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"Crop Rotation" 2024, by Nienke Bruijning

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Editorial

Articles

Interviews

Book Review

About Cover Artist

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EDITORIAL

Celebrating young scholars

By Kristine Ask, Sofia Moratti, Kim-André Myhre Arntsen,
Shan Wang, Nora Kristiansson & Birgitte Nygaard

The Nordic Journal of Science and Technology (NJSTS) celebrated its 10-year anniversary in 2023, have used the occasion to direct attention toward young scholars in STS and bring in reflections about how STS is changing as a field. While publishing high-quality research is the main priority of the journal, we consider NJSTS's role in STS to extend beyond publishing; it is also a place where young scholars learn about the making of science (through editorial work) and build the kind of academic community they want to be part of (Moratti & Ask, 2022). As part of our anniversary celebrations, we wanted to shed light on young scholars´ experiences and viewpoints, and to seek out different perspectives about what STS is and should be.

Illustrative of our values as a journal and dedication to early career scholars, we hosted a plenary panel at the Nordic STS conference on the 8th of June in 2023 titled "Leaving the old behind? The future of STS, academic identity and disciplinary boundary work among early career scholars." We had noticed how panels about the state of the field (and its futures) tended to be populated by scholars with already established names, prestigious networks and high visibility. While it makes sense to platform influential thinkers and institution-makers in meta-discussions about where the field is headed, an overreliance on recognizable names implies that those with seniority in the field are best suited to set the course of the future. We, instead, opted to highlight and platform the perspectives and experiences of early career STS scholars because we believe that the future of the field should be shaped by the people who will be doing the work. We invited four early career scholars from different Nordic countries to discuss the scholarly and institutional identity among STS scholars today and in the future: Ingvild Firman Fjellså, Jakob Lundgren, Kamilla Karhunmaa, Alexander Myklebust. The panel discussed disciplinary boundary work and new collaborations for STS, highlighting where young STS scholars take inspiration from when developing the field of STS and how a phd in STS can lead to different trajectories both inside and outside of academia.

A brief history of a community driven journal made by phd students

NJSTS's interest and commitment to young scholars traces back to the journal's origins. NJSTS was started by a group of phd students at The Department of Interdisciplinary Studies of Culture at Norwegian University of Science and Technology Studies, as a response to the shortage of journals dedicated to STS and a desire to support the Nordic STS community.

The idea to start a journal was first articulated at the magic hour between 3 and 4 AM, after a few drinks. Most ideas that emerge at that time, and in that state, are promptly forgotten the next day. However, Henrik Karlstrøm, the journal´s first editor, started investigating exactly how you would go about starting an academic journal. To everyone's surprise, the requirements were achievable and involved setting up a journal webpage, registering the journal in the right academic databases, putting an external review system in place and attracting submissions. The group obtained support funds for open-access journals from the Norwegian Research Council as well as administrative support from the Department of Interdisciplinary Studies of Culture at NTNU. The next steps were recruiting members to the advisory board, writing aims, mission statement, author guidelines, drawing up ideas for a journal logo, having a professional company make a logo and template for the journal, and scouting authors for the first issue. This experience taught the young scholars that ambitious goals can be within reach, with effort and dedication.

While the journal's aims and goals have been revised since, the core mission remains: to be an open access STS journal with a broad interest in the role of science and technology in society.

The journal was launched in 2013 during the first Nordic STS conference at Hell. The journal hosted a panel about Nordic STS asking what characterizes Nordic STS. Some argued it was a fascination with technology for heating (given our cold climate), while others noted a pragmatic approach and rich empirical work. After some deliberation, the panel concluded that maybe there wasn't any defining characteristics of Nordic STS. While it was a slightly disappointing answer to our question, we remained steadfast in our belief that even if Nordic STS research might not be notably different – the need for local scientific communities and publication venues persists. Accompanied by home brewed beer made special for the occasion, complete with the journal's logo printed on the

bottles, the journal was launched in the same lighthearted spirit in which it was conceived.

In the 10 years that followed, both the journal and its board members have matured. The journal has published 17 issues, including two special issues – one on Crafting Sustainability and one on Care in STS. Publishing on a range of different topics relevant to STS, the journal continues to publish research that engages with STS perspectives and the Nordic region, spanning from how surrogacy is governed through media (Levold et al., 2019) to how businesses appropriate digital technology (Pettersen, 2014) to the valuations that take place in interdisciplinary collaborations (Lamberg et al., 2023). New editors have joined the board, adding their specific focus, flavor and interest to the journal. We want to use this opportunity to thank previous editorial members for their work– with a special thanks to previous editors: Henrik Karlstrøm, Tomas Moe Skjølsvold, Jenny Bergschöld and Roger A. Søraa. In addition, we want to thank all authors and reviewers who have contributed to making the journal possible.

Current and future issues

The path we set out on continues, with new people joining the board and shaping the journal in ways that differ from the original vision. We see this as a good sign that the journal is moving, if not necessarily with the times, at least with the people that it is by and for. We are proud that the journal has survived through ups and lows in its first decade, and for it to remain a venue and community for Nordic STS scholars. Not least, are we also happy to be a venue for interdisciplinary work and in support of STS in its many different forms. This is visible in a forthcoming special issue on "Knowledge, Technologies and the Police" to be published later this year, that combines police studies with STS to gain new insights into how knowledge and technology shape policework.

The current issue has two research articles. The first is "No rose on this one? Citizen science field excursion negotiations at the Great Alvar" by Björn Ekström. The article concerns the material qualities of the tools that shape information practices, such as observing and documenting species in citizen science. The participant observation and trace ethnography showed that the tools used by participants got redefined depending on the situation. This case study shows how knowledge produced *in situ* is translated into biodiversity citizen data, and at the same time manifests one of the core tenets of STS: that knowledge-making is negotiable, materialized and entangled with different practices.

The second article is titled "'I Love it" Caring for second-hand inventory in a university living lab" by Ruth Woods, Thomas Berker, Thomas Edward Sutcliffe & Hanne Marit Henriksen. The authors expertly conjoin the concepts of circular economy and care in this study based on a living lab study conducted by the authors at NTNU in 2021. The aim of the living lab study was to investigate whether further measures could be implemented to reduce the consumption of university inventory, such as furniture and computer equipment. The authors found that reuse, in contrast to centralised administrative provision of inventory, encouraged practices of care. The caring practices they identified were context-aware, empowering, egalitarian, and avoid prioritising some kinds of practices and objects over others.

Together with the article, this issue also includes a review by Ivana Suboticki of the book With Microbes edited by Charlotte Brives, Matthäus Rest & Salla Sariola, 2021. The book applies science and technology studies (STS) approaches, along with theories from anthropology and philosophy, to investigate the intricate and evolving relationships between humans and microbes, highlighting their impact on daily life. It presents a diverse range of perspectives on how microbes are sensed, regulated, and identified, from sensory practices in winemaking to governance issues related to antimicrobial resistance. The book also features innovative elements, like QR codes for listening to yeast recordings and a theatrical dialogue with E. coli, which enhance its experimental approach. Although the book's detailed empirical content makes it particularly valuable for academics and STS scholars, its rich analysis offers insights that could benefit policymakers and managers involved in microbe regulation.

The cover page is the artwork "Crop Rotation" by Nienke Bruijning. With a master in STS, Nienke currently works as a research assistant at Interdisciplinary Studies of Culture at NTNU where she combines her creative talents with a critical perspective on technology. The cover art is inspired by the pursuit of knowledge through a researcher's career, the dragon goes from curiously navigating an unfamiliar field, to expertly soaring the skies and eventually breaking the mold. These research stages are not linear or sequential, but can occur on the same day, or repetitively through one period of time. It represents individual scholars, and at the same time it is also an epitome of scholars across the generations.

Interviews across three academic generations of STS scholars

For this special issue, we conducted interviews with STS scholars spanning across three generations. We deliberately chose a variety of voices capable of offering distinct insights, to give insights into different ways of thinking about and experiencing the field.

Our career stage, and the academic generation we are part of, influence how we perceive both the discipline and the academic community we work in. The interviews provide valuable insights into the expectations, norms, and values experienced by individuals within academia, that can be complex for scholars to navigate – regardless if they are new or experienced. This contributes to shaping and renewing the academic landscape, reflecting the continuous development within research and education. We hope this journal can serve as a space for reflection on this ongoing exploration and adaptation to the ever-changing landscape of ideas and practices within academia.

The first interview is with the young scholar and co-founder of the virtual STS community FeminiSTS Repair Team, Claudia Schwarz, which is currently a postdoctoral researcher at the Karl Landsteiner University of Health Sciences in Austria. She sent shockwaves through the STS community in late 2022, as her testimonial of power abuse, sexual harassment, and disillusionment within the Harvard STS programme went online. Since then, she has advocated for doing STS ethically. We interviewed Claudia to learn more about her call for challenging the orthodoxy of the STS-field and emphasising a need to confront the 'field shadows' - the disowned and neglected parts of STS by drawing upon decolonial and feminist scholarship.

