two pivotal and related notions: the one of public interest (i.e. data circulation being crucial for research) and the other of the “secure access to data”. Analysing the legal landscape and discourse we will demonstrate that since 2016 health data circulation for research has only been accepted as long it can be justified by a public interest in conducting the research and can be organised thought a secure environment for data circulation, in which PETs are crucial. We will demonstrate that rather than closing any debate on data privacy, it has actually open new questions on the efficacity of PETs and on what that list of PETs should include.

A UK perspective on encryption, child safety and client-side scanning

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“Is It Possible to Reconcile Encryption and Child Safety?” This rhetorical question—posed by two technical directors at the UK Government Communications Headquarters (GCHQ)—suggests that techniques like client-side scanning could reconcile these goals, provided sufficient effort is made to improve these solutions (Levy & Robinson, 2022). This raises two important questions: How has child safety become a major focus of the longstanding encryption controversy—ongoing debates in which the intelligence community seeks ways to maintain their investigatory capabilities in encrypted environments while the technology community resists over concerns of privacy and surveillance? Furthermore, how is the “problem’ of reconciling child safety and encryption constructed and how has client-side scanning emerged as a proposed “solution”?

Since 2019, debates around encryption have shifted toward a focus on child safety, redefining the “problem” and enrolling new actors into the discussion. In this paper, I use controversy analysis in STS to examine the changes in the relational ecology of the encryption controversy and the agency of client-side scanning as a contested solution (Callon, 1984; Clarke et al., 2018; Star & Griesemer, 1989). A key characteristic of controversies like the encryption controversy is their indeterminate nature: they lack clear boundaries of where they begin or end and consist of a series of interrelated debates (Barry, 2013; Venturini, 2010). For example, Apple’s proposed on-device child sexual abuse materials (CSAM) detection—broadly referred to as an exemplar of client-side scanning—was introduced against the backdrop of child safety organisations opposing Facebook’s plan to implement end-to-end encryption on its messaging services. The opposition rhetorically was not to encryption itself but to the absence of appropriate mitigation for the increased child safety risk posed by it. Apple claimed its proposed technology was an innovative solution capable of detecting CSAM while preserving privacy. However, the technology was reinterpreted as a continuous scanning feature, which critics—including security researchers, privacy lawyers and digital rights advocates—argued could enable image surveillance. Following the backlash, Apple turned to agree that it was not possible to scan users’ content without compromising their privacy. The debate over Apple’s CSAM detection proposal appeared to have ended with the company’s decision to abandon its on-device CSAM detection proposal. Yet, client-side scanning technology found new support in the UK government’s Safety Tech Challenge Fund. The projects awarded funding subsequently became controversial evidence testifying to the availability of technologies that detect CSAM while preserving user privacy during the UK Online Safety Act 2023 legislation.

Rather than treating each debate as isolated, I structure my discussion around the technological device—client-side scanning. By studying the interrelated debates surrounding client-side scanning—considered by intelligence agency officials as a solution to “reconcile” child safety and encryption but disputed due to its potential for mass surveillance—I examine the involvement and mobilisation of actors and the shaping of their propositions in this transformed encryption controversy.

Can client-side scanning—or any technological device, existing or yet to be developed—“reconcile” child safety and encryption? I argue that posing this question subscribes to the framing of the "problem" as an innovation challenge, as constructed by child safety

organisations and governments. This redefinition of the “problem” is central to the transformation of the encryption controversy. However, it has not resolved or achieved consensus in this longstanding controversy. The so-called “innovation challenge” has been resisted by security researchers, privacy lawyers and digital rights advocates due to concerns about potential “mission creep”. The use of client-side scanning technology for CSAM detection remains contentious and the redefined encryption controversy—as a struggle to reconcile child safety and encryption—continues to unfold.

15: Balancing Innovation and Accountability: Wicked Questions of AI Governance in Digital Sphere.

Session Chair: Swati Kumari, Radboud University, The Netherlands

Chair: Raghvendra Singh, Indian Institute of Technology Indore, India

Chair: Madhu Kumari, Lulea University of Technology, Sweden

Critical AI Literacy and the future of knowledge work

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The incremental integration of AI-based technologies in various organizational and societal settings affects the role of contemporary knowledge work. In common narratives, AI is expected to produce new knowledge, boost innovation and productivity. However, these narratives are theoretically and empircally questionable. Moreover, constructive use of AI also requires new knowledge: not just about technical features but about its sociotechnical implications for working practices as well as its practical limitations. Added value can only emerge if the technology is integrated into operational processes in line with working practices and the organization of work. This also requires clarity about the purpose, objectives and pitfalls of the use of AI. Particuarly to deal with risks of automation bias aggravating with increasing AI usage. Coping with these risks not merely demands transparency about how AI systems work but also transparency and realistic perspectives of utilization. In contrast to basic assumptions, AI can neither really generate new knowledge nor automate complex tasks. Its main potential is supporting repetitive, formalized tasks. AI-based automation is more complex, more dynamic and more volatile than traditional forms of automation. This creates new challenges and demand for individual and institutional coping strategies. This contribution presents main results of the research project CAIL (critical AI Literacy), funded by the Austrian Chamber of Labour, which explored how AI-based technology transforms knowledge work.

Based on qualitative studies in different domains (e.g. media and journalism, health and medicine, education), the project analysed the potentials and practical limits of AI. As will be shown, there is a certain gap between AI used as expert system and „en passant" technology lacking clear task-related purpose and quality requirements. Dealing with AI requires knowledge and new strategies to employ it: the CAIL-framework developed in the project demonstrates why human interpretative capacity and coping capacity become essential parts of modern knowledge work.

From Compliant Innovation to Innovative Governance: Experimental Regulation with AI Sandboxes in the EU

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AI sandboxes operated by universities allow for controlled experimentation with AI technologies and present unique governance challenges. While universities are exempt from the direct application of the EU AI Act, its principles—particularly the emphasis on fundamental rights and risk-based regulation—provide an orientation for ethical AI governance. These research-related responsibilities demand proactive and autonomous measures, placing research ethics boards at the forefront of decision-making to ensure alignment with societal expectations and ethical principles.

This contribution aims to explore how the principles of the AI Act can serve as a foundation for university self-regulation and decision-making processes, emphasizing the balance between fostering innovation and upholding ethical standards, leveraging the EU AI Act's risk-based framework as a compass for ethical oversight. It emphasizes the dual role of universities as experimental grounds for technological innovation and as laboratories for developing governance structures that prioritize ethical integrity and public accountability. The approach presented in this contribution supports that universities not only foster responsible innovation but also contribute to the evolving regulatory discourses on AI. The findings underline the importance of rigorous risk classification and innovative governance structures in navigating the ethical complexities of AI research.

The research employs a mixed-methods approach, including a normative analysis examining the ethical principles underpinning AI governance and their application in university contexts, as well as a comparative assessment of the alignment between university practices and the risk-based approach of the AI Act. To this end, we also analyze case studies of governance practices in selected European universities operating AI sandboxes. The governance of AI has been a critical area of inquiry within STS studies, particularly concerning how AI impinges on public interest [1] and the ethics of its development and deployment [2]. Earlier works have highlighted the importance of risk classification, stakeholder involvement, and the integration of fundamental rights into AI governance frameworks [1]. Our research builds on these foundational studies by focusing on the university research setting, where ethical and regulatory challenges are compounded by the dual role of universities as sites of innovation and public accountability [3, 4].

The findings of this contribution highlight:

- Universities must establish robust ethical review mechanisms tailored to the unique risks associated with AI research. These mechanisms should draw from the AI Act's risk-based approach, translating the fundamental-rights-priority into research practice.

- Effective governance requires the active involvement of diverse stakeholders, including researchers, ethicists, policymakers, and affected communities.

- Universities face the challenge of promoting innovation without compromising ethical standards. This requires a nuanced and well-balanced approach to risk classification and prioritization of ethical considerations.

- As experimental environments, universities provide an opportunity to autonomously develop and test governance frameworks that can inform broader regulatory practices.

This research contributes to STS by addressing the interplay between ethical governance, technological innovation, and societal impacts within the university context. It advances theoretical and practical understanding of how experimental environments can serve as testbeds for rulemaking and governance, aligning with STS' focus on the co-construction of technology and society.

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Towards a Constructive Ethics of Artificial Intelligence

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In 2023, the Centre for Artificial Intelligence Safety (CAIS) released a statement warning that AI poses an existential risk, comparable to pandemics and nuclear war. This message, endorsed by leaders from OpenAI, DeepMind, and Anthropic, shaped public discourse, reinforcing fears of AI-driven human extinction. The statement was signed and endorsed by prominent figures within the Artificial Intelligence (AI) community, including executives from OpenAI, DeepMind, and Anthropic. However, while such catastrophic forecasts capture headlines, they overshadow the more immediate and pervasive impact: the erosion of autonomy, human agency, and democratic foundations through surveillance capitalism (Zuboff, 2019).

Surveillance capitalism, pioneered by tech giants like Google and Meta, turns human experiences into commodifiable data, while predicting and influencing human behaviour on an unprecedented scale. As the deployment of AI systems increasingly influence major decisions in politics, economy, and social norms, the fear is not just about a dystopian future where humans are overridden by machines, but a present reality where human choices are subtly dictated by algorithmic processes. The question is whether the response to the rise of surveillance capitalism should be directed at AI systems themselves or rather at the economic logic that mediates our relationship with these systems (Morozov, 2019).

The prevailing discourse on AI ethics is largely centred around risk mitigation, adopting an approach best described as an ‘ethics of constraints’. This perspective predominantly focuses on delineating what technology should refrain from doing, rather than exploring the constructive possibilities of what it could achieve—an ‘ethics of construction’ (Von Schomberg, 2019). For instance, the EU AI Act introduces bans on high-risk AI applications, such as behavioural manipulation and social scoring (European Parliament, 2024). In exposing the exploitative mechanisms of surveillance capitalism that mediate our interactions with AI, we advocate for a shift from an ethics of constraint toward an ethics of construction engaging with how AI systems mediate human relationships within the digtial sphere (Blok, 2024). Unlike traditional ethical frameworks that treat AI as an external object to be controlled, this approach acknowledges AI as an integral part of social and political life.

Against this background, this paper poses the following research question: *What constitutes a constructive ethics of AI in the age of surveillance capitalism?* Firstly, we account for the emergence of surveillance capitalism as a new economic order in the digital age. While the discourse on AI ethics often leans towards an ethics of constraints to mitigate its risks and adverse effects, we argue that this fails to recognise how our relationship with technology is ultimately mediated by surveillance capitalism. Secondly, we adopt a political concept of responsible innovation inspired by the philosophy of Hannah Arendt (Arendt, 1998; Von Schomberg & Blok, 2023), suggesting that a shift towards a constructive ethics of AI must consider the human-technology relationship from a fundamentally political standpoint. In doing so, we argue that AI systems should be designed to promote plurality, empower citizens, and genuinely serve the public sphere.

Deepfake Technology: Challenges for Embedding Responsibility

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The rapid advancement of deepfake technology has introduced unprecedented challenges at the intersection of artificial intelligence, media ethics, and societal trust. Deepfakes—highly realistic synthetic media generated using machine learning techniques—have garnered significant attention due to their potential applications in entertainment, education, and accessibility. However, their misuse in misinformation campaigns, identity fraud, and political manipulation raises profound ethical and regulatory concerns. This study critically examines deepfake technology through an analysis of high-profile incidents, exploring the socio-ethical ramifications and the broader implications for responsible research and innovation.

Building upon existing Science and Technology Studies (STS) literature, this research interrogates the epistemological and ethical dilemmas posed by deepfakes. The proliferation of synthetic media challenges traditional notions of authenticity, truth, and trust, necessitating new theoretical and regulatory frameworks. By employing a qualitative case study methodology, this study investigates the mechanisms through which deepfakes are produced, disseminated, and weaponized in digital spaces. Through an in-depth analysis of recent incidents—including instances of political disinformation, reputational damage, and non-consensual synthetic media—this research identifies key patterns in the evolving landscape of digital deception.

A central theme in this study is the interplay between technological innovation and ethical responsibility. While deepfake technology is often framed within the discourse of technological determinism, this study adopts a more nuanced perspective by examining the socio-technical systems that shape its development and deployment. The analysis reveals that deepfakes do not merely pose technical challenges; they also create complex moral and epistemic uncertainties, requiring interdisciplinary responses from policymakers, technologists, and social scientists. This study highlights how regulatory lag, insufficient ethical guidelines, and inadequate digital literacy exacerbate the risks associated with deepfakes, enabling their widespread misuse.

Preliminary findings underscore the pressing need for multi-stakeholder interventions to mitigate the risks associated with deepfake proliferation. First, policy frameworks must be adapted to address the legal and ethical implications of synthetic media, balancing innovation with accountability. Second, technological safeguards—such as deepfake detection algorithms, watermarking systems, and blockchain verification—must be integrated into digital ecosystems to enhance transparency and trust. Third, public awareness initiatives and media literacy programs are crucial to empowering individuals to critically engage with digital content and recognize manipulated media. These measures, when implemented collectively, can foster a more responsible and anticipatory approach to deepfake governance.

By situating deepfake technology within broader discourses on anticipatory governance, responsibility in research and innovation, and the socio-political dimensions of emerging digital technologies, this study contributes to ongoing debates in STS. It highlights the necessity of a reflexive approach to technological development, where ethical foresight and interdisciplinary collaboration shape the innovation trajectory. As deepfake technology evolves, its governance

must move beyond reactive measures toward proactive strategies that balance its benefits and risks.

In conclusion, this research advances a critical understanding of how societies can navigate the evolving landscape of synthetic media responsibly. By bridging anticipation and responsibility in research and innovation, this study underscores the need for ethically informed technological development and regulatory responses that align with democratic values, transparency, and public trust. This work provides valuable insights for scholars, policymakers, and technologists seeking to engage with the ethical and societal challenges posed by deepfake technology in an increasingly digitized world.

16: Thinking With and About Generative AI in STS

Session Chair: Lukas Griessl, University of Tübingen, Germany

Session Chair: Christian Dayé, Graz University of Technology, Austria

Epistemic Ambivalence, Generative AI and the Transformation of Established Practices in the Social Sciences and Humanities

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Generative AI is currently transforming many areas of academic life. While the qualitative social sciences and humanities are often not the first to incorporate technological advancements, generative AI quickly started reshaping these disciplines in unprecedented ways. Epistemic practices, traditionally understood to be controlled mainly by human researchers, can now be conducted by or in collaboration with AI. These shifts in epistemic agency provoke disciplines to not only realign their own self-understanding but also to cultivate new practices and rules regarding the use of this new technology. Based on ethnographic material and in dialogue with the technological underpinnings behind generative AI, this paper introduces the notion of “epistemic ambivalence”, describing not only a fundamental attitude that students and researchers cultivate towards the outputs of generative AI, it also highlights how grappling with this ambivalence plays a crucial role in successfully integrating generative AI in epistemic practices.

Is AI a Knowledge Agent? Hybrid Epistemic Practices and Research Regulations

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On December 1st, 2023, the European Research Council (ERC) published a statement emphasizing the need for researchers to be mindful of their use of AI. Related to current developments of AI technologies, specifically so-called Large Language Models (LLMs) challenge existing notions of knowledge creation and sharing (Ho 2023) and redefine traditional knowledge paradigms (Ngwenyama & Frantz 2024). Acknowledging that AI is used "to brainstorm or generate ideas, to search the literature, and to revise, translate, or summarize text," the ERC clearly stated that "use of external help in preparing a proposal does not relieve the author from taking full and sole authorship responsibilities." This distinction highlights a divide: while certain uses of AI align with good research practices, others conflict with academic integrity. Notably, the ERC's recognition of AI – mentioned alongside "human third parties" – is revolutionary, legitimizing discussions on AI-mediated hybrid epistemologies and the collaborative production of knowledge by human and non-human agents.

In this research, we conceive of AI as epistemic technology (Alvarado 2023), which performs epistemic operations such as prediction, analysis, and knowledge representation.The concept of hybrid knowledge production is not new (Haraway 1985, Wilson 2009). However, the rapid development and widespread use of generative AI offer new opportunities for in-depth investigation. On a practical level, the proliferation of AI has drawn the attention of regulatory authorities, adding legal and ethical dimensions to the conversation.

To explore these issues, our research will analyze existing guidelines and policies on AI use in academic research across Europe. We want to look at different levels – starting with EU level of regulation (e.g. ERC), turning to the German funding institution (e.g. DFG, BMBF, Alexander von Humboldt Foundation) and lastly, to the German university level. This analysis will focus on identifying the divide between acceptable and unacceptable uses of AI in research. We will examine how the boundaries of appropriate AI use are defined —what forms of AI assistance are permitted and which practices are restricted. This divide reflects how AI is "treated" within academic contexts—either as a tool or as an agent with limited autonomy in knowledge production. A part of this investigation will be identifying regulatory blind spots where formal guidelines have not yet been established. These gaps expose areas where AI use remains unregulated, potentially creating inconsistencies in research practices across institutions. Understanding these blind spots will help reveal how institutions prioritize certain ethical and epistemic risks while neglecting others.

Through this practical analysis of AI regulations, our study will transition into a theoretical discussion on the broader implications of these limitations. We will explore how these institutional boundaries shape current epistemic practices and what they reveal about the human and non-human agents in knowledge production. This approach will allow us to critically assess whether AI is being integrated as a legitimate knowledge-producing actor or a passive tool in academic research.

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On the way to responsible practices – analysis of guidelines on generative AI from scientific publishers

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Generative AI tools have, on the one hand, the potential to enhance the efficiency with which scientific publications are created, revised and translated, and to accelerate the processing and analysis of research data. On the other hand, the use of AI raises questions about research integrity. These could include questions about authorship or forms of plagiarisms (Frisch 2024). Against this background and in the context of rapid technological development, shared standards and of great importance, not least to ensure the integrity and credibility of scientific publications. Guidelines can provide an important foundation for designing a responsible use of generative AI in scientific publications (König 2023).

Recent research shows that only a small proportion of scientific publishers have guidelines concerning the use of generative AI (Ganjavi et al. 2024). Furthermore, similarities across guidelines are identified: no authorship of generative AI and disclosure on its use. Perkins and Roe come to a similar but more detailed conclusion.

We examined publishers with their own guidelines. Our research is part of the Leibniz ScienceCampus – Digital Transformation of Research (DiTraRe) (https://www.ditrare.de/en). In this STS-related project, we reflect on the increasing on of digitalization processes in

research. This includes the theoretical-conceptual level, methodological issues as well as consequences for science and society.

We expanded the selection of Ganjavi et al. (2024) to include publishers with guidelines that have been added since the conclusion of the study (end 2023), as well as German scientific publishers. The analysis follows a systematic content analysis in which central themes are identified across all guidelines. Common themes include authorship, transparency, responsibility, research integrity and prohibitions/restrictions. In addition, there is agreement on how generative AI should *not* be used: The guidelines explicitly prohibit the use of generative AI to generate content, in the peer review process, and the creation of images, unless the research question explicitly involves generative AI and is only permitted to improve readability and language.

The necessity for more detailed guidelines is evident, as the current guidelines do not adequately address the practical implementation of generative AI in academic publishing. Particularly regarding the actual use of generative AI in the research process, e.g., in the use of generating research questions and gaps or the specification of prompts and output, aspects are missing to provide researchers with helpful orientation.

To sum up, the absence of comprehensive and consistent guidelines can result in a lack of clarity and inconsistencies in the practice of scientific publication. The high degree of abstraction and heterogeneity have been identified as contributing factors. The authors therefore argue for uniform publication guidelines, even when specific demands from disciplines must be considered. The development and implementation of overarching guidelines by actors independent of publishers, such as international guidelines from the Committee on Publication Ethics or national solutions via central research actors like DFG, can be essential to establish shared standards in publication practice.

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To What Extent and How Do Scientific Structures and Practices Shape the Use of Generative Artificial Intelligence? Evidence from an International, Large-scale Survey

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The use of generative artificial intelligence (GenAI) tools in and for science has sparked considerable debate over the past two years. On the one hand, some argue that GenAI will revolutionize the way science is done by shortening the typical timeframe needed for scientific discoveries (Arranz et al. 2023). On the other hand, more cautious voices warn that it may challenge many long-established and widely-acknowledged scientific norms like transparency, ownership, and accountability (Lund et al. 2023). Since the launch of OpenAI's ChatGPT, a growing number of contributions have investigated the use and perception of GenAI tools by faculty, students, and in academia more broadly. Yet few have examined to what extent and how institutional and research practice-related factors such as institutional support for the use of GenAI, team size, type of academic work, academic hierarchies, as well as disciplinary conventions affect the use and perception of GenAI.

Building on insights from the scholarship on scientific work practices and technology adoption (Walsh and Bayma 1996), our contribution addresses this blind spot by surveying 10,000 scholars from five different research fields (Arts and Humanities, Life Sciences and Biomedicine, Social Sciences, Physical Sciences, and Technology) about their use of GenAI. We randomly selected corresponding authors from a sample frame of 251,617 publications indexed in the Web of Science, based on random clusters of 30 index dates and stratified by field, as survey participants. We linked a respondent's publication to the survey, which allowed us to explore how the survey participant's roles and responsibilities in the research project, team dynamics, as well as research processes and outcomes affected their use of GenAI.

Our pilot survey (N=21) and in-depth interviews with 11 scholars reveal that both institutional and research practice-related factors shape GenAI perception and adoption in academia. Regarding institutional factors, research teams with strong institutional support and clear GenAI guidelines report higher usage rates (57%) compared to those without formal institutional frameworks (50%). Team characteristics also matter: larger teams (>5 members) tend to integrate GenAI more extensively (67%) than smaller teams (33%). In terms of research practices, our interviews reveal distinct patterns across disciplines and methodological approaches. For instance, laboratory-based researchers primarily employ GenAI for methodological and analytical tasks, while those conducting qualitative research more commonly use it for writing assistance, if they use GenAI at all. Academic hierarchies further shape these patterns: Our survey respondents generally view GenAI use as more appropriate for senior researchers (mean=4.0/5.0) across most research tasks, while expressing more reservations about its use by junior researchers (mean=2.0/5.0).

Our ongoing large-scale survey of 10,000 scholars across five research fields will expand upon these preliminary findings and provide more detailed evidence on how research practices and institutional contexts shape GenAI use in academia. In doing so, our results will provide deeper insights than existing studies, as we do not only aim to shed light on overall trends in the use of AI within academia, but to deductively explore the underlying factors which shape these trends.

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Understanding GenAI Disclosure in Higher Education: Task and Disciplinary Effects

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The integration of Generative AI (GenAI) tools in higher education represents a critical socio-technical transformation that challenges traditional notions of academic integrity and authorship. While previous research has examined how digital technologies reshape academic practices, particularly through phenomena like the “Google effect” where students externalize memory storage to digital tools, GenAI introduces a fundamentally different dynamic. Unlike search engines or digital databases that primarily serve as information repositories, tools like ChatGPT actively participate in the cognitive processes of analysis, synthesis, and content creation. This shift from passive information retrieval to active intellectual collaboration introduces unprecedented questions about human-machine collaboration and ethical disclosure. Drawing on Technology Acceptance Model and cognitive dissonance theory, we examine how task complexity and disciplinary contexts shape students’ decisions to disclose AI use in academic work, investigating the underlying psychological mechanisms that influence these behaviors. Our mixed-methods approach combines quantitative analysis of survey data from undergraduate students in Singapore with in-depth interviews exploring psychological barriers to transparent AI use. Our findings reveal that students using GenAI for cognitive tasks are significantly less likely to declare its use, with this effect amplified in pure disciplines despite their stronger emphasis on ethical rigor. Qualitative analysis identifies two key mechanisms driving this pattern: the placebo effect, where perceived cognitive enhancement through AI leads to risk-taking behavior, and the AI ghostwriter effect, where diminished sense of ownership over AI-generated content reduces perceived need for disclosure. The interviews further reveal that students in pure disciplines experience heightened internal conflict between their field’s emphasis on intellectual rigor and their use of AI assistance, paradoxically leading to less transparent disclosure practices. This research advances the understanding of human-AI interaction in academic contexts in two key ways. First, it demonstrates how psychological factors and disciplinary epistemologies jointly shape ethical behavior around emerging technologies. Second, it shows how GenAI introduces unique challenges beyond the well-documented “Google effect,” particularly in how it blurs boundaries between human and machine contributions to intellectual work. The findings challenge conventional assumptions

about the relationship between ethical awareness and behavior, revealing how strong ethical commitments can sometimes inhibit rather than promote transparency. Our findings have important implications for technology governance in higher education, suggesting that effective AI policies must account for both psychological barriers to disclosure and disciplinary variations in how students negotiate human-AI collaboration. The study also highlights the need for discipline-sensitive approaches to AI integration that address the unique challenges faced by students in different academic contexts, particularly in fields where strong ethical commitments may paradoxically inhibit transparent AI use.

Integrating anticipation and responsibility into a generative AI course

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Since 2023, our program has offered a multidisciplinary, team-taught undergraduate course that combines prompt engineering techniques with examinations of the cultural, environmental, and political contexts that have been (and currently are) disrupted by enhancements in computing and artificial intelligence (AI). As generative AI has grown more popular and complex, instructors and students grapple with the obligation to “keep up” in the rapidly changing field. But more crucially, we question in what ways “keeping up” is situated, desirable, and responsible, as the development and use of generative AI continues to have disparate social and ethical impacts across domains. To explore this question, we conduct a workshop on the four dimensions of responsible innovation (RI) (anticipation, reflexivity, inclusion, and responsiveness) (Stilgoe et al., 2013), and more specifically, van Grunsven’s extension of anticipation into two criteria – reflective anticipation and technological groundedness (van Grunsven, 2022). Reflective anticipation prompts awareness as to how the act of anticipating (from situated perspectives) frames how society assesses the social acceptability of an emerging technology, while technological groundedness aims to ensure that there is engagement with the feasibility of technical functionalities, enough so to make realistic speculations. In our experience, generative AI pedagogy cannot do without either of the two criteria: students need to be both technologically familiar and critically reflective to make meaning from their use (or refusal) and the impacts of generative AI extending beyond the classroom into their workplaces and personal lives. The themes of RI and anticipation are woven throughout the course, complemented by approaches including Value Sensitive Design (Friedman and Hendry, 2019) and critical design (Orchard and O’Gorman, 2024); to this end, we underscore the necessity for STS scholarship to continue investigating the pedagogy and practice of analyzing and using generative AI in academic settings. This paper will provide an overview of the course context and workshop, describe the opportunities and tensions of using and teaching generative AI, and highlight student work that engaged with RI across disciplinary perspectives.

Choreographies of AI Voices: the discursive construction and cultural implications of "best practices" of artificial intelligence

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In this talk, I will present an analysis of discourses about AI in the entertainment sector, which can serve as an interesting point of comparison and contrast to discourses about (generative) AI in academia. Specifically, I will focus on the media coverage surrounding two recent cases, both of which feature AI-generated models of human voices as their centerpiece: that of American country music singer Randy Travis and of British broadcast journalist Michael Parkinson.

In spring 2024, Randy Travis has released his first new song in over a decade, after having previously been left unable to speak or sing in the aftermath of a stroke. Shortly after the release of the song, it was revealed that the song was made possible by an intricate interplay between an AI-generated model of Randy Travis' voice and a close-knit community of human professionals with a long-standing working relationship with Travis, who himself was seen to not only consent, but also actively contribute to the making of the new song. I will compare the media discourse surrounding the release of this new song with that of another recent case that prominently features an AI-generated voice: the release of the new podcast series "Virtually Parkinson" (announced in late 2024, with episodes being launched from January 2025 onwards), in which an AI based on not only the voice, but also the interviewing style of the late Michael Parkinson, interviews various celebrities. Also as part of the podcast, the interviewees are invited to debrief about their experience of being interviewed by a generative AI in conversation with the producers of the podcast – one of whom is the son of the deceased talk show being mimicked by the AI.

The two cases show notably differences, but also some similarities, as both are presented by their makers as best-practice examples of the "ethical use" of AI in the entertainment sector. After all, both models have been trained on data that have been provided by the legal rights-holders; both take seriously questions of consent; both are embedded in intricate, human-led working practices and promise not to threaten the livelihood of human professionals. Through a close analysis of the media coverage of the roll-out of the song and the podcast, I demonstrate how such a construction – to varying degrees of success and controversy – of ethical uses of AI is achieved through a careful "choreography" (employing the concept developed by Cussins/Thompson in 1998). Drawing on scholarship from the fields of STS, sound and music studies, disabilities studies and critical data studies, I address the cultural implications of the process by which a controversial new technology is being rendered as harmless and familiar through these discursive practices and choreographies.

17: Artificial Intelligence and Society: Perspectives from Global South

Session Chair: Sushant Kumar, O.P.Jindal Global University, India

Sovereign AI: National allegory (?) in the use and imagination of Artificial Intelligence in contemporary India

Ritam Sengupta

O.P. Jindal Global University, India

At least since the launch of GPT 4, that gave widescale access to Artificial Intelligence applications to the lay public, the mediation of everyday life by AI has become a palpable reality in the Indian subcontinent. My paper will explore how this everyday *use* of AI in India is necessarily supplemented by an *imaginary* quest of the spatial scales on which this evolving technology becomes effective. I will demonstrate that the ineluctable association of use and imagination in the deployment of AI is particularly geared towards the question: how can AI be nationalised/localised/channelled into the crafting of techno-economic sovereignty? In pursuing this problematic, I will look at three kinds of discursive articulations. Firstly, I will study the conception of such techno-economic sovereignty in the formulation of state policy and in statements by state functionaries who bear a long-standing anxiety about the global nature of data capitalism. I will try to trace how the reproduction of such anxieties around issues of AI enables imaginary enclosures – of the production of data and its (cultural) uses - within which data-based applications can be assigned a national, autochthonous career. On a second register, I will study discussions on online platforms (like Reddit) by Indian users and try to understand how such users of AI applications, often quite conscious of their spatial particularity, develop strategies to serve localized objectives. Finally, I will analyse how cinematic texts like LSD 2 (2024) attempt to carve out peculiarly Indian dystopias in engaging with the problem of designating human functions to computerized processing. In bringing together these three clusters of AI imaginaries within a single analytical frame, I will offer a critique of AI's subjection to national allegories, while also trying to understand how (spatial) scales are reorganized and negotiated via the coupling of use and imagination in the execution of AI in contemporary India.

Gender Evaluation of AI Policy in South Asian Countries: A Comparative Analysis

Anupama Saxena

Guru Ghasidas University, India

According to the Global Gender Gap Report 2024, South Asia ranks seventh out of eight regions, with a gender parity score of 63.7%. This indicates significant disparities in economic participation, educational attainment, health, and political empowerment. AI can contribute significantly in Empowerment of women. But to ensure that women are benefitted equally by development and deployment of AI it's important that AI policies integrate gender concerns into it as there are documented evidences to show that women are lagging behind in access to , use of and control over AI. In this context Gender evaluation of AI policies in South Asian countries is crucial for promoting equality and empowerment. This paper evaluates the gender implications of Artificial Intelligence (AI) policies in select South Asian countries, examining existing policies, laws, and initiatives. It identifies gaps and recommendations for gender-sensitive AI policymaking. Theoretical frame and Indicators developed by Association for Progressive Communication group(The author of the paper was part of the group) titled 'Gender Evaluation Methodology for Internet and ICTs' are used with some modifications. The research uses a comparative analysis design to analyze AI Policies of India, Pakistan , Bangladesh and Sri Lanka . Data is collected from Policy documents, and other secondary literature. For analyzing data thematic analysis, content analysis and case study tools are used . The research identifies that though unintentional but there is Lack of gender consideration in AI policies in all countries and there is limited women participation in shaping of AI policies those results in unequal benefits of AI to women. The research also finds that there are data gaps in various sectors related to AI that complicates the identification of needs of women. There are infrastructure limitations in promotion and deployment of AI that coupled with socio-cultural barriers result in unequal in access to , use of and control over AI by women. The research suggests that there is an urgent need of gender sensitive AI Policies in South Asian countries to ensure this gender mainstreaming of AI policies must be mandatory , data protection should be ensured , women participation in shaping AI policies should be ensured and for this capacity building programmes should be conducted . Gender sensitization of those who shape and implement AI policies should be done.

Employability and Productivity Indicators in India's Healthcare Sector: The Impact of AI Regulations

Deep Francis

National Innovation Foundation, India

Abstract:
In India, The Medical Devices Rules, 2017 mandate that AI-based tools classified as medical devices must adhere to Central Drugs Standard Control Organization (CDSCO) standards. Additionally, the National Digital Health Mission (NDHM, 2020) was introduced to integrate AI into healthcare systems while ensuring data security and privacy. Alongside, the ICMR Ethical Guidelines for AI in Biomedical Research (2020) emphasize patient consent, data security, and mitigation of biases in AI tools. These initiatives highlight the proactive approach of policymakers in designing a 'robust regulatory framework' and ethical considerations for the adoption of Artificial Intelligence (AI) in the Indian healthcare sector.

The integration of AI into India's healthcare sector has emerged as a transformative force, reshaping workforce dynamics and service delivery. This paper explores the interplay between employability and productivity indicators in healthcare, emphasizing the pivotal role of AI regulations.

By analyzing current policies, ethical considerations, and compliance requirements, the study highlights how effective regulation can facilitate innovation, safeguard data privacy, and address workforce displacement concerns. This paper underscores the importance of a balanced regulatory approach in fostering AI adoption while ensuring equitable employability and sustained productivity in India's healthcare ecosystem.

Objective

This paper aims to develop a conceptual understanding of the impact of Artificial Intelligence (AI) on the productivity and employability of the healthcare sector from the perspectives of healthcare providers, users, and regulations.

Methodology

The paper carries out a thorough literature review to identify the measures of productivity and employability in the healthcare sector. By analyzing policies and regulations, it draws evidence on the interrelationships among these measures of productivity and employability in healthcare.

Findings

We observe that key indicators of productivity in the healthcare sector include length of stay (LOS), patient satisfaction, and the cost of healthcare goods and services. AI lies at the core of healthcare productivity dynamics. Through its role in aiding a practitioner’s analysis, it has the potential to enhance the productivity of healthcare providers, reduce the cost of specific healthcare services, and shorten inpatient stay. Nevertheless, the interplay between employability and AI (and AI regulations) is much nuanced.

Research Limitations/Implications

This research identifies gaps in the literature regarding the interlinkages between healthcare productivity and employability indicators, in relation to the role of regulations. Additionally, the study considers a cross-country context to evaluate productivity, and the results may vary depending on country-specific contingencies.

Originality/Value

Limited research has been carried out to identify AI's impact on productivity and employability measures in the healthcare sector. Moreover, limited attention has been paid to exploring the interrelationship among these parameters and the existing regulations.

The Changing Social Structure of Epistemic Dependence in Scientific Collaborations

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The last three decades have witnessed significant transformations in global research systems. Increased scholarly mobility and enhanced connectivity across countries have boosted the globalization of academia. While the global nature and complexity of the global research system are undisputed, scholars have less agreement on its basis and historical development. Our work starts by describing two divergent views on these issues: one based on the idea that the scope of rationality and efficiency in scientific endeavors are continuously spreading from global North to global South countries, and one that focuses on material inequalities and epistemic dependencies between these world regions. We offer a descriptive empirical analysis that supports the latter perspective and identifies potential areas to reduce inequalities and foster a more inclusive and truly global research environment.

Our work highlights persistent exclusions from the scientific landscape and enduring epistemic dependence between the global North and South, that could challenge the notion of truly pluralistic global research. Despite global trends towards convergence, significant disparities remain. Only a handful of countries have entered the scientific landscape dominated by the Global North. We ask if there is unrealized potential for the research system and identify potential actions to achieve it. This requires investigating and addressing research infrastructure inequalities that could facilitate a more inclusive, diverse scientific community.

AI Surveillance in a Class Diverse Nation

Soumya Singh Chauhan

O.P. Jindal Global University, India

The Indian government has integrated artificial intelligence (AI) into various surveillance technologies across multiple sectors, without any regulatory laws. The Digi Yatra system employs facial recognition technology to streamline security checks at airports. The Union Public Service Commission (UPSC) plans to implement AI-based surveillance, including facial recognition and fingerprint authentication, to prevent cheating and impersonation during examinations. Delhi Police have introduced the Intelligent Traffic Management System (ITMS), which utilizes AI in the form of high-resolution cameras and sensors to monitor and manage traffic. In Uttar Pradesh, an AI-enabled video analytics platform named "Jarvis" has been deployed across 70 prisons to monitor inmates by analysing real-time footage from CCTV cameras to identify unlawful activities, contributing to improved security within correctional facilities.

While these implementations reflect the government's efforts to leverage AI for enhanced surveillance and public safety, they also raise concerns about data privacy and the balance between security and individual rights. The absence of robust legislation despite the enactment of DPDPA creates a vacuum of independent oversight. DPDPA has gaps in defining boundaries for government access and surveillance allowing the government to exempt its agencies from compliance in the interest of national security. There’s a risk of mass surveillance through the large scale use of facial recognition systems, which discourages citizens from exercising their rights to free speech, assembly, and protest. Data security and breaches are a concern by default of sensitive biometric data collected through surveillance tools. The concern of profiling and discrimination is raised if AI algorithms are not designed inclusively, they may disproportionately target or misidentify specific groups. Communities based on caste, religion, or ethnicity could face discriminatory profiling and enhanced AI surveillance might amplify targeting of marginalized groups, further entrenching social inequalities. AI-based traffic management systems, CCTV monitoring in prisons, and other tools reduce the scope for anonymity in public spaces. Once AI surveillance systems are in place, there is a risk they may be repurposed for broader or unauthorized uses. For example, tools designed for traffic management could be used for monitoring political dissent.