The second interview is with Cecilia Åsberg, Professor at the Department of Thematic Studies (TEMA), Linköping University. We selected Åsberg for her prominence in Nordic feminist technoscience studies, a fascinating stream of STS literature. Cecilia incarnates and champions a transdisciplinary approach, drawing from STS, cultural studies and feminist theory, and she advocates for problem-based theorizing and against disciplinary silos. Her interview showcases one of the most intriguing features of STS as a field: the intellectual latitude it offers. Cecilia is also attuned to power dynamics within the academic community. She acknowledges gender disparities in academic career progression and epistemic hierarchies among themes and approaches and underscores the significance of support networks within academia.

Finally, we also chose professor emeritus Knut H. Sørensen, NTNU, to give a perspective on the field that stretches back to its beginnings. Sørensen has been central in building up STS as a field in Norway, and has made important contributions to the field, particularly through his work on technology use and domestication theory. In his interview he reflects on how the field has changed, the pragmatic choices he had to make to get funding to do STS research, as well as how life as an emeritus is ripe with freedom - but lacks connection.

Together, the three interviews provide very different stories about what it means to be an STS scholar, spanning different topics, approaches and academic lives in different institutions. We hope that their personal stories will be a source of reflection and inspiration, as we keep on building the field – and particularly, that we encourage and ensure that it a field open to new ideas, new perspectives and new people.

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NO ROSE ON THIS ONE?

Citizen science field excursion negotiations at the Great Alvar

by Björn Ekström

This study explores how material qualities of tools contribute to shape information practices of observing, documenting, identifying and reporting species in biodiversity citizen science. Through participant observation and trace ethnography, information practices enacted during a field excursion at a World Heritage Site in south-eastern Sweden are investigated in relation to reported data submitted to the species observation system Artportalen. The study, which adopts a theoretical lens comprising the analytical concepts of epistemic objects and inscriptions, finds that the participants' situated questioning, discussion, documenting and comparison of species through tool use establishes the observations as projections of knowledge claims. These projections are subsequently constrained but also appended as they are reported as data via Artportalen. As material qualities are generally made invisible, the reported data are augmented by the observation system when merged with other reports to aggregated data. The study extends knowledge concerning how biodiversity citizen science field excursions are conducted by understanding information practices and their outcomes as entangled activities characterised by negotiations in relation to material tools rather than as streamlined processes. Consequently, the results expand knowledge of the messy practices carried out to produce biodiversity citizen science data.

Keywords: Botany, biodiversity, citizen science, information practices, materiality

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Introduction

Biodiversity citizen science includes public engagement in identifying, monitoring and recording biodiversity, producing data volumes for scientists which are not otherwise possible to obtain (Dosemagen & Parker, 2019; Peter et al., 2021). Practically speaking, biodiversity citizen science comprises voluntary efforts to monitor and assess the environment through observation of and interaction with nature (Bonney & Dickinson, 2012). While participants encompass a variety of backgrounds and levels of expertise, a shared component among practitioners is the utilisation of tools such as notebooks, field guides, cameras, report systems and image recognition-supported smartphone applications. These tools, in varying extents and forms, are used to observe, document, identify and report species types, numbers and occurrences.

As discussed in previous research, tools such as web portals and information systems can facilitate and simplify the management, processing and sharing of biodiversity data (Chandler et al., 2017). Moreover, participation in biodiversity citizen science has been stated to be made more available and simplified due to technical development (Bina et al., 2021). However, it is important to recognise that such simplification does not equal uniformity of practices. Instead, as seen from a materiality perspective, human *and* nonhuman actors mutually contribute to the production of scientific results (Forlano, 2019). Through such a viewpoint, objects possess qualities that shape practices. From this view, studying participants' use of tools for observing, identifying, documenting and subsequently reporting species, i.e., information practices (Ekström, 2022a, 2023), becomes a key issue for understanding how material qualities of tools shape and control efforts to monitor and overview biodiversity.

Citizen science is an increasingly researched topic, and the scholarly interest concerning environmental and biodiversity citizen science has risen in recent years. While citizen science can approach environmental disasters by addressing locally significant issues (Dosemagen et al., 2022), questions arise concerning how volunteers' information practices occur on-site and what aspects of the practices come to be reported through web-based forms in relation to classification systems. Since biodiversity classification normalises nature into structured, standardising categorisations (Montoya, 2022), volunteers come to depend on established taxonomic systems to make sense of what is found in the field and how to report identified findings to large-scale information systems for data aggregation. Since knowledge, previous research shows, "[…] is temporary, […] validation in the [species observation system] is a never-ending activity" (Hetland, 2020, p. 12). Furthermore, software for tabulating data can be considered organisational tools tangled with structured activities such as talking about, producing and working with data (Dourish, 2017). To understand how tools shape practices of interacting with and in relation to data, careful consideration of the handling of instruments, literature, applications and other material objects during biodiversity field excursions is needed.

An increase in research on material qualities of environmental citizen science projects in general, and biodiversity citizen science in particular, is traceable lately. In a study of birdwatching, field guides were considered media establishing the epistemic community (Lundquist, 2018). Identification activities comprised ongoing negotiations among practitioners during which the birdwatchers attempted to recognise and classify species, which created motivations among the participants (Lundquist, 2018). Another study showed that particulate matter sensors for home air quality measurement were used by participants in an exploratory fashion, testing their limits prior to expert validation (Matz et al., 2017; see also Ekman, 2021). Yet another prominent study placed an educational technology focus on the biodiversity citizen science project *iSpot*, where species reports were shown to structure participation in a community of practice (Scanlon et al., 2014). Drawing on these fruitful research contributions to knowledge production in citizen science, the present study emphasises how tools shape information practices in a botanical citizen science field excursion.

On the same note, the Swedish biodiversity citizen science species observation system *Artportalen* (literal translation: the species portal) functions as a node for storing and validating professional- as well as volunteer-reported data of animals, fungi and plants in Sweden (Swedish University of Agricultural Sciences, n.d.). However, while the information system encompasses reports of amphibians, birds, fish, fungi, invertebrates, plants and more, participants with a range of knowledge interests utilise the same standardising tools for registering findings. In line with this, the epistemic culture around *Artportalen*, as the culture that produces and mandates knowledge (cf. Knorr Cetina, 1999), has been described to value "[…] the individual trusted observer for performing particular observations" (Kasperowski & Hagen, 2022, p. 458). Yet another contribution considers, through an actor-network-theoretical approach, how a sighting of a northern lapwing is transferred by an ornithologist from a field observation through *Artportalen* to the large-scale Global Biodiversity Information Facility (GBIF) (Peterson et al., 2022). From this, questions emerge concerning how biodiversity citizen science field excursions incorporating multiple practitioners are conducted in relation to tools used during and after excursions take place.

Relevant prior studies have focused on tool use in environmental and biodiversity citizen science (Ekström, 2022a; Lundquist, 2018; Matz et al., 2017; Peterson et al., 2022; Scanlon et al., 2014). There is, however, a lack of research on how information practices are enacted in practice in relation to material qualities of tools. Studying material qualities of information practices in biodiversity citizen science through observation methods can foster an understanding

of how tools shape information practices in biodiversity citizen science. Consequently, this knowledge can serve to improve the prerequisites for species observation systems to be utilised in environmental monitoring initiatives.

Aim and research questions

This study aims to investigate how material qualities of tools contribute to shape information practices of observing, documenting, identifying, and reporting species in biodiversity citizen science. This is done by exploring how information practices are enacted through the situated use of tools by participants active in a botanical field excursion at a Swedish World Heritage Site. Reported data are subsequently studied in relation to physical observations to understand how the field excursion is translated to biodiversity citizen science data. The study is guided by the following research questions:

1) Which constraints and opportunities do material qualities of tools provide for biodiversity citizen science information practices?
2) What do these constraints and opportunities mean for how data are produced in the given empirical setting?

The empirical material is approached through Karin Knorr Cetina's (2001) theory of objectual practice and Bruno Latour and Steve Woolgar's (1986) concept of inscriptions. These points of departure, viewed through the overarching theoretical approach of sociomaterial practice theory, are explicated after a further description of the research context.

Research context

The empirical setting for this study is a field excursion at the Great Alvar, a limestone plateau part of the Agricultural landscape of southern Öland, Sweden, a UNESCO World Heritage Site. A botanical association in southern Sweden arranged the excursion. Organised regularly, the association organises these types of field excursions to monitor the flora of given geographical regions through inventorying plants at trails. The species observed during excursions or other inventorying activities are subsequently reported to the Swedish species observation system *Artportalen. Artportalen* is developed and maintained by the Swedish Species Observation Centre at the Swedish University of Agricultural Sciences in Uppsala, Sweden, on behalf of the Swedish Environmental Protection Agency (Swedish University of Agricultural Sciences, n.d.).

The excursion was conducted on a trail from a research station on a slightly cloudy day, the barren landscape stretching out as far as the eye could see. Twenty participants followed the excursion leader with their eyes focusing on the ground, asking questions about the soil, the wildlife, the climate and, most notably, the plants growing in the area. In many ways, the excursion resembled a field biology lecture with pupils following a teacher, inquiring at will about plants discovered. Some participants knew each other from before; others were new to the group. Some were experienced in inventorying the field; others were still adjusting to the practices. Occasionally, participants went about at their own pace, sweeping the bushes with nets in the hope of sampling insects or watching the skies for birds in flight. As the excursion went on, new, smaller groups were formed as extensions of the larger group. When these smaller groups stopped and fixed their gaze upon a specific plant, other members backtracked to the area of interest, intrigued about possible findings. The excursion carried on throughout the trail, circling the area before heading back to the starting point of the research station.

The distinctiveness of the Great Alvar as a World Heritage Site, as the site of enquiry, provided possibilities to the practices enacted in the sense that the participants arrived with preconceived understandings of what went on and how participation was conducted. However, there were also initial constraints to the excursion as the excursion leader's route was more or less expected to be followed. Unspoken rules were followed as the participants would leave the area as it was when they arrived, respecting the World Heritage Site.

Theory

The present study draws on a theoretical approach grounded in sociomaterial practice theory, assuming a stance where people "[…] as they interact with a technology in their ongoing practices, enact structures which shape their emergent and situated use of that technology" (Orlikowski, 2000, p. 404). Practices, from this perspective, "[…] are always sociomaterial, and this sociomateriality is integral, inherent, and constitutive, shaping the contours and possibilities of everyday organizing" (Orlikowski & Scott, 2008, p. 463). Moreover, practices are understood as sets of activities invoking shared understandings, rules, conventions and norms, along with routinised activity, places and material objects (Pilerot & Lindberg, 2018, p. 256). A notable presupposition is that practices are relational, routinised and intertwined in character.

While practice theory is employed as an overarching theoretical perspective, the study also draws on adjacent, additional theoretical concepts, which are described in what follows. Seeking to grasp situated information practices enacted during a citizen science field

excursion necessitates the utilisation of theoretical concepts where the tension between situated knowledge and standardised reported data can be unfolded. To achieve this, the study makes use of Knorr Cetina's (2001) theory of objectual practice and, in relation to the current empirical setting, the theoretical notion that epistemic objects emerge throughout participants' information practices. In the present study, species observed in nature are understood as epistemic objects during observation and identification; knowledge is projected upon the species as participants try to identify a plant, a bird or an insect. Or, in the words of Knorr Cetina, "[…] moments of interruption and reflection into the performance of research, during which efforts at reading the reactions of objects […] play a decisive role" (2001, p. 184). Epistemic objects are hence understood as projections of knowledge in lieu of objects clearly defined (Knorr Cetina, 2001). Species in the process of being identified thus open up for questions and interpretations among the participants as work activities are dispersed and distributed among the many actors (cf. Knorr Cetina, 2001). They recurrently change their properties and acquire new ones.

As Beaulieu and Leonelli (2021) describe, "[…] an amateur taking pictures in the woods produces objects through their interaction with the world" (p. 57). These objects can later be utilised by professional researchers, serving as botany data (Beaulieu & Leonelli, 2021). One way to understand the reported data is to understand them as inscriptions, practices of textually naming and noting what has been observed (Law, 2004). Tools used for these matters are understood as inscription devices, i.e., arrangements that enable the conversion of relations from non-trace-like to trace-like forms (cf. Law, 2004; cf. Latour & Woolgar, 1986). Inscriptions can be understood as immutable mobiles, objects maintaining meaning or form in various contexts (cf. Latour, 1986, 1987). However, there are also mutable aspects to inscriptions where information systems can be assumed to be mediators, not only transferring meaning as points of passage but altering the meaning through the very tools used for carrying out the reports (cf. Lammes, 2017). The study of immutable and mutable aspects of inscriptions permits the scrutinisation of how epistemic objects in the field conform to biodiversity citizen science data in *Artportalen*.

Method

It is of great significance in practice-based studies to be able to investigate the empirical setting closely while still being able to consider the setting from afar. Drawing on the methodological approach of combining participant observation and trace data studies (Ekström, 2022b, 2022c), participants' information practices and their reported findings, as uploaded to *Artportalen*, were analysed. In the present study, this coupling of methods invoked the methodological strategy of zooming in and out of practice (cf. Nicolini, 2009) by closely examining the real-time practices of conducting a field excursion and subsequently trailing the reported data as outcomes of the excursion. In turn, the approach enabled the analytical emphasis of geographical aspects of information practices, retroactive understandings of what is made visible from the field excursions and the examination of metadata as traces of information practices, as proposed in previous research (cf. Ekström, 2022b, 2022c). By so doing, it was possible to emphasise and articulate closely investigated aspects such as doings and sayings enacted in the field, bodily movements and the role that material objects play out, as well as considering distantly examined aspects as, for instance, relationships between practices and the effects of the global on the local (cf. Nicolini, 2009).

Data selection and production

The data produced and collected comprised author-produced field notes and photographs during on-site participant observation (cf. Delamont, 2004) of a field excursion as well as species reports exported as trace data (cf. Geiger & Ribes, 2011) from *Artportalen*. Invoking previous studies with participants active in this association (Ekström, 2022a, 2023), the field excursion was chosen on the basis that the participants routinely observe, identify and report species in nature, both on their own and through regularly held excursions. The participants thereby have more or less established routines and know-how concerning observing, identifying, documenting and reporting species for inventorying the flora in the region. Concerning ethical considerations, the participants of the event were informed about and granted permission for the conducted study. Information about and forms of consent to partake in the study were signed by participants or agreed upon verbally on-site. Usernames in the trace data were omitted from visualisations.

Data production was initially carried out during a one-day field excursion in the spring of 2022 through participant observation of members of the botanical association. Twenty participants altogether attended the excursion. The participants ranged from new members to experienced organisers, providing a set of participants with various experiences concerning the inventorying of plants in the Swedish landscape. During the participant observation, field notes and photographs were taken of participants observing, identifying and documenting species on-site in the field, focusing on how tools were used to enact these activities, which were conceptualised as information practices. Occasionally, informal conversations were also held with participants to allow further enquiry concerning the information practices taking place.

After participants reported their findings to Artportalen, the reports were exported in Microsoft Excel spreadsheet format. These data, as exemplified in Table 1, were considered documentary traces of participants and their activities in a trace ethnographic vein (cf. Geiger & Ribes, 2011). The trace data comprised 40 entries

of tabulated data. Each of the 40 rows represents a reported observation, with 61 columns comprising metadata variables. The variables selected for this part of the study included species names, scientific names, observation sites, dates, quantities, geographical coordinates, biotope descriptions and age stage. Trace data export was conducted on the 9th of May 2022 and was demarcated to the geographical area of the field excursion. Informed by digital sociology (cf. Marres, 2017), these digital traces were seen as remnants of information practices, the metadata representing bits and pieces of past activities.

TABLE 1.

Species name	Scientific name	Site name	Province	Quantity	Biotope description	Age/stage
Elder-flowered orchid	*Dactylorhiza sambucina*	Station Linné syd	Öland	Noted	Grazed old field	In bloom
European chickweed	*Cerastium pumilum*	Skogsbyalvaret	Öland	Noted	Grazed, tufty alvar	In bloom
Green-winged orchid	*Anacamptis morio*	Station Linné syd	Öland	Noted	Grazed old field	In bloom
Orange tip	*Anthocharis cardamines*	Station Linné SV	Öland	*NA*	*NA*	Imago/Adult

Table 1. Trace data exported from Artportalen (excerpt, translated into English)

Analysis

The analysis drew on an information practices-oriented methodological coupling approach for spatially investigating trace data in relation to traditional ethnographically inclined methods (cf. Ekström, 2022b, 2022c). This approach enabled the investigation of how biodiversity citizen science information practices are enabled and constrained through material objects (Ekström, 2022b, 2022c) by zooming in and out of practice (Nicolini, 2009). Comprising an abductive approach (cf. Pritchard, 2013), the analysis process was conducted in a fashion where field notes and photographs from the participant observation were analysed in relation to the visualised trace data through the lens of the theoretical framework comprising objectual practice (cf. Knorr Cetina, 2001) and inscriptions (Latour & Woolgar, 1986). Occurrences of reported entries and reporting participants were also visualised. The following entities emerging from the empirical data, while overlapping in practice but analytically separated, were in focus:

- Cameras and magnifying loupes for observing species;
- field guides and smartphone applications for identifying species;
- notebooks, GPS devices and Dictaphones for documenting observations and
- the standardising, large-scale information system *Artportalen*.

Compiling and structuring the field notes and photographs, the exported trace data were visualised utilising digital methods (cf. Rogers, 2019) through an author-developed geographical information system (GIS) application (cf. Ekström, 2022b, 2022c). The application was written in the R programming language. It made use of software packages such as *tidyverse* (Wickham et al., 2019), *shiny* (Chang et al., 2020), *leaflet* (Cheng et al., 2019) and *wesanderson* (Ram & Wickham, 2018) along with map data from OpenStreetMap (2022). Qualitatively studying notes, photographs and trace data visualisations alike, the reported observations, seen as outcomes of participants' information practices in the field excursion, were represented as data points on an interactive map.