Discriminatory profiling in AI systems can arise due to bias in data, algorithm design, or the way systems are deployed. Facial recognition technologies have been shown to have higher error rates for certain demographic groups, especially ethnic minorities. In a diverse country like India, variations in skin tone, facial features, and regional attire could exacerbate these biases. If systems trained on biased datasets are used in law enforcement or surveillance, they may disproportionately flag individuals from marginalized communities. AI tools used for crime prediction often rely on historical crime data. If past data reflects systemic biases, the AI will reinforce and amplify those biases. In India, caste biases can seep into crime records, where members of Dalit or tribal communities are disproportionately charged or implicated. Predictive policing tools could unfairly flag these communities as "high risk," leading to over-policing in their areas. If areas with a high population of a particular religion are historically marked as “high-crime zones,” predictive algorithms may continue this cycle, even if crime rates don’t support it. Facial recognition and AI surveillance have been deployed during protests in India,

such as the Anti-CAA Protests (2019-2020) where protestors were reportedly identified using CCTV footage and facial recognition tools.

The challenge lies in ensuring security while respecting individual rights through Transparency and Accountability, Independent Oversight, Privacy by Design, and Proportionality.

AI Governance in the Global South: a case study of AI Applied Research Centers in Brazil

Guilherme Cavalcante Silva

York University, Canada

Governing artificial intelligence has become a key concern within STS over the last few years, with scholars providing critical outlooks on current legislation or national strategies (Bareis and Katzenbach, 2022), ethical issues (Phan et al., 2022), political economy (Burkhard and Rieder, 2024), and the reproduction of technocratic discourses in the AI hype (Kitchin et al., 2019). Part of the focus has been on the transnational circulation of AI regulation, infrastructure, and discourse, with topics such as the influence of the EU AI Act in the Global South and the US-China dispute over key AI infrastructure in Latin America and Africa (Bradford, 2023). Despite the relevance of renewed extractivist impulses in AI development within the global geopolitical order, these approaches tend to miss the internal dynamics of technology development in Global South countries, such as how they articulate development against the historical underpinnings of dependency (Silva, 2025), often offering pathological views of AI development in these areas (Hassan, 2022).

In this contribution, I want to address this gap by engaging empirically with Brazil's first AI policy initiative 'in action': the creation of six AI Applied Research Centers in the country through a partnership between the São Paulo Research Foundation (Fapesp), the country's Ministry of Science, Technology, and Innovation (MCTI), and the autarchy Internet Steering Committee (CGI.br). In a process that started in 2019 with the publication of the call for proposals, six centers were approved in 2021 focusing on four different areas: health, agriculture, manufacturing, and smart cities. Fapesp, MCTI, and CGI.br invested up to BRL 1 million per year in each center as long as recipients were able to find partner companies to invest a similar amount. The centers, which are hosted in different Brazilian regions, have been in activity since 2022-2023. Since the release of the first call, four other AI Applied Research Centers have been approved.

Drawing on a series of elite interviews with executive members of the first six applied AI research centers in Brazil, I intend to showcase how the institutes articulate AI development, socioeconomic impact, and an AI future for Brazil with the country's historical technoscientific dependency as well as infrastructural gaps. The analysis paints a picture of a policy initiative that navigates between a push for sovereignty and renewed dependency, dealing with opportunities such as a thriving scientific community and limitations such as a funding crunch.

As the country moves forward with key AI-related legislation, such as the new National AI Plan (PBIA, released in 2024), a new version of the National AI Strategy (to be released in 2025), and an AI Bill, approved in the Senate and waiting for approval in the House of Representatives, I conclude that AI governance in Brazil needs to be more strategic with the partnerships for AI developments both at a firm level and internationally, paying less attention to “catching-up” Western nations and more to the country’s institutional capabilities.

Despite being focused on Brazil, considering the country’s prominent position in the Global South and alternative orders to the Western liberal geopolitics (e.g. BRICS), the analysis can offer insights into the challenges and opportunities for AI development in the South.

18: Fairness and Artificial Intelligence

Session Chair: Anna Schreuer, Graz University of Technology, Austria

Session Chair: Bernhard Wieser, Graz University of Technology, Austria

Session Chair: Peter Müllner, Know Center Research GmbH, Austria

Session Chair: Dominik Kowald, Know Center Research GmbH, Austria

Session Chair: Simone Kopeinik, Know Center Research GmbH, Austria

Automated Machine Learning and the multiplicity of control

Laura Kunz

University of Graz, Austria

Automated Machine Learning (AutoML) has been praised as an advancement in Machine Learning (ML), foremost used as practice of prediction and guide in decision making. It is implemented through so-called Low Code or No Code Development Platforms (LCDP or NCDP), providing a visual interface guiding the development process of a ML-based system, thus requiring minimal or no coding expertise. Therefore, AutoML is meant to make the development of advanced ML-based systems available to everyone who owns and wishes to process data. It has thus been praised as democratizing access to machine learning.

In my analysis of actual and suggested AutoML applications (use cases) described on AutoML provider websites I challenge this notion by juxtaposing the democratization of access to use machine learning vs. the control over what to use it for. I trace and compare the problems as stated by AutoML providers and how they have been (or are envisaged to be) tackled or

improved. I do so by mobilizing theoretical lenses of Marthe Stevens, Steven Kraaijeveld & Sharon Tamar on “Sphere Transgressions” and Maximilian Kasy´s notion of multiplicity of objectives in democratic control, showing how the epistemological concept inscribed into machine learning (approached logics of calculation and data analysis in ML) only ever promotes certain approaches of optimization. These are, in the case of AutoML, in particular a) optimizing speed leading to cost optimization and b) informing decision making in regard to cost optimization. Both aspects show a manner of sphere transgression by transferring a particular epistemological practice of optimization as economization into sectors like healthcare and education. Further, this epistemology inscribed into machine learning, thus AutoML, only allows for a single objective approach, single understanding of what can be optimized, contradicting a notion of democratization as allowing for a multiplicity of objectives in what to use AutoML for. Therefore, I argue that we need to investigate new ways of approaching (Auto)ML in order to allow for participation beyond giving access to executing the same single objective of cost reduction and profit maximization - allowing participatory usage with a wider set of objectives in usage.

Thereby, my work addresses the notion of fairness from a different perspective, challenging the notion of democratization of access (through AutoML) as an aspect of fair AI usage thus showing it as not given if not including access to control over AI- usage objectives as well - adding a fairness criteria to the singularity of machine learning objectives, arguing that there exist a multiplicity of optimal outcomes in correspondence to a multiplicity of intentions in society. I am convinced, if we in STS want to think of ways of how to increase fairness in AI approaches by e.g. tackling matters of representation, we need to similarly be aware of the inscribed logic (epistemological practices of machine learning calculations) coming with the technology we intend to make fairer. Therefore my presentation shows how AI, and its “democratized” child of AutoML, does not come as an epistemological blank space we need to feed and use in a more fair way but which´s internal logics of operations we need to challenge as well.

Bringing feminist STS and sociology of categorization into conversation for health equity through medical AI

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While algorithmic fairness is a buzzword in computer science when it comes to justice considerations and AI, beyond tech sciences equality, equity, and social justice are more prevalently discussed concepts. Social justice is particularly important for AI-based applications in healthcare as these applications could not just reproduce but also increase health inequalities which influence many other related opportunities in life. This paper will address how different disciplinary approaches and theories can be used to analyze problems of discrimination through AI with the aim to reach more health equity.

Skin cancer detection tools are one of the known examples of racial bias and have been assumed to reproduce health inequalities along the axis of race (Baumgartner & Ernst, 2023).

While early tools have been developed in the early 2000s, the last years have been pivotal, as deep learning was introduced and technically more accurate outcomes have prominently been announced. However, critiques soon found that the tools would not work for people of color and could therefore, reproduce existing racial discrimination already present in the field. This paper draws on an earlier analysis of Baumgartner & Ernst from 2023 based on feminist STS and adds sociology of categorization as additional theoretical lens. The analysis of the AI-based tools shows that besides analyzing the technical tool itself the analysis of the social context in which the tools are used is highly relevant. The paper also advocates that besides feminist STS, also the sociology of categorization can be fruitful to analyze existing discriminatory examples of technology. Feminist STS looks at race in an essentializing manner. That way a lot of relevant questions cannot be addressed such as: When is race made relevant and how is it constructed within the particular situation? Brubaker's conceptualizations of race (2009) and Epstein's (2007) theories on race in medicine help to pose these very questions adding more granularity to the problem of race-based discrimination: How is race made relevant in the field where skin cancer detection tools are used and how particularly is race constructed in the field? How is race constructed within the AI-based tools? And how do these constructions relate to each other? The paper will also address how accounting for differences within AI-based tools in medicine and healthcare – particularly when it comes to increasing fairness – might lead to the naturalization of these very categories.

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The Enabling Dilemma of Artificial Intelligence: Analyzing the Use of AI and the Autonomy of Disabled Individuals

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The fairness of AI for individuals with disabilities is a highly controversial debate as this technology comprises both inclusive and exclusive potentials for this social group. The primary opposing forces include the enabling power of AI and its potential to alleviate challenges raised by disability versus discriminative attributes of this technology against underrepresented social groups, including disabled individuals (Whittaker, 2019). Moreover, intersectional discriminations, which elaborate on the unique experience of oppression for those who belong to multiple marginalized social groups, further question the fairness of AI for disabled individuals (Lythreatis et al., 2022; Mitra, 2006; Tsatsou, 2020). Concerning this debate, the question of 'how enabling AI is for disabled individuals' arises. Nevertheless, to relate the fairness of AI and its enabling power for disabled individuals, an analytical approach, in our case, autonomy, is needed. We believe autonomy, defined as 'people's ability to decide, plan, and act in ways that [...] will help them to achieve their goals' (Friedman & Hendry, 2019), is a justifiable approach. Since it inherently covers aspects like accessibility and agency, which are debated in disability studies literature (Hofmann et al., 2020; Timpe, 2019). Accordingly, the opening argument of this study could be re-articulated: AI has some potential to enable disabled individuals by raising their autonomy, but this enabling power is even more threatened due to intersectionality. However, this statement is too static to reflect AI's fairness dynamics for disabled individuals. Therefore, this study aims to qualitatively analyze the interrelation between employing AI, the autonomy of disabled individuals, and intersectionality.

To avoid binding the analysis to the scientific discourse, which might be selective in reflecting realities in the social sphere, a corpus, including blog posts about inclusive AI for disabled individuals, is used as empirical data. This corpus covers perspectives on various AI tools (such as recognition, generation, and matchmaking) from different viewpoints (including business, policy-making, and education). Our results, derived from qualitative codes and concepts that emerged from the qualitative analysis of the corpus, enrich our initial argument in two directions. First, the argument that 'intersectional discriminations hinder the enabling potentials of AI to be realized' is too ambiguous, and the counterargument, suggested by our interpretations, is that these discriminations might even reverse the enabling power of AI and diminish the autonomy of disabled individuals. Second, our conceptual framework merely compares the autonomy of disabled individuals before and after employing AI, disregarding the precepted autonomy of the whole society. Whereas the enabling power, autonomy, and fairness of AI is a relative concept and measuring it in the disability discourse is too diminishing: while employing AI might raise the absolute autonomy of disabled individuals, the entire outer society is being enabled as well, shrinking the relative autonomy of disabled individuals.

Here arises the enabling dilemma of AI: while the potential of AI promises to enable disabled individuals, this trend is interrupted by two less visible forces: intersectional discriminations and how they might even negate this enabling power and the parallel trend of the whole society being enabled, leaving the gap between the disabled social groups and society open and even widened. So, although AI has the potential to enable disabled individuals, it might manifest as

a disabler for them as compared to themselves before employing AI and to the entire ever-enabled society. In conclusion, fair AI practices should not focus on single discriminating attributes of AI and resolve to address other discriminative attributes of AI and intersectionality actively. Furthermore, to assess how fair and enabling AI is for disabled individuals, one should analyze it in the broader social discourse and not just in the discourse of disability.

Innovating in the Energy Sector: Bridging the Sociotechnical Divide in Machine Learning Fairness

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Researchers in artificial intelligence (AI) and society emphasize the importance of situating fairness issues about machine learning (ML) within the real-world context where an ML model operates. For instance, Veale and Binns (2017) highlight the institutional character of ML challenges around fairness, suggesting that fairness-related problems must be treated as "messy", "contextually grounded", and ultimately sociotechnical ones. Similarly, drawing upon sociotechnical systems research and STS, Selbst et al (2019) argue that technical designers could contribute to the mitigation of fairness-related problems by considering the social actors involved in the ML deployment stage. For Chen and Metcalf (2024: 2), a sociotechnical analysis of AI/ML systems becomes relevant to their deployment, where such systems "meet people outside of the research and development contexts". In this presentation (part of an Innovate UK interdisciplinary project), we, as STS and Information Studies researchers, argue for a shift from the theoretical sociotechnical approach to ML fairness represented by the above studies to one that investigates, and attempts to bridge, what we have found to be an existing gap between the "social" and the "technical" when it comes to the actual deployment of an ML model. Based on thirteen semi-structured, in-depth, interviews with a UK University-based ML project team (computer/data scientists and a software engineer) and potential industrial users of the ML model (energy planners/forecasters and an innovation manager), we examine its design, development, evaluation, and potential use relating to UK energy demand planning. Following a Grounded Theory approach (Corbin & Strauss, 2015), involving open, axial, and selective coding of the interviews, our analysis is framed through six types of fairness, recently recommended to better comprehend AI/ML fairness within its multifaceted sociotechnical environment: Data Fairness (DF), Application Fairness (AF), Model Design and Development Fairness (MDDF), Metric-Based Fairness (MBF), System Implementation Fairness (SIF), and Ecosystem Fairness (EF) (Leslie et al, 2023). Our study demonstrates a "sociotechnical divide" around the different fairness dimensions that stakeholders are/should be interested in. According to this divide, the project team is concerned with the technical aspects of fairness (DF: e.g. data representativeness and fitness-for-purpose; MDDF: e.g. non-discriminatory algorithm design; MBF: e.g. clearly defined and transparent metrics), whereas the potential industrial users appear to be mainly interested in the social ones (AF: e.g. energy system operators are responsible for ensuring their "plans are representative, fair, and unbiased"; SIF: e.g. explaining "the model prediction […] to help the downstream users"; EF: e.g. "service providers would not be pleased if there was some model that gave preference to a competitor rather than themselves for some unknown unjustified reason"). Concluding, we suggest that,

when addressing the accountability and governance aspects of ML innovation, increased attention should be given by policymakers and regulators not only to the technical dimensions of fairness but also to the social dimensions of fairness where the former is embedded.

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Fair Recommendations in Tourism

Anna Schreuer[1], Bernhard Wieser[1], Peter Müllner[2], Simone Kopeinik[3], Dominik Kowald[2]

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Recommender systems support end-users' economic decision-making by filtering available options, e.g., products and services. This digital support is especially useful, when the recommendations can be tailored to the individual needs and preferences of those seeking information. However, besides the end-users, how are other actors and stakeholder groups impact by AI-driven recommender systems? What criteria are used to evaluate the actors and offers involved and does the provision of recommendations lead to undue disadvantages for some stakeholder groups? To investigate these questions regarding multistakeholder fairness, a range of computational methods have been proposed to identify and mitigate fairness problems in recommender systems. Nevertheless, as Sonboli et al. (2022) argue, the definition of fairness itself is a multi-stakeholder issue that must be negotiated between the groups involved. In the tourism sector, key stakeholder groups include tourists, service providers (e.g. hotels, restaurants), local residents, and recommendation & booking-platforms (cf. Banerjee et al. 2023).

This presentation focuses on fairness among service providers as well as fairness between service providers and recommendation & booking platforms. Taking AI-based route choice and point-of-interest recommendations for cycling tourists as a case study, we explore how such

recommendations may contribute to (un)fairness between tourism service providers and how regional value creation may be supported or inhibited. In a first step, we outline fairness challenges in tourism recommender systems from the perspective of computer sciences, where the main focus has been on fair ranking algorithms, including appropriate bias mitigation strategies. In a second step, drawing on qualitative interviews, we examine how tourism stakeholders employ and reason over criteria for the promotion and ranking of tourism services to (cycling) tourists. On this basis, we outline how questions of algorithmic fairness are embedded in broader socio-material relations that raise a number of different fairness issues, and attempt to derive guidelines for AI-based recommender systems.

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Can a diversity-sensitive human-centered approach make AI developments fairer?

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IFZ, Austria

In the white paper “On Artificial Intelligence – A European approach to excellence and trust” the European Commission (2020) argued for the importance of non-discriminatory and fair AI based on the fundamental founding values of the EU, including human dignity and that no one should be discriminated against on the basis of gender, origin, religion, age or sexual orientation.

Our presentation provides insights into a study (2023-2024) with the aim of researching the potential of integrating gender and diversity into the research of an applied AI research institute, to make their AI research fairer. The first phase of the study comprised a literature analysis on gender and intersectionality in research and innovation with a focus on IT design and fair AI (cf. Oudshoorn et al. 2004, O'Neil, 2016, Buolamwini 2017, Burtscher 2019, Anslinger 2021, Nowotny 2021) a document analysis of successful and rejected research proposals of the involved technology organisation as well as interviews with all their heads of research units and further key personnel. The second phase followed a co-creation of knowledge approach using data of the first phase, and multiple feedback loops with members of a sounding board to inform a workshop with researchers and administrative staff to co-create gender and diversity knowledge for specific AI research topics of the technology organisation (Thaler et al. 2022). The third phase concluded the study with a written report on the potential and implementation strategies to include a diversity-sensitive human-centered technology design approach to make their applied and industry-related AI research more responsible.

Already in phase two, a research proposal with this approach had been successfully submitted, researching now, how such a diversity-sensitive approach could be integrated in the design of

a RAG framework, to make the resulting AI technology more trustworthy. In our presentation we introduce the study from 2024, its methodology and results and reflect on, whether AI designed with a diversity-sensitive human-centered approach can indeed be used to make AI research fairer.

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Proposing an adaptive approach to fairness in AI by drawing from Decision Making Under Deep Uncertainty (DMDU)

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From the mundane (personalized recommendations) to the existential (hiring decisions, credit approvals, medical diagnoses) AI powered decisions are already influencing our lives whether we are aware of it or not. Yet, even to developers, the opacity surrounding AI algorithms raises concerns about accountability and fairness. Biases inherent in data further complicate matters, as current AI systems lack moral or logical judgment, relying solely on predictive outputs derived from learned data patterns.

Technical solutions to address fairness such as de-biasing data, or finding partial solutions to overcome the “impossibility theorem" face significant challenges, as different definitions of fairness can lead to conflicting outcomes and a universally satisfactory solution remains elusive (e.g., Barocas et al 2023). That said, the polysemy of fairness is a common phenomenon with a long history in philosophy and social sciences. Scholars have worked on different (often conflicting) definitions of fairness such as distributive, procedural, informational, interpersonal or retributive fairness, identifying criteria and rules to describe and achieve these (e.g., Adams, 1965, Thibaut und Walker 1975, Deutsch 1975, Leventhal 1980, Greenberg 1993, Tyler et al. 1997, Colquitt 2001). Moreover, the fact that the concrete manifestation of fairness is always culture and context specific has been valid long before the term algorithmic fairness entered the conversation.

Recognizing this as well as acknowledging that technology is never neutral but inherently political and emerges as a social phenomenon from a constantly shifting material-semiotic relationship (Latour 1996, 2005, 2009; Barad 2007), a nuanced inclusive discussion about the types of fairness relevant in specific contexts and the potential trade-offs involved is inevitable.

In our proposed adaptive framework for fairness in AI we approach the topic more as a “wicked problem,” such as climate change and wealth inequality, and many of the critical challenges we face today. These complex issues are characterized by diffuse boundaries and an often-undefined problem scope, making them difficult to address with traditional problem-scoping methods. Conventional policy analysis techniques, such as numerical analysis and survey instruments, have proven ineffective in tackling wicked problems, highlighting an urgent need for novel approaches. Decision-Making Under Deep Uncertainty (DMDU) methodologies are emerging as promising tools for policy support in complex environments with inherent uncertainty that cannot be adequately captured using traditional probabilistic methods. This form of uncertainty, known as deep uncertainty, complicates decision-making because the effects of decisions are unpredictable, and consensus on the desirability of outcomes is elusive.

DMDU methods advocate a "monitor and adapt" paradigm, preparing for uncertain events and adapting to them, rather than a "predict and act" approach that relies on forecasting and acting on predictions. This paradigm explicitly acknowledges the deep uncertainty surrounding decision-making for uncertain events and long-term developments, emphasizing the need to incorporate this uncertainty into the decision-making process.

A foundational concept of DMDU is the direct involvement of stakeholders in the analytical and decision-making processes. Stakeholders participate in problem formulation, performance metric selection, and scenario development, fostering collaboration between researchers and practitioners. This inclusive process serves as a blueprint for developing bottom-up approaches to socio-technological problems, where diverse stakeholder preferences must be accommodated in complex environments.

The objective is not to find one definition of fairness but to offer an inclusive, participatory, adaptive framework to respond to the multifaceted and changing understanding of fairness arising with the manifold applications of an emerging technology like AI. We hope that a fresh focus of decision-making may even lead to reinvigorate or draw attention to unfair practices currently ignored.

19: Digital technologies and social services in the welfare state

Session Chair: Daniela Boehringer, University of Duisburg-Essen, Germany

Session Chair: Tanja Klenk, Helmut-Schmidt-University Hamburg, Germany

Social Rights – digitalisation and third sector organisations

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The proposed paper focuses on the issue of digitization in the delivery of social counselling, more specifically, on the access to social rights through intermediaries. We focus on non-profit-organisations (NPO) and their increasing use of digital tools in their day-to-day processes. Since social law is complex and fragmented, and public administration rarely provides comprehensive low-threshold legal and social advice, we analyse the specific contribution of NPOs and the societal role of third sector organizations in access to benefits and services. We suggest to focus on two dimensions, the level of social work and the level of advocacy: On the one hand, NPOs provide social counselling, thereby relieving citizens of some of the administrative burden, translating citizens' idiosyncratic needs into standardized applications, and guiding citizens through administrative processes. NPOs therefore need a specific knowledge of social law, administrative processes as well as communicative skills. On the other hand, NPOs have in-depth knowledge of administrative processes and capacities that enable them to represent the interests of claimants. In this perspective their work relies on their organisational knowledge and power/ organizational capacities as well as on expert networks. In both ways, counselling NPOs serve as citizen agents.

In our paper we will – on the basis of a literature review – analyse a) the specificities of social counselling that is delivered by NPOs in contrast to public administration as e.g. job centres or migration offices, concerning their capacities and advocacy as well as b) their use of digital tools and structures. Such usage may support their own processes, but may also connect to the digital portals of public administrations, either to support the client or the public administration.

The proposed paper is based on preliminary research on (general) social counselling delivered mainly by NPOs and paper presentations to two conferences in November 2023 in Berlin and Mai 2024 in Duisburg-Essen. Its aim is to clarify the importance of social counselling as a social service on its own, the role of non-profit-organisation in the provision of these services and the challenges that represents digitalization in the domain of social service delivery for non-administrative actors. In social policy, advisory and counselling is not a solely neutral process but includes power relations and advocacy. With the introduction of digital tolls the role and function of such counselling NPOs may alter and their position may evolve towards the state and towards the citizens, which is of interest to STS.

Digitalisation of the German pension system – opportunities and challenges

Carla Greubel[1], Anja Eder[1], Juliane Jarke[1], Jan Heilmann[2], Tanja Klenk[2]

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In a conservative-corporatist welfare state such as Germany, the pension system constitutes a comprehensive social security network for the older population. Over the past several years, the German pension system has undergone a significant digital transformation, encompassing the digitization of pension applications, consolidation of diverse data sources, and automation of work processes. In our presentation, we will share first results from the ongoing project “ChanGe DigiTs”. The overarching objective of ChanGe DigiTs is to investigate the potential contributions of institutionalised self-administration to the development of an inclusive and citizen-oriented digital pension system. To do so, the project examines the opportunities and challenges of the digitalization of the German pension system from the perspective of different actors: (1.) volunteer advisors, (2.) elected representatives working in so-called “objection committees”, (3.) pension insurance experts, and (4.) pensioners themselves. This will contribute to research on the digital transformation of social self-administration specifically and the welfare state more generally.

Since the foundation of the German welfare state, those paying into state pension (employees and employers) and those receiving state pensions (pensioners) elect representatives who participate in the organisation and management of the pension system. The around 500 elected representatives nominate about 2300 additional voluntary advisors who offer support to citizens in their questions about or applications for state pension. The elected representatives and voluntary advisors provide a close connection between civil society and the state, which may be seen as a key premise for ensuring a low-threshold and inclusive digitalisation of public services, particularly in the context of digital public services for older people (Jarke, 2021).

However, the extent to which self-administration as practiced in the German welfare state can actually contribute to a low-threshold and inclusive digitalisation of the pension system requires empirical investigation. Starting from the premise that technology and society co-configure each other, digitalisation processes like the shift from paper-based to electronic pension application forms are not only shaped by the presence of voluntary advisors, who support citizens in filling out those forms, but these processes also affect the work, role and identity of voluntary advisors. While voluntary advisors are described as lobbyists for the interests of citizens who pay into or receive money from the pension system, the development of the digitalisation strategy seems to be primarily in the hand of the state. Whether this implies that the digitalisation and datafication of public services follows a top-down approach with only tokenistic citizen participation, as observed in other countries (see e.g., Broomfield & Reutter, 2022), requires empirical investigation.

In consideration of the aforementioned context, the objective of our presentation is to offer preliminary insights into the practices, experiences and attitudes of the voluntary advisors and members of objection committees, as derived from interviews and participant observation. The central inquiries guiding this study pertain to the experiences they have encountered and the role they as actors of the governance model of self-administration (can) play in the digital transformation of the German pension system. To illustrate: what was the experience of voluntary advisors regarding the transition from paper applications to electronic applications? To what extent are voluntary advisors and members of objection committees involved in the development of strategies for the digital transformation of the pension system? What are their wishes for the future regarding the digitalization of the pension system? Our presentation responds to the call for more in-depth empirical studies on the digitalisation of social services in Germany, which are needed to be able to apprehend and also critically reflect upon the scope, working and effects of digital transformation in the welfare state (Klenk, 2023).

Algorithm Aversion in Practice – Insights and Strategies

Pascal de Vries, Igor ter Halle

Windesheim University of Applied Sciences, The Netherlands

Background The rapid advancement of algorithms and artificial intelligence (AI) has transformed decision-making across various domains, from medical diagnostics to financial forecasting and recruitment processes. Despite their proven effectiveness, algorithms often encounter resistance from users, a phenomenon known as algorithm aversion. This aversion reflects a cognitive and emotional reluctance to trust algorithmic decision-making, even when empirical evidence suggests superior performance compared to human decision-makers.

Objective This study explores the origins, theoretical underpinnings, and practical implications of algorithm aversion. By synthesizing insights from psychology, sociology, and human-computer interaction (HCI), we identify the key drivers of algorithm aversion and propose design strategies to mitigate resistance. Our findings aim to equip organizations with practical tools to foster algorithm acceptance and trust.

Methods Our research adopts a multi-method approach. First, we conduct a literature review of 15 peer-reviewed studies that examine algorithm aversion from cognitive, emotional, and contextual perspectives. Second, we leverage generative AI tools to analyze the factors contributing to aversion and identify strategies for enhancing user trust. Lastly, we develop a set of design patterns based on empirical research and case studies, providing actionable recommendations for organizations deploying algorithmic decision systems.

Findings To address algorithm aversion, we have identified several design patterns that help foster user trust and acceptance. The **Expert-Validated Assistance** pattern emphasizes positioning algorithms as tools that support rather than replace human expertise. This approach reassures users by ensuring that algorithmic decisions are reviewed by domain professionals, thus mitigating fears of automation replacing human judgment. Another key pattern, **Transparent Decision Justification**, involves providing clear and interpretable explanations of algorithmic decisions, making users more comfortable with automated recommendations.

Further, the **User-Controlled Customization** pattern enhances trust by allowing users to modify certain algorithmic parameters, giving them a sense of autonomy in the decision-making process. **Social Proof Integration** leverages peer influence by showcasing how trusted individuals or organizations successfully implement and rely on algorithmic decisions, normalizing AI adoption. Lastly, **Adaptive Learning Mechanisms** ensure that algorithms evolve based on user feedback, demonstrating responsiveness and continuous improvement, which reinforces trust in algorithmic systems over time.

By implementing these design patterns, organizations can proactively address the factors contributing to algorithm aversion, fostering a more balanced and constructive relationship between humans and AI-driven decision-making.

Findings To address algorithm aversion, we have identified several design patterns that help foster user trust and acceptance. The Expert-Validated Assistance pattern emphasizes positioning algorithms as tools that support rather than replace human expertise. This approach reassures users by ensuring that algorithmic decisions are reviewed by domain professionals, thus mitigating fears of automation replacing human judgment. Another key pattern, Transparent Decision Justification, involves providing clear and interpretable explanations of algorithmic decisions, making users more comfortable with automated recommendations.

Conclusion Algorithm aversion remains a significant challenge in AI adoption. Our research underscores the necessity of a multi-disciplinary approach to addressing user concerns. By integrating principles from behavioral science, trust theories, and participatory design, organizations can create AI systems that are both effective and user-friendly. Future research should explore real-world case studies to validate these strategies further. We invite practitioners and researchers to collaborate in refining these principles through empirical testing and applied implementation.

Enacting Trust in Estonian digital identification and e-governance platforms.

Oisin Miguel O'Brien

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In Estonia, digital identification technologies are commonplace, working in the background to facilitate seamless public services. “e-Estonia” has gone beyond digitisation as it looks toward future imaginaries involving a “personal government” with automation mechanisms. How does the state in this case encourage compliance from a wide range of citizens? Looking toward acts of trusting as a processual network of relations, perhaps this is the key to understanding how a citizen makes the uncertain, momentarily certain, in a trade off for convenience. This trust can produce a plethora of affective dimensions, compliance, ambivalence or perhaps an overreliance on these technologies. Looking into pivotal texts on trust has led me to the point where I can acknowledge the necessity to move beyond what trust is, and look at what trust does practically, between the state and citizens, however, where do technical actors figure into this process?

Within the sociological and anthropological texts, I have explored on trust, there is a distinct lack of attention paid to non-vital actors in networks. There is also a general lack of acknowledgement of the material dimension of trust. In my context if trust building/ making is so much based on digital infrastructures and thus a technical question, how can we define trust in a way that accounts for this technical dimension of trust and trust-building? The following paper will look to key works in Anthropology and STS to acknowledge “More Than Human Sociality” (Tsing, 2014) in a sociotechnical web of relations. I will relate this conceptual framework to my chosen context of trust relating to digital identification platforms in Estonia.

A central question to more than human sociality is how we study things that cannot speak to us. Once again, these digital devices are often programmed to be able to speak to us. This could make studying this relation easier as we can communicate with our digital devices in (almost) the same manner we communicate with other humans. Communicating through human language is not taking a more than human sociality approach; however, as machines communicating with us are merely performing a service, we programmed them to do so. The inner workings of the interface, the overheating/crash of a device, and the coding of a program are other examples of ways we can communicate with our device. Perhaps we can communicate with our devices through how often we use them when and when we need them. Our reliance on our devices exhibits a profound trust in those who program them and the devices to perform.

How can we translate cyber elements into relationships involving humans without always centring the human? I will utilise Hyaesin Yoon's text (Yoon, 2021)on posthuman linguistic performativity to attempt to make sense of this issue. Yoon takes a decolonial approach to interpreting non-human linguistics by focusing on listening to the difference rather than glorifying Western uniformity. This approach allows for a more diverse and inclusive perspective in studying posthuman sociality.

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Infrastructuring openness. Practices and politics of opening government data for creating public value

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This paper discusses diverse practices and politics of opening government data for creating public value. It draws on qualitative fieldwork on different data infrastructures dedicated to opening government data in Austria: an open government data portal, a microdata infrastructure for research purposes, and a digital twin project of the city of Vienna. To discuss cross-cutting questions on how public value is created, how data integration adds value, and how to work towards a collaborative paradigm, I conducted desk research, website analyses, and 13 qualitative expert interviews with stakeholders involved in the different data infrastructures. My interviewees included representatives of the data.gv.at portal, the Open Commons Linz initiative, the AMDC, the Platform Microdata, the digital geoTwin of Vienna, as well as policy makers, open data and digital rights activists, and researchers working with open and administrative data.

Theoretically, the chapter draws on open government research, STS-informed infrastructure studies, and critical data studies to trace the open government movement and its core values and juxtapose them with data practices on the ground – ranging from organizational requirements of infrastructure building to new ways of thinking and governing data, data solidarity most importantly (Prainsack et al. 2022). Empirically, the analysis will focus on three core aspects of infrastructuring openness: 1) practices of creating public value, 2) politics of data integration, and 3) a new paradigm of collaboration. Despite their differences, all data initiatives show that opening data does not automatically create public value (in whatever form it takes), but that the actual data use decides over the value it creates. Moreover, complex data work and organizational coordination are required for creating public value, especially if data integration is at work – calling for a new paradigm of collaboration to overcome Austria’s long-standing political culture of secrecy.

In the light of large-scale data infrastructures such as European Data Spaces the EU currently aims for, more professional, interdisciplinary processes of creating and governing data infrastructures would be needed. New governance bodies are expected to be installed according to EU policy, but also new concepts for thinking and governing data would be required if the integration of heterogeneous, highly sensitive data like health data proceeds. Rather than undermining public sectors with economic rationales and data analytics (self-made or outsourced to companies), public administration could start thinking about ways of making use of data in a more responsible way than big tech companies with their strategies of “assetization” (Birch et al. 2021). To conclude, I discuss how more open data practices could be achieved in public sectors and how governance concepts grounded in data solidarity may help with this challenging endeavor.

20: Ageing Technofutures-in-the-Making

Session Chair: Helen Manchester, University of Bristol, United Kingdom

Session Chair: Juliane Jarke, University of Graz, Austria

Session Chair: Daniel López Gómez, Open University of Catalonia, Spain

Session Chair: Andreas Bischof, TU Chemnitz, Germany

Chair: Dagmar Lorenz-Meyer, Charles University Prague, Czech Republic

Building anticipatory design practices with older adults

Helen Manchester, Laurene Cheilan, Marisela Gutierrez-Lopez

University of Bristol, United Kingdom

There is very little research that develops participatory futuring approaches in the field of digital concerns in gerontology despite a rich and growing interest in participatory futuring in fields such as digital civics (Metcalf et al., 2008) and art and speculative design studies (Chopra et al., 2022, Sheikh et al., 2023). Our research centres on the concept of 'sociodigital futures' (SDF) (Halford and Southerton, 2023) and sets out to explore how we can work with communities at the margins to make visible their hopes and concerns around SDF.

This paper draws on our experiences co-producing SDF research with older adults living at the margins in the UK. Over time we have worked with older adults living in an independent living facility in a rural community and with a group of older adults who meet as a local history group in an urban area, both in the South West of the UK.

Our feminist technoscience approach to how SDF are claimed, imagined and acted upon works with principles of design justice (Constanza-Chock, 2020) bringing this approach into our praxis alongside anticipatory orientated design approaches (Korsmeyer, Light and Grocott, 2022). Following Korsmeyer et al (ibid) we set out to explore how we can build a 'response-able', justice led approach to digital innovation for older adults through working alongside groups to unsettle dominant imaginaries and begin to imagine together more equitable futures.

The older adults we work with are often excluded from dominant narratives of SDF. Our research has involved nonlinear, iterative and decentralised work (adrienne maree brown, 2017) starting from prompts anchored in everyday experiences and personal histories, recognising that futures are made in everyday, mundane practices in the present (Watts, 2015). We have used creative and visual methods, intergenerational place based approaches and brought emerging technologies into the room. These methods have helped us to connect with and access affective temporalities of the past and of the future as felt in the present (Mandich et al 2024, Coleman 2017).

We have found that the concept of SDF can be at best, intriguing and difficult to grasp; and at worst, alienating and insensitive. Its ‘digital’ component seems to dictate closed-down futures where ‘digital first’ becomes the norm and where fear, overwhelm and a loss of agency seem to be dominant affective responses. Here views expressed support Annette Markham’s (2021) work on discursive closure tending towards a sense of trajectorism and technological determinism in how older adults envision sociodigital futures. In parallel, the emphasis on ‘futures’ is often perceived as disregarding present, immediate concerns such as the cost-of-living crisis and austerity politics (Brannen and O’Connell, 2022), a focus on hopeful futures often ignoring questions of loss that percolate through the everyday sociodigital experiences of older adults and the stories of the past that they tell.

Given this we are developing our anticipatory design practices that starts from what matters to older adults living at the margins and their lived, felt, embodied encounters with sociodigital infrastructures in the complex, thick present (Haraway, 2016).