While the qualitative analysis of field notes and photographs provided close examinations of knowledge claims emerging in situated information practices, the visualisations enabled an overarching understanding of reported observations, filtered by participants, with pop-up labels describing associated metadata entries. Thereby, the species reports that the field excursion resulted in were made visible and understandable in relation to the on-site participant observation during the field excursion. This enabled zooming in on an organised set of sayings and doings observed and zooming out on the traces of information practices by following connections in action (Nicolini, 2009).

Results

In this section, the results of the study are presented. Through a series of vignettes of volunteer data production (cf. Peter et al., 2019, 2021), information practices are in the present section explored with an emphasis on how tools contribute to shape the practices, as seen through the theoretical framework priorly depicted. First, tools used for annotating and magnifying plants are examined as implicating the ongoing establishment of species' features. Second, samples and the tools used for collecting them are investigated as a means for ongoing negotiations on species' identities. Third, the subsection on reported species data provides an analysis of which aspects of the field excursions are made visible in the information system *Artportalen* and which are not.

Annotating and magnifying plants as objectual practices

The participants walk in small groups as part of the larger whole, listening to the excursion leader describing the landscape, the plants living there, the professional research going on at the site and the wildlife animals walking the fields. Occasionally, some of the participants stop at a site to ponder a plant that they find especially fascinating. As this fascination arises, people kneel or lay down on the ground, studying the plants with magnifying loupes, annotating details found with the ambition to identify the species in question.

"They are horrible", one participant exclaimed, "those white flowers, they all look the same!". Identifying plants on an excursion simply by eyesight was, quite literally, not a walk in the park, especially when the flowers were not yet in full bloom. However, with tools, guidance, and a large portion of patience, the identity of the plants could, in many cases, be at least partly settled. In cases when the distinctiveness of a single species was not directly determinable, the identification was negotiated collectively among participants in the excursion. In order to establish an adhocratic consensus of species' identities through negotiations, participants took turns comparing details, habitats, and other circumstances, such as time of the year for the observation. As seen through the lens of the theory of objectual practice, definitions of the species were looped through the species as knowledge objects temporarily constructed (cf. Knorr Cetina, 2001).

Annotating plant details brought up in discussion with other participants became crucial for species identification, the practices intermingling so as to indicate which taxon the species should be labelled. The excursion leader, who had extensive experience and expertise regarding the region's flora, suggested some ideas on what to look for and how to identify almost every species found throughout the excursion. Several of the other participants relentlessly scribbled annotations in their notebooks, functioning as analogue inscription devices (cf. Latour & Woolgar, 1986; Law, 2004). One participant described signs necessary to document and keep one's eyes open for: "well… species, circumstances and conditions, recognisable features". The notebooks served as instantaneous checklists regarding things to keep in mind during the excursion.

During the time of identification, the species started to take the shape of epistemic objects in the sense that they opened up for questions, fostering further inquiry (cf. Knorr Cetina, 2001). A prominent example of this was the effort to identify dandelions, of which there are more than 900 microspecies in the Nordic countries. Being able to describe and identify a dandelion by eyesight was, hence, no easy task, but the utilisation of a magnifying loupe enabled this practice to a greater degree. In Figure 1, both the loupe and the notebook are visible as tools used by the participants for trying to make sense of the flower in question, establishing an epistemic object. The leaves, the buds and the details provided indicators that can be recognised either by field guides or via the experience-based knowledge shared between participants.

Figure 1. Two participants are kneeling on the ground, trying to identify a dandelion

As the participants, throughout the excursion, realised that there were several types of dandelions blooming in the area under scrutiny, the epistemic object pended between mainly three species: *Taraxacum intercedens, Taraxacum rubicundum* and *Taraxacum suecicum*. Several dandelions were seen during the day, and each provoked further questioning among the participants, questions that turned the species into epistemic objects. Subsequently, a participant called the excursion leader over, asking, "but there is no rose on this one?" and "what characterises this one?". As discussions and negotiations took place, the epistemic objects unfolded, inquiries and identifications swaying to and fro until consensus was reached or could not be established.

Kneeling or lying down on the ground, loupe in hand, comprised the usual procedure for a participant engaged in this kind of excursion. However, there were cases where rigorous notetaking intertwined with that which was seen through the magnifying loupe. In the instance of one particular dandelion, a discussion took place among the participants regarding which types have smooth leaves. Notes were compared, and friendly discussions were held among the participants. Loupes were brought out, and the flower in front of the group was determined to be a *T. suecicum*. Up until the point of establishing the species, the notebooks and the loupes fostered the epistemic objects, enabling previous annotations to be circled through species observed and participant notions to be coiled through iterated use of the loupes.

Samples as epistemic objects

After some further walking along the trail, various participants make use of tools for capturing species. A few participants assist each other in putting insects caught in a sweeping net into a sample tube. Others utilise image recognition-supported smartphone applications to be able to identify plants of which they are unsure. The species, whether as physical samples in the tube or as digital representations on the smartphone screen, provide means for further study and subsequent possible identification practices.

About halfway through the excursion, the participants rested for a bit by a set of stones and a stretching field of orchids. Using a

walking stick, the excursion leader pointed towards the orchids, describing three types growing on the site: *A. morio, Orchis mascula* and *D. sambucina*. The excursion leader went on to show and discuss the plants' characteristics, mentioning also how some of the orchids have been taxonomically reclassified. Such a reclassification of species implies that identified species could be understood as epistemic objects as their definitions were reconsidered (cf. Knorr Cetina, 2001), the taxonomic trees being shifted and rearranged over time. As the walking stick directed the attention of the participants to a specific flower, knowledge about the flower could be shared among the group.

Aiding the group guidance, the excursion leader was in possession of several other tools that helped shape the practices, as is visible in Figure 2. To ensure that all participants could hear the description of the flora and the milieu, the leader wore a vest with patched-on loudspeakers, amplifying the statements uttered through a headset. This, in turn, provided a way to sonically follow the events of the tour even if a participant lingered and was not at all times physically located in direct proximity to the leader or the site currently under scrutiny. Species documentation was primarily conducted through a Dictaphone, recording the species mentioned by the leader and the questions coming from the association members. Another device used was a GPS tracker, tracing the path that the leader took throughout the site. Both the Dictaphone and the GPS tracker were analytically understood as inscription devices (cf. Latour & Woolgar, 1986; Law, 2004); the Dictaphone recorded speech to digital audio files and the GPS tracker converted the trail from non-trace-like to trace-like form. Altogether, these tools shaped the temporal and spatial aspects of the identified species through digital stamps in the recorded sound file and through geographic positions in the GPS tracker, respectively.

Figure 2. The excursion leader points with a walking stick towards an orchid, directing the participants' attention. Other equipment includes a Dictaphone (top), a GPS tracker (on the waist) and a wearable loudspeaker system

While the association walking the site had a botanical focus, not only plants were observable on the limestone ground of the Great Alvar. As many of the participants were engaged in investigating the flora, one participant with a sweeping net joined them, showing his findings. The net functioned as a way to capture species that the participants could seek to identify, i.e., a trawling device through which one could pull the net through the vegetation and hope for serendipitous encounters with insects. After several attempts to sway the net in the bushes near a stone wall, the participant encountered another excursion partner, leading to the following conversation described in the field notes.

> The other participant looks into the net, "a tick, is it the big one?" he asks. No answer is given, my impression is that the participants do not want to expose any possible lack of knowledge. "That one is a click beetle, but that one I do not know off the top of my head", says the man with the net. The interested participant takes his smartphone from his pocket and starts searching the web for answers about the tick. "There are ten kinds of [tick] species in Sweden". The participant keeps searching the web for tick character features but concludes that "it is not *Hyalomma marginatum*, the big one".

Discernible from the conversation snippet, the net here served as a container of species through which the knowledge of the participants, as well as the web search queries conducted on the spot, were circulating the species observed and sought to be determined (cf. Knorr Cetina, 2001). While the click beetle was almost immediately identified, the tick proved more challenging to determine. Nevertheless, the sweeping net shaped the practices, and the identity of the tick was re-evaluated up to the point that the participant could deduce that what they had in front of them was not the *Hyalomma marginatum*. The tick, however, remained unidentified.

Yet other tools were utilised during the excursion for capturing species samples. Returning to the participant with the net, who was highly inclined to show his findings, he resumed his bug-catching endeavours by finding butterflies in the vegetation. Standing beside an ancient monument site, where several other participants were in the midst of observing obtuse sedge growing on a tumulus, he was once more helped by another participant getting two butterflies into the sample tube. When asked about the findings, the man with the sample tube became slightly perplexed: "I am not quite sure what this is; you have to look at the antennae, the wings…". Twisting and turning the tube, as seen in Figure 3a, the participants looked for clues regarding character details. The sample tube holder, still unsure of the species' identity after negotiating, finally reverted to having to bring the samples home for further analysis: "I do not know at this point. I have to consult my books".

Figure 3. (a) Two at the time unidentified insects sampled in a tube from a sweeping net and (b) a strain of Sesleria uliginosa identified through the image recognition application Google Lens

Another tool used for sampling findings at the excursion, albeit in a slightly different form, was that of the image recognition-supported smartphone application Google Lens, integrated into the official Google search app. Through such an app, primarily used by two participants in the excursion, it was possible to identify species on the fly with the aid of deep learning technology. As seen in Figure 3b, two participants identified a strain of *Sesleria uliginosa* using the smartphone application. The identification was not unproblematic as it depended on human-nature alignment. The participants described how hands shivering when holding the strain of grass made it difficult for the application to parse the image seen through the camera. Likewise, the wind blowing on the little strain made it flutter, and the need for good lighting was considered crucial for the image recognition to be correctly conducted. Apparently, the application mistook an *O. mascula* for a *Muscari botryoides*, implying another instance of classificatory negotiations. Through continual use, the epistemic objects emerged in relation to the image recognition app.

Reported species data as mutable mobiles

Following the field excursion, some of the participants report the findings to the species observation system Artportalen. By entering metadata through the forms, fields and checkboxes in the user interface, the species found during the excursion are transformed to structured representations comprising fine-grained metadata. The representations that comprise the data conform, but also expand, the field excursion practices through translations conducted through the Artportalen information system.

Returning to the research station after the excursion, the participants concluded and compared their findings, informally conversing about the day. Since the findings would be subsequently reported to the species observation system *Artportalen*, the excursion leader asked to be notified of which of the participants would like to be described as co-observers in the reports. Co-observation was valuable for many of the participants, considering that the reports would appear in their observation lists, denoting participation. Such an enquiry by the excursion leader provided a conforming, yet welcoming, collaborative aspect to field excursion, indicating which of the participants were present when the *O. mascula*, for instance, were observed.

Post reporting, the identifications made during the excursion were visible in *Artportalen* along with details such as species name, quantity, activity, discovery method, observer(s), accuracy, geographical coordinates, date and time of observation. Exported and visualised, the reports produced following the field excursion were made visible, each inscription being conformed to comma-separated values. In Figure 4, the results of the excursion and the negotiations taking place are visualised on a geographic information system map. The pop-up field denotes the metadata entered for one of the daffodils, the *T. suecicum*, as seen and identified by the participants. Visible in Figure 4, the reports of observations sprawl the field site. The colours of the data points indicate various reporting users and the blue nodes represent reports made by the excursion leader.

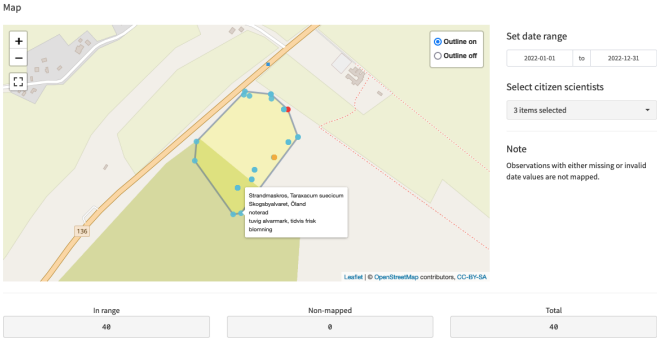

Figure 4. Visualisation of reported species observed at the field excursion. The pop-up field describes metadata affiliated with a report of the observed T. suecicum. Marker colours represent the reporting participant

The metadata of the selected data point indicates species type in Swedish ("Strandmaskros"), Latin name ("*T. suecicum*"), site of observation ("Skogsbyalvaret, Öland"), quantity (translation: "noted") biotope description (translation: "tufty alvar ground, occasionally healthy") and age stage (translation: "in bloom"). While the context surrounding the emergence of the daffodil as an epistemic object was lost in translation from the Dictaphone and the notebooks to the information system, meaning being translated between inscription devices (cf. Latour & Woolgar, 1986), granularity was added to the metadata entries of the report. This granularity, in retrospect, has been achieved by the loupes, notebooks, and cameras utilised during the field excursion. However, it is also regulated as per the reporting interface and data structure invoked by *Artportalen*.

As *Artportalen's* interface influences the participants to discipline when reporting observations, the data produced are regulated but also appended through the data tabulation occurring when storing the reports in the information system. Understood as a mutable mobile (cf. Lammes, 2017; Latour, 1986, 1987), an observation changed shape when translated from the species documentation

tool to the report tool. Conversations held, bodily movements carried out, observation tools used, and knowledge produced collaboratively in the field were restricted in the report as a data point, among others. However, the entering of metadata such as geographical coordinates as well as date and time stamps, as assisted by the GPS tracker, allowed for the visualisation of reports through interactive map tools, fostering further enquiry into volunteer-produced metadata such as biotope, age stage and quantities. Moreover, one participant also noted the use of the sweeping net as a method for sampling the insects found. Observations as data points contain details regarding the circumstances of sight, enabling data aggregation but becoming confined knowledge-wise.

While the actual bodily movements of the participants in terms of kneeling or lying down to visually examine the plants were lost, the GPS tracker provided traces of where the practices were enacted, as represented by the data points. As such, some intricate knowledge relating to the particular observation got lost in the translation. At the same time, the standardising function of the information system enabled observations to be spatiotemporally aggregated, allowing researchers, civil servants and volunteers to read and analyse the accumulated data eventually. In other words, the local knowledge enacted by volunteers during the field excursion became altered into standardised fields but allowed for visualising a snapshot of the Swedish flora and fauna.

Concluding discussion

This study has served to explicate how the material qualities of tools contribute to shape information practices of observing, documenting, identifying, and reporting species during a botanical citizen science field excursion at a Swedish World Heritage Site. Information practices enacted through a botanical field excursion were analysed through the theoretical concept of epistemic objects (cf. Knorr Cetina, 2001) to understand the emergence of situated knowledge. The concept of inscription devices (cf. Latour & Woolgar, 1986) and immutable mobiles (Lammes, 2017; Latour, 1986) were adopted to understand how the knowledge produced in situ is translated to biodiversity citizen science data.

The study showed that participants' tool use when partaking in a botanical field excursion was considered not to be stable but redefined as per their current use (cf. Knorr Cetina, 2001). On-site classification work by participants was understood to be enacted through discussions held, and questions asked, as well as through repeated observations made through loupes. These results are comparable to previous studies focusing on epistemic objects emerging through birdwatching, where the ongoing identification of birds motivates participants (Lundquist, 2018). However, the present study also demonstrated that the attempts to identify botanical species fostered discussion and practices of seeking information intuitively and informally, leading to adjacent attempts to identify species that were not found on site.

Particularly important for this collaboration to occur was the comparison of notes made through inscription devices (cf. Latour, 1986) such as notebooks or image recognition applications, as well as practices of sampling species through tubes. Practices of documenting and collecting species were hence understood as distinctly entwined with observing, as is perhaps most notable through the participant examining a daffodil and simultaneously asking, "but there is no rose on this one?". Taking notes, discussing the correct taxon or viewing a sample through Google Lens offered room for interpretation, providing an opening for the knowledge to emerge and take shape through the practices. The volunteer production of inscriptions played a distinct role in the collaborative establishment of epistemic objects. Similar to previous studies (Matz et al., 2017), these tools were used in an adhocratic manner where species identities as epistemic objects emerged through repeated tool use.

On the other hand, some aspects of the tool use narrowed or closed the negotiations, most notably in relation to the directedness of the excursion leaders' use of a walking stick and loudspeakers. Nonetheless, the informal setting paved the way for participants with varying knowledge backgrounds (cf. Ekström, 2022a) to partake in the collaborative production of botanical citizen science. While species reports have previously been described to structure the community of practice (Scanlon et al., 2014), the botanical field excursion studied arguably shaped practices in a more situated sense as the collaborative negotiation and classification attempts were centred on the emergence of species as epistemic objects.

Drawing on previous research where *Artportalen* has been understood as an inscription device (Kasperowski & Hagen, 2022), the constraints and opportunities of situated tool use for information practices could be unfolded. Echoing previous research on material qualities of information systems for organising work (e.g., Dourish, 2017), *Artportalen* was understood as being a tool of reports, systematisation, arrangements, and exhibitions, part of the messy apparatus through which botanical information practices take place. In particular, this perspective opened up to foster further understandings of how nature becomes normalised into standardising categorisations in relation to established taxonomy (cf. Montoya, 2022), but also how information systems invoke the visibility and invisibility of situated information practices as translated to reported observations. From this, it can be concluded that further situated biodiversity knowledge would be possible to gain as data points should information system stakeholders consider opening up for data inconsistencies.