When Futures Are Hard to Envision: Methodological Reflections on Collaborative Design with Informal Caregivers

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This paper critically examines the moments when 'futuring' - the collaborative anticipation and imagination of possible futures - becomes fraught, particularly for those whose everyday circumstances place significant constraints on their ability to engage in forward-looking activities. Drawing on theoretical perspectives from design studies and critical futures studies, the paper asks how the very practices intended to democratise the imagination of futures can, in certain contexts, produce dissonance, discomfort or disempowerment. While futuring exercises often rely on participants' willingness to speculate, envision transformative scenarios, or identify emergent desires, these aspirations may clash with the temporalities of those living under acute time pressures or chronic stress.
A recently completed project with informal carers serves as a central case to illuminate these dynamics. In many contemporary societies, the role of informal carer falls disproportionately on individuals - often women - who simultaneously juggle paid employment, domestic responsibilities and emotional support for family members in need of long-term or intensive care. In the midst of this constant juggling act, finding moments to pause, reflect and imagine alternative futures can be extremely difficult, if not impossible. Observations from ethnographic fieldwork, interviews and participatory workshops underline how carers, despite being acutely aware of what they are missing, feel uncomfortable or even guilty when asked to imagine a future beyond their immediate responsibilities. Their limited time horizons make it difficult to reconcile the goals of futuring with the lived realities of perpetual 'present-mindedness'.
The paper situates these observations within a broader conversation about power, temporality and the politics of imagination. Building on our experiences within the co-design project, we explore how methodological practices of linear, progress-oriented narratives challenge actual collaboration with informal carers. We argue that, despite their best intentions, project settings with such a prevalence risk inadvertently marginalising or excluding those whose capacity to

engage in forward-looking creativity is compromised by structural inequalities, emotional exhaustion or inadequate material resources. The very act of inviting 'big dreams' can become a form of symbolic violence if it neglects the unequal distribution of time, energy and imaginative bandwidth across different social groups. Methodologically, the paper offers a critical reflection on how to adapt participatory and co-design approaches to asynchronous settings. We discuss the affordances and limitations of common tactics such as cultural probes. Our analysis highlights strategies that shift the emphasis away from grand utopian projections towards more modest, situated and reflexive forms of anticipation. These include a focus on the tight schedules of the participants themselves. We suggest that a respectful recognition of people's uneven capacities for futuring can open up alternative pathways for collective imagination, ones that accommodate uncertainty, exhaustion and ongoing crisis in ways that do not foreclose hopeful possibility. By interweaving conceptual critique with a practical exploration of methodological adaptations, this paper contributes to a deeper understanding of the ethical and epistemic challenges inherent in collaborative anticipation. It calls for attention to the complexities of temporal entanglements, power asymmetries and embodied experiences in the co-production of futures.

Grassroots Innovations and the Anticipation of Aging Futures: Building Senior Cohousing in Spain

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Studies of anticipation and future-making in Science and Technology Studies (STS) have traditionally focused on technoscientific innovations related to climate, health, energy, and security challenges. Despite the aging population and long-term care being pressing societal challenges, particularly in the so-called aging societies of the global north, STS has paid much less attention to aging techno-futures. This paper explores grassroots innovations aiming to prevent 'threatening' and create 'alternative and positive' aging futures, based on an ethnography of the senior cohousing movement in Spain.

The paper shows how dystopic and utopic aging futures shape these initiatives and their development in Spain. These initiatives are built by older people who aim to prevent social isolation, becoming a ‘burden’ to their families, or ending up institutionalized in a nursing home without autonomy or privacy. These groups seek to build a supportive aging community and collaborative, self-managed housing with personalized long-term care. They are community-led, self-managed initiatives that are gaining attention in public policies as innovative solutions to the ‘care crisis’ and a means to deinstitutionalize traditional nursing homes.

The paper critically examines the practices of imagination, calculation, and performativity that bring these futures into the present when designing these communities. Through these practices, specific anticipated futures come to shape the community, architectural, and care design of these communities. It also shows how these practices create specific affective, future-oriented dispositions towards old age, encapsulated by the motto “self-manage your

future," widely known in the Spanish senior cohousing movement. The paper also discusses the enactments of aging-well that this future-oriented disposition produces.

Imaginary Futures and Phygital Spaces: Deploying Speculative Design for Alternative Ageing Techno-Futures

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We are a team of designers, creative technologists, and policymakers who have been collaborating for over two years. Our collective effort focuses on promoting awareness and educating policymakers, technologists, and civic servants about the possibilities and risks associated with immersive technology. Together, we explore the implications of these technologies across three types of interactions: person-to-person, person-to-space, and person-to-reality (P2P, P2S, P2R), with a particular emphasis on the ageing population.

Our investigation integrates speculative design with principles from game design to demonstrate how innovative technologies can shape and redefine the experiences and environments of older adults. These interactions raise critical questions regarding human rights and values, such as privacy, autonomy, freedom, equality, control, and sociability. We aim to identify the potential benefits and risks associated with these emerging technologies. Recognizing a misalignment between public awareness, policymaking, and the pace of technological development, we developed a unique methodology to address the gap between regulation, technology, society at large, and the individual.

Our project exemplifies an innovative, dialogic, and participatory approach by leveraging speculative design methodologies to address emerging societal challenges in the phygital era. Phygital technologies, such as smart glasses, intertwine physical environments with layered digital realities, creating numerous opportunities for reconfiguring age-tech or well-being technology and enhancing civic engagement and public discourse. However, they also present critical challenges related to privacy, dignity, and sociability. Our paper explores these challenges through a theoretical and visionary lens, addressing the ethical, social, and legal issues arising from the rapid adoption of the phygital in public spaces, particularly for ageing populations.

In this paper, we offer a comprehensive framework for preparing for multiple futures rather than a single future. The Voros Cone—a model used to portray alternative futures—presents several kinds of futures: possible, plausible, preferable, and preposterous. Considering that futures are experiential, contingent, and emerging rather than premised on nation-state and innovation agendas (Pink, 2022), futures are not only imagined but made, tamed, and transformed. They are integral to everyday life (Pink & Salazar, 2017).

Our co-design approach enables us to go beyond binary futures, techno-utopian or apocalyptic visions (emblematic in the concepts of "wellbeing tech" and "crisis care"), and to focus on shifting and complex relationships. Central to our approach is a board game designed to

facilitate decision-making around the ethical use of emerging technologies. The game introduces participants to near-future fictional scenarios in which they must navigate the complex trade-offs of technology adoption. Through this lens, we argue for a participatory, dialogue-driven process that invites diverse stakeholders to envision inclusive and resilient digital public spaces.

The game centers on interactions between multiple stakeholders—elderly individuals, families, caretakers, gerontologists, technology experts, policymakers, and designers. By participating in the role-play scenarios we developed, they encounter and help us envision blind spots and frictions between different kinds of people with conflicting agendas. Imagining future public spaces enables us to consider technologies, innovation narratives, and the needs and perceptions of older people. This leads us to explore alternative actors, debates, divergencies, and values (privacy, control, agency), design choices (discretion, prediction, surveillance), and ways in which elderly individuals can be better integrated into public spaces and participate in civic society.

As William Gibson wrote, "Imaginary futures are always about the day on which they were written." This position paper contributes to the discourse on creating equitable digital futures by offering a practical, interdisciplinary framework for understanding and designing phygital public spaces that uphold fundamental human rights, particularly for ageing populations, as we can envision them today.

Datafied ageing futures: Regimes of anticipation and participatory futuring

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With this paper we join others in their call to resist and challenge regimes of anticipations that suggest our futures are inevitably linked to certain imaginaries about data-driven systems. The future is not simply happening but is made now – through regimes of anticipation that shape our expectations, imaginaries, visions and hypes, and define what is thinkable and desirable. Who or what is able to claim the future is an exercise of power and a matter of social justice. However, current anticipations circulating about datafied futures are often determined by powerful social actors such as states or technology companies. In this paper, we explore how we might open up futures-making to different people in relation to futures of ageing. Central is the question of whether and how we can actually think (and imagine) outside of powerful anticipation regimes around the increasing spread and relevance of data-driven systems and/or ageist assumptions about how to ‘fix’ the problem of demographic ageing. We draw on data from a series of design fiction workshops with older adults, civil society organisations and civil servants in Germany, Austria and the UK. Our analysis explores how participatory futuring might allow participants to question their own assumptions and anticipations about the futures of data-driven technologies in ageing societies but that, due to ‘discursive closure’, this may not lead to radically different futures imaginaries.

From making user-friendly technologies to making the user technology-friendly – Peer tutors enhancing the use of digital technology and services in later life

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The widespread adoption of digital technologies and services (DTS) has significantly impacted contemporary societies. While digital technologies are often seen as solutions to improve citizen participation and wellbeing, they also perpetuate negative stereotypes of older adults as resistant and incompetent users. This study challenges these stereotypes by recognizing the active engagement of older adults with DTS and reconfiguring them as technology-friendly users. Embedded in the technology design, the configuration of the user may often represent an ideal user characterized as “young, white and male”. The assumption of the ideal user creates a distinction where older users may feel incapable or insecure of using technology. In the contrary, making the user technology-friendly is an attempt to get closer to the ideal type, yet not totally reaching it. In this study, volunteered peer tutors who teach digital skills to their peers of similar age and life situation challenge these negative stereotypes and reconfigure older adults as technology users. Drawing upon social practice theory and research on digital divides, we ask: 1) How do tutors perceive older adults as users of DTS, and touching on these perceptions 2) How do tutors enable the use of DTS among their peers? The dataset consists of 21 semi-structured interviews carried out in Central Finland in March 2022. Interviewees were peer tutors aged between 63–84 years old. Tutors had expertise in using digital technologies often in their former work lives and provided individual guidance on digital skills to their peers. Inductive thematic analysis resulted in two main themes touching peer tutors’ perceptions on older users and tutoring as a way to enable older adults to become technology-friendly users. The findings reveal that peer tutors did not consider aging itself a barrier to learning new digital skills or using DTS. Instead, they aimed to create practices to overcome the usability flaws and inadequate digital skills and, ultimately, the distinction between ideal and older user. This meant teaching new digital skills and creating new meanings for participating in digital society in later life. Peer tutors reconfigured older adults as technology-friendly users who needed encouragement and support but wanted to learn to use DTS. This research contributes to widening the understanding of the use of DTS in later life and reconfiguring older adults as technology-friendly users instead of seeing them only through negative stereotypes or deficits. Furthermore, this study helps to understand how initiatives and strategies to enhance digital skills and literacy are a specific way for public authorities to reconfigure relations between older users and technologies in digital society.

Finnish Care Workers' and Experts' Attitudes and Views on the Utilization of Technology in Care Work

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Introduction: Finland is one of the fastest-aging countries in the world, leading to an increased demand for care services. There has been discussion about a prevailing technology hype in Finland as quick solutions are sought amidst changing demographics and a shortage of caregivers. Technology is presented as a means to achieve savings and meet care needs cost-effectively. This study aims to explore how technology-driven development in the care sector is perceived by private sector care workers and experts.

Methodology: The presentation is based on a research project conducted in 2023, which included an online survey (n=539) and semi-structured interviews (n=11) with employees from eldercare, and a Delphi study with experts on the field (n=13). The project aimed to examine eldercare from a future perspective, focusing particularly on the organization of care work and the role of technology in addressing future challenges. In previous studies that have addressed the care sector in Finland, the respondents have mostly represented the public sector. Nevertheless, the share of private service providers has steadily increased between 2015 and 2020, and the role of the private sector as a service provider is particularly emphasized in eldercare, covering almost 50%. Thus, the sample of study is exceptional because the respondents in the survey and the interview are employees from the private eldercare sector.

Results: Based on the results of the study, we conclude that those working in eldercare in the private sector generally have a positive attitude towards technology, robotics, and client information systems. Th care workers considered recording information in these systems as easy, and they assessed that the systems are helpful in forming a comprehensive view of the client's situation. The care workers highlighted the potential of technology in enhancing clients' functional abilities and safety. While most respondents believed that using technology makes practical work easier, those in supervisory positions had even a more positive view of technology.

Challenges: However, ambiguities in legislation arose in the responses of both field workers and experts. Managerial employees raised the issue of costs and who should be responsible for funding the acquisition of new technologies for care homes. We observed regional differences in a country as small as Finland regarding which types of technology, such as surveillance, were perceived as legal and which were not.

Conclusion: The study highlights that to ensure user-friendly development of technology, legislation should provide clear frameworks for the legal utilization of technology.

Digitalization as Part of Society: The Perspective of Older Adults

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Introduction: Digitalization is the process through which the business world, educational institutions, everyday life, and society start to operate using digital technologies. Consequently, digitalization can be seen as having immense transformative power in influencing society (1,2). Most of previous research has focused on examining digitalization from individual perspective, special focus on everyday and personal life, investigating how older adults utilize digital devices or why they do not use them, and what personal expectations they have towards digitalization(e.g. 3,4). Some studies have taken a broader perspective and examined how older adults are portrayed in mainstream media or what societal discourses are associated with older ICT users (5,6) but despite extensive studies around older adults and digitalization the perspectives of older adults on how digitalization is transforming society have not yet been thoroughly studied.

Aim: Our study aims to observe societal transformation leading of digitalization in the interviews of older adults to better understand shared opinions, social values and encapsulate shared meanings and interactions.

Methodology: The data comes from 36 interviews (20 women, 16 men) with individuals aged 63-94 years. Interviews were conducted from 2018 to 2019 in Finland. To find a nuanced understanding of how older adults make sense of digitalization of society and how they talk and interpret it as social phenomena we combine the theory of social representations and approach of interpretative repertoires.

Results: Digitalization was viewed as deeply intertwined with societal structures, acting as a non-human force that disrupts daily life and increases dependence on devices. Even the benefits of faster services and social media connectivity were viewed negatively, as they contributed to the accelerated pace of modern life. The results of this study suggest that rapid digitalization can deepen inequality and the divide between citizens and participants highlighted the generational divide. While promoting the ideal of an efficient digital citizen, Finnish society may inadvertently exclude some older adults who struggle with digital devices.

Challenges: Our findings align with previous research, indicating that although willingness to embrace digitalization is important (e.g.3), some older people may adopt digital devices and services against their will, highlighting the need for inclusive policies that do not equate digital participation with full citizenship.

Conclusion: The study underscores the societal power dynamics and generational divisions exacerbated by the proliferation of technology, particularly in the context of its differential views and impact on younger and older populations.

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Cold Care in the Cloud? Re-imagining ageing in (digital) place, opening up "breathing spaces"

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In this paper, I take a spatial perspective in exploring the advance of the "digital society" (Marres 2017) onto ageing-in-place and elderly care in the Netherlands. I start this analysis at the ethical and policy consequences of 'ageing-in-place', because discussions around the digitalization in/of healthcare are often abstract, which is in part what allows a promissory therapeutic discourse (Pickersgil 2011, 2019) to take root in public imaginations. The paper therefore asks the question "*Where is (ageing) care?"* to generate insights, free from dominant technological discourses. A spatial perspective allows an alternative exploration of the sociotechnical imaginaries of ageing, because it grounds the – often wild – imaginaries of future placelessness (Ivanova 2020, Ivanova and Simonsen 2023), emphasizing the place/action, instead of the technology/digitalization.

In the Netherlands, the inevitability of elderly care digitalization has been tightly wrapped in discussions of "crisis", leading to a discursive closure (Markham 2021). Recently, the Dutch government proclaimed AI and digitalization to be the "solution" for the healthcare problem, stating that without digitalization, our healthcare systems would "fall apart". With a large ageing population, the Netherlands – not unlike other European countries – struggles to imagine what good care for the future looks like. The only image available is that of *the cloud*, where

electronic information exchange, robotics and decentralization of services will supply a kind of “cold care” (Pols 2009).

The main question this paper grapples with is how to open “breathing spaces” (Ruckenstein 2024) for re-imagining ageing in place differently? For instance – should ageing in place be necessarily high-tech? What are low-tech possibilities for ageing? How can we imagine ageing as both digital and physical process, abandoning the dichotomy of the digital vs. the physical? Could it be productive to discuss warm technologies, as opposed to cold, as Pols suggests, so that we can imagine digitalization differently?

To answer these questions, the paper makes use of semi-structured qualitative interviews analysis of Dutch urban informants ‘ageing-in-place’. With an emphasis on the built environment and its (possible) digital counterparts, the interviews discuss what ageing in place means in the context of wide-spread societal digitalization. As Ruckenstein suggest, I try to create “breathing spaces” for my informants to imagine a future of “good care” (Pols 2010). The goal is to approach future-making as place-making, which allows for concreteness in asking the question “*where?*” Where would I like to sit, talk, give blood, walk around, etc.? This approach stands in contrast to future-making as hype-making, in discussing for example emerging technologies and asking people to imagine themselves using them. A focus on place - on the couch or in the cloud, will be productive and generative.

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21: Responsible Innovation and the Future(s) of Healthcare

Session Chair: Lukasz Nazarko, Bialystok University of Technology, Poland

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Responsible Innovation in Healthcare: Prospective Overview of Key Challenges

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Scientific breakthroughs and technological innovations in healthcare are reshaping the way we diagnose, treat, manage, and prevent diseases. Responsible Research and Innovation (RRI) paradigm mandates researchers, innovators, entrepreneurs, and policy makers to design new goods, services, and process that are both ethically acceptable and societally desirable. The pace of technological advances applicable to healthcare and the complexity of their intended and unintended impacts on societies, economies, and the environment make RRI especially relevant to healthcare sector. Effectively, studying RRI challenges in healthcare is a critically important area of science and technology studies (STS), providing a lens through which production, adoption, and regulation of healthcare innovations is investigated.

The aim of this work is to assess the degree to which RRI principles are considered and discussed in various domains of future-oriented healthcare research. The study employs literature review and bibliometrics as main research methods. The following research questions were stated:

How has the volume of RRI-related publications changed over time in specific healthcare domains?

What are the most common conceptual themes and emerging RRI topics in healthcare innovation?

Which healthcare fields show the strongest RRI engagement?

Basing on authors' prior research the following healthcare innovation domains with the potential to drive major changes over the next 10–15 years were selected for analysis: (1) genomics and precision medicine, (2) wearables and remote patient monitoring, (3) immunotherapy, (4) regenerative medicine and tissue engineering, (5) nanomedicine, (6) preventive medicine, (7) microbiome research and therapeutics, (8) neurotechnology, including brain-computer interfaces, (9) Augmented Reality (AR) & Virtual Reality (VR) in medicine, (10) robotics and advanced surgical tools, (11) synthetic biology applications in medicine, (12) vaccines and infectious disease control, (13) digital therapeutics and behavioral

science for health, (14) advanced imaging and diagnostics, (15) drug discovery and pharmacological innovations.

Next, the healthcare innovation domains listed above were evaluated from the perspective of the presence of RRI topics in the related publications. The following RRI keys/dimensions were considered: (1) ethical acceptability, (2) societal desirability, human wellbeing, (3) gender equality, (4) governance, (5) open access, (6) science education, (7) sustainability, (8) public engagement, (8) stakeholder involvement (inclusion and responsiveness), (9) risk management, anticipation and reflexivity.

This study employs an approach in which each predefined healthcare domain is evaluated based on bibliometric data. The ambition of this contribution is to set the evidence-based stage for further domain-specific and qualitative research. Further investigation will also have to take into consideration the holistic, systemic dimension of healthcare. Responsible Innovation in Health (RIH), apart from its product-service dimension that is driven by progress in science and technology, has equally important social-political dimension in which organizational and policy innovations are in demand.

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Anticipation in Health Technology Assessment: Integrating Ethics, Sustainability and Participation in HTA Continuing Education for Healthcare Professionals

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The Danish healthcare system faces significant challenges, including an aging population, increasing demands for healthcare services, and workforce shortages. Aligning well with the RRI lemma – to utilize research and technological innovation to address grand societal challenges – digital health technologies are often promoted as solutions to enhance efficiency and improve patient care. However, implementation is rarely without challenges, such as insufficient training and lack of inclusive frameworks for assessing and integrating these digital technologies effectively. Including STS perspectives in RRI is important as it can generate thoroughly descriptions of such processes and challenges.

This paper presents findings from a Danish Health Tech project, which aims to develop a research-based continuing education module to enhance healthcare professionals' and local decision-makers' competencies in HTA. The project emphasizes an inclusive approach to HTA and enactments of anticipatory competences. Thus, this project enacts several RRI dimensions: Engagement, Ethics, Education and Governance.

Drawing on qualitative data from 20 semi-structured interviews with healthcare professionals and local decision-makers, and participatory fieldwork in hospital wards we identified a need for a more practical HTA model that can be applied by the health professionals that are tasked with using the digital health technology. We also registered a perceived lack of ethics, sustainability and participation in existing HTA practices. Problem-Based Learning (PBL) and other practice-based educational models were listed as the preferred pedagogy of continuing education modules with the aim of bridging perceived gaps between theory and practice. By equipping healthcare professionals with tools to conduct HTA close to practice, the suggested module enables more informed and forward-looking decisions, aligning technological innovation with societal impact and the practicalities in healthcare.

In translating HTA to practical settings in healthcare we suggest the development of Mini-HTAs – a new form of HTA that adds ethics, sustainability and participation to more conventional assessment domains to not only improve decision-making processes but also to support the development of more effective and sustainable healthcare innovation.

In this paper, the critical role of continuing education for healthcare-professionals and local decision-makers in bridging the gaps between technological innovation and practical implementation, for a more responsible and resilient healthcare system will be discussed. The aim is to advance the dialogue on continuing education within RRI and STS by proposing ways to integrate ethics, sustainability, and participation in HTA.

Ethical aspects of Co-Creating XR Technologies for Planetary Health: Insights from the GreenTouch Project

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In the FFG funded project GreenTouch, an interdisciplinary consortium explores the use of Extended Reality (XR) technologies to foster climate competence among occupational therapists and their clients. The development of an XR prototype takes place through a co-creative process in which a mixed group of occupational therapists, clients, XR-technologists, climate communication experts, STS sociologists, and a dramaturg work together to develop XR-scenarios in which users can actively dive into virtual environments and interact with them.

XR encompasses Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR), all of which enhance learning through embodied cognition and the creation of emotional affects through immersive scenarios. This enables users to experience situations, such as successfully overcoming challenges created by climate change in an experiential manner. The aim is to enhance the users' capacity to integrate planetary health principles, which emphasize the interdependence of human health and the health of the planet, into practice.

On the one hand, this caters to the ethical impetus that it is no longer justifiable to not include planetary health in therapeutic practice since without maintaining planetary health, no sustainable improvement in the health of patients can be achieved in the medium and long term. On the other hand, the development of the XR prototype comes with lots of ethical questions regarding the design of the co-creation process but also the XR prototype itself.

In the presentation, researchers from the field of STS and climate communication share insights into the ethical challenges and opportunities encountered during the preparatory phase of the co-creation process which will begin in May 2025. These learnings are grounded in the research teams' participation in two ethics workshops by an external facilitator, the application of the Pro Ethics framework for technology development, an extensive literature review and expert interviews we conducted with professionals from different fields including occupational therapy, climate communication, XR technology, education, sociology, and ethics. On the basis of the co-creation process through which we want to ensure alignment of the XR prototype with the interests of the user groups, we want to share reflections on:

The incorporation of reflective tools, such as ethics templates and external facilitation,

The strategies to ensure accessibility and equitable participation in the co-creation process,

The opportunities and limitations of participatory methods in health technology development, and

The potential of co-creative approaches to align health innovation with ethical and societal values.

By presenting this concrete case study, we aim to foster a critical discussion on the role of co-creation in addressing the ethical complexities of responsible health innovation and planetary health research.

Ethics in the Design of a 'Speaking' Vacuum Cleaning Robot for Fall Detection: Challenges and Solutions

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The research and development project "Smart Companion" addresses the growing need for assistive technologies that support independent living for seniors, by integrating fall detection and emergency response into a speaking robotic vacuum cleaner. The project aims to create a system that is functional, ethically sound, and acceptable to its users. In the proposed contribution, we highlight key findings regarding technical and practical challenges encountered during development, focusing on ethical considerations.

On a **theoretical level**, the contribution draws on the established notion of the co-constitution of society and technology; more specifically, society, technology, its users, and their social context. This notion is echoed by the methodological framework of Ethics by Design, applied in the current project, which postulates explainability, stakeholder engagement, and a human-centered approach, among other principles. Recent technologies integrating AI, camera sensors, and voice assistants developed for assistive purposes for older users (with heterogeneous tech experiences) pose new challenges, e.g., regarding the ethical principles of privacy, non-subjugation and prevention against deception that go beyond regulatory frameworks like GDPR or the EU's AI Act.

Consequently, the paper addresses the following **research question**: What are the technical, practical, and ethical requirements for developing a speaking vacuum robot for fall detection that aligns with seniors' needs and adopts an Ethics by Design approach?

The project applies various methods to implement the **Ethics by Design** approach, including user workshops, interviews, iterative prototyping, and real-world trials in six senior citizens' apartments in an assisted living facility, where the system operated autonomously over a six-month period. An ethics board, including experts and target group members, provided guidance on ethical considerations.

This contribution outlines the project's trajectory from identifying relevant ethics criteria, their technical and practical implementation in a prototype approved by an ethics commission. It then highlights selected ethical criteria, their implementation, and challenges in developing an ethically sound, robust, and responsible healthcare technology.

Preliminary results of the iterative design process and the evaluation of user experiences (e.g., in interviews) show how ethics criteria are closely entangled and sometimes at odds with user expectations. Our results include, among others, the following solutions:

(1) **Explainability** of algorithmic decisions is strengthened when the robot announces its actions (e.g., "I will now start with the scheduled cleaning task."). However, this may lead to users perceiving the robot as an interlocutor, which challenges the project's goal of avoiding strong anthropomorphism to prevent deception.

(2) **Non-subjugation** is safeguarded by a **human-in-the-loop approach** that ensures **algorithmic decisions are ethically constrained**, with emergency assessments escalating to humans for final decisions about whether to send an ambulance.

(3) **Prevention of deception** is targeted through clear communication of capabilities with predefined voice interactions (in contrast to using a LLM that is prone to providing unpredictable responses and has potential for hallucinations), distinguishing the system as non-human and avoiding misunderstandings.

(4) While participants expressed no concern about the robot taking pictures for health-related purposes, this raises **privacy issues** as the robot must freely move and capture images for fall detection, which are analyzed and immediately deleted. To address this, the prototype allows users to define no-go-zones, balancing privacy and autonomy, though falls cannot be detected in these areas.

Despite these complexities, we argue that an iterative Ethics by Design approach – as demonstrated within this project – is apt to ensure that future healthcare technologies, which are understood as deeply rooted in and affecting social contexts and individual life worlds, both meet ethical criteria and users' needs, ultimately offering much-needed solutions to current societal challenges.

The project passed ethical review by the Ethics Commission of the Medical Faculty of Johannes Kepler University Linz (EK-Nr: 1022/2024).

22: Advancing Theory – Methods packages for Participatory Design in Health Technology Development

Session Chair: Ayush Shukla, Vrije Universiteit Amsterdam, The Netherlands

Session Chair: Bianca Jansky, University of Augsburg, Germany

Session Chair: Renate Baumgartner, Vrije Universiteit Amsterdam, The Netherlands

Situational participatory design? Exploring synergies between situational analysis and participatory design

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Participatory design (PD) is widely considered as the gold standard for developing ethical and user-friendly technologies, particularly in healthcare, where often patient involvement is key. However, PD is often applied pragmatically rather than grounded in theory, with no concrete concepts or methods to identify power relations between the different fields and stakeholders involved in the development. In contrast, Situational analysis (SitA), as developed by the STS researcher Adele E. Clarke, offers a theoretically grounded methodology for mapping complex socio-technical situations. SitA's research focus lies in analyzing how technologies are shaped by power structures within social worlds and arenas. However, while SitA explicitly incorporates the perspectives of implicated and marginalized persons through the concept of implicated actors, it does not include specific methodological guidance on how to practically involve individuals with less power in the research or in a development process. This paper explores the synergies between PD and SitA and investigates how their integration could enhance both methodologies.

Building on power critical epistemologies, both methodologies share a commitment to democratic inquiry, acknowledging that certain actors have specific investments and expertise in defining and solving problems while others are often implicated and have not the power either to participate and/or to being heard. Participatory designs cultivate a sensitivity to the co-production of knowledge and social change, whereas SitA offers a power-sensitive tool that examines how different forms of knowledge are produced and contested. While PD emphasizes practical co-design, SitA provides a relational, historically aware, and reflexive lens to analyze power dynamics, marginalized perspectives, and socio-material entanglements. SitA, through tools such as social world/arena mapping, can help answer fundamental questions: What is the situation about? Who defines what is seen as a problem, and for whom? PD, in turn, can apply these insights to pragmatically address the identified challenges and involve those who have not been seen or heard before and even ideally empower them or at least raise critical consciousness.

This paper argues that integrating SitA into PD could lead to a more reflexive and theoretically informed participatory design process, enhancing its emancipatory potential and grounding it

in theory. SitA's mapping techniques could facilitate co-interpretation of data, empowering underrepresented actors to critically understand their social positioning and take action. Whereas PD is consequently taking the implicated actors into account by helping marginalized groups to participate and co-design technologies through a reciprocal process of learning and teaching for both marginalized groups and researchers. By bridging these methodologies, we propose a richer framework for ethical and user-friendly technology design that moves toward more power critically but at the same time practical methodology.

A participatory data walk to reconstruct the practices of use of diagnostic health apps

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How can participatory, STS-inspired health research and design processes be organized that focus on health technologies that are already established in the health care system and/or in everyday health practices?

Many technologies are already a part of the healthcare system or are well advanced in the development process. For a democratic digitalisation of healthcare, it is essential to create opportunities for participation and to take into account the diverse health and embodied knowledge of users, including for digital health applications that are already on the market. Marginalised users in particular do not usually have the privilege of being a selected part of a development team. As Paula Bialski explains, software work is driven by a culture of good enough (for now) and is therefore always provisional, with room for change and adaptation, and therefore also for participatory action research with a diversity-sensitive view from the outside.

The relevance of participatory approaches to technology development and research are highlighted, particularly from a feminist STS perspective, such as d'Ignazio and Klein's principles of data feminism (2020). In the context of health inequalities and existing health gaps, this is particularly relevant and necessary for sensitive health technologies that classify and measure vulnerable bodies.

The starting point and inspiration is the explorative-experimental method of data walks (see Amelang et. al. 2023/Jarke 2019), which is primarily designed for community research, but is transferred here as a modified variation to the reconstruction of practices of using diagnostic health apps (so-called symptom checkers) and their embedding in the lifeworld. This approach can also be applied to participatory approaches to technology development.

In the sense of Donna Haraway (1995), technologies, data, practices of use and development have to be located, embodied and their lifeworld consequences reconstructed in order to initiate accountability. Above all, especially participation holds the potential to situate knowledge and to create connections between partial (and never closed) perspectives and to make them productive for (action) research and development processes.

Ethnographic walks emphasise physicality and sensuality (Amelang et al. 2023), which in turn are needed by symptom checkers as a way of gaining knowledge in order to be able to produce data. As a method package, this variation of the data walk is linked to elements of the app walkthrough (Light et. al. 2016) and the principles of *Follow the People* and *Follow the Thing* (Marcus 1995), and seeks out different locations of use and practical (pre-)knowledge. Symptoms are enacted in the respective socio-material constellations and are multiple (Mol 2017). The bodily (pre-)knowledge of the practices of (self-)classification in use is thus located and contextualized. (Gorir et. al. 2023).

The reality-generating effect, the situating and contextualising of the classifications of the health app, which would otherwise remain obscured or implicit due to the limited socio-technical script of the apps, becomes tangible again. In this way, the lifeworld becomes visible as a data world (Amelang et. al. 2023). This is supported by experimental visualisation using the participatory methods of photovoice and mapping. The data walk narrows the perspective on the materiality, body and practices of the home and at the same time expands the view on institutions, infrastructures, etc. of the co-world. In this way, design processes can integrate the required and existing knowledge of diverse users as well as structural embeddings such as power relations, norm systems and limitations of the health care system. This enables developers to take the needs and knowledge of users into account in a more targeted manner and to develop more inclusive socio-technical systems (Samerski/Müller 2019).

Research Project: “Sociotechnical Practices of Objectivation (STePOn)”: Prof. Dr. Silja Samerski, Dr. Dr. Corinna Bath

Participatory Mapping: Mobilizing Actor-Network Theory (ANT) and Situational Analysis (SA) for RRI Research*

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Responsible Research and Innovation (RRI) emphasizes the active involvement and engagement of societal actors in research and development practices, a principle increasingly institutionalized across European projects. This paper explores the application of participatory mapping methodologies in the context of building capacity for RRI within the European research consortia. Drawing on Actor-Network Theory (ANT) and Situational Analysis (SA), the mapping activities are designed to surface and interrogate ethical, legal, and social implications (ELSI) in the research and development of novel therapeutics.

Through participatory mapping workshops, participants identify and analyze heterogeneous actors and their relationships, co-creating shared socio-technical maps of their technoscintific project. These workshops foreground the material and discursive relationalities that underpin innovation processes, demonstrating how diverse actors—including researchers, technologies, and institutional norms—co-constitute the socio-technical configurations of novel biomedical therapies. By engaging researchers in co-mapping activities, this work provides a

critical lens for examining the interplay between participatory engagement processes and the mapping artifacts produced.

This presentation critically assesses the methodological contributions of ANT and SA to ELSI research, particularly their capacity to illuminate power asymmetries, contestations, and the performativity of mapping practices. It also reflects on their limitations in addressing broader socio-political and ethical complexities. The analysis underscores the potential of participatory mapping not merely as a tool for inclusion but as a reflexive mechanism for disrupting conventional innovation narratives, fostering more democratic and critical research practices in the development of biomedical innovations.

23: Neurotechnologies for all?! Rethinking neurotechnologies between neuroenchantment and neuroenhancement

Session Chair: Eugen R. Dolezal, University of Graz, Austria

Session Chair: Thomas Gremsl, University of Graz, Austria

Session Chair: Juliane Jarke, University of Graz, Austria

Session Chair: Guilherme Wood, University of Graz, Austria

Session Chair: Sara Skardelly, University of Graz, Austria

Session Chair: Petra Zandonella, University of Graz, Austria

Fictional Technofutures of Merging Minds with Machines

Wenzel Mehnert

Austrian Institute of Technology, Austria

From the end of the twentieth century until today, research on brain-machine interfaces has inspired the arts and popular culture in a variety of ways. Science fiction (SF) has taken up this emerging technology and produced various cultural artefacts that ascribe different functions of the technology and speculate on possible impacts on our society. The neurointerface blurs the boundary between humans and machines, imagines technomorphised hybrids and leads to new images of human being like the cyborg or the simulated mind within a computer framework. These imaginaries raise technophilosophical questions about the soul, about individuality and autonomy in the face of technological progress, about the qualia of life as well as the question of what it means to be and to be perceived.

Spread through entertainment media such as computer games, books and moving images, these SF imaginaries are more than just entertainment, as they also shape the way we image this emerging technology. The imaginaries diffuse into areas outside of SF and form a cultural

ecosystem surrounding the actual technology. Here, different Visioneers and Entrepreneurs commodify these fictional technofutures, reduce the critical visions to pure gadgetery and ignore the often deeply philosophical questions articulated in SF. Seen in this way, the neurointerface becomes one of many examples of the discursive transformational process on the intersection between technological development and popular culture.

In this paper I reflect on the ecosystem of the neurointerface and trace the transformation of the trope through different discursive fields. It addresses two dimensions of fictional technofutures: the content of imagined futures and their influence on technological innovation. It argues that these imaginaries, often preceding technological realization, act as social frameworks that shape public debate and ethical reflection. The neurointerface in particular exemplifies this dynamic by offering visions of enhanced capabilities, immersive media experiences, and posthuman transcendence. This work understands SF as a contributor to socio-technical future-making and provides an insight into Neuropunk, a SF subgenre that encompasses a variety of SF-narrations that negotiate the neurointerface as an object that imagines possible social, political and cultural change, and are preceded by different images of humans and notions of human-machine interactions.

MemorAI - Dementia and Neurotechnologies A neuropsychological perspective

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Dementia is a chronic and progressing disease of the brain leading, according to the ICD-10, to disruptions of cognitive functions, loss of emotional control and changes in personality (World Health Organization [WHO], 1997). It can be divided into different forms of dementia. The most prominent dementia type is Alzheimer's Disease and has a prevalence of 43.5%. Other frequent forms are the vascular dementia (14.5%, Lewy Body Dementia (5.4%), the frontotemporal dementia (1%) and alcohol induced dementia (0.7%) (Goodman et al., 2017). They are all defined by different underlying pathophysiological factors, different symptoms and varying ages of onset. Since dementia is not curable, treatments consist of prevention work, early diagnosis, approaches to postpone disease progression, increase quality of life and psychoeducation of relatives. Neurotechnologies (NT) are applied in some of those steps. They are methods used in order to record, analyze and influence brain activity. Electroencephalography (EEG), a method to record electric current fluctuations of the cortex, is an approach for early diagnosis and biomarker detection. While NTs pose great possibilities, they also entail challenges that need to be addressed. Early diagnosis approaches can lead to false positives or false negatives, whereby both can have different consequences. Moreover, several NTs are more motivated by ableism than by genuine demands from affected persons. Since NT are becoming more and more accessible, these topics are in need of a thorough discussion. This contribution will focus on the discussion of a neuropsychological perspective.

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Anticipating neurotechnology and AI for people with dementia – a sociological perspective

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How we feel, think and approach “societal problems” is strongly influenced by anticipations about technoscientific progress (Adams et al. 2009; Markham 2021: 248). In the context of this panel, this is particularly relevant with respect to anticipations about neurotechnology and AI. These anticipations are not neutral but define what futures seem thinkable and desirable. They are based on the “socio-technical imaginaries” that powerful actors such as policy makers or technology developers articulate (Jarke & Manchester 2025). In our paper, we address these by focusing on neurotechnology and AI in the context of dementia care – where these technologies are claimed to be revolutionary. This raises critical questions: What kinds of anticipations are articulated about dementia care responsibilities of neurotechnology and AI? How are societal imaginaries of dementia care negotiated and contested through the development and implementation of neurotechnology and AI? We draw on 12 semi-structured interviews conducted as part of *MemorAI*[1], to explore the anticipations of different stakeholders, including healthcare professionals, policymakers, and developers in Styria (Austria). In our paper, we will also critically reflect on these visions and promises that would redefine dementia treatment and care practices. On the one hand, the tools offer opportunities for innovation; on the other, there is a growing literature highlighting unintended consequences of AI on people with dementia, including ageism, discrimination, and widening social inequalities (Berridge & Grigorovich: 2022). By bridging these empirical findings with critical reflections, as well as theoretical insights from critical studies of ageing and technology, this research contributes to debates on the sociotechnical futures of care, demonstrating how anticipations about neurotechnology and AI contribute to the ongoing reconfiguration of “ageing well”, “healthy ageing” and “good care”.

[1] For a dignified aging with technology: Interdisciplinary approaches for the interaction of neurotechnologies, artificial intelligence (AI) and people with dementia in Styria. Source: https://memorai.uni-graz.at/de/. Funded through the Zukunftsfond Steiermark (Projectnumber 1619).

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MemorAI – a legal perspective on the use of neurotechnology in dementia

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Like every powerful technologies, neurotechnologies (NT) are part of a rapidly growing economic sector. Their impact on individuals and society is undeniable. Again, the crucial role of the law is to harness the potential of emerging technologies by ensuring a fair balance between benefits and harms to safeguard social peace. The risk-based approach adopted by the EU legislator seeks to manage dangers as risks in order to avoid harm as far as possible, in line with the precautionary principle. If, despite all preventive measures, harm occurs – which is inevitable with powerful new technologies – it should be easy for injured parties to claim compensation.

Given the potential for serious harm, the use of technology (including NT) in healthcare is strictly regulated by the legislator de lege lata. At the same time, general product safety legislation defines comprehensive regulatory protection goals and high product safety requirements. For instance, the EU Medical Devices Regulation (MDR) applies not only to NT when used for medical purposes as defined in Article 2(1) MDR but also to specific non-medical NT, as outlined in Annex XVI. Additionally, the EU provides robust protection for human rights and fundamental rights, which should not be undermined by so-called 'neurorights' (Wood et al., 2024).

The Austrian Dementia Report 2014 assumes that the number of people with dementia will double by 2050 (Höfler et al., 2015); emphasising the urgent need for intensive interdisciplinary research in this field. The MemorAI Styria project, funded by the Styrian Future Fund (PN: 1619), analyses the use of NT, including AI, for dementia care in Styria through specific use cases.

Analysing the use cases from a legal perspective, several challenges emerge. These include exaggerated promises about the efficacy of NT ('neuroenchantment'), monitoring through NT ('surveillance'), and concerns about the voluntary nature of NT use for a diagnosis ('right not to know'). In all instances, consent is crucial and must be based on information and transparency ('informed consent'). According to established case law on surgery, the scope of informed consent depends in particular on the necessity of the intervention (RS0026772). Applied to NT and taking into account the specific transgressive character of NT properly, this requires a discussion about informed consent that includes both the possibilities and limitations of these technologies.

Another critical issue to highlight is the inclusion of people with dementia within the scope of protection offered by the Convention on the Rights of Persons with Disabilities, as argued by *Müller/Walter* (Müller&Walter, 2013). According to *Müller/Walter*, no stigmatisation shall be derived from this classification. Instead, it aims to ensure that dementia patients are not placed in a worse position than other individuals with disabilities. It is essential to protect human well-being and human dignity legally from economic and financial restrictions. For example, physical and psychological 'immobilisation' should only be prescribed by specialists and not by administrative staff (RS0129749).

As outlined above, this contribution seeks to categorise NT from a legal perspective, based on real-life scenarios of NT use in dementia. Overall, the legal considerations regarding the challenges posed by NT are based on human dignity as enshrined in Article 1 of the Charter of Fundamental Rights of the EU, which always forms the foundation of all considerations.

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MemorAI - Neurotechnologies for Dementia. An ethical Perspective

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Scientific prognoses estimate, that the amount of people with dementia will increase about 50% in Austria in the next thirty years (Bundesministerium für Soziales, Gesundheit, Pflege und Konsumentenschutz, 2020). A major factor for this increase is the progressively improving health care, which allows for a longer life span, however, high age is a dominant risk factor when it comes to dementia indications (World Health Organization [WHO], 2023). One option to tackle this issue is through technological advancements, an approach which, while promising, needs to be accompanied with ethical considerations and oversight, to mitigate potential harms and risks.

In recent years, neurotechnologies (NT) have gained attention as promising tools in dementia care. These encompass a range of methods—such as electroencephalography (EEG)—designed to record, analyze, or even influence brain activity, as well as, virtual and augmented reality applications, which allow cognitive stimulation through optical inputs and shared social experiences. By offering pathways for earlier biomarker detection (Jiao et al., 2023), NT hold the potential to facilitate more timely and targeted interventions. However, this promise also raises profound ethical questions regarding accuracy, consent, autonomy, and equity. Early diagnostic tools may inadvertently mislabel individuals through false positives or fail to diagnose those in need through false negatives, with significant implications for psychosocial well-being. Moreover, when NT are driven predominantly by assumptions of restoring or maintaining “normal” cognitive functioning, they risk perpetuating ableism by overlooking the diverse needs and values of those living with dementia, as well as shifting care from an inter- and intrapersonal affair into a technicised task that must become ever more efficient.

From an ethical standpoint, ensuring clarity and honesty about the capabilities and limitations of NT is paramount. Especially since NT are embedded in a seductive sphere full of neuromyths (especially “neuroenchantment” (Ali et al., 2014)) and misconceptions. This and the particular vulnerability of individuals experiencing cognitive decline demand scrutinous ethical evaluation and oversight.

Therefore, an ethical examination of NT in the context of dementia must foreground the particular vulnerability of individuals experiencing cognitive decline. As decision-making capacities shift, these individuals become increasingly reliant on professional guidance and caregiving structures that may wield significant influence over their choices. NT—whether employed for early diagnosis, symptom monitoring, or cognitive training—have the potential to both empower and marginalize. Affected individuals and their families require transparent communication about diagnostic results and their possible ramifications, respecting both the right to know and the right not to know. If not carefully regulated and transparently communicated, NT can inadvertently compromise autonomy and privacy, leading to further dependency or stigmatization.

Equitable access to NT also warrants attention, given the socioeconomic disparities that can shape who benefits from innovative diagnostics and interventions. An ethical reflection calls for policies that address cost, availability, and healthcare infrastructure to ensure that these tools do not become the privilege of a select few. Moreover, ethical considerations must extend beyond technical and clinical issues to the broader social context in which dementia care occurs, including family support structures, long-term care facilities, and community-based resources.

Taken as a whole, NT’s potential to enhance dementia diagnosis and care is accompanied by a responsibility to engage with foundational ethical principles of respect, autonomy, beneficence, justice, and non-maleficence. By foregrounding these ethical dimensions throughout the design, implementation, and distribution of neurotechnological tools, stakeholders can strive for practices that truly honor the dignity, rights, and well-being of individuals with dementia.

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25: Political and economic values of experimentation in the governance of environmental change

Session Chair: Juliane Miriam Schumacher, Humboldt-Universität zu Berlin, Germany

Session Chair: Giovanni Bettini, Lancaster University, United Kingdom

Ecological governance: Geopower, natural capital and financialization

Juliane Miriam Schumacher

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Experimental forms of knowledge production recently attracted attention, ranging from „living labs“ or participatory approaches to border regimes (Aradau 2020; Bieler et al. 2021). They have become a dominant approach in the governance of non-human actors and human-non-human interactions. At the same time, „ecological“ thinking is one of the most important sources and references for these emerging forms of governance (Hörl and Burton 2017).

Such „ecological“ forms of governance have been discussed in adaptation to climate change, like in the case of „resilient“ cities (Wakefield 2020), and they have been proposed from a STS perspective as a way towards developing new human-non-human assemblages (Braun 2015). In this paper, I want to relate these developments to shifts in capitalist dynamics, new forms of valuation and the dissolution of the human-non-human divide (Bigger and Webber 2021).

I use the examples of forest-based carbon markets – an early experiment for the valuation of ecosystem services (Corbera 2012) – and the concept of „investment landscapes“ to show how these processes are related to new technologies like AI, to financialization and changing scales and temporalities of „matters of concern“ (Latour) in times of increasingly uncertain futures. I discuss the economic and environmental effects of these shifts in governance (Chandler et al. 2021), how they relate to questions of justice and responsibility (Haderer 2023), and how they challenge and complicate previous forms of contestation and critique (Grove and Rickards 2022; Nelson 2014).

Finally, I explore how these developments might further unfold as part of recent debates on geopower and planetary forms of governance (Goldstein 2018; Luisetti 2018), and which theoretical and practical tools are needed in order to grasp and critically discuss their consequences, as well as to develop alternative approaches to adress the contemporary crises.

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Failing Forward? Experimentation, failure and the politics of smart climate adaptation

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Digital technologies are increasingly central to climate adaptation, with international organizations, funders and practitioners promoting 'smart' interventions that are said to enhance adaptation's effectiveness, fairness, and economic sustainability. Applications range from smart agriculture projects, to advanced index-based insurance schemes drawing on remote sensing, user data and AI, and crowd-sourced disaster alert systems.

However, despite extensive - and emphatic - promotion of the many pilot initiatives lunched in recent years, few smart adaptation projects successfully scale up, and comprehensive analysis of their performance remains scarce. Critical adaptation research has barely engaged with such tendencies, which represents a significant gap given the omnipresence of the digital, and the role it will have in the next generation of adaptation interventions.

Rather than viewing this pattern of 'failing pilots' solely as an implementation failure, this paper develops a framework for understanding how experimentation and failure function in the digitalization of adaptation efforts, particularly in the Global South, and more broadly how these dynamics are part of the establishment of adaptation as a pervasive assemblage and discourse (what Paprocki terms an 'adaptation regime'). Drawing on a global mapping of smart adaptation initiatives and fieldwork carried out by the Digital Climate Futures project, we examine these tendencies and the implications of discourses on 'smart adaptation'. Our analysis suggests that, even when implemented through failing pilots – they pave the way to a combined datafication and financialization of adaptation. We close by highlighting the significant implications of these tendencies for fairness and justice in climate adaptation efforts.

Public-Private Extraction: Rethinking Value in Experimental Governance

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Experimental governance is presented as a tool for innovation in environmental policymaking. However, its funding mechanisms and institutional structures frequently reinforce existing power asymmetries, obstructing systemic change and limiting grassroots empowerment. This paper introduces the concept of public-private extraction, where institutional actors divert public resources to established entities, reinforcing systemic invisibility—a condition in which radical innovators are either excluded outright or absorbed into governance structures under extractive terms. Institutional actors monopolize public funding and experimental policies to entrench power within established governance frameworks. In doing so, they restrict grassroots agency and close off alternative pathways for systemic change.

Governance experiments such as test beds and living labs are often presented as participatory and inclusive, yet they operate under institutional constraints that determine who can participate and under what conditions (Engels et al. 2019). Instead of fostering systemic change, these spaces embody particular visions of the future that align with existing governance priorities, ultimately limiting the agency of grassroots actors to drive change on their own terms. Similarly, Petryna's (2009) concept of "experimentality" shows how governance experiments are often designed not to enable open-ended transformation, but to manage systemic risk and control uncertainty. Nguyen (2009) examines how government-by-exception in public health shapes participation in experimental interventions, highlighting ways institutional priorities dictate who is included in governance experiments and under what terms.

The invisibility of grassroots actors in experimental governance is reinforced through selective recognition and co-optation. Murphy (2017) introduces the concept of "Alterlife", illustrating how historical and environmental injustices shape ongoing conditions of exposure and exclusion rather than being eliminated by governance interventions. Only innovations that conform to institutional logics receive support, while more disruptive approaches remain on the margins.

At the same time, emerging AI-driven experimental governance and digital test beds are reinforcing these power asymmetries by prioritizing efficiency-driven decision-making, further marginalizing grassroots-led systemic change. Digital experimentation restricts innovation access, reinforcing financialized control over who can experiment and which innovations receive backing. These digital experiments entrench extractive governance, embedding efficiency-driven decision-making into institutional frameworks.

This paper empirically examines these dynamics through a case study of Peelpioniers, a grassroots initiative navigating financialized governance and seeking to embed systems thinking and regenerative practices within environmental governance. This case highlights how financialized governance limits grassroots autonomy and access to decision-making spaces critical for systemic change. Despite its innovative approach, this case illustrates how governance experiments reinforce institutional dominance rather than facilitating structural change. Specifically, I show how:

1. Grassroots innovations remain structurally invisible unless absorbed into pre-existing funding and governance logics (Murphy 2017).

2. Experimental governance is shaped by financialization, limiting who gets to experiment and under what conditions (Engels et al. 2019).

3. Radical systemic change requires a shift away from extractive funding models toward regenerative financing, ensuring that experimental governance remains community-driven, autonomous, and resistant to co-optation.

By situating this analysis within Science and Technology Studies (STS), this paper contributes to debates on participatory governance, financialized innovation, and experimental politics. The study builds on STS critiques of power asymmetries in governance and knowledge production (Latour 2004) and Stengers' (2015) call for "slow, collective experiments" as an alternative to financialized, technology-driven governance and extends discussions on how green capitalism and clean-tech entrepreneurship reinforce financialized environmental governance (Goldstein 2018). The findings challenge assumptions about participatory

experimentation, revealing how governance mechanisms often entrench rather than dismantle systemic inequalities. This paper advances a framework for non-extractive, regenerative experimentation that decentralizes control and drives the emergence of participatory governance. Rather than sustaining hierarchical financial dominance, this approach empowers grassroots agency, dismantles institutional barriers, and fosters governance models rooted in adaptability, equity, and community leadership.

26: Inclusive Paths of Transformation: Unpacking Just Transition Challenges and Opportunities in the Global South

Session Chair: Dwarkeshwar Dutt, Indian Institute of Technology Delhi, India

Session Chair: Jyoti Prabha, Directorate of Education, Delhi, India

Session Chair: Stephani Cetimia Mariotti Ruiz, Institute of Economic - UNICAMP, Brazil

Uncovering Sustainability Trade-offs in Energy Efficiency: A Business Models Lens on the Indian Sugar Industry

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Energy efficiency research has traditionally focused on carbon emissions and energy demand reduction, neglecting the sectoral and contextual dynamics that shape its outcomes. This study examines the case of energy efficiency in the Indian sugar industry through the lens of circular business models (CBMs), exploring how resource optimisation drives sustainability transitions [1].

The study unveils that the sugar industry's energy efficiency value chain extends beyond factory operations, to encompass sugarcane cultivation, sugar processing, and byproduct integration into diverse revenue streams. Efficiency gains are realised through biomass conservation, value creation from byproducts, revenue diversification, and decarbonisation. Crucially, the most significant opportunities for energy efficiency emerge not from sugar production but from optimising the value of byproducts such as bagasse, molasses, and ethanol. These byproducts link the agriculture, energy, and transport systems, and position the sugar industry as a central player in India's sustainability transitions. However, a holistic understanding of practices across the value chain is needed to identify where efficiency is gained or lost—and for whom—from a justice perspective.

Using a business models framework[2], the study investigates patterns in the utilisation of energy sources and byproducts, revealing how values prioritised and stakeholders served influence energy efficiency approaches and sustainability outcomes. For instance, while circular practices like repurposing bagasse for power generation or ethanol production drive resource efficiency, they also exacerbate water resource depletion due to extensive sugarcane production and carbon emissions.

The analysis contrasts CBMs with Sustainable Business Models (SBMs), highlighting critical differences in theoretical underpinnings and practical implementation [3]. While CBMs in the sugar industry emphasise resource efficiency and economic value capture through circularity, SBMs aim to balance economic, social, and environmental goals. Using Bocken's Value Mapping Framework [4], the study uncovers how CBMs prioritise energy efficiency and ethanol production but often overlook values such as equitable economic benefits and water resource management. These trade-offs raise deeper questions about why certain values are prioritised or missed, who benefits, and how these decisions shape sustainability outcomes. This research also explores how internal and external factors to the businesses, including policy mandates, market dynamics, and ecological conditions, co-evolve with business model approaches and energy efficiency measures [5]. For instance, ethanol blending mandates, fluctuating sugar prices, agricultural productivity and water availability shape firms' operational priorities.

The methodology employs a multi-case study approach, drawing on fieldwork conducted in major sugarcane-producing states of India. Data collection includes semi-structured interviews with industry stakeholders, technology providers, state government and researchers, complemented by analysis of policy documents and technical reports. Finally, the study critiques the limitations of circular strategies in the sugar industry. While circularity addresses resource extraction and production, downstream impacts such as carbon emissions and end-of-life product disposal remain underexplored. The findings suggest that energy efficiency and circularity are not ends in themselves; achieving just sustainability transitions requires reconciling industrial priorities with broader environmental and social objectives. The types of values prioritised by business models play a pivotal role in shaping sustainability pathways, underscoring the need for an equitable and holistic approach.

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Regional Energy Cooperation in Eastern Africa: Examining Historical, Political, and Institutional Dimensions

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Just energy transitions, driven by the imperatives of decarbonization, energy equity, and the eradication of exploitative practices, have profound implications for energy governance and resource management in the Global South. However, these transitions are unevenly realized in Eastern Africa—a region endowed with significant mineral wealth and renewable energy potential but simultaneously burdened by pervasive energy poverty and systemic governance challenges (Goldthau et al., 2020). The interplay of structural and institutional weaknesses, compounded by the enduring legacies of colonial and neo-colonial exploitation, continues to shape contemporary climate and energy debates in the region (Morrison et al., 2022).

Within this context, regional cooperation emerges as a crucial strategy for Eastern African countries to align their energy priorities and pool resources to navigate the complexities of global energy transitions. While some scholarship explores the interlinkages between energy and regional cooperation, the nuanced interactions between regional energy cooperation and resource management remain underexamined, particularly in Eastern Africa's socio-political landscape.

This paper critically investigates the institutional frameworks, policy architectures, and energy projects within the Eastern Africa Power Pool (EAPP). The analysis is anchored in three dimensions: the historical, political, and institutional contexts of energy development and regional cooperation in Eastern Africa. It interrogates how environmental, socio-economic, and political dynamics intersect to shape energy development pathways, while also situating these findings within the broader challenges of regional integration. The study synthesizes theoretical perspectives with empirical insights, exploring innovative approaches to designing regional organizations that prioritize renewable energy development and equitable resource management.

The findings reveal that the EAPP has achieved notable success in fostering cross-border energy trade and enhancing grid interconnectivity, which has contributed to improved regional energy access and reliability. Despite some successes in fostering regional energy cooperation and mitigating energy insecurity, the EAPP faces persistent challenges. Misaligned national policies, fragmented institutional capacities, and unresolved diplomatic tensions impede the region's ability to address escalating energy demands effectively. Additionally, weak legislative frameworks fail to mitigate exploitative resource extraction practices, which are often exacerbated by external pressures and market-driven energy transitions.

This study argues that achieving just energy transitions in Eastern Africa necessitates a paradigm shift in regional cooperation, moving beyond mere alignment of energy objectives to a model that integrates comprehensive resource management and socio-economic equity. It posits that regional energy governance must prioritize localized energy demands while addressing the systemic injustices tied to resource extraction. This requires robust legislative interventions to regulate external exploitation and promote transparency, accountability, and equity in energy-resource management.

The paper concludes that while regional cooperation holds transformative potential to advance energy objectives, its effectiveness remains contingent upon addressing entrenched structural and governance challenges. It calls for the adoption of an intergovernmental energy-resource cooperation strategy that reconciles national energy trilemma objectives with broader resource management imperatives. The EAPP's approach to regional energy integration, despite its challenges, offers valuable lessons for other regions seeking to balance energy cooperation, resource management, and equitable development.

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Exploring Ecosocial Energy Transitions in the Global North and South: Insights from Chile and the Uk.

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The ecosocial energy transitions framework introduces a distinctive approach, differing from current models like just energy transitions and sociotechnical energy transitions by emphasizing the care of nature, recognizing colonial and capitalist legacies, and integrating a feminine perspective. It advocates for nature-based solutions that reduce reliance on extractive activities, critiques the capitalist energy model and its colonial practices, and promotes gender-responsive policies that challenge patriarchal structures. The ecosocial framework presents a more comprehensive and equitable approach to energy transitions, contesting dominant power structures and advocating for a just and inclusive energy system that respects the varied needs and contexts of global communities. Dominant transitions frameworks, such as socio-technical transitions and energy justice, have often fail to address the structural causes of socio-ecological collapse and the perpetuation of injustices, particularly in the Global South. The ecosocial transitions framework emerges as an alternative, placing at its core the questioning of the capitalist model within the energy sector and the significance of the socio-ecological crisis that predominantly impacts countries of the Global South.

The analysis finds five core principles at the heart of the novel ecosocial transitions framework: transformation, reparation, decentralization, autonomy and feminine perspective. By emphasizing these principles, the ecosocial energy transitions framework aims to contribute to the current energy transitions framework making them more equitable and responsive to the diverse needs and contexts of communities worldwide. Rather than dismissing the significance of just energy transitions or sociotechnical transitions, which are well-established in public

discourse, this paper advocates for incorporating the Global South's perspective. By doing so, we can enrich the discussion and foster a more comprehensive understanding of energy transitions.

Future research should explore the practical application of these principles, encouraging academia and policy to advocate for transformative agendas within the energy sector. The focus should be on transforming energy systems, investigating reparation and financing mechanisms, especially in the Global South, and examining decentralized systems and new local economies that can provide greater autonomy to communities. Additionally, integrating a feminine perspective in energy transitions is crucial, as it allows us to envision energy systems from a different lens, one that is rooted in collaboration and distanced from the capitalist and patriarchal regime. By thoroughly investigating these areas, research can drive meaningful change, promoting more equitable energy transitions that challenge existing power structures and amplify the voices and needs of the Global South.

Approach to People-Centric Energy Transition: An Empirical Study from Rajahara Coalfield, Jharkhand

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India, one of the world's top five mining countries, is grappling with a multifaceted energy transition challenge, especially regarding coal, which accounts for around 55% of the country's energy requirements. The Prime Minister's net-zero economy (NZE) vision can't be achieved without ramping down coal (including mines). While the closure of mines is necessary for NZE by 2070, it is likely to seriously impact the lives and livelihoods of communities in the region. This hypothesis was tested through an empirical study of a discontinued coal mine in the Rajhara Coalfield of Palamu district, Jharkhand. A mixed approach was adopted to test this hypothesis. Key informant interviews were designed and conducted for targeted stakeholders, the impacted communities, Coal India Limited, Central Mine Planning & Design Institute Limited, District Mineral Foundations, and policymakers for qualitative data. Further, focus group discussions were conducted with local coal miners to comprehend the impact of coal mine discontinuation. Further, for quantitative data, a survey of 201 households in the region was carried out to explore and assess the impact of discontinued coal fields on the lives and livelihoods of communities. The study proposed a framework and approaches for the betterment of life and livelihood in impacted communities. Besides, mapped the roles and responsibilities of stakeholders associated with the mining ecosystem, including the setting up of Centers of Excellence (CoE) or National Knowledge Networks (NKN), recommending a Life Sustenance Action Plan (LSAP), inclusion of local community-based organizations, government bodies, etc. Additionally, the research generated recommendations for innovative financing models and approaches for people-centric and just energy transition. The findings of the study include identifying four interventions from the sustainable livelihood bucket and three interventions from the better life bucket. The novelty of this research lies in the "*empirical study*

of discontinued mines in India." The proposed people-centric selected solutions to identified social, environmental, economic, and technical challenges are demonstrated as part of action research in the second phase of the ongoing study. This work analyzes empirical data and addresses the knowledge gap in the literature on just energy transition. The study also addressed the methodological limitations of previous works by applying a mixed approach that enhanced the depth and breadth of findings. Lastly, the study bridged the gap between theory and practice in the subject to contribute to academic discourse besides providing tangible benefits to the affected. It could serve as a pivotal study for India, where the future of 299 abandoned mines is to be determined soon.

27: Advancing Urban and Rural Energy Systems for Inclusive, Scalable, and Technologically Integrated Energy Solutions

Session Chair: Vanja Djinlev, Empa, Switzerland

Session Chair: Michael Brenner-Fliesser, Joanneum Research, Austria

Session Chair: Malgorzata Matowska, Th!nk E, Belgium

Energy-mobility-digitalisation nexus for integrated urban energy system: the cities of Freiburg and Graz

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As part of my literature review for the EMPOWER project, I found a range of interactions between electric vehicle (EV) batteries and other urban systems and technologies. They are rapidly emerging in the form of e.g., grid to vehicle (G2V) for charging EV batteries, vehicle to grid (V2G) for discharging EV batteries, and vehicle to building (V2B) as a substitute for grid system for powering buildings and for mitigating fluctuations from renewable energies (cf. Huang et al. 2022; Wang et al. 2023). Emerging resource flows among these systems calls for establishing new structural couplings to support associated activities of EV batteries, e.g., charging infrastructure and technology and battery regulations to enhance integrated urban energy system (cf. Baars et al. 2023).

I will discuss if and how energy-mobility-digitalisation nexus might create an enabling environment for sustainable integrated urban energy system by drawing on different theoretical frameworks e.g., smart cities (cf. Tranos and Gertner 2012; Karvonen et al. 2020), sector

coupling (cf. Robinius et al. 2017; Münster et al. 2020), duality of structure (cf. Giddens 1984; Sewell 2005), and on the ontology of socio-technical structures about the need to include non-human material objects into the social structures (Elder-Vass 2017).

By discussing the energy transition pathways and practices in the new city-districts of Dietenbach (Freiburg) and Smart City (Graz), I will provide insights into the possible patterns and development of energy-mobility-digitalisation nexus for sustainable smart cities and regions.

The key research questions are: How do actors and their associated activities generate new structural couplings between different urban sectors of energy, mobility and digitalisation across the dimensions of actors, technologies, and institutions? What is the role of territorially based institutional & governance structure and business models to support low-carbon smart cities and regions?

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European energy companies’ operations in and views towards energy community developments

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Several issues hinder the expansion of energy communities to become an intrinsic part of the low-carbon energy system, such as unequal distribution of opportunities and resources to join, set up and manage these communities. Researchers have thus become increasingly interested in how commercial actors, including energy companies, could support energy community developments. These activities could include for example providing services related to the development and deployment of energy projects and establishing projects with a shared ownership structure.

However, the complex relationship between energy companies and communities has thus far been studied predominantly from the energy community perspective, without fully attempting to understand the company perspective. So, although strong arguments have been made for the potential co-benefits of company involvement in energy community projects, e.g., access to finance and knowhow (de Bakker et al., 2020; Goedkoop & Devine-Wright, 2016; Tolonen et al., 2023; Warlenius & Nettelbladt, 2023), there is lack of in-depth understanding of energy companies’ operations in the energy community space. Consequently, the grounds for and promises of such cooperation to scale up to advance the niche remain unclear. Conducting energy community research also from the company perspective is thus essential for better understanding the potential role that energy companies can have in the development of the energy community space.

In our paper, we shift research focus specifically on large energy companies involved with energy production and retail, to explore company-community collaboration in the energy space from this new angle. Our study is guided by the question: *What are energy companies doing in the energy community space, and why?* We answer this by conducting a multi-case study of European utility companies that actively work together with energy communities, and use thematic analysis grounded in critical realism to analyse the data. Throughout the paper, we frame and make sense of the focal phenomenon in the wider context of low-carbon energy

transition through the application of transition theories and concepts related to regime destabilization, centred around the idea of incumbents' configurational dimensions as foundational elements of their behaviour (Geels & Turnheim, 2022). Adapting this configurational approach helps us to link the observable behaviour of these companies to their inner beings and procedures, based on which we can develop more detailed accounts of these incumbents' behaviours in transitions, as well as estimate potential future behaviours and how this might influence the speed and direction of the transition.

Our paper provides new empirical insight into the underlying regime-to-niche dynamics in the energy sector. This will help us to better understand the complex and contested relationship of energy companies and communities, and how this might influence the energy transition.

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Utilizing Social Sciences Framework for New Service Development in Advanced Energy-Efficient Buildings

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This study presents the development of a Social Science Framework aimed at engaging residents and promoting a design-thinking approach to co-creation and feedback loops within the DEDALUS project. The framework integrates a combination of methodologies, including questionnaires, qualitative research, workshops, user feedback, and segmentation, to understand customer needs and improve services related to demand response (DR). The framework was built upon insights from a literature review and previous project experience, drawing on the High-Performance Cycle model and the Theory of Planned Behavior. It was designed to facilitate effective DR behavior change and enhance social engagement. The primary focus was on understanding the motivations, barriers, and behaviors of residential users in relation to DR.

During the first nine months, the project focused on designing and implementing co-creation activities at each pilot site, aimed at fostering interaction between project partners and end users. These activities generated valuable insights into user motivations, preferences, and profiles. Three key workshops were developed: (1) understanding barriers and drivers of DR participation, (2) assessing the importance of various DR-related incentives, and (3) identifying effective nudging interventions. These workshops employed techniques such as Likert-scale response questions, Q-sort methods, ranking tasks, and group discussions to explore user perceptions and preferences.

In addition to the workshops, segmentation approaches were used to analyze the characteristics of residential users. A questionnaire-driven segmentation method was used to assess socio-demographic and psychological factors, while a machine learning-based clustering method was applied to electricity load profiles. The latter employed K-means clustering to create load profiles, enabling more targeted DR strategies. The study also explored financial and non-financial incentives through co-creation workshops, where participants ranked different incentives to identify the most effective ones for encouraging DR behaviors. The results provided insights into which incentives were most valued by users and how they could be leveraged to increase participation in DR programs.

Overall, this framework combines social science research and data-driven approaches to improve user engagement in DR programs, providing valuable insights for developing effective demand response strategies. The findings will contribute to the future stages of the DEDALUS project and support the development of scalable, user-centered energy solutions.

28: Energy Poverty Expertise — Knowledge, Tools and Practices

Session Chair: Adèle Sébert, University of Reims Champagne-Ardenne, France

Session Chair: Ute Dubois, ISG International Business School, France

Understanding energy poverty: the lived experiences of affected households in the Netherlands

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In 2023, over 400 thousand households lived in energy poverty in the Netherlands [1]. Existing research has provided insights into the consequences of energy poverty for households. Households living in energy poverty are more frequently affected by physical health problems such as respiratory issues, asthma, osteoarthritis, and cardiovascular diseases [2][3][4]. In addition, households are more prone to mental health problems such as (financial) stress, anxiety, sadness, and depression [2][3][4][5].

The use of qualitative research methods does not have a long history in the fields of energy and the study of the qualitative nature of energy poverty has only gained importance in the last 20 years [6]. In the Netherlands, little qualitative research into energy poverty is conducted and the existing national monitor on energy poverty is quantitative in nature (i.e. showing the number of households living in energy poverty and their demographic characteristics) [1]. However, not all aspects of energy poverty can be measured through quantitative approaches alone, such as the assessment of gender disparities in energy poverty among women, or the various ways in which households cope with energy poverty in their daily lives [7]. Qualitative studies, especially those conducted on an annual basis like this study, on the *lived experiences* of households affected by energy poverty are crucial. They can substantiate quantitative results [8][9][10] and allow monitoring of households' experiences. Since relief measures taken by the government change over time, these studies generate knowledge for policy makers as well [11].

This study draws attention to the lived experiences of households affected by energy poverty across the Netherlands, based on 34 semi-structured interviews. In collaboration with energy aid providers – organizations that visit households to offer advice on energy-saving behaviour – participants were invited to share their experiences in a semi-structured interview. The findings provide valuable insights into households' living conditions, energy consumption and challenges, needs for support, and perspectives on the energy transition. These results highlight that the energy crisis has deeply affected households' energy consumption. Many households continue to use less energy than necessary for a healthy indoor environment due to fear of rising energy costs. This phenomenon, termed 'hidden energy poverty', leaves affected households ineligible for government initiatives such as the Temporary Energy

Emergency Fund, which only supports those with exceptionally high energy bills. The study also reveals that households feel reliant on government measures. While emergency measures provide temporary relief, they do not equip residents to manage their (energy) expenses independently. Furthermore, while households recognize the importance of the energy transition, they express concerns about its financial accessibility and want more information on its implications for their personal situations. Based on these findings, we offer recommendations for the national government, emphasizing the need for a multidisciplinary approach to energy poverty, stronger collaboration between housing associations and energy aid providers, and clear communication about the energy transition's impact on households.

Quantifying households living in energy poverty: between co-construction and fragmentation

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The sharp rise in energy prices (gas, electricity, fuel) in 2021 and 2022 and inflation have served as a reminder of just how difficult it can be for some French households to meet their energy bills (ONPE,2023). In this context, the rise in energy prices is crystallising questions about the current and future effects on the most precarious households, particularly in a context where prices have been rising for two decades and changes in the energy mix in the context of the ecological transition are causing upward pressure. In addition to inflation, the effects of rising energy prices on households are all the more complex to estimate because the measurement of fuel poverty is itself subject to debate over what the concept covers (Devalière, 2008), how it is measured (Belaïd, 2018) and the data needed to provide a stable representation over time (Thomson, Bouzarovski, and Snell, 2017).

Since the mid-2000s the measurement of energy poverty has been the subject of an abundant academic and professional literature on the data on which it is based (Erard, Chancel, and Saujot, 2015), the relevant statistical tools (Charlier, Risch, and Salmon, 2015), on the dimensions (housing, transport, health) that it takes into account (Ledésert, 2013) or on the evaluation of public policies (Missemer and Swaton, 2017). There is an initial consensus that energy poverty is characterised by three common denominators: energy price, state of the building and household income. A second consensus relates to the diversity of households in energy poverty, which need to be identified on the basis of this triptych (Devalière, 2007). This double consensus implies difficulties in terms of the quantification itself and the qualification on which it is based. What is involved in measuring energy poverty? Do we measure access to energy in order to deduce the idea of a lack, or do we measure a lack of access directly? What are the processes on which the measurement is based? Are these processes capable of shedding light on the effects of situations of 'crisis' on households and/or on households that are already in a precarious situation?
This proposal is translated from Association d'Économie Sociale (AES)'s Conference proceedings of year 2024 but never discussed outside from French conferences (Sébert, 2024), and based on a chapter in a thesis (Sébert,2022). It aims to consider the measurement of energy poverty as a process and a result. Based on material from French publications, texts

and reports in the professional literature (by statistical experts or those who deal with energy poverty), and using the literature on the sociology of quantification (Desrosières, 2008), we want to show that measuring energy poverty is an activity that relies on a double circulation (Desrosières, 2005). These include data and metadata relating to energy poverty 'figures'. We begin by analysing the multiplicity of data on the basis of which energy poverty is quantified and show that the production and presentation of these data results in a fragmented understanding of energy poverty. We will then look at the indicators currently used by official statistics to account for energy poverty. Thirdly, we return to the criticisms levelled at the quantification of energy poverty. We will emphasise that these criticisms lead to the legitimisation of approaches that combine a variety of data in the form of dashboards. We will present the role of the French Observatoire National de la Précarité Énergétique (ONPE) and question its capacity to circulate data. We will conclude by pointing out that this variety of data can blur the boundaries between official statistics and data emanating from para-public or private organisations, and between the measurement and evaluation of public policies.

The impact of energy aid providers on households: Evaluating effectiveness and pathways for improvement

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Since the onset of the energy crisis in 2021, the Dutch government has allocated a total of €550 million in funds to municipalities to support residents experiencing energy poverty in saving energy and improving their overall living conditions [1]. Many Dutch municipalities have chosen to use the received grants to deploy energy consultants, energy coaches, and fix team retrofitting, which we will refer to as *energy aid providers*. Existing research shows that these energy aid providers enhance residents' perceived residential comfort, and promote changes in energy consumption [2][3]. However, it remains unclear which approach adopted by energy aid organizations leads to the most positive impact on households' living conditions. This research therefore aims to identify the characteristics that constitute effective energy aid and assess to what extent these characteristics improve residents' living conditions.

The study was conducted in collaboration with thirteen organizations that provide energy aid in the Netherlands. These organizations distributed a questionnaire to residents before or after receiving energy aid. 1,877 residents participated in the questionnaire. We compared the living conditions of residents who received energy aid (N = 1,213) to those who had not yet received energy aid (N = 664). Effectiveness was defined as significant improvements in residents' living conditions related to energy poverty, such as residential comfort, physical and mental health, and financial concerns.