The present study moreover found that some material qualities of tool use, such as the site of observation, quantity, biotope and age stage, were directly translated to the reports as metadata. However, other aspects, such as the variety of tools and participants' negotiations, became invisible in relation to species reports. Inscriptions, as shown in the visualisation of the *T. suecicum* (Figure 4), were not considered immutable but mutable mobiles (cf. Lammes, 2017) since the observations changed shape as they became translated from documentation tools to report tools. In other words, when observed species were reported to *Artportalen*, the individual aspects of the methods used for collecting species were, in many cases, the first to disappear, streamlined to standardised, tabulated reports through forms, fields and checkboxes. One exception included that a participant entered the method for sampling insects, i.e., the sweeping net, as metadata for the report.

Much in the same way that scientists conduct laboratory work, participants in biodiversity citizen science were considered to organise and systematise the field to transform species into digital representations, i.e., inscriptions (cf. Latour & Woolgar, 1986). By doing so, the information practices enacted to produce botanical citizen science data could be understood in terms of ongoing negotiations in relation to material tools. Rather than the data being produced in a streamlined, rationalised manner, information practices related to classifying wildlife organisms are messy and entangled, sometimes open and sometimes closed (cf. Peterson et al., 2022). As such, material aspects of tools, whether physical or abstract, are constitutive in shaping the information practices in terms of the enquiry and annotation of species, the capturing of samples as well as the reports of identified species. Future research on citizen science field excursions could benefit from this and neighbouring studies in the investigation of temporality. This could foster new knowledge concerning how the participants' information practices change throughout projects, improving material prerequisites for environmental monitoring. A methodological approach focusing on both the situated field excursion and the outcomes of this field excursion, as conducted in the current study, would be feasible for answering such questions.

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"I LOVE IT"

Caring for second-hand inventory in a university living lab

by Dr. Ruth Woods, Thomas Berker, Dr. Thomas Edward Sutcliffe & Hanne Marit Henriksen

Reducing greenhouse gas (GHG) emissions through renovation of the existing building stock is high on national and international agendas, but a broader understanding that includes building inventory and the circular economy is not often included. By 2028, the Norwegian University of Science and Technology (NTNU) plans to consolidate university campuses and rehabilitate up to 45 000 m² of buildings. There are some signs of circular economy at the university in institutionally established practices such as waste sorting, and green procurement, but there exists a greater potential. In 2021, the authors organised a living lab at the university, aiming to investigate whether further measures could be implemented to reduce the consumption of university inventory, such as furniture and computer equipment. We found that reuse, in contrast to the centralised administrative provision of inventory, encouraged practices of care. The experiments in the living lab addressed the dominant homogeneity and standardised character of university fixtures and fittings, provoking enthusiasm for previously discarded and unwanted objects and offering opportunities for new caring relationships. The paper asks, in what ways caring practices are performed in efforts to reduce consumption and achieve sustainability goals in complex organisations such as universities. Data was collected during experiments organised as part of the living lab. The caring practices that we identified are context-aware, empowering, egalitarian, and avoid prioritising some kinds of practices and objects over others.

Keywords: Care, universities, sustainable consumption, reuse, circular economy

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Introduction

A woman who had become the proud owner of a used black office sofa told her friend that she "loved it" as they carried the sofa out of a reuse zone to its new home on campus. In many ways the sofa and its owner were a match made in heaven; a practical need, not having somewhere comfortable to sit, was met by a sofa that needed a home, and as the common fate of similar items, the sofa would probably have been discarded. A reuse zone organised as part of a living lab on the Gløshaugen campus at the Norwegian University of Science and Technology (NTNU), helped the sofa to find its new home.[1] The reuse zone gave university furniture, digital devices, and miscellaneous office equipment away for free to students and university employees. The Gløshaugen campus is at the centre of plans for an upgrade, that includes approximately 91 000 m2 of new and rehabilitated buildings by 2028.[2] Although rehabilitation of existing buildings is central in discussions about how to reduce greenhouse gas (GHG) emissions (EU COM 2020), a broader understanding of the circular economy involving building inventory or green procurement is not part of the Gløshaugen concept. There are some signs of a circular economy in institutionally established practices such as reuse, waste sorting, and green procurement. Despite these actions there exists a greater potential, and as the story about the black sofa indicates, more circular activities could meet needs within the social context of the university.

The Gløshaugen living lab started with the idea that more could be done with the circular economy to reduce consumption of inventory in the context of the university's declared desire to reduce carbon emissions (Skaar et al. 2019). The focus on university inventory was initially inspired by anecdotal evidence where perfectly usable furniture was seen being discarded in large quantities by the university employing the authors of this article. Individual observations of a lack of care for inventory at the workplace were reinforced by a short feature produced by the Norwegian Broadcasting Corporation (NRK) which showed mountains of office furniture disappearing into skips. This caused an interest in the routines and practices associated with the reuse of furniture and other inventory, as well as the practices related to procurement.

Buildings on university campuses are expensive to maintain and manage. Storage space is limited and storing unwanted items is a challenge on university campuses. There is also an interest in reducing waste within the university system. In 2019, NTNU stated that it aimed to "reduce the amount of waste by 15% compared to the 2011 level and at the same time increase it the sorting percentage to 85% by 2020." (NTNU 2019). NTNU's Property Division introduced several actions to achieve these aims, i.e. a digital market for the reuse of furniture and equipment and changes in the use of transport on campus. In collaboration with university's Property Division, a living-lab was established where we investigated whether existing circular practices could play a larger role on campus and if there is room for new ones. Moreover, we asked whether employees and students are willing to accept a significant increase in reuse, recycling, or the postponement of investments in new equipment.

A caring, and at times, joyous approach (i.e., loving a black sofa) to reusing previously unwanted objects was observed in the reuse zones that were temporarily established as part of the living lab. The interest by students and employees for the objects showed signs of care. When caring we are often maintaining, repairing, cherishing, and selecting (Fisher & Tronto 1990; Martin et al. 2015). Activities that are closely related to principles associated with the circular economy (European Commission 2023). The paper therefore asks, in what ways caring practices are performed in efforts to reduce consumption and achieve sustainability goals in complex organisations such as universities. The question is answered by first placing the activities from the living lab within the context of the circular economy and care theory. This is followed up by the methodology which clarifies the ZEN Centre's approach to living labs. The empirical section has a narrative approach and provides stories about the care for reused objects found in the reuse zones. A concluding discussion addresses the untapped potential within universities to enable and participate in circular-economic practices.

Reuse and the circular economy

Reuse is a re-actualised practice, which, in recent years, has become central to European and national climate, environmental, and industrial policies commonly grouped under the banner of the circular economy concept (e.g., European Commission 2015; 2020). This concept is interpretive and definitionally flexible but refers generally to a model of production and consumption that involves practices of reuse, sharing, leasing, repairing, refurbishing, and recycling existing resources and products (European Commission 2023). As a consequence of strategic policy development, the circular economy concept has been growing in relevance in industries,

1 NTNU is Norway's largest university with 40 000 students and 6 500 employees. The university is located in three cities, Trondheim, Ålesund and Gjøvik. The largest campus, the Gløshaugen campus, is found in Trondheim.

2 The original plans proposed 92 m2 of new buildings and 45 000 m2 of rehabilitated buildings https://www.ntnu.no/campusutvikling/tidslinje-campusutvikling. This has now been reduced due to state budget cuts https://www.statsbygg.no/prosjekter-og-eiendommer/ntnu-campussamling.

governments, businesses, and environmental organisations across scales. Until now, actions for a circular transition have tended to emphasise measures within the waste management sector, or post-consumption practices (Maitre-Ekern, 2021), but have also focused on efficiency strategies aiming to reduce primary resource input and energy demand (Bimpizas-Pinis et al. 2021).

Parallel with the heightened relevance of 'circularity' at the European policy scale, there is a goal in Europe to reduce the carbon emissions associated with buildings to zero (Energy Performance of Buildings Centre 2021). However, building certifications and investigations about the environmental impact of buildings rarely include the emissions associated with furniture and other inventory (Hoxha & Jusselme 2017; Lauvland 2021). Hoxha and Jusselme (2017) in a study of assessment of the environmental impacts of furniture and appliances used in highly energy efficient buildings, found that furniture and appliances were responsible for around 30 % of GHG emissions and non-renewable energy consumption and 15 % of primary energy consumption when compared to the overall impacts of the building. They also noted that, how to deal with furniture that is no longer wanted is usually not included in strategies for the follow-up of buildings. In 2017, from 80 % to 90 % of European furniture waste was incinerated or sent to landfill, and only 10 % was recycled (Forrest et al. 2017).[3] The reuse of furniture has become more common, but it tends to be small scale actions, rather than larger scale environmental ones. Where reuse does occur, it is mostly through commercial second-hand shops, social enterprise companies or charities (Ibid).