The findings highlight key characteristics of effective energy aid. First, local embeddedness is important. Energy aid organizations operating in municipalities for over five years are generally more effective in improving residential comfort (e.g., reducing cold or mold), physical and mental health (e.g., alleviating joint pain or depression), financial concerns, and loneliness

among residents. Their long-term presence and local embeddedness likely enable more effective identification of, outreach to, and assessment of the needs of residents most in need.

Second, energy aid workers who visit residents at least twice show greater improvements in physical health and sustainable behavior (e.g., lowering heating at night or optimizing washing machine use). Workers spending over four hours in total with residents further enhance residential comfort and physical health. Longer and repeated visits allow for tailored support and provide the regular feedback essential for fostering lasting behavioral changes in energy consumption. Conversely, organizations with fewer visits or shorter engagement times show no significant effects.

Third, organizations employing volunteers or workers from disadvantaged backgrounds improve residential comfort and physical health and reduce financial concerns. These positive findings might be explained by the intrinsic motivation of these volunteers and workers and the extra guidance and support they receive from the organizations.

Lastly, collaborations between energy aid organizations and social housing corporations significantly enhance residential comfort, physical and mental health, and reduce financial concerns and loneliness.

Our research emphasizes the need to refine energy aid approaches by strengthening collaboration between social housing corporations and energy aid providers, as well as securing structural funding from local and national governments. Structural funding is particularly essential to enable energy aid organizations to establish long-term local embeddedness – beyond five years – in the neighborhoods they operate in, which is a key factor in enhancing their effectiveness in addressing the needs of residents.

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Assessing the role of energy poverty expertise in exploring energy poverty challenges of young adults

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Expertise in the field of energy poverty has developed considerably in France over the last 15 years. Today, expertise plays a crucial role in tackling household energy poverty, as experts are able to identify the main challenges faced by households and provide appropriate solutions. However, it is essential to assess whether the current state of expertise is sufficient to address energy poverty difficulties faced by population groups that have so far been underrepresented in policy approaches. This study investigates whether expertise in the field of energy poverty effectively contributes to understanding and addressing the problem young adults.

Existing energy poverty approaches - both in academia and at the policy implementation level – have predominantly focused on population groups that are well known in the field of social policy. These groups include various types of households, particularly elderly people, single person households, families with children, but generally not people who are at the beginning of their adult life. This has resulted in overlooking critical energy poverty dimensions of young adults, including students, who are often experiencing situations of socio-economic precarity as well as precarious housing conditions. This gap raises questions about potential blind spots within energy poverty analysis, particularly concerning how knowledge is produced and whose perspectives are included. By examining the extent to which current energy poverty experts recognize and engage with the challenges faced by young adults, this study aims to assess the alignment between expertise and actual needs of this population.

Our research combines a review of the different existing data sources and analyses of the living conditions of this population on the one hand, and expert interviews on the other hand. It focuses on the city of Paris, where students and young adults are particularly exposed to housing affordability problems, which often result in this group being exposed to substandard housing or precarious housing conditions. This allows us to evaluate the scope and limitations of expertise in addressing energy poverty for young adults. Preliminary findings indicate that while experts provide valuable insights, certain epistemic biases and disciplinary silos may limit their ability to fully capture the lived experiences and constraints affecting young adults faced with energy poverty difficulties. The study highlights the need for further research on this population and for the inclusion of diverse knowledge systems to ensure a more comprehensive and equitable approach to better characterize young adults' energy poverty.

This research also contributes to ongoing discussions on the role of expertise in shaping research agendas and policies. It underscores the importance of assessing how expert knowledge is generated and applied, particularly when addressing issues affecting marginalized or underrepresented populations.

32: Exploring Fuel Futures and Circularity

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Session Chair: Marlon Philipp, TU Dortmund University, Germany

Session Chair: Antonio Gennaro Isopp, TU Dortmund, Germany

Session Chair: Paula De Pablos Sanz, Graz University of Technology, Austria

Circularity and the Future of Mobility: Bio-fuels and Energy Efficiency in the Indian Sugar Industry

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Bio-ethanol, produced from starch-rich sources, including sugarcane, corn, etc., has emerged as a cornerstone of sustainable mobility, offering a renewable and low-carbon alternative to fossil fuels. In India and other major sugarcane-producing countries, ethanol blending mandates are transforming transport systems, reducing greenhouse gas emissions, and fostering energy security. As the global push for decarbonisation accelerates, the sugar industry is positioned as a vital actor in advancing circularity in the mobility sector by leveraging its byproducts for renewable fuel production. To understand the circularity of bio-ethanol, it is essential to explore the circularity of the sugar value chain and how circular business models illuminate resource or energy efficiency practices within the sugar industry. This paper focuses on unpacking energy efficiency in the Indian sugar industry, examining how its circular business models optimise resource use and drive sustainability outcomes. Industrial energy efficiency is often conceptualised in the literature as a linear process focused on reducing energy demand, with limited attention to the sectoral, regional, and contextual dynamics. This paper examines the Indian sugar industry as a case, highlighting these complexities of energy efficiency, through the lens of circular business model archetypes such as expanded product value and industrial symbiosis [1–3]. The industry's energy efficiency value chain spans sugarcane cultivation, sugar processing, and the repurposing of byproducts into ethanol, bioelectricity, and bio-CNG. Efficiency gains are realised through biomass conservation, cascading value creation, and material efficiency, with ethanol production serving as a nexus for industrial, agricultural, energy, and mobility systems. Through the lens of circular economy business models, this study explores how firms in the sugar industry create, propose, and capture value from byproducts, focusing on variations in energy-efficient practices across cooperative, private, and public enterprises. For example, cooperative models prioritise socio-economic value for farmers, while private firms optimise economic value through technological efficiencies and profit maximisation. These variations reflect the influence of external drivers such as ethanol blending policies, co-generation incentives, market fluctuations, and ecological constraints on firm-level strategies. This research addresses two central questions: (1) How does energy efficiency manifest within

the sugar industry's circular economy practices? (2) What co-evolutionary factors shape business model archetypes and their value creation strategies? Using a co-evolutionary framework [4], the study analyses the interplay between institutional mandates, technological innovation, ecological conditions, and economic imperatives, revealing how these factors converge to shape energy efficiency and circular practices.
The methodology draws on a multi-case study approach, incorporating fieldwork in major sugarcane-producing states, semi-structured interviews with stakeholders, and analysis of policy documents. Abductive coding integrates theoretical insights with empirical findings, enabling a comprehensive understanding of the sugar industry's role in sustainable mobility transitions.
This paper contributes to the discourse on circularity in mobility by highlighting ethanol production as a transformative pathway for decarbonisation. While the sugar industry's circular practices enhance resource efficiency and renewable energy integration, they also reveal critical trade-offs, such as water resource pressures and inequitable value distribution among stakeholders. By contextualising circular economy principles within the sugar industry, this research advocates for tailored strategies that balance industrial priorities with broader sustainability and equity objectives in the mobility sector.
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Energy Orientalism: Identifying a power-knowledge dispositive in international energy transitions

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The 2015 Paris Agreement marked a pivotal moment in global climate action, with the challenging task of transitioning from fossil fuels to renewable energy at its core. While this transition presents different challenges for traditional fossil fuel consumers versus producers, energy transition research increasingly focuses on the distinct challenges faced by developing economies. As several economies in the Middle East and North Africa outline strategies to produce renewable energy, the framing of their experiences as "challenges" towards decarbonization may be questionable. While recent scholarship has begun to critique Western-centrism in energy transitions, denouncing this tendency as imbalanced or neo-colonial often falls short of providing adequate alternatives or explaining deviating phenomena. This article moves beyond simplified critiques to examine how power-knowledge relations manifest in energy transition research and implementation. Drawing on Foucault's dispositive concept and

a nuanced reading of Said's Orientalism, it introduces "Energy Orientalism" as a heterogeneous ensemble of strategic responses, scientific-technical knowledge, administrative-legal frameworks, philosophical-moral discourses, and institutional power relations that shapes how energy transitions are conceptualized, implemented, and evaluated. Using Morocco's emerging green hydrogen sector as a case study, this article presents findings from a two-fold Bourdieusian ethnographic approach: participant observation at a stakeholder workshop on green hydrogen sustainability criteria conducted in Rabat in June 2024, and semi-structured interviews with experts in Morocco's energy sector. The empirical investigation examines how different stakeholders navigate, contest, and transform established power-knowledge relations in energy transitions. By recognizing Energy Orientalism as a structural feature rather than simply a bias to be corrected, this framework enables more sophisticated analysis of how power-knowledge relations shape transition possibilities and outcomes, moving beyond binary critiques to examine complex interdependencies and institutional innovations in international energy cooperation.

The prospects and challenges to sustainable end-of-life management of electric vehicle batteries: the pathways to circular battery economy in Norway

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In our systematic literature review for the EMPOWER project (Sustainable Batteries in Mobility - (Em)powering a Net-zero Energy Transition), we found a range of environmental and social impacts at the end-of-life (EoL) phase of electric vehicle (EV) batteries. Different terminologies about the scope and boundary of the EoL phase have been discussed in the literature. Richa et al (2017:717) provides a management hierarchy framework for the EoL battery pathways: reusing, remanufacturing, recycling, incineration, and landfilling, depending on the context of battery industry and regulations. However, Hill et al (2023:13) discuss only two significant pathways for the EoL phase: reusing and recycling, and Cusenza et al. (2019:340) state that “reuse is preferable to recycling”, which is consistent with circular battery economy principles and the waste management hierarchy.

In light of the ‘circular battery economy’ notion, this study will provide insights into the key practices, policies and pathways of the EoL management of EV batteries in Norway. Due to the growing market uptake of EVs in Norway, the focus of discourses and policies have been largely on providing purchase incentives and necessary infrastructure for the use phase of EVs. In the next decades the need for the EoL management of retired EV batteries is projected to raise enormously in Norway, which creates not only a huge challenge to develop appropriate regulations and infrastructure for the EoL management of batteries (Noudeng et al. 2022:1) but a great opportunity for recovering large amounts of critical minerals (e.g., lithium, cobalt, copper, lead, etc.). A sustainable EoL management of retired EV batteries will reduce the reliance on extracting new raw materials for manufacturing batteries and therefore helping to decrease a number of environmental and social impacts in the battery lifecycle (cf. M. Wang et al. 2022:10; Noudeng et al. 2022: 5).

By discussing the pathways and practices of circular battery economy in Norway, we will provide insights into the possible patterns and discourses of sustainable EV batteries in Norway. For our analysis, we will use the results of the EMPOWER projects (e.g., reports, surveys, expert interviews, stakeholder workshop, etc.) in which the views of the key actors in the Norwegian battery industry are reflected. The key research questions are: How do Norwegian EV users comprehend the challenges to sustainable EoL management of EV batteries in Norway? How do actors across the value chain include these challenges in their business models and policies? What is the role of territorially based institutional & governance structure in enabling sustainable EoL management of EV batteries?

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33: Boosting Future Visions for Sustainable Mobility

Session Chair: Filipa Corais, University of Minho, Portugal

Transitioning to a new culture of mobility: The contribution of the Future Thinking Methodology

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This paper aims to reflect on the potential of the Future Thinking methodology to accelerate behavioural change towards sustainable urban mobility. The results presented contextualise the development of the European project Shared Green Deal - Social Sciences & Humanities for Achieving a Responsible, Equitable and Desirable Green. In response to the climate emergency, this project aims to contribute to the fulfilment of the zero pollution targets established in the European Green Deal.

Within the framework of the Sustainable Urban Mobility topic, and as part of this project, four partner cities were selected (Braga-Portugal, Sofia-Bulgaria, Galway-Ireland and Panevėžys-Lithuania) to set up an Urban Mobility Laboratory in a school context, adapted to the reality of each city. The main goal of the project was to accelerate changes in mobility behaviour in the context of school travel by creating institutional strategies capable of promoting more sustainable and intelligent mobility modes.

Around 60 young people (aged between 10 and 16) and 10 members of the school community, including teachers and carers, took part in the Braga Mobility Lab. The working sessions, which took place between June 2023 and January 2024, were developed in 3 phases, structured over 8 forums. A first phase of co-identification of local problems and needs related to the dynamics of the home-school journey. A second phase of Co-Selection & Co-Preparation aimed at prioritising proposed solutions and policy recommendations, which included a training workshop on the difficulties associated with the most vulnerable groups, particularly children. And a third phase of Co-Development & Co-Implementation dedicated to the systematisation and public presentation of the project's results.

The Shared Green Deal project did not limit the issues to the dynamics of changing the physical space, but brought to the debate urgent questions related to the social context itself. The Shared Green Deal project was, first and foremost, a project of social experimentation, where the concept of the city is emphasised by its convergence with the idea of *civitas* (Calix, 2013).

From this perspective, and in the context of the several forums held, the approach of the Future Thinking Methodology stands out for its potential to define more disruptive measures, capable of accelerating changes in behaviour and attitudes in favour of sustainable urban mobility. The comparative analysis carried out between the group of participants who worked within the

framework of this methodology, from a time perspective of 25 to 30 years, and the group who worked from a time perspective of up to 5 years, revealed significant differences in their understanding of the urgency of the problem. Although both groups identified the excessive number of cars as the main mobility problem in Braga, the solutions proposed by the first group were more radical and more in-depth in their interpretation of the impacts of the problem. This group also demonstrated a greater understanding of the relevance of decarbonisation for citizens' quality of life and greater convergence on the importance of defining a collective commitment.

In the context of social innovation, the Future Thinking methodology appears to have great potential in terms of its contribution to visioning the future and understanding the needs to achieve a new culture of sustainability.

Plant-Microbial Fuel Cells: A Promising Technology for Energy Transition

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Plant-Microbial Fuel Cells (PMFCs) emerge as an innovative solution in the realm of renewable energy, with the potential to address global challenges associated with energy transition and decarbonization of the energy sector. This technology relies on the generation of electricity from the symbiotic interaction between plants and soil microorganisms, harnessing the surplus of organic compounds released by plants during photosynthesis. Despite its potential, the large-scale implementation of PMFCs faces significant scientific, technological, and social challenges (Lepikash et al., 2024).

From a scientific perspective, one of the primary challenges is understanding and optimizing the interactions between plants, microorganisms, and system electrodes. The bioelectrochemical processes involved remain partially understood, particularly regarding the efficiency of electron transfer. Selecting plants that produce high amounts of root exudates and identifying microbial communities highly efficient in degrading these compounds are key areas of research. Additionally, ensuring system stability under variable environmental conditions is a major hurdle, requiring long-term studies on factors such as seasonality, temperature, and moisture content.

The scalability of PMFCs represents another significant challenge. Current energy efficiency levels are relatively low, limiting the commercial viability of the technology. Improvements are needed in the design of electrode materials, which must be highly conductive, durable, cost-effective, and environmentally sustainable. Moreover, system design must be optimized to

maximize electron capture and minimize energy losses. Another critical issue is the integration of these technologies into existing energy systems, requiring solutions that enable coexistence with other renewable sources such as solar and wind power.

From a social standpoint, overcoming the lack of awareness about the potential of PMFCs as a clean energy source is essential. Education and awareness campaigns can play a crucial role in promoting this technology. Additionally, pilot projects in rural communities can demonstrate the feasibility of PMFCs, particularly in regions lacking reliable access to electricity. To ensure social acceptance, ethical concerns related to land use for system deployment must be addressed, as well as potential impacts on local ecosystems.

Advances in scientific research, technological innovations, and social engagement are crucial to transforming PMFC technology into a viable and widely adopted solution, paving the way for a greener and more sustainable future.

Aware of the strategic role of Green Infrastructures for urban resilience and global sustainability, we developed and implemented project SEIVA - Energy Systems and Green Infrastructures for Agriculture, with the financial support of the Environmental Fund from the Portuguese Ministry of Environment and Climate Action. This project made it possible to install a demonstration unit of a green wall for practicing vertical farming integrated with PMFC energy systems, which has been encouraging and supporting the development of educational activities based on the Project Based Learning (PBL) methodology and the STEAM (acronym for Science, Technology, Engineering, Art and Mathematics) approach (Rodrigues et al., 2022). The project has included other awareness-raising, training and technical capacity-building actions, with the aim of promoting sustainable production and consumption models based on technological solutions inspired by nature, such as green infrastructures and plant-microbial fuel cells for bioelectricity production. Several experimental assays have been carried out to assess and optimise electricity production with different plants in PMFC systems, integrating citizen science initiatives.

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Assessing pathways for passenger mobility towards decarbonisation and sustainability

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The convergence of two pressing crises shapes the contemporary global landscape: the urgent need for a substantial and immediate reduction in greenhouse gas (GHG) emissions to meet climate targets and sustainable development goals, alongside increasing economic pressures, particularly within the European context. This dual challenge has significant implications for the European Union's development, with the transport sector emerging as a crucial area of concern. From 1990 to 2022, emissions from the mobility sector in the European Union have increased by approximately 25,9 per cent (European Environment Agency, 2025) and in 2022 accounted for 28.9 per cent of total national GHG emissions (European Environment Agency, 2024). Additionally, the impact of the transport sector goes beyond solely GHG emissions and leads to an increase in traffic congestion, accidents, noise levels and other external effects, contributing to delays, social and economic losses, and environmental degradation (Maier et al., 2023).

This underscores the urgent need for structural changes in passenger mobility to reduce environmental impacts, enhance the efficiency of transport systems and ensure long-term economic sustainability. In response, this study focuses on pathway development for passenger transport by 2040, comparing a baseline with enhanced scenarios that integrate Avoid-Shift-Improve (ASI) policies. The ASI framework consists of three core strategies: (i) Avoid, which reduces travel demand through spatial planning, teleworking, and behavioural shifts; (ii) Shift, which promotes a transition from private car use to public transport and active mobility; and (iii) Improve, which focuses on advancing vehicle technology, particularly through electrification and efficiency improvements (Creutzig et al., 2023 & 2018).

As a result, the study presents a multicriteria assessment of passenger mobility pathways comprising vehicle costs, carbon emissions, travel time, health benefits and other transport externalities. Furthermore, this study assesses all forms of ground-based passenger mobility, ranging from private cars to active mobility and passenger transport, while also covering various spatial contexts, from urban centres to rural areas, for more targeted policy development.

Our findings indicate that the key outcome of the implementation of the ASI policies is a reduction in both embedded and operational CO_2 emissions. This is primarily driven by a shift away from car ownership towards active mobility and public transport, along with increased adoption of low-carbon vehicles. Additionally, vehicle costs decline, mainly due to reduced reliance on private cars. Health benefits from increased active mobility surpass the remaining external costs, reinforcing the case for policies that promote walking and cycling. However, travel time may increase depending on modal shifts and potential changes in transit durations for specific groups of travellers.

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Why value conflicts matter – understanding normative tensions in Transdisciplinary Research on Sustainable Urban Mobility Transition

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This contribution aims to address the problem of value conflicts in inter- and transdisciplinary research on Sustainable Urban Mobility. From an ethical point of view, the transition to sustainable urban mobility is a normatively controversial project that is characterized by a multitude of value conflicts. For example, ecological values around sustainability and climate protection are often in conflict with economic interests and values such as economic growth and individual mobility. The value of individual freedom of movement often clashes with the need for a collective quality of life. Divergent values lead to intense societal debates about the future(s) of urban transport and mobility, but these debates are also shaped and constrained by institutional conditions and power hierarchies. So how do value conflicts affect efforts towards Sustainable Urban Mobility Transition within a collaborative research context? And how can researchers and co-researchers deal with the tension between moral convictions, normative demands, disciplinary backgrounds and associated values in cross-disciplinary projects? (Aschhoff und Vogel 2018; Kenter et al. 2019)

Assuming that research and development on socio-ecological transformations and respective conflicts (Sommer und Schad 2022) should be based on value pluralism, emphasizes the role of *value conflicts* in transdisciplinary or other participatory, cross-disciplinary research practices. Drawing on an ongoing case study on a transdisciplinary project on sustainable urban mobility transition, I will present a framework for understanding and navigating value conflicts. I therefore suggest approaching value conflicts not as obstacles to be eliminated and overcome quickly, but with analytical curiosity in order to understand deadlocked transformation processes. Hence, (value) conflicts can be seen as catalytic elements in the transdisciplinary research process. (Dietz et al. 2019) Dealing with value conflicts in modes of (self-)reflectivity contribute to a more reflexive, power-critical understanding of epistemic and social practices in research on Sustainable Urban Mobility (Fritz und Binder 2020). Building on integrated Ethics and Technology Assessment, this work-in-progress methodology is open to debate and further adjustments. The results of this study should foster a deeper understanding of the ethical dimensions of collaborative STS research in the context of sustainable transformation goals.

Title: A New Approach to Sustainable Development of Airport and Seaport Territories through Citizen Science – HubCities

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Decarbonizing energy-intensive industries represents one of the most significant challenges of Europe's climate goals, especially in urban areas shaped by airport and seaport infrastructures—so-called HubCities. These global trade and logistics hubs, with 347 airports and 3,024 seaports in Europe, are essential nodes for international exchange but consume vast amounts of resources and cause substantial CO2 emissions. This paper explores how the HubCities project is developing innovative approaches to address these challenges by integrating not only ecological but also social, economic, and spatial aspects of decarbonization. A particular focus is placed on the role of Citizen Science and participatory planning processes as tools for promoting sustainable, inclusive, and socially equitable urban development.

The HubCities project, awarded the Seal of Excellence by the European Commission in 2023, aims to develop decarbonization strategies that are ecologically viable and socially inclusive. A central element of this strategy is the active involvement of the local population in the planning process. Citizens are integrated into the entire decarbonization process, ensuring that their perspectives and needs are not only considered but actively incorporated into the development of solutions. This strengthens community engagement and ensures that the measures developed are widely accepted and sustainable in the long term.

A key mechanism of the HubCities project to promote public participation is Citizen Science. By actively participating in the collection, analysis, and evaluation of climate data, citizens contribute to transparent and participatory decision-making. This form of involvement not only improves public understanding of science but also transforms citizens into active participants

in the transition toward more sustainable urban environments. Especially in the context of airports and seaports, which often have significant industrial environmental impacts, the sustainable spatial integration of industries is seen as key to reducing emissions and improving resource efficiency.

Another central goal of the project is the improvement of public space quality. How industrial activities are integrated into urban environments has a significant impact on residents' quality of life and the social acceptance of decarbonization measures. The project aims to design surrounding industrial infrastructures in a way that meets ecological decarbonization requirements while also addressing social needs for accessible and livable public spaces. Here, collaboration with the local population plays a crucial role in developing solutions that meet both ecological and social requirements.

The HubCities project relies on case studies in various European cities, such as Graz Airport and the Port of Koper, to test decarbonization methods in urban contexts. These case studies not only serve as models for other cities worldwide but also provide valuable insights and best practices that can be applied to other HubCities. In this context, technologies like Open Data, the Internet of Things (IoT), and renewable energy sources are used in collaboration with local communities to drive sustainable urban transformations.

The project demonstrates how Citizen Science and participatory planning can work together to shape the transition to a CO2-negative future in energy-intensive urban areas. By involving the local population in the decarbonization process, it promotes not only ecological sustainability but also social inclusion and understanding of the necessary transformation. Additionally, it makes a significant contribution to Science and Technology Studies (STS) by highlighting the role of the public in shaping science and policy within the context of sustainable urban development.

Overall, the HubCities project contributes to creating cities that promote not only ecological but also social, economic, and spatial sustainability. It sets a critical precedent for sustainable urban development of airport and seaport areas, using innovative, participatory, and technology-driven solutions to create a livable future by improving the quality of space for all citizens.

Transition Management, Backcasting and Urban Design as tools for defining a methodology for promoting the Sustainable Urban Mobility

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In the next 30 years, it is estimated that 70% of the world's population will live or work in cities, and that the transportation needs generated by human activity in cities will have a major impact on the problem of climate change (Banister, 2008).It is therefore necessary to reallocate public space and change behaviors in this area.

Thus, with the main objective of defining and evaluating a *Methodology to Accelerate Changes in Behavior, Attitudes and Mindsets* (MACBAM) for the promotion of *Sustainable Urban Mobility* (SUM), a cyclical interaction between research techniques (from the social science) and action techniques (e.g. Transition management, Co-creation, Design of Public Space), evaluated by research techniques, was applied to a *Living Lab* in a neighborhood of Braga, as an exploratory case study.

The concept of *Transition Management* (Geels et al., 2008; Loorbach et al., 2015; Nevens & Roorda, 2014; STRN, 2010; Van den Bosch, 2010) emerged in the Netherlands as a methodology for accelerating systemic changes towards sustainability in society. In this action-research project, these methodologies are articulated in an innovative way with the design of the collective space through techniques from the *Urban Acupuncture* (UA) project (Lerner, 2003; M. de Solà-Morales, 2008), in a continuous interaction of experimentation, reflection and evaluation, consummating a logic of “learning-by-doing”.

Pan & Ryan (2024) suggest that social psychology can be a lever in defining interventions aimed at lasting behavior change. The combination of theories, especially the Theory of Planned Behavior (Ajzen, 1991), with the Transtheoretical Model of Behavior Change (TTM) (J. Prochaska et al., 1992; J. O. Prochaska & DiClemente, 1983; J. O. Prochaska & Prochaska, 2010), can contribute to encouraging positive, voluntary and permanent change in individuals' behavior.

Future Thinking (e.g. Mãnoa approach (Schultz, 2015), Three Horizons approach (Curry, 2015; Sharpe et al., 2016) and the creation of future scenarios also have the potential to influence the decision support of politicians and civil servants, contributing to building more sustainable agendas and mitigating climate change. In this way, the possibility of achieving an Extreme Vision through co-creation has the potential to shape more sustainable policies, practices and cultures and formalizes a new approach to governance.

The concept of “walkability”, in counterpoint (and re-evaluating) the traffic policy promoted throughout the 20th century, began in the 1990s (in North America, Europe and Oceania), in favor of the 3D`s: Density, Diversity, and Design (Cervero & Kockelman, 1997). The first two variables of the 3D theory (Cervero & Kockelman, 1997), Density and Diversity, have been widely studied, but the third, Urban Design (Gehl, 2010, 2011; Gehl & Svarre, 2013; Lynch, 2009),needs more research.

The use of Experimentation in an incubator has made it possible to analyze social phenomena in a real context, test research hypotheses and identify the causal effects of variables on

outcome measures. It also allowed the involvement of Transition Agents, promoting capacity building and mutual learning (between Researchers, Administration and Society) to change the current system to a more sustainable one with an impact on Structure, Culture and Practices.

34: The Potential of Gender and Intersectional Approaches in the Content of Research: Training of Young Researchers for a More Inclusive Research

Session Chair: Anne-Sophie Godfroy, Ecole Normale Supérieure - PSL, France

Session Chair: Clemens Striebing, Fraunhofer IAO, Germany

Session Chair: Anita Thaler, IFZ, Austria

How Gendered Innovation Practices Can Inform Policy Design

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Joanneum Research, Policies – Institute for Economic, Social and Innovation Research, Austria

Gendered Innovations are a requirement in many funding research programs. While this policy is already quite well practiced in research projects (Cederroth et al. 2024; Barr et al. 2023), less is known about how to integrate an inclusive perspective in innovation funding. Research Funding Organisations (RFOs) as key actors in funding innovation also address companies conducting research and innovation, the so-called Business Enterprise Sector (BES). From a fairness perspective, innovation funded with public money should be required to apply an inclusive approach, guaranteeing that they benefit broad parts of society. Following this political target, innovation funding agencies have developed different policy approaches to foster this target.

Within INSPIRE, the Centre of excellence on Inclusive Gender Equality in Research and Innovation funded in Horizon Europe - we have analysed four different policy approaches from four different RFOs, all aiming to enhance the inclusiveness of innovations. Our focus was on companies, which were involved in funded projects implementing (inclusive) gendered innovations. We were interested how gender and inclusiveness were addressed in the different steps of the innovation process (see abstract from Reidl et al.). Here we learned for example that identifying user groups and specifying subgroups plays a key role in these processes. Further on in the process, gender and inclusiveness are relevant when designing personas and scenarios, or when preparing samples for testing prototypes. We learned that collaborating

with research organisations already experienced in gender and inclusiveness is crucial for companies.

Building on the findings from companies, we have developed some conceptual reflections about different forms of inclusive innovations and their purpose. We discuss the role gender plays in different forms of inclusive innovation and how other inequality dimensions beyond gender are relevant. We conclude with potential implications for the design of inclusive innovation policies by national and international RFOs, built on empirical evidence from the Business Enterprise Sector.

With this presentation, we contribute to a better understanding of how gender and inclusiveness are addressed in innovation companies and translate this into implications for policy design. This way our findings can be picked up by innovation funders to advance the policy design on an evidence base.

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Why and how to bring gender and intersectionality in humanities and social sciences ? Ideas for the training of young researchers

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How do we know what we know? The importance of the social foundations of scientific knowledge has been highlighted by feminist work. Far from being 'neutral', knowledge production can be biased. Developing gendered and inclusive perspectives is a way of moving towards 'strong objectivity' (Harding, 1991).

Despite the interest in opening up new and relevant research questions and the fact that it is a mandatory requirement in EU-funded research, the integration of research as a gender dimension remains an area where the least progress has been made in promoting gender equality in the research sector (ERAC 2020).

The VOICES COST Action (2021-2025) explores how early career researchers can be trained to better integrate sex, gender and intersectionality in their research topics. It has organised a training school in 2023 and proposes tools and recommendations to better integrate gender and intersectional approaches in three different streams: Environment and Mobility, Health and Biology, Information Technologies.

In 2024, an additional stream, Humanities and Social Sciences, was introduced. In addition to developing gender and intersectionality perspectives in HSS, it has also stimulated reflection on the issues raised by this requirement at a more conceptual level. Incidentally, the integration of intersectionality and/or gender is far from being obvious and unambiguous: there are different ways of doing it, with different implications for the research itself.

The paper will explore a case study: the history of science. It is particularly relevant because the issues raised are transferable to other fields of HSS, and furthermore it adds value through the reflexivity it offers on science and the production of science. Using concrete examples, we will discuss three questions : Where to include gender and intersectionality in the history of science? Why? and How? The same questions could be applied to literature, political science or any other field of HSS.

The paper discusses these three questions (where, how and why) in turn and proposes to reflect on the benefits and transferability of this approach in the conclusion. It also provides the first practical elements for training researchers and evaluation panels, and for taking action to create an environment that facilitates gender and intersectionality research, with easy access to objects of study and methodological tools. To summarise the findings of the paper: there is a need to include gender and intersectionality in the "canon" of HSS fields, the case of history of science illustrates what this means and it is easy to imagine how it can be transferred to other fields. It also provides some interesting ideas for transfer beyond HSS to other scientific fields.

Data Feminism in Media AI Systems: A Workshop Approach

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The integration of gender and intersectional approaches in research is crucial for achieving strong objectivity and addressing biases in knowledge production (Harding, 1991). This research explores the design, conduction, and effect of a workshop on Data Feminism (D'Ignazio & Klein, 2020) given to data scientists in a large Dutch Media company. Four of the participating data scientists are PhD students collaborating with the company for their research. Initial, ongoing, findings from qualitative interviews and a content analysis of data science papers reveal that data scientists often conceptualize diversity and bias in statistical terms, with limited intersectional awareness. Despite some understanding of societal issues, these perspectives are not reflected in their data science work. To address this issue, an interactive workshop on Data Feminism was design and conducted, focusing on the application of feminist principles to current projects, including recommender systems, computer vision, and automatic speech recognition.

Data feminism provides a framework in which discussions around biases and power dynamics within the AI landscape are allowed to flourish. Previous research has already demonstrated the potential of feminist principles to enhance the inclusivity and fairness of AI systems (e.g., Browne et al., 2023; D'Ignazio & Klein, 2020 & 2024). Additionally, Ørngreen and Levinsen

(2017) have demonstrated the utility of workshops as means, practice, and/or research methodology which can aid participants in understanding complex work and knowledge processes.

The Data Feminism workshop was recorded and analyzed to understand how data scientists react to and discuss feminist principles. Follow-up interviews and ethnographic observations were also conducted to assess any changes in the work practices and perceptions of the participating data scientists. The purpose of this study is to understand how data scientists respond to feminist principles and to reflect on the effectiveness of workshops on their perceptions and/or work practices. The results indicate that while data scientists initially struggle to integrate feminist principles into their work, follow-up interviews and observations reveal a gradual shift in their understanding.

The research builds on earlier work that highlights the importance of considering multiple dimensions of identity and their intersection in technology design and analysis (e.g., Grzanka et al., 2023; Wajcman, 2009). Furthermore, this study contributes to the ongoing discourse in feminist STS by demonstrating how feminist theory, knowledge, methods, and epistemologies can be applied to interrogate and address the biases and power dynamics inherent in AI systems. By examining the reactions and adaptations of data scientists to feminist principles, this research sheds light on the potential for transformative change within the field of data science. The findings underscore the importance of interdisciplinary approaches and the need for continued efforts to promote inclusivity and fairness in technological development. As such the research has practical implications to the field of STS by highlighting the challenges and opportunities in integrating data feminism principles into data science work, providing valuable insights for future research and practice.

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Gendered Innovations in Practice: Experiences from Austria and Sweden

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This presentation explores the implementation and impact of two funding programs at the beneficiary level, both designed to integrate inclusive gender innovation into research and development: the FEMtech research projects (Austrian Research Promotion Agency FFG, Austria) and the Norm Critical Innovation funding program (Vinnova Innovation Agency, Sweden).

The case studies were conducted as part of the Horizon Europe project *INSPIRE - Building Europe's Centre of Excellence on Inclusive Gender Equality in Research and Innovation* (https://inspirequality.eu/) and draw on our previous research on the integration of gendered perspectives in research, innovation and funding processes. In our previous research, we approached (inclusive) gendered innovations from different perspectives: On the one hand, we integrated inclusive approaches into our FEMtech research projects and reflected on our experiences (Reidl et al. 2022, Reidl et al. 2023). On the other hand, we analysed the funding perspective, focusing on how to integrate inclusive perspectives into R&I and its funding concepts (Schiffbänker 2023, Palmén et al. 2020). In addition, as part of the INSPIRE project, we conducted a recent literature review on the concept of gendered innovation (Karaulova et al. 2023).

The two funding programs we analysed in the INSPIRE project approach inclusive gender innovation with different methodologies. In this presentation, we aim to take a closer look at the beneficiaries' experiences in implementing (inclusive) gendered innovations and the effects these funding programs had on them.

Our research examined the contextual frameworks of these two funding schemes, as well as their characteristics. Through interviews with program managers, reviewers and beneficiaries, we analysed the practical implementation of gendered innovation at both the funding agency and project levels. Particular attention was given to companies as beneficiaries, addressing questions such as: *What was the motivation to carry out a research project as part of a gendered innovation funding program? How was gendered innovation implemented in practice? What knowledge and capacities were available for this implementation? Which tools and methods were used? What learnings, outcomes and outputs emerged? What would the beneficiaries need from the funding agencies to support their efforts in implementing gendered innovation?*

The findings highlight both the successes and challenges of integrating gendered perspectives into innovation processes, shedding light on beneficiaries in particular. By presenting these two case studies, this contribution supports the dissemination of good practices for integrating gender into the research process, highlights learnings and identifies room for improvement.

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Beyond 'green' hydrogen: Imagining feminist energy futures for all

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'Green' hydrogen is currently regarded by policymakers as a promising bridging technology and praised for its potential role in transitioning from fossil to sustainable energy carriers as part of the energy transition. However, in the pursuit of green hydrogen, the ubiquitous growth paradigm responsible for climate change is not questioned at all: hydrogen is portrayed as a key technology that will lead us into a climate-neutral future with infinite 'green' energy, in which we will not have to alter our lifestyles in any way (Sovacool & Brossmann 2010).

At the same time, tendencies of 'green colonialism' can be observed (Lang, Manahan & Bringel 2024), where resource exploitation and 'green' hydrogen production in the Global South reinforce existing colonial power structures (Löw 2024; Tuana 2016). These processes exacerbate existing inequalities rather than promoting a socially and ecologically just transformation (cf. Kaijser & Kronsell 2013; Rule 2014; Dunlap 2021).

Besides that, feminist critique highlights the lack of gender-sensitive engagement with both the causes of and responses to the climate crisis in general (MacGregor 2009) and, more

specifically, in the organization of global energy systems (Pueyo 2020; Dematteis et al. 2021). For instance, MacGregor (2009) identifies androcentrism in approaches to solve the climate crisis, wherein a historically rooted socio-ecological problem is reduced to a purely scientific, technological and at times militarized question of the future.

Feminist Science and Technology Studies analyze how hegemonic notions of masculinity shape technological developments and their societal integration (cf. Haraway 1988; Wajcman 1991). Technological innovations are often portrayed as ostensibly neutral or universal solutions, while in reality, they reproduce specific power structures and exacerbate existing inequalities (Ernst 2021; Paulitz 2012).

In the paper, we aim to investigate the dominant conceptualization of 'green' hydrogen as a technological solution for future energy systems through an interdisciplinary approach that combines Gender Studies with Science and Technology Studies. Drawing on Jasanoff's concept of the *sociotechnical imaginary* (2015), we critically analyze these visions for addressing the climate crisis and explore alternatives (cf. Felt 2015). We seek to advance an intersectional approach toward socio-ecological justice (Dematteis et al. 2021; Tuana 2016; 2023; Löw 2024; Müller, Tunn & Kalt 2022) by examining the masculinity constructs underlying this sociotechnical imaginary. In particular, we aim to challenge the techno-optimistic androcentrisms.

We want to open up space for different sociotechnical imaginaries of feminist energy futures for all, that emerge out of radical activism and alternate knowledge creation, coming from the periphery rather than the center of power. For example, Özge Yaka (2017, 2023) shows in her empirical research in the Eastern Black Sea Region, how the embodied relation of the local women with 'their' river, to be used for hydropower generation, influences the women's radical opposition against said technology. Drawing from Cueva's (2023) narrative-based research with members of a to be 'modernized' marketplace in Mexico City, we seek to explore creative, collective forms of imagining the future of the energy transition.

Inspired by Laura Watts' interpretation of Donna Haraway's work (2016), we endeavor to understand "how these energy futures came to be and how we might remake them—so that we have options" (Watts 2018: 14). With this analysis, we aim to contribute to a vision of radical (intersectional) feminist energy futures less oriented on monetary gain for a few, but instead on distributing energy justice, responsibility and care equally on all humans and more-than-human nature (Puig de la Bellacasa 2017).

35: The past, the present and the future of queer STS

Session Chair: Anita Thaler, IFZ, Austria

Session Chair: Magdalena Wicher, Vienna Science and Technology Fund, Austria

Queering the Creative Binary? Cultivating Creative Identities in Creative District Projects

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Amid growing political advocacy for creativity as a cornerstone of economically viable and socio-ecologically desirable futures in a post-growth world, urban creative districts have emerged as tools for this reimagination. Situated at the nexus of technological advancement and cultural reform, they ostensibly unite diverse creative spheres – including creative and artistic (sub)cultures and technology-focused start-up scenes – and serve as experimental sites for more democratic, sustainable, and inclusive urban futures. While existing research often evaluates successful innovation and creative sectors in these districts through market-oriented frameworks, this study critically interrogates the cultivation and co-stabilization of worthwhile creative cultures and innovation. It hereby approaches creative districts as socio-material manifestations of entrenched hierarchies that define desirable forms of creativity, innovation and the respective identities of the "creatives" within a city's sociopolitical constitution.

Employing the conceptual lenses of *Regional Innovation Cultures* (Pfotenhauer et al. 2023), *Seeing Like a State* (Scott 1998) and queer-feminist STS sensibilities, this research comparatively analyzes eight creative district projects in Munich and Bristol. In addition to traditional semi-structured interviews and short-term qualitative ethnographies, it integrates poetic text and comic-reminiscent ethnographic drawings as simultaneous modes of gathering and analyzing material. These artistic practices foreground slow and careful observation, reveal abstracted meanings, and challenge the researcher's own gaze to foster different paths of reflexivity regarding the usually non-transparent labor of transforming ethnographic experiences into abstract theory.

The findings explore the notions of the "creative binary" and the "queering" of creative politics of innovation policy. Despite their potential as negotiation sites for more systemic and inclusive transformations, creative district projects paradoxically fail to transcend binary categorizations of creative identities. Attempts to "queer" urban innovation through practices and products that focus on mutual understanding of diverse social needs are hence choked by the persistent binary valuation of creative contributions. Informed by gendered norms and power dynamics, creative districts impose an unequal and essentialist dichotomy between economically driven, rational (tech) innovators – stereotypically associated with the male – and socially driven, emotional creatives – stereotypically associated with the female. Due to the restricted

institutional readability, state rationales and (financial) valuing systems force involved actors to “pass” as either one of the two categories to participate in creative districts, shifting the focus from transformative desirable practices (what you do) to constrained creative identities (who you are).

Ultimately, creative districts tend to reproduce hegemonial power hierarchies and economic imperatives by imposing technocratic visions of urban transformation while externalizing social and ecological responsibilities to non-profit creative actors. This research contributes to STS discussions on counterhegemonic forms of reflexive innovation policy and urban future-making by underscoring the need to reimagine governance frameworks and valuation systems that genuinely counteract structural inequities. It advocates for embracing diverse creative expressions and collective agency in the pursuit of socio-ecologically viable urban transformation approaches.

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Queer/ing and Trans/ing Feminist Science and Technology (Studies) with the example of Assisted Reproductive Technologies (ART): Insights and Outlooks

Doris Leibetseder

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Using my research on queer and trans assisted reproductive technologies (ART) as a lens, I demonstrate the potential for queer(ing) and trans(ing) STS to contribute to our understanding of the normalization, domination and epistemic violence in contemporary societies. However, the need and potential implications of queering and transing STS extend beyond the disciplinary boundaries of STS. Queer and trans STS also encompasses a queering and transing of the boundaries between disciplines such as STS, Gender Studies and Philosophy (Ethics). Within these intra and multi-disciplinary parameters, queer- and transfeminist STS grapples with questions around the definition and production of just technologies as well as entrenched norms in technological procedures and scientific research (Mamo and Fishman 2013). These considerations and debates are shared by the fields of ethics and especially bioethics, where biopower and bodily implications of biomedical practices are prominently discussed. STS’s focus on justice also represents another potential benefit of integrating queer and trans STS into other disciplines, where inequality, technoscience practice and society more broadly can be positively impacted (Fishman 2017, 392 -396).

My own research exploring ART illustrates this necessity of this inter and cross-disciplinary integration and as another crucial point of queering and transing STS the importance of queer and trans ethical and political solidarities based on different intersectionalities and

interdependencies. I can give a short overview on past (queer)-feminist STS discourses about ART and I am interested in the contemporary two-way exchange of influence between queer and trans practices of making kin shape ARTs, and exploring how ARTs are both queered and transed (and thus, are queering and transing ARTs and society), while also impacting queer and trans making of kin.

With this insights and outlooks I would like to contribute to your workshop.

The past, the present and the future of queer STS

Anita Thaler, Magdalena Wicher

IFZ, Austria

In 2008, feminist STS researchers in Graz began to discuss queer-feminist literature in a ‘reading circle’. This initial reading group gradually developed into a working group whose critique of heteronormative and binary gender concepts (i.e. a queer perspective in the original sense) was just as important as questioning the power mechanisms of scientific organizations. Against the backdrop of the economization of science, questions of social justice and intersectionality became relevant both as research content, but also from the perspective of those affected from discrimination. In 2011, the working group officially named itself 'AG Queer STS' (AG as in “Arbeitsgruppe”, German for working group) and has been working together loosely but continuously ever since. Since 2016, the working group publishes the “Queer-Feminist Science and Technology Studies Forum” on their website https://queersts.com, a freely accessible, transdisciplinary, multimedia online journal. The journal is dedicated to one topic each year and used by the queer feminist community in- and outside academia. Topics ranged from “Queering the Class in Academia”, “Interfaces of Queer Technologies and Sexualities” to “Academic Kindness” and the latest issue on “Queer-Feminist Solidarities in Times of Social and Political Turbulences”.

For this workshop, we invited papers and discussion inputs to present past and current issues of queer-feminist STS. In the second interactive part, we include the audience in a knowledge co-creation setting to discuss emerging topics of interest for the feminist STS community and start creating the future of queer-feminist STS.

37: Cultivating Participation: Pathways to Shared Innovation

Session Chair: Elisabeth Frankus, Institute for Advanced Studies, Austria

Session Chair: Erich Griessler, Institute for Advanced Studies, Austria

Participatory approaches in techno-scientific innovation in Austria. Experiences and Challenges

Erich Griessler, Elisabeth Frankus

Institute for Advanced Studies, Austria

Citizen participation is still a marginal phenomenon in the Austrian research landscape, despite a vibrant scene of researchers using participatory methods (e.g. Dörler & Heigl, 2023) and a few established but small funding programs. Despite the peripheral position of citizen science in Austria, a number of initiatives have emerged in recent years to promote citizen participation in research and innovation in various fields. These have largely been inspired by European trends in research funding, characterized by buzzwords such as Responsible Research and Innovation (Griessler et al., 2022), citizen science and open science.

To illustrate Austrian approaches to public engagement in research and innovation, the presentation draws on evaluations of three recent examples of participatory research in the country (Frankus et al., 2023, Starkbaum et al., 2021, Neundlinger et al., 2023).

In all three cases, the use of participatory methods was intended to increase the usability of the research results and to ensure that the research meets the needs of users and potentially affected parties. The cases differed in terms of the type of actors involved, as well as the voluntary nature, interest and commitment to participate. Citizen participants in two projects expressed high levels of satisfaction with their involvement. The integration of lay participants in the third project was more challenging, as it proved difficult to integrate them into the research and create a shared culture that would allow them to open up more to the research question. Making citizen participation happen was sometimes challenging. First, recruitment, especially of less visible groups, was sometimes difficult. In these cases, support from gatekeepers and incentives, financial in some projects, helped. Second, gaining and maintaining the commitment of lay participants was also a challenge. Third, participatory research also means extra work for researchers in terms of learning new attitudes, methods and skills. Finally, power asymmetries remain a challenge in participatory research. Researchers in one project emphasized that they are the ones ultimately responsible for the quality of research in the projects and therefore have a duty to address quality issues. Challenges to the quality of results can arise because of the complexity of the research and the quality standards required for scientific research. This can be difficult for lay participants, especially for vulnerable groups, as it can also be physically demanding and time consuming. The cases showed the need for realistic expectations about what lay participants are able and

willing to contribute. In one project, lay participants or their representative organizations were also not regular project partners, which also leads to an imbalance of power.

Citizen participation means changing routines. It is often a disruption of the way things are usually done, the established roles to be played, the way systems work. As the cases show, lay participants have to rethink and take on different roles than usual: as students, as patients, as employees. Researchers, teachers, civil servants, doctors, research funders, etc. involved in participatory research also have to reflect and change their roles and routines. This also means that self-perceptions and perceptions of others have to change in participatory research. Participatory research also depends, and this is another important point, on the commitment of research policy and funding.

The GreenTouch project: Exploring Co-Creation at the Intersection of Climate, Health, and Technology

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The FFG funded project GreenTouch explores how Extended Reality (XR) technologies can help to address the interconnected challenges of climate change, sustainability, and health. XR, encompassing VR (Virtual Reality), AR (Augmented Reality), and MR (Mixed Reality), enhances learning through embodied cognition and emotional effects in immersive scenarios. Users experience situations like overcoming climate crises and integrating planetary health principles.

Framed within this planetary health framework, which emphasizes the interdependence of human and ecosystem well-being, the project explores the potential of XR to enhance climate competency among occupational therapists and support patients in adopting therapeutic practices that align with climate-friendly principles. This approach aims to generate co-benefits for health and sustainability by making planetary health principles more actionable and relevant in everyday therapeutic contexts.

At the core of Greentouch lies a co-creation process that actively engages interdisciplinary stakeholders, including occupational therapists, clients, XR technologists, climate communication experts, sociologists, ethicists, and a dramaturg. This participatory approach ensures that the development of the XR prototype is informed by real-world needs and expertise, maximizing its future relevance and usability. By fostering emotional engagement and experiential learning, the prototype aims to enhance the capacity of occupational therapists and their clients to address planetary health challenges while maintaining a focus on client-centered care.

The proposed presentation focuses on the preparatory phase of the co-creative process, shaped by interdisciplinary insights and participatory design principles. Initial findings include:

Expert Interviews: Insights from diverse professionals reveal strategies for integrating planetary health into practice, such as leveraging XR's potential for experiential learning, fostering emotion-driven narratives, and addressing barriers like accessibility and technological adoption.

Literature Review: Key themes include integrating sustainability principles into practice (Aoyama, 2014), highlighting the need for approaches that connect ecological and occupational health. Additionally, the review emphasizes addressing power dynamics in co-creation processes to ensure equitable participation and fostering inclusivity by incorporating diverse perspectives and removing barriers for marginalized groups.

Ethical Frameworks: Guided by the Pro Ethics framework (Wiarda et al., 2024), we address ethical complexities, including data privacy, equitable access, and the inclusivity of participatory research.

GreenTouch aspires to demonstrate how co-creation, guided by interdisciplinary research and the principles of planetary health, can generate actionable solutions at the intersection of climate, health, and technology. This approach contributes to broader conversations on participation, sustainability, and innovation, showcasing the potential of participatory research to foster meaningful, transformative change.

In our presentation, we will discuss the process of designing inclusive tools, aligning diverse perspectives to improve XR prototypes, and leveraging XR as a participatory medium for advancing climate and health education.

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Traversing cognitive spaces : Material samples for harnessing tacit knowledge | experiences with experimental negotiation methods

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Whenever a problem definition (1) needs to be negotiated in design/research projects, we consider it particularly important to offer a common basis for discussion for as many different people involved or affected as possible. We would like to introduce and discuss in this panel a way to bring areas into focus that are often difficult or impossible to address: the immeasurable repertoire of tacit knowledge (2,3) that each participant brings with them is too valuable and too influential to be left unused and unquestioned in sensitive situations. Moreover, the method presented can be used to navigate and overcome deadlocked situations by harnessing tacit knowledge, thus offering an unusual approach to reaching agreement, especially when language proves insufficient or begins to exclude some of the participants (for whatever reason). With the help of material samples in a test tube, we involve discussion partners who would otherwise be unable or unkeen (afraid?) to contribute.

In previous research, we have explored how material samples can serve as tangible gateways to access tacit knowledge. (4) Our first promising experience with this unconventional approach was in workshops with commercial clients, where we asked participants to negotiate their corporate identity using the symbolic power of carefully selected material samples in test tubes. This stimulated thought processes that went beyond verbal communication (5) and provided an unusual, unique perspective on the issues being negotiated. The participants represented different, even opposing positions within the organization, and the tangible elements helped overcome the limitations of traditional language-based negotiations. This low-threshold, tangible, non-linguistic approach brought movement to a discussion that seemed frozen at first glance.

The material samples presented in (large) test tubes, are carefully selected to represent different aspects of the problem at hand. As participants handle and reposition the test tubes, previously unheard voices are expressed, breaking through a blockage that language alone could not overcome.

Venturing beyond the realm of language allows for the collaborative exploration of tacit knowledge, creating an alternative space for negotiation. The tactile exploration of material samples opens a gateway to insights that otherwise may remain hidden. (8) Alternative ways of understanding a situation can lead to deeper understanding, but – as we delve into the non-linguistic realm, uncomfortable questions arise about how to translate findings back into language and who is authorized to do so. Exploring tacit knowledge helps to uncover insights that contribute to a more universally supported consensus. But the critical question about translation remains. We recognize, however, that we have only scratched the surface of what could be a powerful tool for groups seeking to make balanced decisions and validly incorporate tacit knowledge into discussions. We want to argue that it goes beyond arbitrary processes and captures hidden goals more precisely than language alone would allow. While many questions remain, we hope to share our insights and deepen each other's understanding of how this method can and should be used, and where its limitations lie.

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39: Knowledge Structures and Epistemic Infrastructures

Session Chair: Franziska L. S. Sörgel, Karlsruhe Institut for Technology, Germany

Session Chair: Judith Hartstein, German Centre for Higher Education Research and Science Studies (DZHW), Germany

Rethinking Epistemic Infrastructures through Feminist Perspectives: The Role of Experiential Knowledge

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This paper explores the relationship between knowledge structures and epistemic infrastructures, with a particular focus on the integration of experiential knowledge into scientific practices. Using case studies from participatory digital health initiatives and feminist self-help movements, the analysis examines how marginalized perspectives and lived experiences challenge established epistemic hierarchies. Specifically, the paper investigates the role of archives, repositories, and digital platforms in connecting different knowledge forms, including positive knowledge, non-knowledge, and negative knowledge.

Addressing epistemic blind spots within conventional scientific frameworks, this contribution highlights the transformative potential of grassroots infrastructures in fostering epistemic diversity. Key questions include: How do feminist movements utilize non-traditional infrastructures to fill knowledge gaps? What role does negative knowledge (e.g., understanding errors, exclusions, and inefficacies) play in reshaping collective epistemic practices? How can participatory approaches democratize the transitions between the known and the unknown?

By proposing a reimagining of scientific infrastructures, this paper argues for inclusivity, intersectionality, and co-production of knowledge as central principles. It advocates for a shift away from epistemic conservatism toward infrastructures that better reflect the complexities and pluralities of lived experiences. The findings contribute to a broader understanding of how feminist theorizing and practice can inform the evolution of epistemic infrastructures and advancing critical discourse in Science, Technology, and Society Studies.

Sustainability by Numbers? Technologies of Government by Numbers for Sustainable Planning and Building Construction

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From the outset, global sustainability policy was linked to political technologies of quantification, but the Agenda 2030 with its 17 Sustainable Development Goals (SDGs) has turned quantification into a global epistemic infrastructure and the apex of quantification at the level of global sustainability policy (Miller 2005; Tichenor et al. 2022). It provides a common language for debating *what counts* and forms a key element in the Agenda 2023 strategy to localize the SDGs, coupled to the rise of indicators, measuring and monitoring systems. STS research, however, has amply demonstrated that often *only* what is counted counts, whereas matters that are not easily translated into numbers get overlooked (Miller 2001; Turnhout at al. 2014). This paper looks into a field where the transformation towards sustainability is extremely urgent and imperative: the field of urban planning and building construction. It examines a set of instruments that are widely used today to promote the implementation of the SDGs in this field, involving elements of quantification in one way or other, namely sustainable city awards and rankings, local sustainability reviews, and sustainable building certificates. It explores how these instruments work, how they refer to the SDGs, and in particular how they address matters of social sustainability and how social sustainability is defined through these technologies.

These instruments, I will argue, can well be understood as technologies of governing by numbers in the tradition of Foucault and Governmentality Studies (Mennicken & Espeland 2019; Miller 2001; Nelson Espeland & Stevens 2008; Rose 1991). Quantification forms a key component of government by numbers, but in addition to producing, communicating and deploying numbers, it is also characterized by forms of guiding and steering the conduct of others that operate more indirectly through setting framework conditions or providing incentives and reward, rather than through law, prescription, prohibition, or command.

The paper concludes that in the field of urban planning and building construction, the strategy of localizing the SDGs has so far not yielded the formation of standardized, empirically measurable and cross-locally applicable indicator systems. The development of such indicator systems is most advanced in the case of privately marketed sustainability certification schemes for buildings and urban districts. Those systems, however, translate social aspects or social sustainability overwhelmingly as meaning health, safety, user comfort and convenience whereas matters of social equity, justice and inclusion are rarely addressed at all. In doing so, they largely reduce the meaning of social sustainability to parameters that can be measured and marketed.

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Making sceptics into believers: The incorporation of epistemic objects into epistemic infrastructures

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Practicing research often means to deal with epistemic objects as a proxy for interacting with other researchers. Epistemic infrastructures -- systematic collections of epistemic objects which are subject to epistemic practices -- are thus a fundamental prerequisite for research. Epistemic infrastructures as providers of epistemic objects as resources have gained attention, i.e. as 'knowledge infrastructures', and 'research infrastructures' have populated the academic world as well as the political and the STS discourse.

However, this discourse is astonishingly decoupled from considerations on knowledge production and epistemic objects as products. With my work, I aim at closing this gap by theorizing the transition of epistemic objects from product to resource. This transition, I argue, manifests in the incorporation of an epistemic object into an epistemic infrastructure. The incorporation of an epistemic object into an epistemic infrastructure demarcates the 'before' from the 'after'. Before the incorporation, the epistemic object is created as a product, and after an epistemic object has been incorporated, it is made available as a resource.

My considerations are starting out from a dialogue between the perspective of interaction in the social system of science (Cocozza, 2023; Goffman, 1963; Storer, 1966) and the perspective of collective rationality (Solomon, 2001) together with a science-as-culture perspective (Knorr Cetina, 1991). I argue that epistemic practices with epistemic objects in connection with epistemic infrastructures retroactively affect the acting persons. I suggest that epistemic infrastructures mediate the transfer of 'scientific truths' from the few to the many along the two dimensions of a) time: the 'before' and the 'after' of the incorporation of thing into

an epistemic infrastructure, and b) trust: the 'sceptics' towards and the 'believers' in epistemic claims.

In my talk, I discuss these theoretical considerations with reference to two case studies of epistemic infrastructures: a peer reviewed journal and a software archive/repository. By comparatively describing these distinct infrastructures, I peel out control, controllability and trust as essential characteristics of epistemic infrastructures. Believers and not-yet-believers interact with others through objects and infrastructures, thereby building trust which likely establishes them as believers. Epistemic infrastructures make it possible that not each and every one has to scrutinize all resources all by themselves but the presence in an infrastructure delivers a heuristic of a resource being trustworthy. So individual decisions by researchers aggregate on a community level and affect the individual researchers again: while trust is an individual action, scepticism is organized.

Epistemic imaginaries: changing directions in scientific fields

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In this paper, I investigate how epistemic imaginaries change in response to societal challenges like the climate crisis. I define epistemic imaginaries as textual or visual representations of an ideal set of future achievements within a research field. Such future achievements range from 'holy grails' of the field to be awarded with a Nobel prize, to generic and mundane assessments of what, realistically, can be expected to be achieved in the near or not so near future. By defining what can be realistically be expected, epistemic imaginaries inform research agendas, directly by stating or suggesting something is impossible to achieve, or indirectly, by foregrounding other priorities. I am interested in how scientific agenda setting processes respond to societal demands and pressures such as an aging population or the climate crisis.

Typically, science and innovation policy aim to change research directions by offering funding and adding conditions. Often, however, disappointment follows when researcher behave opportunistically, for instance by relabelling their research. This paper has another starting point and asks how directions in science appear in the first place.

Empirically, I study the fields of plasma chemistry and neurodegeneration research (including studies on Alzheimer's disease and Parkinson's disease). In the two chosen research fields, I delineate epistemic imaginaries and investigate how these - in the last decade - have changed by societal pressures. I will trace epistemic imaginaries by (i) interviewing researchers in the field, both established and newcomers; (ii) analyzing review articles; (iii) studying agenda-building activities at conferences, such as programs, welcoming lectures, state-of-the-art overviews and (panel) discussions. In these sources, I will trace epistemic imaginaries by delineating texts, symbols, graphs and images that circulate in a field. In addition, I will consult the media coverage of the field. While such popular representations may differ from internal

repertoires, public accounts of researchers about the importance of their field help to corroborate the findings. I will formulate tentative insights into how epistemic imaginaries change, with pathways, stages and mechanisms.

Theoretically, the paper bridges two STS perspectives: the sociology of expectations and studies on epistemic cultures. The former is interested in the performativity of promises in science and innovation and studies how futures shape current research and technological developments. Studies on epistemic cultures stress the diversity of scientific practices and deny the unity of a single scientific method. Knorr-Cetina defines epistemic cultures as "construction of the machineries deployed in fact construction"; they comprise discipline specific heuristics and criteria of what counts as good arguments and good data. The interest in epistemic cultures emerged from laboratory studies in the 1980s; it continues to be prominent in STS research. The theoretical aim of the paper is to clarify epistemic imaginaries and to specify their roles in the frames of epistemic cultures.

To improve the governance of science, such insights are important and urgent. As epistemic imaginaries frame the direction of

science, they may facilitate or hinder change for the better, too.

Tracking Knowledge and Power Dynamics in the Scientific System

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Our knowledge is a dynamic construct shaped by individuals and collectives and their institutions, norms, methods or instruments, and deliberate restrictions (e.g., Berger & Luckmann, 1966; Fleck, 1935; Hitzler, 2013). In this talk, I want to explore knowledge as a multifaceted structure and network comprising (1) positive knowledge as knowledge about how things work and that is voluntarily shared, (2) non-knowledge (e.g., Mittelstrass, 1996) as knowledge we do not (yet) have, and (3) negative knowledge (Oser, 2005) as knowledge individuals have about things and processes telling about how the same do not work. The latter, I observed, is not to be shared deliberately (Sörgel, 2024). All three forms reflect distinct power dynamics and relations within the scientific system and society. Foremost, I want to explore the actors of knowledge production and those who control the dissemination of new and developing knowledge within scientific communities. At the heart of this contribution lies the development of a 'map' that visualises the movement and traces of knowledge – its flows, distributions, and deliberate interruptions within the scientific system (that can be epistemic infrastructures (Hedstrom & Kind, 2006)). This map aims to illuminate the mechanisms of sharing and withholding knowledge and the resultant power dynamics.

Through this map, epistemic infrastructures can be pivotal nodes in these dissemination processes. They mediate access to knowledge objects (e.g., Daston, 2000; Leighton, 1907) and shape how knowledge is shared or constrained. The analysis investigates how authority over knowledge is established within the scientific system, examining how these structures

mediate access to knowledge and privilege certain epistemic frameworks over others. Within this process, we can expose a broader sociocultural phenomenon deeply intertwined with the 'democratic fabric' of society. Through the meanwhile tradition of citizen science, we know that emphasising specific forms of knowledge may delineate boundaries between what is considered legitimate expertise and what is excluded, thereby shaping public trust in science as an institution. By scrutinising these dynamics, we confront fundamental questions about transparency, equity, and the participatory role of the public in the co-creation and dissemination of knowledge (e.g., Marres 2012). As Latour (2004) argues in *Politics of Nature*, how knowledge is produced and framed has profound implications for how we conceptualise the democratic legitimacy of science. Similarly, Jasanoff's (2004) *States of Knowledge* explores how science intersects with policy and society, revealing the power structures that underpin epistemic authority.

This investigation situates the scientific system within a broader network of sociopolitical relations, recognising that the construction of knowledge is inextricably linked to the distribution of power and the negotiation of competing interests. In doing so, it interrogates the epistemological hierarchies inherent in scientific practice and reflects on their consequences for the inclusive and equitable production of knowledge in a democratic society. Is it possible to determine where interpretive authority is situated within the scientific system and whether only a specific type of knowledge is being distributed? What does this imply for our scientific system and the associated democratic understanding of knowledge production? The deliberate withholding of knowledge – whether driven by political, economic, or ethical motives – raises critical questions about the responsibilities of science and its actors.

Tracing the movements of knowledge – whether shared, redirected, or withheld – this map should provide a framework for understanding the broader dynamics of knowledge.

With this approach, I seek to decode the power structures and epistemic processes underpinning the generation and dissemination of knowledge, offering a critical foundation for rethinking the role of science and epistemic infrastructures in society.

"Dark Species" and "Dark Taxa" as Known Unknowns

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The scientific concepts of „dark species" and "dark taxa" are still rather new; like "orphan disease" in biomedicine, "dark species" and "dark taxa" in biodiversity research hint at a lack of attention, knowledge and data on certain epistemic objects, in this case: species or taxa. Speaking of "dark species" and "dark taxa" thus acknowledges and specifies non-knowledge beyond the limits of knowing. It exemplifies a state of "knowingly not-knowing" (cp. the discussion to known unknowns in Wehling 2006) and informs "[n]egative knowledge [as] knowledge of the limits of knowing, of the mistakes we make in trying to know, of the things that interfere with our knowing, of what we are not interested in and do not really want to know" along Knorr Cetina's (1999: 64) detailed her understanding of 'negative knowledge'. It also

links to Oser's (2005) more practical use of the term 'negative knowledge' as knowledge about "what something is not, (in contrast to what it is), and how something does not work, (in contrast to how it works), which strategies do not lead to the solution of complex problems (in contrast to those, that do so) and why certain connections do not add up (in contrast to why they add up)" (Oser and Spychiger 2005, p. 26, quoted from Gartmeier et al. 2008). Finally, "dark species" and "dark taxa" link to Hess' (2016) conception of 'undone science' that fails to inform industrial transition movements.

In this presentation, I reconstruct how the notions of „dark species" and "dark taxa" have emerged in taxonomy, biodiversity research and biodiversity conservation during the past two decades based on literature research. Drawing on an ongoing study of current digitalisation practices at natural history museum and in biodiversity research, I discuss the role of basic and applied research, (molecular) paradigms, (sequencing) technologies, (barcoding) initiatives, (datafication) trends and (data) infrastructures. I also address the relevance of social movements like biodiversity conservation, of institutions like museums and universities, of specialties like taxonomy and of characteristics of distinct groups of organisms. I conclude that – as with Knorr Cetina's earlier (1999) reconstruction – the biodiversity researchers' culture of non-knowledge (Böschen et al. 2010) differs from that of particle physicists, even with the distinct awareness of unknowns depicted by the concepts of "dark species" and "dark taxa" and the explicit verbal reference to physics' "dark matter". But it also differs from the epistemic culture Knorr Cetina ascribed to molecular biologists. The new interest in "dark species" is triggered by a shift in the researchers' horizon of epistemic care: what is it that we should know and what is hence still missing?

Crafting Ocean Knowledge: Understanding Marine Observation through the Construction of Monitoring Technologies

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Stretching over the earth's oceans, marine observation networks like the *GOOS* or the *ICOS Ocean Thematic Center* are attributed a pivotal role in assessing the bio-geo-chemical dynamics of the Earth system (O'Malley et al. 2009, Sullivan 2020). These networks have thus become central to the production of environmental and climate change knowledge, directly informing political decision-making. Large-scale data is collected aboard research vessels, through permanent monitoring stations, and in collaboration with private-sector ocean carriers—so-called *ships of opportunity*. This data not only feeds into climate models but is often made publicly accessible– unlike the conditions of its production.

In the social-scientific study of scientific innovation, experiments and revolutions, measurement has for a long time been black-boxed as unproblematic technical object (Rheinberger 2006), instrumental process or has been reduced to its result of datafication, while an interest in scientific data infrastructures has only recently developed (Brodie et al. 2024). Still, technology in science often is held to be the objects stabilising it (as materialization of positive knowledge) and setting the conditions for its reproduction. It is often attributed with

the role of setting more or less stable boundaries for scientific advancement, understood as work around epistemic objects. This contribution seeks to unpack the processes involved in the realisation of marine monitoring, focusing on the non-technical aspects of constructing, maintaining, applying, and advancing marine research technologies.

Drawing on ethnographic fieldwork at a marine research institute focused on the Baltic Sea, I will step back from data networks to the stories of how these monitoring facilities are built at the intersection of scientific projects and engineering practice. The case of the Baltic Sea – one of the fastest-warming seas in the world – supports a perspective that is sensitive to scalar translations between local knowledge production and planetary epistemics. Following diverse forms of translations – ontological, epistemic, paradigmatic, cultural and semiotic – it is revealed how engineering practice realises the construction of marine observation technology *for* and *as* science. I will demonstrate how these translations are accomplished by local aspects of engineering culture and practice, including networks of reciprocal exchange, tacit knowledge, culture-building myths and mechanical imagination. I will show that while stable ideas – like an understanding of problems as *errors found*, or the Baltic Sea as the *incalculable factor* (see Crockford 2020) – as well as handed-down best practices do shape the work, they do not change its tinkering nature. In order to understand the messy, iterative nature of problem-solving and the ongoing negotiations of technical and environmental challenges, it is helpful to assume a perspective that is sensitive to engineers', technicians' and chemists' accounts (Garfinkel 1967) of *what it is they do*. This allows to approach the construction of measuring technology as the production of it being a technical (thus stable and instrumental) matter.

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Paradoxes of Ignorance: The Role of 'Not Knowing' in the Site Selection for a Repository for Nuclear Waste

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The search for a final repository for high-level radioactive waste poses a current and unprecedented challenge in the global context: How to guarantee a safe containment of material that is harmful to the environment and people for up to 1 million years? For this purpose, Germany is relying on a science-based and participatory procedure. However, time requirements due to the complexity and expense of outstanding research work are increasingly pushing the decision into the distance. While the site selection law (StandAG) originally aimed for a decision by 2031, a final selection was postponed until between 2046 and 2068.

The article provides a sociological analysis of the role of ignorance and raises the question of how specific ways of interpreting and processing the 'unknown' influence the site selection procedure in Germany. To answer this question, the article combines a social theoretical discussion and conceptualization of ignorance with empirical results of a qualitative discourse analysis.

Drawing on social constructivist theories, such as systems theory (Luhmann 1992) and actor-network theory (Latour 2008), it is argued how non-knowledge forms an independent object in relation to knowledge, developing its own social and political relevance. Following current approaches in the field of sociology of ignorance, the article explores and discusses types and conceptions of 'not knowing', such as dimensions and cultures of ignorance, making it a tangible object for empirical analysis. Ignorance is conceptualized as a contingent, socially constructed definition of meaning, referring to what must, can, or should be known. The relevance and production of ignorance in the German site selection procedure are illustrated, using debates on seismic activities and temperature development as examples.

The results of an empirical discourse analysis are then presented. The sociology of knowledge approach to discourse (SKAD) combines social constructivist, pragmatist, and post-structuralist approaches and is used to empirically reconstruct ignorance as a discursive object and knowledge constellation (Keller 2010). The analysis focuses on the legal foundations and political implementation of the site selection procedure. Various publicly available text materials were analyzed, including legal documents, position papers, expert opinions, and documented public debates.

The results illustrate how the site selection procedure oscillates between different understandings of controllability, responsibility, and the temporal stability of non-knowledge. The procedure's structures establish spatial, but not temporal, boundaries of ignorance, creating paradoxes in the relationship between knowledge and non-knowledge. The self-description of the procedure as "science-based" and "participatory," along with its practical implementation, leads to an inability to commit to (especially temporal) boundaries and responsibilities of non-knowledge. Consequently, the procedure fails to establish an internal, socially constructed definition of the finiteness of ignorance, which is crucial for decision-making processes from a social theoretical perspective. This generates conflicts of ignorance, resulting in procedural paralysis, as evidenced by the political decision to postpone the site

selection. In an international context, this highlights a unique phenomenon within the German site selection procedure.

In conclusion, the article argues for a recognition and further research on dimensions and cultures of ignorance and their essential role in the implementation of precautionary and environmental policy, as well as their implications on science-based political decision-making processes in general.

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Tacit Dimensions in Interfaces – Relational Cognition

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Countless interactions with physical objects that happen every day flawlessly dissolve in our usual behaviour, while we are hardly aware of these interactions: brushing teeth, making a phone call, eating, washing our hands, driving a car, riding a bycicle, using public transport, working on a computer, writing texts. The only occasions when these interactions surface in our conscious awareness are when the interaction itself is either unexpectedly joyful or the intended flow of actions is interrupted: a bottle seems impossible to open, an automatic sliding door does not open as expected, a person is unable to operate the elevator because she is carrying groceries in both hands, the ticket machine is so complicated or buying a ticket takes too long that the passenger misses the bus. Most of the time the user knows what she is expected to do with certain objects – she can read the Affordances (Norman 1988, Gibson 1973) in her surroundings. But how is this kind of communication possible? Our design practice helps us explore how Affordances are designed into objects and how this concept also needs the responding human beings to be able to read or perceive what things are able to tell them. Having discussed the possibilities before (Egger, 2022) and pointed out which responsibilities lie in that kind of relationality for designers, who are able to design that process of translation (Latour), we are interested now in ways of knowing and forms of (tacit) knowledge in “between“: how is knowledge “distributed” between objects and users?

Since language cannot sufficiently address the phenomena in question, we are always complementing our research in design projects with collecting observations, short videos and photos of everyday interactions, because they help immensely in discussing certain aspects of the phenomena under investigation. Another important question concerns the dissemination of this kind of knowledge. One way, also explored in „Stummes Wissen“ (Egger, 2022) is

revisiting the gathered material in a virtual exhibition on forms of tacit knowledge in design, taking place in a conceived, virtual room, enabling the authors not only to convey findings but also allowing for further insights.

Questioning everyday interactions is vital for designers. However, trying to precisely understand the fundamental mechanisms of how the communication and the understanding between humans and things actually happens is essential for everyone who is designing in the broadest possible sense of the word. By conceptionally grasping such an intangible but astoundingly common everyday phenomenon, we aim to facilitate fellow designers of all fields with conceptual tools that allow them to better think about, talk about and argue their work. For this presentation we want to deep dive into the concept of tacit knowledge as Polanyi originally described it, we want to explore what the two terms of tacit knowledge (Polanyi, 1966) in detail could mean for designers and researchers alike.

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40: From global to local: Enabling inclusive and democratic agri-food system transitions

Session Chair: Anita Pinheiro, Independent Researcher, India

Session Chair: Neha Sehra, Delhi University, New Delhi, India

Rethinking Cultivated Meat: Accounting for Animal Futures in the Debate for a Just Food Transition Beyond Hype and Contestation

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The emergence of cultivated meat and fish, presented as a groundbreaking innovation with the potential to mitigate the ethical and environmental harms of traditional animal agriculture, has provoked both optimism and intense controversy. While proponents frame this technology as a solution to global food security, health challenges, and animal welfare concerns, its political, social, and ethical implications remain hotly contested. This paper critically examines cultivated meat as a socio-epistemic practice, highlighting how it not only reshapes ethical norms but also mobilizes conflicting political alliances, including those between animal rights organizations and traditional meat industries. Although these alliances may appear pragmatic, they reveal deeper ethical compromises and raise crucial questions about the true implications for animal welfare in this emerging food system (Ferrari and Lösch 2017).