The role of buildings and infrastructure is also of relevance in the circular economy literature. For example, Mendoza et al. (2019) report a lack of studies that analyse the implementation of circular economy thinking in universities. They use the University of Manchester as a case study to identify, evaluate, and prioritise intervention areas for circular economy business model innovation. The authors identified that refurbishment of existing inventory, predominantly furniture, was viewed as a priority action for the university. A key principle of a circular economy is extending products' lifetime, which entails an expansion of repair and maintenance practices. Bugallo-Rodriguez and Vega-Marcote (2020), for instance, argue that universities have a valuable role in disseminating the circular economy as a new sustainability paradigm. How this is done is also under researched, as identified, for example, by Serrano-Bedia and Perez-Perez (2022) in their review of the role of higher education institutions as central supporting stakeholders in circular-economic transitions. Here, the authors identified a sub-group of circular economy literature they categorised as 'campus management'. Serrano-Bedia and Perez-Perez (2022) frame initiatives and activities under this category as contributing to the cultivation of circular economy mentality and eco-responsible citizenship; highlighting that university campuses can act as ideal places for testing circular economy activities. Our paper is a direct contribution to the marginal literature on this issue and seeks to contribute to better understanding how circular economy practices can be implemented in higher education institutions.

According to Stahel (2016: 435), "Quality is still associated with newness not with caring". As such, the idea of newness as opposed to reuse is a critical element to address in a transition to increased circularity. Newness is relevant to the Gløshaugen living lab, as NTNU campuses throughout their lifetime have been subjected to the renewal of their facilities, e.g., offices, laboratories, study areas and canteens. In most instances, the campus renewals entail the acquisition of new inventory, including electronic equipment and furniture.[4] Therefore, while there are established reuse practices at the university, there is still more that can be done if public procurement is to reach sustainability goals, which is a priority in the Norwegian circular economy strategy (The Ministries, 2021). The reuse of inventory and the testing of circular economy activities can be seen as an effort to address how we value unwanted items. What we value, why we value things and who decides what is valuable is far from clear. In a perfect situation everything is durable with an infinite lifespan and stable value. Unfortunately, many of the objects around us have a transient value, that constantly decreases until they reach the non-valuable category of rubbish (Thompson 2017). Objects can however be re-discovered and through creative processes re-evaluated and re-interpreted.

Conviviality and care as strategies for increased circularity

An alternative avenue for sustainable and more circular activities in universities is a convivial approach to the circular economy (Genovese & Pansera 2021). The approach emphasises the interdependence between people, technology and the world around us. It implies an orientation towards socio-technical pathways that surpass modernity, contributing to social and ecological justice through collective action (Stirling 2015). Ivan Illich (1973) saw conviviality as promoting the satisfaction of needs through individual skills, learning and creativity, as well as through autonomy from industrialisation and commodification. Our approach considers how caring practices along with conviviality can become a central building block in existing and new circular-economic practices of higher education institutions related to how they manage inventories of miscellaneous equipment, electronics, and furniture.

3 More recent figures specifically for furniture are currently unavailable.
4 https://www.statsbygg.no/nyheter/forskningsutstyr-for-milliardbelop

Caring practices are between people, and between people and things, and they can create connections between public and private values. Fisher and Tronto (1990: 34) provide a broad definition, where care is "everything we do to maintain, continue, repair our 'world' so that we can live in it as well as possible." This idea of how we repair or maintain our world is essential to understand reuse as an active and caring approach towards achieving a sustainable future.

In feminist scholarship, the concept of care is applied to describe the work and responsibilities involved in maintaining the wellbeing of others, i.e., health care, childcare, or caring for the elderly (Mol et al. 2010). Practicing care represents a dedication, concern, and attachment to others (Kleinman & Van der Geest 2009), it also tends to be highly gendered, with women being associated with unpaid caring responsibilities (Martin et al. 2015). Furthermore, caring practices are often unaccounted for in economic conceptualisations of labour, despite being essential for maintaining wellbeing (Fisher & Tronto 1990; Puig de la Bellacasa 2011; Martin et al. 2015).

By taking a used and previously unwanted object into their possession, in our case a piece of second-hand university inventory, a person is expressing an active desire to engage with the object. People are dependent on care and so are technologies and objects. This implies "tinkering", where practices, situations and tools are adapted to suit individual and collective needs that address complex and shifting tensions (Mol et al. 2010: 15). Care has a place in sustainable practices that are outside the controlling and universal technological focus that we recognise from the modern world (Arora et al. 2020). It also challenges established consumption practices that are based upon seemingly endless growth and affluence (Syse & Müeller 2015). Consumption practices are part of consumers' identities which seem difficult to change because they are closely connected to how we present ourselves to the world (Giddens 2008). Godin and Langlois (2021) propose that this could change if care and caring are prioritised by society. Caregiving and care-receiving point to vulnerability and the interdependencies that make it possible for us to be part of the world (Puig de la Bellacasa, 2011; Godin & Langlois 2021). The reuse of second-hand inventory or furniture implies maintaining, repairing, and caring for objects that do not have a place in the world and require help to find a place. It also suggests an interest in the history of the object and a willingness to repair and adapt it to other uses, and needs, that may be as diverse as the people who are interested in the reuse of these objects. Objects, in our case university inventory, degrade when there is a lack of care. What is required is a willingness to tinker, to adapt objects to the situation and to adapt the situation to the objects at hand (Mol et al. 2010).

A caring approach avoids normative, one-size fits all solutions, and the pitfall noted by Puig de la Bellacasa (2011: 100) that "a way of caring over here could kill over there." The challenge is that this selective mode of attention, which means valuing some things, can end up excluding others (Martin et al., 2015; Lindén & Lydahl 2022). However, what is selected can provide a direction to follow, in our case second-hand objects rather than the newly procured. Caring for second-hand objects privileges interdependence, rather than hierarchically-ordered categories of the good, the bad, the new, the old, the ugly and the beautiful. When care is practiced subjects are interconnected in diverse relational webs that are horizontal rather than vertical. People and things can be different, but caring means solidarity and collectiveness that is based on the acknowledgement of difference (Arora et al. 2020). It is also a grounded and situational approach that prefigures humility and learning from each other as key to achieve more sustainable solutions (Jasanoff 2018). People and objects require care that is adapted to their needs in ways that highlight and promote neglected things, respecting them and engaging with what they could become (Puig de la Bellacasa 2011).

Taken together, circular economy activities in universities, care and the role of buildings and inventory in sustainability transitions provide a framing that allows for a research design that emphasises an active and heterogenous approach to university inventory. Where sustainability goals on European, national, and administrative levels at the university are given a local social context involving students and employees in a living lab on the Gløshaugen campus in Trondheim.

Methods: a living lab approach

The ZEN centre chose living labs to involve and engage citizens with the technical innovations being developed. A ZEN living lab is defined as a creative arena for knowledge exchange, between people, places, and technology (Woods et al. 2019). This definition is associated with qualities that inspired the first living labs at MiT during the 1980's where the intention was to study people and their interaction with new technologies in a living environment (Schliwa & McCormick 2016).

The Gløshaugen campus was one of nine pilot neighbourhoods associated with the Research Centre for Zero Emission Neighbourhoods in Smart Cities (ZEN). The centre aimed to develop emission-free neighbourhoods that reduce their "direct and indirect greenhouse gas emissions towards zero within its life cycle".[5] Living labs, experiments and interventions are often about supporting interests and avoiding potential opposition (Evans 2011; Bulkeley & Castan Broto 2013). In the present case the strategic interest was promoting ZEN's zero emission research and its relevance in urban sustainability transitions. Furthermore, the living labs were intended to avoid discontent with technical innovations that are the focus of the centre. Overall, the

5 https://fmezen.com/about-us/

living labs provided what Janda and Topouzi (2015: 517) call "learning stories", which were co-produced together with the recipients of the innovations in the context of the living lab. As part of this, ZEN's living labs offered stories of opposition to the goals associated with the ZEN Centre. The challenges uncovered by the ZEN living labs can briefly be summarised as arising from a mismatch between the universal solutions that the zero emission technologies represent and the challenges and needs of the local contexts provided by the pilot projects (Woods & Berker 2019; 2020; 2021).

The stories from the living labs also highlighted the potential for opposition in communities where research was taking place and showed that communities do not always react positively to being considered test beds, being experimented on, or being defined as a pilot project (Woods & Berker 2021; Hobson & Marvin 2007; Bulkeley & Castan Broto 2013). When designing experiments to consider the relevance of technical solutions for a reduction in GHG production within a pilot project, ZEN's research team learned to expect challenges when engaging with the social context the pilot project represented. It came therefore as a surprise that the experiments that were part of the Gløshaugen living lab should provoke enthusiasm and even expressions of joy.

The Gløshaugen living lab

ZEN's living labs are based around four main criteria (Woods et al. 2019). Living labs are often problem based (Steen & van Bueren 2017), and ZEN's living labs start by identifying a challenge or problem within the local social context. In the Gløshaugen living lab, the challenge identified was the comprehensive discarding of university inventory. The second criteria is a clearly defined geographical space, and the third, is the involvement of representatives from different local groups. In the Gløshaugen living lab, the campus was the location, and the participants were students and employees, both academic and technical staff. Experiments represent the final criteria for the living labs. These should ideally be an action that engages with citizens in the neighbourhood (Sengers et al. 2016).