The contemporary debate centers on the potential of cultivated meat to drive a sustainable food transition, positioning it as a pivotal innovation within the growing field of alternative proteins. Despite advances in bioreactor technology and cost-reduction methods, such as animal-free cell media, significant challenges remain—particularly in scaling up production and securing regulatory approvals. Early commercial introductions of cultivated meat in Singapore (2020), followed by its launch in the US and Hong Kong, initially sparked widespread optimism. However, growing political and social resistance—manifested in bans on cultivated meat in Italy, the US, and initiatives in various European countries—underscores the entrenched resistance to changes in agricultural practices. This opposition is often driven by a denial of the ecological impacts of animal food production in the context of climate change and biodiversity loss, coupled with a defense of animal husbandry as a cultural heritage that fosters a connection to nature, including practices such as transhumance tourism and the protection of locally sourced products (Ferrari 2024).

Amidst the complex landscape of hype and political contestation, which pits defenders of industrial livestock farming and its lobbying power against progressive calls for change, crucial ethical dimensions remain overlooked. On both sides, the debate on cultivated meat is largely confined to theoretical or speculative discussions, with insufficient attention to the evolving, practical implications of this technology—particularly in regard to its continued reliance on animals in the production process. This paper identifies a critical gap in the discourse,

specifically the lack of comprehensive assessment of the impact on animal bodies and the potential futures of animals still implicated in the production of cultivated meat and fish (cf. Dutkiewicz, J., Abrell 2021). This gap distorts our understanding of the normative dimensions of this innovation, offering an incomplete picture of its consequences.

To address these shortcomings, this paper proposes the integration of Science and Technology Studies (STS) and foresight methodologies, explicitly focused on the implications for nonhuman animals. Such an approach can ensure that the roles and futures of animals are central to ethical and policy frameworks, fostering more comprehensive and nuanced discussions about the role of cultivated meat and fish in a just and sustainable food transition.

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Is there Enough? Examining the Acknowledgement of Planetary Boundaries and the role of Sufficiency Narratives as part of the Bioeconomy Discourse

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The concept of the bioeconomy encompasses the production and use of biomass, from its agricultural, forestry or marine source to its use as food, raw material or energy. In the EU, the understanding ot the concept oscillates between envisioning a potential high-tech future in which bio-based materials enable additional economic growth, or emphasizing biomass as a necessary means to replace fossil resources in a world characterized by reduced overall consumption. This research aims to better understand these divergent narratives among current bioeconomy stakeholders in Germany and implications of these narratives for equity, growth and climate change mitigation.

Since its inception in the 1970s, the concept of the bioeconomy has evolved from a Club of Rome-influenced vision of sufficiency, to the promise of technology-driven economic growth, to green growth and sustainability. Recent debates seem to have returned to the concept's roots by increasingly emphasizing sufficiency, degrowth, and equity, raising the question of whether and how these new interpretations manifest themselves in the German discourse.

First, the work focuses on the recognition of a biophysical limit as an upper guard rail of biomass production, to explore whether the narratives acknowledge that there may not be *enough* biomass to meet the demand of meeting nutritionally needs and provide additional energy and materials. Second, it asks whether the bioeconomy narratives, based on the first,

or independently, integrate a demand reduction perspective under the premise that humans could achieve *enough* or higher life satisfaction even with lower energy and material use, e.g., sufficiency or degrowth.

To arrive at a conclusion, a Q-methodological approach is applied, in which German bioeconomy stakeholders are asked to reflect on the promises they associate with the bioeconomy. In a series of online workshops, 30 stakeholders from different backgrounds (politics, industry, science, NGOs) were asked to evaluate 26 statements on a Q-grid based on their level of agreement. The statements are taken from a non-scientific literature review and represent the full range of possible views on the bioeconomy. After the Q-sort, the respondents are interviewed on their sorting. The individual sorts are used as input for a factor analysis, which is interpreted with the help of participants' written comments and the statements from the post-sort interviews. The emergent factors reveal the common views and the underlying differences in perspective.

The results of the qual-quan method presented here shed light on a fragmented discourse and provide a better insight into the fuzzy boundaries of the bioeconomy concept. In doing so, the work is able to improve our understanding of the evolution of this transition discourse over time, and the role of growth, global justice, and climate mitigation in the different narratives identified.

Gene-edited crops in India: A frame analysis of scientific, public, and policy discourses

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Introduction

Food insecurity remains a pressing challenge in many third-world countries, including India. Over the years, scientific innovations like the Green Revolution have played a crucial role in addressing this issue. Today, attention has shifted to modern advancements such as genetically modified (GM) foods and gene-edited crops. While GM foods have faced criticism due to environmental, ethical, and social concerns, gene-edited foods are often seen as a safer, more precise alternative with fewer regulatory and ecological hurdles.

However, despite their promise, gene-edited foods are not without controversy. Questions about their benefits, risks, ethical implications, and long-term effects continue to spark debate. Surprisingly, there is limited research on how social, economic, environmental, and political factors influence these discussions, leaving a critical gap in understanding the broader context shaping this technology's future.

Public and policy conversations around technological innovations play a vital role in shaping how society accepts new technologies. When it comes to gene-edited foods, it's important to understand how they are presented and discussed in public and policy spheres.

Objectives

This study delves into whether gene-edited crops are perceived and framed differently from genetically modified (GM) foods and explores the social, economic, and political factors that influence these perspectives.

Methods

This study uses a frame analysis approach to examine policy documents, scholarly articles, and media content, uncovering the dominant narratives around gene-edited crops. By interpreting these frames and their broader social, economic, and political contexts, the research identifies key discourses and sheds light on how social structures, government policies, and power dynamics shape the conversation.

Findings

The study revealed that the discourse around gene-edited crops in India is shaped by three dominant perspectives:

Market-Liberal Perspective: This frame positions gene editing as a driver of economic growth, innovation, and export competitiveness, with strong support from private sectors, think tanks, and some policymakers. It highlights reduced regulatory hurdles and the potential for technological self-reliance under initiatives like "Make in India."

Agrarian Perspective: Rooted in concerns about corporate control and the commodification of agriculture, this narrative is championed by civil society groups and advocates of traditional farming. It calls for solutions that prioritize farmers' autonomy, environmental sustainability, and organic practices.

Equitable Development Perspective: This nuanced frame emphasizes that the impacts of gene editing depend on its implementation. It advocates using the technology to benefit marginalized communities, promote sustainability, and address structural challenges like hunger and inequality without deepening social and economic divides.

Conclusion

The study highlighted the influence of India’s socio-political context, including past controversies with GM foods, government policies promoting innovation, and farmer realities, such as limited awareness and resistance to corporate-led initiatives. While gene editing offers transformative potential, its acceptance and integration require addressing ethical concerns, long-term ecological impacts, and equitable access to its benefits.

Decolonial Futures in Coffee and Cacao: Bridging Farmers' and Scientists' Assemblages for Sustainable Agroforestry

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This paper focuses on distinctions and interplays between smallholder farmers' and scientists' practice assemblages in Aceh Gayo and Bali, Indonesia. Throughout this investigation, I aim to *privilege relations over categories* by offering an agroforestry perspective on what can constitute "decolonial futures" in coffee and cacao production. Approaching these practices as performed by assemblages of interrelating humans and nonhumans (Callon, 2007), I argue that such relational approaches challenge the often-silenced political dynamics of knowledge productions and values interconnectedness of social and ecological systems. Political assemblages composed of many forms of relations allow one to be explicit about the role of power in performing practices without neglecting the importance of other relations, such as care and solidarity. The unequal relations are pinpointed to different alternatives, associations and knowledge generated by farmers and scientists that coexist with each other. What farmers' assemblages ultimately afford is a constant dialogue between plural ways of knowing as multiple coexisting forms of socio-material relations. Framed by qualitative methods, I used various data collection techniques such as interviews, photovoice and observations. By integrating critical Science and Technology Studies (STS) with decolonial thinking, this work contributes to ongoing efforts to reshape knowledge production within the coffee and cocoa supply chain towards a more equitable future, where local and Indigenous perspectives are not only included but foregrounded as central to agroecological innovation and sustainability.

Reimagining Agri-Food Systems: Glocal Perspectives, Prefigurative Technologies, and Grassroots Justice

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Agri-food systems connect global sustainability challenges with local socio-economic realities. While contributing to climate change, they hold transformative potential. This contribution examines how grassroots initiatives, aided by socio-technical design, can drive just and sustainable agri-food system transitions. Drawing on research in the Foodsharing community in Siegen, Germany, it explores grassroots-driven food-sharing and resource practices addressing food waste, inequitable distribution, and unsustainable production.

The studies (Engelbutzeder et al. 2023a & 2023b) reveals that grassroots initiatives are uniquely positioned to address sustainability in agri-food systems due to their bottom-up approaches, which emphasize local knowledge, community engagement, and socio-political advocacy. Collaborative practices like redistributing surplus food and sharing seeds and knowledge promote environmental sustainability and social equity. Shifting focus from surplus management to fostering abundance, grassroots initiatives challenge traditional economic

paradigms. Abundance transcends material excess, fostering sustainable systems where resources are shared equitably, supporting resilience, community cohesion, and ecological balance.

This contribution integrates the concept of 'glocal', emphasizing the dynamic interplay between global sustainability strategies and their adaptation to local contexts within grassroots initiatives. Glocalization refers to scaling practices that respect and leverage local knowledge, values, and capacities while aligning with broader global objectives. Grassroots initiatives can scale horizontally (meshing) by replicating adaptable, locally grounded models that form a mesh. This approach of cultural sensitivity bridges global frameworks and local realities, ensuring inclusive and impactful transitions.

Central to this research is the role of socio-technical design in supporting grassroots initiatives. Digital platforms like Foodsharing.de and Telegram enable community building, coordination, and scaling. The study highlights the importance of designing socio-technical systems that are adaptable to local needs while fostering broader sustainability goals. For example, integrating prosumption practices (combining production and consumption) into grassroots food-sharing initiatives carries the potential to enhance community resilience and food system sustainability.

Moreover, this abstract delves into the notion of (re-)distributional justice within agri-food system transitions. It explores how grassroots initiatives confront and negotiate fairness in the distribution of resources, addressing systemic inequities. By prioritizing equitable access to food and resources, these initiatives redefine justice not merely as equality but as the redistribution of power, resources, and opportunities.

This contribution also introduces the concept of prefigurative technology (Engelbutzeder et al. 2024), which aligns means with transformative ends by embedding community values into the design and use of socio-technical systems. Prefigurative technology fosters experimentation and envisions sustainable futures. In the context of agri-food system transitions, it emphasizes designing technologies that not only meet immediate community needs but also prefigure broader systemic changes toward equity and sustainability.

In aligning with recent discourse (Doggett, Bronson, and Soden 2023), this contribution acknowledges contrasting future visions for agri-food systems: the conventional profit-oriented production model versus an alternative model emphasizing sustainability and community-led practices. It calls for a nuanced understanding of the socio-technical imaginaries shaping these systems, advocating for a broader consideration of diverse perspectives and the intricate interplay between technology, sustainability, and community practices.

The findings contribute to Science and Technology Studies (STS) by emphasizing the socio-political dimensions of grassroots practices within agri-food system transitions. This research advocates for reimagining agri-food systems as spaces of collective innovation and resourcefulness, where socio-technical design not only mitigates environmental impacts but also fosters socially just and democratically governed practices.

References (short):

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Engelbutzeder et al. (2023). From surplus and scarcity toward abundance: Understanding the use of ICT in food resource sharing practices.

Engelbutzeder (2024). Utopian Design Space: Practical Concerns and Transformative Ambitions.

Doggett, O., Bronson, K., & Soden, R. (2023). HCI research on agriculture: competing sociotechnical imaginaries, definitions, and opportunities.

42: Co-creative approaches (learning spaces) for (agro-)biodiversity-positive and socially just transformative changes

Session Chair: Sandra Karner, IFZ, Austria

Session Chair: David Steinwender, IFZ Graz, Austria

Session Chair: Anita Thaler, IFZ, Austria

Two sides of the same coin: exploring destruction and creation for biodiverse landscapes

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The multifaceted social and ecological crises confronting human and nonhuman communities are becoming increasingly clear to untrained eyes, with extreme weather events, growing geopolitical tensions, and displays of extreme wealth contrasted to extreme poverty shaping day-to-day media communciations. Scientists, too, are sounding the alarm regarding climate catastrophe and irreversible biodiversity loss, calling for imminent action (Pörtner et al, 2021). Proposals for change towards conservation of biodiversity sound from different ideological corners, yet critical scholars like Massarella et al. (2021) arguing that many proposals tend not to consider power, politics, justice, or alternative knowledge. In order to explore initiatives with potential for transformative system change, this case study considers the grassroots socio-environmental movement of the *Brigadas Deseucaliptizadoras* in Galicia (Northwestern Spain) who fight against the invasion of eucalyptus and acacias in Galicia. The hegemony of eucalyptus and acacia in the Galician landscape today is due to various historical sociopolitical changes, where especially the Francoist dictatorial regime from 1936 to 1975 undertook large-scale interventions into Galician common lands in pursuit of a vision of productive forestry through monoculture plantations, machinery, and scientific forestry knowledge.

Through acts of destruction, the *Brigadas Deseucaliptizadoras* eradicates monocultures from the Galician landscape to "re-root the commons" as González-Hidalgo et al. (2024) have eloquently put. Their mission to change the Galician landscape hinges on the understanding that ecological and social change are inextricably connected, and thus the initiative engages in biodiversity restoration and the revaluing of traditional (knowledge) practices, through destruction. Once or twice per month, the group gathers together with a commons community to work together to remove undesired trees from their lands. In Galicia, a fourth of the territory is under communal management, with the region counting more than 3,000 commons communities. The aging population and the fall in rural population make the eradication of monocultures very difficult for many communities, who simply do not have the human power nor money to engage in such works. By collaborating with the *Brigadas Deseucaliptizadoras* these communities are able to battle invasive eucalyptus and acacia trees.

In this paper, I explore the way this grassroots movement works towards a desirable future for the Galician landscape to be achieved through destroying particular, unwanted trees. The paper sets out a) how practices of destruction create more biodiverse futures, b) how traditional practices are made relevant to said transformations, c) what knowledge practices inform acts of destruction, and finally d) how *Brigadas*' interventions not solely seek to change the species that make up the landscape but also call for concomitant social change. The case study raises important issues regarding knowledge practices and the inextricability between nature and culture within transformations towards more biodiverse landscapes.

Nature-based turn in climate action and co-production of just mangrove knowledge

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Global climate action now witnesses an increasing focus on Nature-based Solutions in complementary to techno-centric solutions. This work-in-progress paper explores how this Nature-based turn shapes co-production of knowledge for socially just coastal transformation.

The knowledge required to address complex challenges is produced across different knowledge systems and communities (Bandola-Gill et al, 2023). The ways of producing knowledge and how different actors are involved in its processes are inextricably linked to power and authority over the knowledge and its application. Co-production of knowledge, envisioned to address the power issues in knowledge production so as to overcome 'both social and technoscientific determinism' (Jasanoff 2004), has been increasingly applied in environmental governance, natural resource management, and climate action (Gerlak et al 2023).

This paper focuses on co-production of knowledge in mangrove restoration projects which is gaining rapid attention globally as a Nature-based solution for climate adaptation, mitigation, and resilience building in coastal areas. Globally, mangroves provide ecosystem services and supports local livelihoods such as fishing. Besides, it also supports unique type of salt-water-

based traditional paddy farming in certain areas like Kerala in India. Although science-based programs with community participation is endorsed in many parts of the world to restore the lost mangrove stretches, there is a dearth of knowledge on how plural systems of knowledge production engages with each other and how it impacts social justice in the transformation processes. In this context, this paper aims to explore

(a) How do co-production of mangrove knowledge (or the lack thereof) in Nature-based climate action shape local livelihoods?

(b) How are justice considerations incorporated into research and policy on mangrove restoration projects?

Using the conceptual lenses of co-production of knowledge and environmental justice, this paper analyses primary and secondary data on mangrove restoration projects in coastal islands in Kerala, India.

The research highlights high levels of top-down and grassroots initiatives for mangrove restoration which, in many aspects, functions parallel to each other. Although mangrove restoration was already an agenda of state and central governments, the debates on Nature-based climate action has boosted these efforts in addition to attracting private funding for climate mitigation, adaptation, and resilience building. Community participation and local adaptability have received key importance in the policy documents while its practical implementation might warrant further investigation to unravel '*who'* constitute these communities and how the prevailing social hierarchy operates in these participatory mangrove restoration initiatives. The research highlights that understanding power relations in knowledge politics in climate action and its implications should go beyond the binary narratives of local/traditional knowledge Vs Western knowledge.

The research also highlights the significance of epistemic, procedural, distributive, recognitional, and restorative justice principles in co-production of knowledge that recognise socio-ecological functions of mangroves and strengthening local livelihoods. Such holistic understanding and consideration are pertinent to make such restoration interventions to be productive instead of mere expansion of the mangrove area.

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Gaia Gartenberg: Learning about perspectives on diversity and biodiversity in a garden for and by women*

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Three years ago, it was unforeseeable that a green space, initially designated for the construction of a base station for a cable car, could become the foundation for a new park.

As part of the Graz transdisciplinary case study “Biodiverse Edible City” within the Horizon Europe project PLANET4B, a community garden for and by women*[1] was established on the edge of the Eggenlend neighbourhood on the aforementioned green space. The overall case study focused on decision-making regarding biodiversity (whether in favour or opposed) and its connection to intersectionality. The planning and implementation phase of the garden created two learning spaces: one at the policy level and one at the citizen level.

The first space involved the development of a Public-People Partnership between the project group, represented by the Forum Urbanes Gärtnern, and the relevant departments of the City of Graz. In this process, both parties' interests, needs, possibilities, and resources had to be negotiated to implement a non-commercial initiative. The initial phase focused on creating a garden for and by women*, with the potential for further developments in subsequent years.

The second space emerged from setting up a diverse group of women* (varying in age, origin, and socioeconomic status) who built the garden and explored and reflected on various perspectives related to biodiversity, social diversity and privilege, using creative research methods, such as community mapping, socio-scientific-issue teaching, storytelling and an experience-stroll.

The conference presentation will delve into the methodological learnings from this process.

[1] We understand the word women* as being inclusive for all people (sometimes) identifying as women. We don’t want to hold on to the binary system but as for many garden participants the queer approach of a non-binary gender system is quite new and not applicable to them, so we decided to use this term.

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From the ‘Fertile Crescent’ to Walmart: Alternative politics for agricultural innovation systems

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With the discovery of archeological sites bearing first signs of domesticated wheat in the region dubbed as the ‘Fertile Crescent’, popular historians have linked emergence of civilizations to agricultural surplus (Diamond, 2005; Harari, 2015). They also caution that agrarian landscapes come with exploitative social institutions such as private property, surplus accumulation, inequality, and colonialism. Given this linear path dependent trajectory of human history, to sustain the global human population (predicted to be 9 billion strong by 2050) the predominantly imagined future of food is to improve upon these agricultural principles, and endure its maladaptive social and environmental externalities (Grunwald, 2024). However, it has been argued that this narrative is constructed on cherrypicked archeological evidence, fitted around ideas of social theorists such as John Locke and Rousseau, and often used as the ethical basis for colonial capture of indigenous lands (Graeber & Wengrow, 2022). It is also the basis for modern agricultural science to promote their innovations as solutions to a lack of productivity or resource efficiency- an approach termed as “lyseology” within critical innovation systems research (Braun, 2024, p.2). This lyseology has been applied in the colonial (Pouchepadass, 1995), as well as post-war agricultural research and policies (Kumar, 2016). Even though the critiques of modern capitalist food regimes have called for epistemic shifts in agricultural knowledge, with inclusion of indigenous modes of understanding the food system (McMichael, 2009) or democratizing local decision making (Ody & Shattuck, 2023), they in general do not question this lyseology. Recent archeological evidence provides alternative to the global framing of agriculture as a socio-technical configuration designed primarily for optimizing food production for humanity in the holocene. Anthropology highlights the entanglement of humans, plants and other species in multiple non-linear trajectories of different agrarian landscapes and food production systems across the world (Richards, 1993; Scott, 1998; Seshia Galvin, 2018). We further use examples from popular media to argue that the varied entanglements are situated in time and space, therefore incompatible with global visions of food security. This is supplemented by in-depth interviews with key thinkers who propagate alternative politics for the agricultural system. The paper analyses how such political engagements create new directions of transitions beyond those that reproduce spatially and temporally linear global supply chains that connect the prehistoric settlements of Fertile crescent to the shelves at modern supermarkets.

43: Empowering Citizens: Hubs for Food Data Sovereignty

Session Chair: Maria Schrammel, ZSI GmbH, Austria

Session Chair: ilse Marschalek, Centre for Social Innovation ZSI, Austria

Session Abstract

In the digital era, food data sovereignty has emerged as a critical yet often abstract concept within Science and Technology Studies (STS). As data increasingly shapes our food systems, it becomes imperative to empower citizens to engage actively with their food data. This session delves into innovative citizen empowerment hubs designed to tackle data sovereignty challenges in food and nutrition, aligning with STS themes of technology, society, and participatory engagement.

The session will focus on five key stages integral to these empowerment hubs, employing a dynamic fishbowl discussion format that reflects the diversity of citizen engagement. This interactive setup allows participants to move fluidly in and out of the conversation, promoting inclusive dialogue. We will begin with "Hub Genesis," emphasizing the cultivation of safe spaces for critical conversations. Here, we discuss the importance of creating environments where citizens feel comfortable engaging with complex data issues and explore approaches to initiating these hubs within diverse communities.

Moving to "Empowering Educators," we focus on equipping local teams with cutting-edge methodologies. This stage examines training methods for local facilitators leading data literacy initiatives and shares tools and resources that enable effective community education. The third stage, "Data Alchemy," involves transforming raw information into citizen action through photovoice workshops. We introduce photovoice as a participatory method for citizens to express and analyze their experiences with food data, discussing outcomes from workshops that have successfully turned data into actionable insights.

In the fourth stage, "Dialogue Dynamics," we center on fostering collaborations across the food data ecosystem. This involves exploring ways to build bridges between citizens, technologists, policymakers, and other stakeholders, discussing collaborative models that support shared governance of food data. Finally, "Ripple Effect" focuses on designing impactful awareness campaigns that resonate beyond hub boundaries. We share strategies for amplifying the impact of local initiatives to broader audiences and discuss metrics for measuring the success of awareness campaigns.

Participants will gain a deeper understanding of food data sovereignty and practical approaches to empower citizens in this domain. By delving into these five key stages, the session aims to share best practices in cultivating community-driven approaches to food data sovereignty. It seeks to foster connections among STS scholars, practitioners, and community members interested in digital rights, data governance, and participatory methodologies. Attendees will leave with actionable insights and potential collaborations to further the discourse on digital citizenship in food and nutrition.

We invite conference participants to join this engaging fishbowl session to explore the intersections of technology, society, and food data sovereignty. Together, we can craft the future of digital citizenship, ensuring that diverse voices are heard and that citizens are empowered to shape their food data futures.

44: Towards Social Studies of (Biomedical) Testing?

Session Chair: Erik Aarden, University of Klagenfurt, Austria

Session Chair: Mara Köhler, Karl Landsteiner University of Health Sciences, Austria

Session Chair: Victoria Meklin, University of Klagenfurt, Austria

Session Chair: Ingrid Metzler, Karl Landsteiner University of Health Sciences, Austria

The Epistemic-Instrumental Convolution of Biomarkerization in Neurology

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New biomarker tests are being researched and developed to improve the diagnosis and understanding of various diseases. The hope is that biomarkers – measurable indicators to reflect underlying biological processes – will make it possible to diagnose patients earlier and with higher accuracy. At the same time, the conceptualization of these diseases changes too. This raises epistemic and normative questions about the interaction between the conceptualization of diseases and ongoing biomarker measurements. Previous research in STS has explored the implications of medical technologies on health concepts and patient identities, yet the impact of this 'biomarkerization' requires further examination

In this paper, we trace the parallel development of biomarkers and conceptualization of diseases through comparative epistemology and investigate the interconnection of the epistemic and instrumental development. We will focus primarily on the neurological condition Multiple Sclerosis, in which biomarkers have already made their entry into medical guidelines and have led to changes in diagnostic criteria. However, we will also briefly compare the developments in Multiple Sclerosis, with Alzheimer's disease, and Parkinson's disease, in which the use of biomarkers is currently debated.

We find that with the incorporation of biomarkers in medical guidelines, disease definitions tend to be adjusted toward 'biological definitions' – drifting away from a diagnosis based on

clinical symptoms. Consequently, new (sub)categories of diseases are invented, making new 'kinds of people'. For example, patients can now be diagnosed with 'clinically isolated syndrome' in the case of symptoms but insufficient biomarker evidence, or with a 'radiologically isolated syndrome' in the case of biomarker evidence without symptoms. These categories, initially viewed as ontologically distinct from Multiple Sclerosis, are increasingly considered prodromal and preclinical stages. Therefore, turning to biological definitions would enable earlier diagnosis and treatment.

In this paper, we discuss how such novel categories challenge how we understand health and disease and who we consider to be patients. By drawing on the work of historian and philosopher of science Hasok Chang (his studies on the invention of temperature in particular), we point to the bidirectional character of conceptualization and measurement of medical conditions. Besides addressing the ontological and epistemological questions, we highlight how biomarkerization not only redefines diseases but also shapes clinical practice and patient identities. Often overshadowed by the promises and expectations of early detection and intervention, the emphasis on biomarker testing raises significant clinical and ethical concerns, including the risks of misdiagnosis and overtreatment.

We conclude that the complex relationship between disease concepts, biomarker measurements, and medical guidelines as its mediator, can best be described as a process of 'epistemic-instrumental convolution'. By critically examining biomarkerization through this lens, we aim to illuminate the profound impact it has on producing medical knowledge, reshaping patient identities, and challenging traditional concepts of health and disease.

Aging as Synthesis: Biological Age Testing in the Context of Longevity

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In current biomedical discourse and the communities that form around it, aging and the associated finitude of the body seem to be increasingly losing their status as a biological inevitability. Under the „thought style" (Fleck 1979) of cellular composition and biomarkers (Rose 2007), biomedical technologies and age tests make the physical process of decay visible, tangible, and thus seemingly modifiable (Ellison 2019: 134). Rejuvenation researchers such as the bioinformatician Aubrey de Grey, the biologist David Sinclair or the biochemist Carlos Lopéz-Otín do not understand aging as a linear progression or even as a uniform phenomenon but rather attribute the physical aging process to the accumulation of various cellular and molecular damages (de Grey and Rae 2007; Lopéz-Otín et al. 2013; Sinclair 2019). The increasing embedding of a relational view of aging as a synthesis of treatable processes is evident in the "Hallmarks of Aging" published by Lopéz-Otín and his team (Lopéz-Otín et a. 2023), which views aging as a phenotype along 12 biological subprocesses. In addition to their age-related manifestations, the hallmarks include the theoretical possibility of halting or even reversing aging through therapeutic intervention in these processes.

The concept of longevity, the pursuit of a long and healthy life, is increasingly giving rise to a social debate about the extent to which biological aging can be influenced. This ranges from the prevention and treatment of age-related diseases and phenomena (Pfaller 2016) to overcoming the meta-illness aging (Spindler 2014: 42) by halting cellular damage (Vincent 2006; Lafontaine 2010). In this way, biomedical tests for determining biological age have established themselves as a central measuring and orientation parameter in the self-experimental biohacking scene. With reference to scientific debates, biomedical age tests measure various characteristics of aging and allow biohackers and longevitists to indicate the success or failure of ongoing interventions and to develop and test specific rejuvenation practices for their own bodies. For Bryan Johnson – longevitist and founder of the “Dont Die” movement – it looks something like this: According to his website, the 47-year-old has the heart of a 37-year-old, the skin of a 28-year-old and the maximum oxygen consumption of an 18-year-old. Overall, he has already shaved more than five years off his biological age, and with an aging rate of 0.62, he ages about eight months per year.

In our contribution, we would like to address the range of biomedical age tests in the context of longevity and trace the socio-technical construction of aging as a malleable process. For this purpose, we provide initial insights from our (online) ethnographic research in the biohacking and longevity community. In online forums, blogs, and social media channels, as well as at international conferences where scientists and the general community meet, socio-technical practices and test procedures are negotiated that are supposed to enable an adequate assessment of the individual aging process and its potential reversal. Precisely because the asynchronous multidimensionality of our organic constitution cannot be reduced to a single physical unit or chronological form, our analysis shows that an understanding of aging is grounded in the figurative affordances of the various testing procedures, which are based on the constant “seeing together” (Elias 1992: 62) of different organic rhythms, socio-technical interventions, and cultural knowledge. Thus, the biological aging constituted by biotechnological aging tests takes place in temporal processes. However, in contrast to chronological aging, it can be slowed down, stopped or even reversed.

From actionable test findings to actionable variants in precision medicine

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This contribution tracks the origins, developments, and current usages of the concept of "actionability" in precision medicine. Originally a label for highlighting "incidental" and "secondary" findings from genetic tests, over time this concept became ascribed to catalogued genetic "variants" that are both potentially pathogenic and "druggable". By including considerations about therapy selection into the categorization of test results, the actionability category disturbs the classical pattern of medical practice according to which testing is done to arrive at a diagnostic or risk profile, on which, in a subsequent step, a therapy selection is based.

Actionability entered the field as a notion from action research and informatic knowledge-management at the end of the 2000s, and subsequently took on an increasingly technical meaning. Yet, precise definitions are scarce and complaints about conceptual ambiguity have been mounting. Meanwhile, a number of researchers from the sociology of science and medicine have noted the peculiar prominence of actionability in medicine (Nelson, et al., 2013; Guchet, 2014; Tempini & Leonelli, 2021). Recently, important conceptual work on the topic has been done by Owens (2021; 2022) and Chin-Yee/Plutynski (2023), both agreeing that the above-mentioned ambiguity and resistance to thorough standardization of the concept is not necessarily a flaw, but functional to those who employ it in their everyday work.

The present research is informed by this, but it focuses more on the development of actionability over time. Drawing on a structured, qualitative document analysis of the literature on actionability, following a grounded theory approach, it shows that the concept answers to various problems faced by precision medicine that emerged gradually, at different points in time, and partially as consequences of previous solutions.

To analyse the concept's shift from a categorization of incidental test results to a label of diagnostically and therapeutically relevancy, first, several clusters of relevant actors promoting actionability are identified. Subsequently, four developments are hightlighted to which the precision medical actionability concept was subject over time: 1) the label "actionability" was increasingly reserved as a qualification of *variants* instead of test findings; 2) by increasingly distancing itself from the notion of "clinical utility" of genetic tests, it was developed into a binary distinction, backed by secondary scales; 3) it was increasingly tied to concrete specifications of the indicated actions; and 4) a "second-order standardization" (standardization of standards for ascription of actionability) took place. To analyze these developments, the paper draws on existing STS literature about databases, standardization, and next-generation sequencing.

Finally, a number of problems are identified that actionability helps solve: the translation between genomic testing in research and clinical testing; the problem of overdiagnosis resulting from a technologically induced information overflow; the complexity of test results in multicausal disease that are based on numerous interdependently and non-linearly linked variables; and finally, the problem of having to "personalize" a therapy selection and at the same time rely on generalized standards.

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NHS England's Genomic Medicine Service: reorganising genomic testing to implement a platform innovation strategy

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In this paper, I discuss the reorganisation of genetic and genomic testing within NHS England since the introduction NHS England's Genomic Medicine Service (GMS) in 2018. The GMS centralises, standardises, and tries to mainstream genomic testing within NHS England. It also is the outcome of a process of platformization of NHS England as part of wider life science industrial vision by the UK Government over the last couple of decades (Faulkner-Gurstein and Wyatt, 2021). Here, I zoom in on one particular aspect of the GMS infrastructure, the National Genomic Test Directory for rare diseases and cancer, to discuss the transformation of genetic and genomic testing in the NHS and to show how it enables both the execution of a platform genomics visions and the mainstreaming of genomic testing.

Based on interviews and documentary analysis, I argue that the National Genomic Test Directory regulates genomic testing in the GMS in a novel way. It acts as the governing frame of a new knowledge-control regime for genomic testing in the NHS that structures the possible actions in the GMS (Hilgartner, 2017). The Directory sets out which tests can be done in the GMS and how, where, when, and by whom they can be ordered and carried out. Through this it has reshaped control over objects, boundaries/jurisdictions and relationships compared to the previous existing genetic testing services which were regulated through the work of the UK Genetic Testing Network (Hogarth and Löblová, 2022). This includes changes in control over who decides what types of tests should be used, what analysis needs to be applied, who has control over updating the test directory, how new types of tests are introduced, what genomic data will be produced, and how the actors in the GMS interact with each other. Overall, this new regime for genetic and genomic testing in the NHS enables and structures the use of whole genome sequencing and other genomic tests in the GMS. Simultaneously, it allows for the platform genomics vision to take hold within the GMS by standardising testing and increasingly producing genomic data for the genomics platform. The subsequent dataset can be linked to other clinically relevant data and used for a variety of research and commercial purposes that NHS England and the UK Government want to achieve.

Overall, I present a case study of the implementation of genomic testing on a national healthcare service level that focuses on the implementation of a particular testing infrastructure to enable the introduction of a new regime for genomic testing and new innovation models. It highlights an often under-represented aspect of platformization, the platformization of public institutions such as NHS England. Through this, my analysis will explore tensions between

platformisation and the healthcare goals of the GMS, as well as the potential risks and consequences of the disruptive platform model of innovation that the GMS has introduced.

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How fertility clinic digital plattforms frame Preimplantation Genetic Testing (PGT) in Spain

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Preimplantation Genetic Testing (PGT) is used to select in vitro embryos for different clinical contexts and purposes. PGT for monogenic conditions (PGT-M), also known as Preimplantation Genetic Diagnosis (PGD), enables the prevention of transmitting a known genetic disorder to one's offspring. Conversely, PGT for aneuploidies (PGT-A), or Preimplantation Genetic Screening (PGS), is used to improve IVF success rates and increase confidence regarding the health outcomes of potential offspring.

Using discourse analysis, we examine how Spanish fertility clinic digital platforms frame these techniques and the subjectivities they shape. We find: first, an excessively unproblematic portrayal of experimental innovations such as PGT; second, a linguistic, semantic, and clinical overlap between "diagnosis" and "screening," which increases the genetic responsibility of couples or women without known genetic conditions towards their prospective children; and third, the use of genomics as a tool for modulating female fertility and managing maternal age-related decline.

Ultimately, I would like to offer some reflections on the topic of the session, Social Studies of (Biomedical) Testing, by considering the role of information provision about biomedical testing at the crossroads of scientific popularization and marketing strategies. I will also discuss the multiplicity of testing as a distinctive feature of both access to healthcare and the targeting of specific patient groups. Technological differences are co-constructed alongside the economic, cultural, and social stratification of healthcare services.

Un/Diagnosed: (Bio-)Medical Testing as a Tool of Identity Un/Making in Solidarity-Based Healthcare Systems

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In the aftermath of the COVID-19 pandemic, the world bore witness to the rising incidence of Long-COVID and thus in an unusually public and conspicuous way to the most salient juncture in the lives of millions of people interacting with healthcare systems around: that of *diagnosis*. While Long-COVID is a most prominent example and a remnant of years-long pandemic emergency, it merely sets into stark relief a key challenge for biomedicine and healthcare systems more generally: managing diagnosis and managing patients in the face of complex, multifaceted and multisystemic pathology (The Lancet Editorial 2023). Dumit and others have claimed that p*atients often need to "fight for their illness" to become recognized as such (Dumit 2006).*

In my research project, titled "Un/Diagnosed", I explore the processes, meanings, and real-life implications of coming to "find" a (clinical) diagnosis in the biomedical system – and, thereby, shed light on the lived experiences of "being without" a diagnosis. Against the backdrop of a policy analysis framework, I explore both the policies that shape the pathways of diagnosis – rather than assuming diagnosis to be a single moment where doctor and patient meet – as well as the implications of not finding a diagnosis at all.

With biomedical testing ever increasing its potential as a pathway towards diagnosis, and promises of targeted and precision medicine on the rise, I ask which role complex and sometimes costly testing solutions – examining, for example, cellular, molecular, and genetic and RNA aspects of the human body – can play especially in solidarity-based healthcare systems with finite resources available for post-diagnostic treatment. Further, a space of murkiness always remains in which even the most cutting-edge biomedical testing solutions, despite tall promises, bear no answers for sometimes decade-long suffering. Hence, I ask which role biomedical testing, and diagnostics at large, play for the making and unmaking of identities, and the real-life consequences of individual identities in the larger context of the healthcare and welfare system. I argue that the testing-based healthcare system itself, through longstanding mechanisms of assigning meaning to diagnostic results, constructs and deconstructs identities, leaving individuals to make sense of self in the midst of complex meaning-making of health and illness within the welfare state.

Considering diagnosis a continuum shaped by complex social, political, and economic processes, and made up of negotiations in decision-making not untouched by gender, age, social, or racial bias (Croskerry & Cosby 2017; Dusenbery 2019), I frame being "un-diagnosed" as the true "normal" working of the healthcare system – with all of the organizations, institutions, and gatekeepers involved.

Testing as anticipatory practice: reproductive decision-making among people with cystic fibrosis

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The rapid advances in genetic testing have long captured the attention of social scientists. Early research in this area focused mainly on the social implications of genetic testing, examining both its applications and speculating about its potential future uses and effects. Less attention has been given to how individuals who undergo genetic testing do so with a view to their own future. This issue has only recently attracted renewed interest within STS and other social sciences, particularly in relation to the study of the future and the role of anticipation (Stephens & Flaherty 2019). A key focus of this scholarship is how individuals anticipate future events and take action to prevent, prepare for, or pre-empt certain events (Anderson 2010).

Building on this body of scholarship, we explore reproductive genetic testing among people with a rare genetic disease, cystic fibrosis (CF). By investigating their reproductive trajectories and decision-making, we explore how genetic testing relates to the future and informs these chronically ill individuals' reproductive journeys - before, during and after pregnancy. We argue that reproductive decision-making, including the decision whether or not to undergo genetic testing for one's condition, is a distinct case within the broader study of the social dimensions and implications of emerging biomedical technologies (Franklin & Roberts 2006). Against this background, we explore the following questions: What are the reproductive trajectories of people with CF? How do they make reproductive decisions and how are these decisions shaped by their genetic condition?

Our research shows that people with rare, chronic genetic diseases such as CF face unique challenges that extend far beyond the typical concerns of young parents. They are compelled to anticipate future scenarios in a way that goes beyond the usual considerations of what kind of person their child might become. They have to consider their own future - particularly the progression of their disease - which may limit their ability to be active parents. In addition, the daily demands of parenting can be complicated by the physical and emotional toll of their condition. On the other hand, they also have to consider the future of their child, particularly in relation to the potential passing on of the disease. This includes considering what constitutes a *good* and *livable* life for their child, taking into account the child's wellbeing and potential challenges it may face as it grows older.

We argue that in the context of CF, genetic testing for potential future children can be seen as a responsible reproductive strategy. Our research participants framed testing as a way of avoiding the sacrificial logic of the *future perfect* - a concept described by Povinelli (2011) as the idea of accepting personal sacrifice for the sake of future well-being. Rather than submitting to this sacrificial logic, our research participants used genetic testing as a pre-emptive approach to the future, treating potential future events (such as the birth of a child with CF) as if they had already occurred. This approach is grounded in a reflexive future horizon in which the present decision to test is shaped by anticipated futures and the discourses surrounding them (Povinelli 2011). By focusing on the conditions that influence these emerging futures, our study highlights how people living with rare genetic diseases navigate complex, future-oriented reproductive decisions.

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Biomedical testing for virulent epidemics at Points of Entry: a site for authoritarianism, exploiting travellers and surveillance in Uganda

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During Covid-19 and Post-covid, many countries engage in epidemic and pandemic preparedness activities in order to tackle better emerging/new health threats. Countries select from a World Health Organisation repertoire of preparedness regimes including surveillance, system strengthening, collecting realtime scientific evidence and securitisation. Since early 2020, I have conducted ethnographic interviews and explored policy discourse about epidemic and pandemic preparedness and response in Uganda. Through a 36 months study at the Points of Entry, observing stringent surveillance measures for epidemics, and through interviews with health policy makers and disease responders. One key finding is that

Post Covid, Uganda's authoritarian regime heavily invested in biomedical testing measures for epidemics at all its points of entry. Typically at Uganda's major POEs with Kenya, Democratic Republic of Congo, South Sudan; disease testing centres were hurriedly constructed and with the help of development partners equipped with ultra-modern virus detection and isolation equipment. The main purpose of the borderpoint testing facilities is to enable early detection and treatment of virulent disease carriers. Officers at the testing sites argued that if all travellers leaving or entering Uganda are tested for potential epidemic-causing viruses, there is a likelihood that epidemics and even pandemics will be contained -at border points. By observation, biomedical testing at points of entry for all travellers was met with mixed feelings. Testing travellers for viruses meant travellers incurred extra travel costs, risked being detained for days-where they pay for their surveillance, quarantine and treatment regardless of whether they are symptomatic or asymptomatic. And sometimes clinicians did arbitrarily detain and exploited *stubborn* travellers for weeks. If the traveller shows any signs of resistance or questioning the state policy, immediately military personnel are deployed to 'discipline them'. In effect, if biomedical testing at borderpoints was for purposes of epidemic control; increasingly we see biomedical testing taking on new roles including behaviour control,

revenue generation, a site for travellers to experience authoritarianism and militarisation of disease containment. In effect, Biomedical testing, though foregrounded as a safety measure for protecting citizens from virulent diseases: biomedical testing for epidemic health threats is not a value-free, neutral procedure conducted on willing clients.

Testing and screening for COVID-19 in Greece: public health crisis and the governance of citizens

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This paper deals with the use of different tests during the COVID-19 pandemic in Greece. Studies have already shown the crucial role of testing during this recent public health crisis and its multifaceted implications in local and global scale. In this paper, we would like to follow the processes through which testing, as the pandemic unfolded, became widespread and ubiquitous. To do this, we follow the public health policy-making processes with respect to the temporal dynamic of the pandemic, by examining publicly available documentary sources (grey literature including policy and regulatory documents as well as laws; medical/biomedical literature; leaflets; press releases; reports/announcements/interviews in the national press and selected news portals).

In this ongoing research, on the one hand, we observe the blurring between testing and screening for the management of the ongoing pandemic as it intersects with the self-management of health with the use of 'self-tests' (rapid antigen tests). On the other hand, we focus on the ways the policies using testing during the COVID-19 health crisis have been correlated with the policies promoting the digital transformation of the Greek state. We take into account both developments to argue for the growing importance of (bio)medical testing beyond clinical spaces, settings and uses. By tracing forward looking policies, based on the intersection of testing/screening and digital governance in Greece, we would like to scrutinize the processes through which testing infrastructures became a key site not only for the control of the pandemic but also for the implementation of the strategic choice for a "digital transformation", in which citizens are responsible for their civil duties and for looking after their health through available digital means. Especially as this approach expands to other health conditions (for instance, screening for the 'risk' of colon cancer).

We consider that focusing on (bio)medical testing is necessary in order to understand sociotechnical differences on public health policies and overall state policy. Drawing from the proposal for a "new sociology of testing" by Noortje Marres and David Stark (2020), we explore whether in a digitalized environment, testing does not occur anymore solely inside the social environment and a specific domain, but it may involve the "very modification of social environments".

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Testing Times: Boundary objects and fragile assemblages of COVID-19 testing in Denmark

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The COVID-19 pandemic challenged and transformed healthcare systems worldwide, prompting a variety of strategies to manage and mitigate infection, including lockdowns, mask mandates, and social distancing. In Denmark, a pivotal strategy was the early and widespread implementation of mass testing, which played a central role in identifying infections, tracing chains of transmission, and sustaining societal functions. An emerging body of scholarship has explored barriers and facilitators to COVID-19 testing, drawing attention to the importance of factors such as economic costs, logistics, and stigma (Bevan et al. 2021; McElfish et al. 2021), while others have called attention to testing as a socially situated practice that is inseparable from everyday routines, relationships, and local moral worlds (Nørholm et al. 2024; Street, Lee, and Bevan 2022).

Building on this work, I explore the notions of ‘good’ and ‘bad’ COVID-19 testing by tracing the multiplicity of meanings and practices that emerge in, with, and around the test, as it moves through different sites from test users to test workers, laboratory staff, and policymakers. The study is based on an ethnographic fieldwork on COVID-19 testing in Denmark, where I followed the test journey and observed everyday encounters with the test among test users, test workers, and laboratory staff. Through ethnographic examples of routines practices and breakdowns, I argue that the COVID-19 test functions as a boundary object (Star and Griesemer 1989) that facilitates coordination and coherence across diverse actors and settings, despite undergoing significant transformations in form and meaning. The analysis conceptualizes COVID-19 testing as a socio-technical assemblage (Lakoff 2017), constituted through dynamic interactions between human and non-human actors, including test users, medical technologies, digital infrastructures, and regulatory frameworks. However, the analysis also reveals that the assemblage is fragile and sensitive to disruptions such as computer failures, shortages of medical supplies, and vulnerable test users unable to complete the procedure. By examining the shifting valuations of ‘good’, ‘bad’, or simply ‘good-enough’ tests across different sites in the testing field, I demonstrate that these notions are not fixed or

immutable but contingent, situated, and negotiated in everyday practice through interactions between human and non-human actors in the assemblage. While this fluidity foregrounds the complex interplay of technical, social, and political dimensions in shaping pandemic governance, it also underscores the fragility of the socio-technical assemblage and its boundary object.

The study contributes to STS scholarship by advancing theoretical discussions on boundary objects, socio-technical assemblages, and the socio-material dimensions of governance, while offering empirical insights into the role of testing in pandemic management and public health interventions.

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Biogovernance and Biomoralities: Tensions between health and education in Covid-19-Testing in Austrian Schools

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The COVID-19 pandemic has profoundly impacted education systems worldwide, leading to school closures and disruptions in learning. To manage this situation and to avoid school closures and lockdowns and with the aim to minimize the spread of the infection schools introduced and used several testing methods against Covid-19. To do so, the school day and daily routines had to be restructured and, if possible, this had to be done in a short amount of time,since the pandemic has taken on new forms and shown unpredictable facets nearly every day.

In the Covid-19-pandemic schools have thereby more than ever been in the field of tension between health and education. They constantly needed to choose between keeping students in school, to be able to educate them and protecting their health through home schooling or covid testing. This is why this situation is a prime example for the concept of biomoralities. In the context of my study it shows how social values such as education and social contact influence and shape the precautionary and health measures taken to ensure the health of all actors in the school and, in turn, how the measures taken, shape social interaction and educational opportunities, whereas biogovernance explains what is being done by an instituition or the government to promote and ensure people’s health. The two concepts biomorality and biogovernance can be linked through Sheila Jasanoff's bioconstitutionalism, which describes the fact that biological and technological innovations raise normative and political questions, which can be seen very clearly in the case of covid testing, here in the school context (Jasanoff, 2011).

Therefor my doctorate study is interested in how Covid-19-Testing was implemented and integrated in everyday school life and how bioconstitutionalism and in in this regard biogovernance and biomoralties take place. My study is structured on three levels, which together form a circle. The first level examines the guidelines and directives that schools have received from their supervising authorities regarding Covid-19 testing. The second level deals with the implementation of these guidelines in school and the necessary creation of new infrastructures. Finally, the third level closes the circle, because it deals with the communication between the different stakeholders regarding the Covid tests in school, the documentation of these tests and the relevant feedback to the supervising authorities from the first level.

The presentation is going to showcase these three levels and show of my firsthand experience as a teacher during the Covid-19-Pandemic. My previous experience in this context serves as a cartography for tensions and problems in the field of testing at school.

The Moralities and Geographies of SARS-CoV-2 Testing Policies in Austria

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Technologies such as vaccinations, contact tracing apps, face masks, and tests played a key role in efforts to manage the global SARS-CoV-2 pandemic. Examining the use of these technologies and the moralities informing their uses can help us better understand the role of technologies in contemporary governance of life.

In this presentation, we examine the use of tests in Austria. Specifically, we explore the testing policies that policymakers adopted to manage the pandemic. Austrian policymakers invested substantial resources in testing, particularly during the pandemic's second year, when some envisioned Austria as the “world champion in testing” and testing infrastructure began to proliferate throughout the country. However, testing policies were highly volatile. In this presentation, we seek to make sense of Austrian testing policies, using them as a case study to better understand the moralities and geographies informing testing policies.

We focus on moments of policy change, using documents and interviews to analyze these moments through pragmatic lenses. How did testing policies evolve? Which stakeholders shaped their development? What moralities—expectations, values, and rationalities—supported these policies? How did policymakers conceptualize their pandemic management responsibilities? Finally, what geographies informed these policies and how?

45: Ethical challenges & role of societal stakeholders for building a pan-European training partnership for (research and) innovation on safe and sustainable nano- and advanced materials

Chair: **Ineke Malsch**, Malsch Technovaluation, The Netherlands

Chair: **Susanne Resch**, BioNanoNet Forschungsgesellschaft mbH, Austria

Chair: **Luis Mauricio Ortiz-Galvez**, EMPA, Technology & Society Laboratory, Switzerland

Chair: **Sabine Hofer**, Paris Lodron University Salzburg, Austria

Chair: **Norbert Hofstätter**, Paris Lodron University Salzburg, Austria

Chair: **Andreas Falk**, BioNanoNet Forschungsgesellschaft mbH, Austria

Chair: **Sophie M Briffa**, University of Malta, Malta

Chair: **Ciro Salcines**, Universidad de Cantabria, Spain

Chair: **Thomas Exner**, Seven Past Nine, Germany

Chair: **Sean Kelly**, Nanotechnology Industries Association, Belgium

Chair: **Effie Marcoulaki**, NCSR Demokritos, Greece

Chair: **Martin Himly**, Paris Lodron University Salzburg, Austria

Session Abstract

The European Green Deal (2021) binds the EU to become climate neutral by 2050 through green growth and innovation, offering opportunities for all citizens and protecting biodiversity.

A key enabler of achieving this Green Deal is the (re)design towards safer and more sustainable materials: Safe and Sustainable by Design (SSbD). This also supports several UN Sustainable Development Goals, including reducing harmful chemical exposure for better health (SDG 3), fostering sustainable industrial practices (SDG 9), promoting environmentally friendly consumption and production (SDG 12), creating eco-friendly alternatives to combat climate change (SDG 13), and encouraging multi-stakeholder partnerships to share knowledge for sustainable development (SDG 17). These endeavors will require well-trained material developers capable of conducting an array of inter-disciplinary assessments and overseeing the aggregation of data from diverse dimensions including functional material performance, impacts on human health, environmental, ethical, social and economic aspects.

We intend to establish the blueprint for an international education, training, re- and upskilling network, as SSbD Innovation Alliance, for students, young professionals, and employees of SMEs gaining the expertise on the principles, integration approaches, experimental and computational methodologies and tools for SSbD-guided innovation, focusing on the case of

nano- and advanced materials. Considering a global geographical scope, this initiative targets and engages partners conducting vocational training as well as academic education, thus, engaging higher education institutes and research institutions as well as industry including SMEs. All emerging teaching materials will be (machine-) translated into the national languages of the partner organizations. The educational scope includes deep knowledge of SSbD principles and methodologies, computational and experimental tools, life cycle analysis including ecological, social, economic, and ethical aspects, (two-way) science communication, and social sciences & humanities aspects.

During the proposed interactive session at STS-conference Graz 2025, we will engage with experts in Social Sciences and Humanities to identify required ethical and other SSH-skills.

The session will start with a general introduction to the proposed SSbD Innovation Alliance, where participants can share their thoughts, ideas and preferences through live interactions with Mentimeter. This is followed by a world café in two rounds, where participants will further discuss the contents of educational modules in ethics and SSH-skills. Finally, the main conclusions will be shared with all participants. This session will be moderated under the guidance of the EU NanoSafety Cluster (NSC) WG Education, Training, and Communication in line with their current Roadmap towards Safe and Sustainable Advanced and Innovative Materials, and internationally connected via the NSC-supported initiative INISS-Nano.

Function-Use Dualism: Sociotechnical Reflections on PMTs Chemicals within Safety and Sustainability Discourses

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Chemicals are central to contemporary societies but pose significant environmental and health challenges. The European Union's Chemical Strategy for Sustainability seeks to promote responsible chemical replacements to align industrial practices with sustainability goals. While ambitious, the strategy's regulatory discussions lack inclusivity, favouring certain social groups compared to others.

The distinction between function and use can illustrate this. The former refers to the task a substance fulfils in a particular material; the latter refers to how the substance is deployed. In the current replacement strategies, function is gaining more attention than use. While the reason for this is understandable due to the highly technical nature of chemicals, not sufficiently considering the use can pose risks to the replacement's effectiveness and undermine its inclusivity.

This distinction reflects a broader issue in technology studies: separating how technology is created from its societal adoption. While this is a recognised challenge with concrete technologies that has led to different approaches and heuristics for studying and overcoming it, the issue is less evident within chemical discourses. This is because chemicals are not concrete technologies but rather materials that constitute the final technological product. For

this reason, discussions about chemicals are often part of those social groups that have to do with the production of the substance, such as chemists and chemical engineers, with little consideration of how the chemical is then adopted by society.

It follows that this paper aims to study the dualism between function and use within chemicals, attempting to make recommendations for replacement strategies that are more inclusive and take into account societal values. To do so, we use the social construction of technology (SCOT) as a primary analytical tool for studying the social adoption of chemicals. The reason for using SCOT is twofold. The first reason is methodological: SCOT presupposes that technologies emerge through different negotiation phases between relevant social groups, thus with the possibility of showing critical areas of intervention for chemical replacements. The second is theoretical: SCOT has often been used to study concrete technologies such as bikes, but chemicals are technologies that constitute other technologies. Therefore, this paper can further contribute to developing SCOT theoretical tradition.

To ground and make the study more concrete, we will focus on replacements for PMTs (persistent, mobile, and toxic chemicals), particularly on three substances: chloroethane, melamine, and dapsone, three substances that are considered to be of concern yet crucial for industrial applications. All three substances will be studied by applying the SCOT heuristic and drawing reflections for possible areas of interventions for chemical replacements.

Overall, this study offers theoretical insights into integrating chemicals into society and pragmatic suggestions for developing responsible replacement strategies.

Navigating Ecosystem Tensions around Safe-and-Sustainable-by-Design (SSbD) in the Chemicals Industry

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“Safe and Sustainable by Design” (SSbD) has been proposed as a holistic approach that would reduce the environmental and social impacts of the chemicals-materials-products continuum (Apel et al., 2024; Leso et al., 2024). Building on the strengths of “Safe-by-design” and “Sustainable-by-design” (Reins and Wijns, 2024), SSbD emphasizes a proactive, lifecycle-based approach to the design and development of (novel) chemicals, materials, and products. In this way, SSbD would promote a toxic-free environment, a circular economy, and a more sustainable future (Furxhi et al., 2023).

However, the successful implementation of SSbD requires coordinated action—a systemic approach (Soeteman-Hernandez et al., 2024)—among diverse stakeholders across complex value chains and ecosystems. These stakeholders encompass industrial actors, policymakers, researchers, societal organizations, and others. Aligning them along the shared objective of SSbD is a complex endeavor, particularly in the face of differing (potentially opposing) incentives, perceptions, benefits, costs, values.

We can explore this challenge by viewing SSbD as the common goal (or alternatively, the "value proposition") of various innovation ecosystems. An Innovation ecosystem is defined as "the evolving set of actors, activities, and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors" (Granstrand and Holgersson, 2020). In this research, we will identify the tensions, uncertainties, and trade-offs that ecosystem actors face in implementing SSbD, and we will propose various approaches to resolve them.

To capture the complexities of SSbD ecosystems, this study will employ a qualitative case study approach. Cases are drawn from diverse contexts to capture the chemicals-materials-products continuum, i.e. (1) a research consortium around chemical substitutes to persistent, mobile, and toxic substances (PMTs) and other substances of concern, (2) a university-industry partnership around the development of an alternative, plasma-based production process, (3) a design ecosystem of product designers, process engineers, material selection experts who collaborate and co-create for new product design, and (4) the quadruple helix of stakeholders (academia, industry, government, and society) jointly developing a framework for SSbD. These cases studies will be built from semi-structured interviews with ecosystem actors, analysis of policy and industry documents, and focus group discussions to understand the interactive dynamics between different actors.

Ultimately, although this research is still at an early stage, it seeks to develop a nuanced understanding of how ecosystems can be structured and managed to facilitate sustainability transitions, in particular the implementation of SSbD. In addition, by identifying the tensions, uncertainties, and trade-offs involved in SSbD ecosystems, it also provides insights for practitioners seeking to develop solutions in response to these challenges, e.g. future competences, mindsets, and capabilities, as well as training programs.

46: Social Innovation for addressing challenges in biomedicine and pharmaceutical R&D

Session Chair: Conor Douglas, York University, Canada

States versus Pharmas: Explaining Innovative Drug policies in Brazil and Italy

Catherine Moury

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Over the past two decades, the rising costs of innovative medications have reached an unsustainable level, even for wealthier nations. This price surge is driven by factors such as limited competition in pharmaceutical markets, the increasing financialization of drug companies, and the significant power these companies wield. Various solutions exist to ensure a decrease of those prices - including national and international regulations, public production, waiver of patents. Those policies play a key role in determining prices, but they involve trade-offs between access to medications and controlling costs, often resulting in considerable savings for payers like the state or other entities.

Politicians face several challenges when interpreting these trade-offs. What motivates them to pursue reforms? What factors determine whether these reforms succeed? Why are certain regulations chosen while others are not? And what does all this reveal about the power of pharmaceutical companies and the state's capacity to serve the public good? This paper addresses these questions by focusing on Italy and Brazil.

Given the power of pharmaceutical companies and the widespread nature of the costs associated with high drug prices, maintaining the status quo is often the default path. Therefore, reforms aimed at lowering pharmaceutical prices can be considered "deviant cases" worth investigating by political scientists and STS scholars. Brazil and Italy are such cases. In Brazil, by the 2000s, the government threatened to issue compulsory licences for antiretroviral drugs (ARVs) - thus inducing price negotiations with multinational pharmaceutical companies for five patented ARVs; and in 2007 it issued its first compulsory license for an ARV.

In 2020, Italy became the first country to require pharmaceutical companies to disclose their research and development (R&D) costs, the public funding they received, prices charged in other countries, and their profits. In 2022, a law was passed to ensure full transparency regarding transfers between the pharmaceutical industry and health actors.

This paper uses a qualitative process-tracing method to analyze the introduction and implementation of the reform in Italy. It triangulates various empirical sources, such as qualitative analyses of official documents and interviews with key healthcare stakeholders, to ensure the validity of the findings. The argument is that certain factors, including strong political will and smart strategies for adoption, explain the introduction of Italian and Brazilian reforms. However, political instability and lobbying hindered its effective implementation in Italy only.

Pharma Commons – conceptual clarifications and a research agenda

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The disparities in accessing high-quality, affordable medicines for unmet medical needs are becoming more prominent every day, caused in part by recent technological developments in the pharmaceutical sector that have fueled rapid price increases of advanced therapies such as cell and gene therapies. Broader advancements, including AI and open science, too have started to reshape the contours of pharmaceutical innovation. Though many of these shifts are generally discussed in a 'crisis' frame, they have also triggered efforts around developing alternative modes of organizing pharmaceutical research, development, payment, and deployment, previously described as social pharmaceutical innovation (Douglas et al. 2022). Examples include patient- and clinician-driven innovation, hospital-based and 'localized' manufacturing, and the use of 'old' drugs for 'new' indications (known as drug repurposing).

We focus our attention here on those experiments that situate themselves in what may be called a 'pharmaceutical commons' discourse. While some writers have made conceptual inroads into the pharmaceutical commons (Bountra et al. 2017; Hendrickx and Dooms 2021; Ibata-Arens 2021; Krikorian 2023; Lezaun and Montgomery 2015), like in the broader commons literature, definitions remain broad and often point in different directions (Vaccaro and Beltran 2019). We would like to bring clarity and a consistent conceptual vocabulary to this crucial dynamic.

We identify three strands of commons theory – property theory, institutional governance, and political action – and suggest three interlinked criteria through which the pharmaceutical commons may be conceptually grasped and existing initiatives analyzed: 1) Property: open, mutualized, based on conditional sharing; 2) Governance: legitimized and based on bounded membership and needs-based agenda; and 3) Practices: run by the people in a way that is fair in terms of risk and benefits, and accountable.

To illustrate and test this conceptual framing, we draw on ethnographic studies of six examples of pharmaceutical commons (patient organization PXE International; the Mario Negri Institute for Pharmacological Research; the Drugs for Neglected Diseases initiative; the Geneva Medicines Patent Pool; the CUREiHUS academic research protocol; the #WeAreNotWaiting movement; and public-private partnership Patient One), some conducted by ourselves, some published by others. All cases and, where available, source materials, were then re-analyzed according to the three 'commons' criteria. We evaluated these case analyses by discussing them together, drawing on colleagues' expertise where needed, to interactively and iteratively 'grade' the selected cases in terms of the relative fulfilment of each 'criterion'. This evaluation is necessarily reductive and subjective but seeks to provide a preliminary mapping of the pharmaceutical commons as studied ethnographically to spark lively debate.

From our evaluation, we draw up a research agenda for developing and enlarging the pharmaceutical commons. The derived research agenda comprises the following topics:

1) the organisation of democratic decision-making, governance, and collective choice arrangements;

2) the role of the state and supra-national bodies in legitimising and keeping individual pharma commons 'safe';

3) the temporality of pharma commons and whether something can be a temporary commons to qualify as a commons;

4) the organisation of a 'virtual network' of 'nested' commons initiatives within a broader ecosystem;

5) and the practical workings of and negotiations underpinning the different partnership types, including public-commons and other models, also within such a network.

While this mapping is necessarily as incomplete as our evaluation of existing 'commons' experiments is reductive, we seek to crystallize conversations that we have been part of in different corners of pharmaceutical social science and civil society, with the hope that others may add to this preliminary charting of the pharmaceutical commons.

Pathways for Development of Advanced Therapy Medicinal Products (ATMPs) in Denmark

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ATMPs include gene and cell therapies in addition to tissue-engineered products and are often targeted rare diseases. In this paper, we set out to explore which pathways for the development and clinical use of ATMPs that are enabled and encouraged by existing regulation in Denmark and the European Union, and which challenges the developers and clinicians implementing them face.

During the past decades we increasingly see a translational ethos in university research urging researchers to "produce results sooner rather than later and more specifically targeted for particular ends rather than for the general good" (Maienschein et al., 2008, p. 43). The push towards translation can be understood as part of what Gabe et al. (2015) term the "pharmaceutical regime" characterized by close collaboration between pharmaceutical companies and basic university-based research (p. 197). Like in other countries, university-industry collaboration is encouraged by policy initiatives and enabling legislation in Denmark (Regeringen, 2024). Yet, Wadmann has pointed to contradictions in existing policies which encourage collaboration between publicly funded researchers and private companies, while also expressing concern that this might install conflicts of interest (Wadmann, 2014). Collaborations between publicly funded researchers and private companies have also evoked criticism, including a concern that the public pays twice for pharmaceutical products – first by publicly funded high-risk basic research and then by paying monopoly prices to the private companies who market the resulting products (idw, n.d.). This raises questions about the public legitimacy of the dominant systems for drug development and marketization. For ATMPs in

particular, the dominant “bio-pharma-led” innovation pathway has proven insufficient to provide these innovative treatments because of the high development and manufacturing costs combined with a limited market size (Douglas et al., 2022; Kliegman et al., 2024). Hence, ATMPs challenge existing market-based practices and regulations.

In this paper, we scrutinize existing Danish and European regulation and legislation concerning ATMPs and analyze which rationales and norms for drug development and clinical use that are prescribed. Following Jasanoff, we understand regulation not only as written documents but also as a “a set of practices, a source of norms, a continuous historical narrative of what societies are about” (Jasanoff, 2012, p. 6). In addition to document analysis, we therefore conduct semi-structured interviews with policy makers, researchers from public and private research institutions, and researching clinicians who are to translate potentially conflicting policies into practice through their daily work. We explore how existing regulation is translated into practice, which opportunities and challenges central actors are experiencing and how the norms prescribed through the legislation are perceived by these actors. By teasing out how alternatives to the dominant “bio-pharma-led” innovation pathway might be facilitated, we aim to contribute to current STS debate about what Douglas and colleagues (2022) term “social pharmaceutical innovation”. Such insights might inform future – and more socially robust – policies for the development and clinical use of ATMPs.

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How social pharmaceutical innovation addresses challenges of availability, accessibility and affordability of treatments for rare diseases

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This paper reports on case studies of "social pharmaceutical innovation" (SPIN) that respond to innovation challenges in biomedical R&D producing inequities or injustices for patients and health systems.

Through these case studies it is shown how SPIN initiatives are reconfiguring pharmaceutical innovation networks in to include more diverse sets of actors who are involved in more diverse -and redistributed- roles within innovation processes. Further, it is shown how SPINs are associated with changes the ways data is gathered, often in clinical contexts rather than in conventional trials, and how evidence is assembled to improve access to the treatments. Finally, we show how SPINs are providing new routes for patients to access treatments for rare diseases, often at more affordable prices.

While promising, SPINs are not cure-alls for what ails the pharmaceutical innovation system. If ways forward are to be developed for addressing these challenges in pharmaceutical innovation it is argued that STS scholarship is needed to help in the following activities: identify and develop specific solutions to the particulars of local framing, institutions, and national contexts of rare diseases; identifying and incorporating local knowledge and expertise for crafting SPINs; developing more systematic approaches and new economic models needed to regularize SPIN.

47: Advancing Open Qualitative Research through Theory, Research, and Action

Session Chair: Nicki Lisa Cole, Know Center Research GmbH, Austria

Session Chair: Agata Bochynska, University of Oslo, Norway

Session Chair: Peter Branney, University of Bradford, United Kingdom

Chair: Kirsti Klette, University of Oslo, Norway

From Loneliness to Engaged Community: (Re)considering advocacy and organising in open qualitative research

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While the uptake of open research practices is increasing in quantitative research, in many disciplines, open *qualitative* research remains a highly contested, minority practice (Prosser, Hamshaw, et al., 2023). Many open qualitative research advocates work alone, or are outnumbered in their departments, institutions or disciplines by those (oftentimes more senior colleagues) who disagree with them. Navigating these dynamics can difficult for those who see openness as a large part of their values or identity, or those who feel a moral imperative to make their research as openly accessible as possible. In this talk, I apply insights from my research on moralised practices and social change to explore experiences of open research advocacy in the qualitative domain. I will speak frankly about my own experiences advocating for open qualitative research over the past decade, including as a student and new faculty member across a number of different social scientific disciplines.

I contextualise my experiences using Sara Ahmed's work on 'Complaint!' (Ahmed, 2021), to discuss how those advocates identifying *problems* can become identified as *the problem* in academic workplaces. This advocacy becomes even more complex when considering existing inequalities and prejudice within academia (Bristow et al., 2017; Pownall et al., 2021), and these tensions have not yet been considered fully in open research advocacy. In this talk, I will discuss how I navigate these tensions surrounding openness in my interdisciplinary qualitative research, alongside the dilemma of between being seen as 'too open for some and 'not open enough' for others. I will also shed light on the psychological impact of advocacy, including strategies for avoiding 'activist burnout' (Prosser, O'Neill, et al., 2023) . Overall, I will explore the conflicts and difficulties I encountered along my own qualitative research journey and provide guidance for how advocates may deal with conflicts compassionately.

Alongside these reflections, I share my experiences of organising a large interdisciplinary conference on the open qualitative in January 2025. I assess the challenges I experienced in doing this, particularly surrounding engagement of scholars unfamiliar with the open qualitative methods literature. Using theory from social movement scholarship and social psychology, I emphasise how and why such gatherings can become a key tool to promote and help maintain

organising around open qualitative research. Throughout these reflections, I provide a personal retrospective analysis of advocacy and organising efforts I have been involved in among the open qualitative research community. I explore what more still needs to be done to ensure open research is inclusive of qualitative methods, and how we can best engage the qualitative research community at large. I conclude by discussing strategies for addressing these issues, including a discussion on how best open qualitative researchers can mobilise as an international community to support and encourage each other.

Preregistering Qualitative Research: Taking Stock

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Preregistration involves putting a study design and analysis plan in an open repository, which can boost transparency. Originally designed to combat irreproducibility in quantitative research, preregistration might also promote openness, transparency, and rigour in qualitative research. Some authors may object to the idea of preregistering qualitative research. Relatedly, the initially available templates were not fit for qualitative research. The author and collaborators used a Delphi study design to develop a preregistration template for qualitative research. The template has been used over 1800 times since 2020, marking an important step concerning the place of qualitative research in the broader open science debate. In this talk, we examine the status quo of qualitative preregistration. We systematically screened all qualitative pre-registrations on the Open Science Framework (OSF), extracting both meta-data and the full registration content. This process enables a deeper investigation into trends, such as the prevalence of qualitative pre-registration across different disciplines and the extent to which researchers adhere to their pre-registered plans. Additionally, we employed a structured approach to systematically match these registrations to their corresponding publications, providing insights into the transparency and implementation of pre-registration in qualitative research. Taking the first step of mapping the community of practice around qualitative preregistration, we found a great degree of heterogeneity in qualitative preregistration. In addition, we reviewed journal policies for encouragement of qualitative preregistration. The results of these two studies underscore the need to implement the practice with care to prevent open science box-ticking.

Supporting reusability of qualitative data: Recommendations for researchers and institutions

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Qualitative and context-sensitive data are, as the term(s) suggest, contextual, here-and-now specific and often person-identifying. This raises a number of problems for reuse and multiple uses of these data and creates barriers to transparency and reproducibility of qualitative research. Additionally, researchers and students who work with qualitative research are still not oriented towards data sharing and reuse, not trained to practice open qualitative research, and very often not aware of each other's challenges but also opportunities within their local academic institutions. Finally, institutions are also often not aware of the lack of support and training specific to data sharing and reuse limitations and needs of qualitative research. Here we present a guidance for supporting and enabling more data reusability in qualitative research. The guidance has been developed through a local QualiFAIR project that was running as a hub-node infrastructure at the University of Oslo in Norway in years 2021-2024. This university-wide project focused on making qualitative and context-sensitive data more FAIR (Findable, Accessible, Interoperable, Reusable) as well as raising awareness about both the need for sharing and reuse of qualitative data as well as its possible limitations. The guidance is based on mapping existing landscape in qualitative data management, sharing and reuse at our local institution, as well as working with training, institutional support development, and with case studies across academic disciplines. Throughout the project we have involved both academic as well as administrative and technical staff from a variety of fields, including anthropology, political science, medicine, linguistics, psychology, music research, theology and education, so the project outputs, including developed guidance and recommendations, can serve the community across the fields and levels of expertise. In this talk, we will share concrete recommendations from each of the five thematic areas that we have worked on in QualiFAIR: (1) Data management planning, such as the need for guidance for Data Management Plans (DMPs) specific to qualitative research and clear guidelines for planning data minimization and anonymization in the projects; (2) Copyright issues, such as developing courses in copyright and licenses for employees and students at all levels within the institution; (3) Ethics and privacy concerns, such as providing specific legal advice on personal data minimization and anonymization, and training ethical committees to offer support in dilemmas relating to open qualitative research; (4) Infrastructures for storing and preserving qualitative data, such as the need for secure data archives with levels of access and access control; (5) Domain-specific metadata that support re-use and data sharing in qualitative research such as the need for clarifying levels of detail and granularity as well as terminology. We believe that this guidance, based on concrete recommendations from the QualiFAIR project, can be relevant to both qualitative researchers as well as research support staff and institutions across different academic disciplines, and open science community more broadly.

How Qualitative Research Can Enrich Open Science

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In this presentation I draw on the results of a review study to explain how Open Science can be enhanced by incorporating established qualitative research practices. We found through a review of literature that discusses reproducibility, replicability and/or Open Science in relation to qualitative research that many authors perceive significant barriers to engaging with Open Science, generally, and data sharing and reuse, specifically. These barriers are ontological, epistemological, and ethical in nature. Yet, while these barriers are well established within the literature, so too is the idea that established practices within qualitative research can enable openness, including data sharing, and some forms of reproducibility, like conceptual or methodological replication. Documentation practices within qualitative research, including the creation of field notes, the use of thick description, and creating process and analytic memos can provide context details and insight into the analytic process that would be necessary for another researcher, or educator, to effectively and ethically reuse qualitative data. The practice of reflexivity, and incorporating it into documentation, can help to balance out the barrier to reuse created by research subjectivity and positionality. The establishment of rapport and trust between researchers and participants can enable active, ongoing informed consent to support ethical data sharing. Our findings indicate that Open Science has much to learn from qualitative research, not just in terms of how Open Science norms and practices can be expanded to include diverse epistemologies, but in how qualitative research traditions can be instructive in opening the research process.

48: Critique in, for, with, and of responsible innovation: a roundtable discussion

Session Chair: Mareike Helena Smolka, Wageningen University & Research, The Netherlands

Session Chair: Tess Ann Doezema, University of Vigo, Spain

Session Chair: Lucien von Schomberg, University of Greenwich, United Kingdom

Session Abstract

Critique has been a central theme in Responsible Innovation and Responsible Research and Innovation (R(R)I). R(R)I promises to critique dominant technocratic and economic regimes by conducting critical analysis, promoting critical reflection, and launching critical interventions to democratize science, technology, and innovation. However, the sheer success of R(R)I as a policy concept promoted by influential international organizations, a measure to satisfy consumer demands in tech companies, and a pedagogical program advertised to students, suggests that its critical impetus has been curbed by the institutions it sought to confront. Tasked with enacting critique within the dominant regimes it aims to challenge, R(R)I finds itself in a double bind.

This roundtable discussion probes the role that critique has played and could play in R(R)I. We build on our edited collection “Critique in, for, with, and of responsible innovation” recently published in the Journal of Responsible Innovation by organizing a roundtable at the STS conference in Graz and an open panel at the 4S conference in Seattle in 2025. The aim is to include diverse voices of collection contributors and discussants, spanning across continents.

The contributors will shed light on the multiple ways in which critique has been conceptualized, performed, and debated in R(R)I, and they deliberate how critique could be reclaimed and become more generative for the responsible governance of science, technology, and innovation. The discussants will share their perspectives on the collection, speaking from different positions within and at the margins of the R(R)I community.

Taken together, the roundtable discussion will explore how critique operates in different modes and across R(R)I’s scholarly styles – articulation, intervention, interpretation, and assessment. In this way, we aim to cultivate the flexibility of critique to provide generative responses to R(R)I’s double bind.