The Gløshaugen living-lab activities and experiments took place from May 2021 until June 2022 and were associated with three main phases. Each phase is briefly presented in Table 1. At the end of each phase, we evaluated the process and the empirical data gathered. The following phases and associated activities were planned and developed based on the evaluations. In each phase we worked closely with eight experts from NTNU. Six were working with either reuse or recycling, and two with procurement. They were each recommended through NTNU networks as "experts" in their fields. They provided valuable input about existing activities and the challenges associated with NTNU's strategy for the reduction of waste on campus.

Data collection was approved by the Norwegian Centre for Research Data, and privacy protection standards were strictly adhered to. All informants are anonymous. People came from a wide range of different cultural backgrounds, reflecting the international character of the campus, but we have not collected the ages or socio-cultural backgrounds of the people that we spoke to. Students and university employees were of different genders and ages ranged from their early twenties, to people that we suspected had already started their retirement.

TABLE 1

When	Method	Who	Number of participants
Phase 1 Autumn 2021			
	Conversations	Experts from NTNU	8
	Site visit and observations at university recycling centre & storage spaces	Experts from NTNU	5
	Rapid interviews carried out by 8 students on two campuses in Trondheim	Students and employees from NTNU	100
	Two workshops where experiments were co-designed	Workshop 1: Students Workshop 2: Experts	Both workshops - 28
Phase 2: Winter 2021/22			
December 2021 Experiment 1	Christmas calendar in collaboration with NTNU's digital recycling platform	University employees. Information about the calendar was available on the university intranet. Some students chose to participate.	Approximately 400 invitations by email were sent to university employees.
January 2022	Follow-up interviews about the calendar with employees and students	University employees and students	10
Phase 3: Spring 2022			

March 2022 Experiment 2	Three-day event with reuse-zones on NTNU's Gløshaugen campus	University employees (including the property division) and students	125 (179 objects)
June 2022	Expert evaluation	NTNU experts	6

Table 1: The three living lab phases

Phase 1: Interviews and a questionnaire

During the first phase we addressed an initial question, which was whether employees and students are willing to accept a significant increase in reuse, recycling, or the postponement of investments in new equipment. Conversations with the experts and a site visit supplied insight about reuse practices at NTNU. In addition, the rapid interviews that a group students carried out on two university campuses in Trondheim during the first phase provided background information to understand reuse practices and expectations among students and employees. Firstly, 82 % of the 100 respondents reported that reuse is an important part of everyday consumption.[6] This was primarily about sorting household waste but buying second-hand clothes and furniture was also mentioned. Secondly, 97 % of students and of employees responded positively to the suggestion that second-hand furniture could be used in new or refurbished campus buildings. Thirdly, students and employees were generally critical of NTNU's sustainable practices, they believed that there is very little in place and that what was in place was poorly communicated. Finally, they maintained that NTNU's reputation will be on the line if nothing is done to increase the reuse of furniture and other university equipment. One student even went as far as to suggest that "Armageddon" would result if NTNU did not change its practices.

The response during interviews and when answering the questions from the questionnaire indicate a general readiness among students and employees for the reuse of university inventory. However, in the follow-up workshop, the experts questioned the alleged positivity towards reuse at the university. They stated that their efforts to encourage reuse of inventory had been met by resistance. The experiments developed gave us the opportunity to examine whether there is a difference between what students and university employees said about their willingness to accept an increase in circular practices in the context of working or student life, and their actions when the opportunity arose to reuse objects. The experiments offered suggestions about what new practices at the university could look like.

Phase 2: A Christmas calendar experiment

The second phase included an experiment that took place in December 2021 and was a Christmas calendar, where employees could win a different piece of free university inventory every day. The data from the first experiment is limited. More than 400 employees received the calendar by email, but it is unclear how many participated and privacy issues meant that we were unable to send the calendar to students at the university. The focus of this paper is the reuse zones that were part of phase three. This was where we had most contact with students and employees.

Phase 3: Experimenting with reuse zones

Three reuse zones took place in March 2022 over three days in two buildings on the Gløshaugen campus. Each day lasted approximately six hours from 9 am until 3 pm. The experiment with reuse zones was supported logistically by six experts from NTNU's property division. They supplied inventory for the zones and transported objects between different parts of the university. The zones included a variety of free and unwanted items that had been collected from the NTNU campuses. This included furniture such as office chairs and tables, electrical items (coffee makers and microwaves), digital technologies (computer screens and cables) and numerous other small and large objects which may be found in offices and meeting rooms on Norwegian university campuses. The items collected stemmed from relocating processes that resulted in redundant furniture due to, i.e., lack of space or incorrect measurements, and other goods that were not considered useful in the new location. Other items were a result of a tidy-up in storage rooms at different departments. The experiment was announced in ZEN's monthly newsletter and through NTNU's intranet for employees. Privacy policy at the university again meant that we were not able to reach out to the students through intranet or email and this meant that students found out about the zones by word of mouth. We noted a marked increase in student participation during the third and final zone.

In total 125 people picked up one or more items. Of these, 47 were students and 78 were employees. The university is a state-owned organisation and cannot earn money from the sale of its property, giving things away on campus ensured that a lot of the things remained in the university system. Some objects ended up in home offices, kitchens, and bedrooms but the property division accepted this was a result of the experimental nature of the living lab. Everyone who took an object was asked to fill out a short anonymous questionnaire. We asked what the new owner planned to do with the object, what it replaced and what they planned to do if they decided that they no longer needed it. People gladly filled out our form, they even asked if there was more that they could do. We experienced this as an unusually enthusiastic response to a questionnaire. The results section presents some of the observations that were made during the re-use zones that connect reuse, circularity and practicing care within a sustainable university context.

6 The Norwegian word for reuse is "gjenbruk". In the interview guide and questionnaire, we asked informants to tell us about their "gjenbrukspraksiser" "reuse practices". Informants understood this in terms of several practices such as recycling rubbish and buying second hand clothes and furniture.

Results: Stories from the reuse zones

In the reuse zones connections were made between what was said during the rapid interviews in phase one and the potential that exists in extending circular practices at the university. When students and employees were given the opportunity to take previously unwanted items into their offices, clubrooms, classrooms, and homes they responded positively and even joyfully. When they filled out our questionnaires and spoke to us about the objects available in the reuse zones, students and employees told us that they were happy to reuse university inventory and they expressed enthusiasm about the opportunity to do this on campus. On the first day, people lined up half an hour before the zone opened. There was the feeling that we had opened a "jumble sale" (Loppemarked), a typical second-hand activity in Norway and one that resembles Clifford Geertz' (1979) description of a Moroccan souq, or bazaar; a hectic, noisy place, with excited people, where piles of assorted wares are thoroughly examined (Geertz 1979). We struggled to meet the demand, and on the first day almost ran out of objects to give away. During the three days that the reuse zones were in place a total of 179 objects found new homes.

We received very little negative feedback about the reuse zones. Some of the technical staff in one of the buildings where the zones were located worried about us blocking escape routes, but we moved things around and solved that problem. Three different social groups associated with the university; academic staff, students, and technical staff, are represented in the stories that follow. In each story there is an active approach to the unwanted objects and the need to reuse them, that is reflected in Fisher and Tronto's definition (1990) where maintenance and repair of the world is central. Different categories of caring practices are present in the stories, tinkering, solidarity, and planning for the future. The stories offer insight into the caring potential found in reuse at universities, where objects become wanted and valuable again.

A perfect match through tinkering

Fig. 1. Trine and Audun's "new shelves". Photo published with permission from informants.

The story about tinkering refers to Audun and Trine, who both work at the University, and the shelves they gave a home to. The shelves were found by Trine and were lying in a pile on a wooden pallet, still in their original boxes with the maker's name on top, looking like a very large puzzle. They were easily the largest item in the reuse zone and very few people had shown interest in them. Trine recognised the maker's name and the potential that the shelves represented. Trine and her partner Audun had planned to buy the same shelving system for the house that they had moved into earlier in the spring. They decided that buying the shelves new was not an option because they were too expensive. On the same day as the reuse zone was organised, Trine and Audun had planned to go to Ikea and buy a cheaper shelving system. When they found the shelves in the reuse zone, they cancelled the trip to Ikea and instead took home the university's unwanted shelves. Buying a shelving system in a store is usually done based on a planned layout with exact measures. The shelving system found in the reuse zone, however, represented a large puzzle, purchased for a different project. Thus, taking home these shelves meant that Audun and Trine had to spend time figuring out how these shelves could fit in their house. Their plans for the shelves had to be adapted to fit what they had found in the reuse zone. Audun later told us that the shelves required an extra 6000 NOK of investment in the pieces that were missing to get them set up in the basement. Thus, it is unclear if money was saved by taking the shelves home. On the other hand, Audun said, there were enough shelves to also cover a wardrobe in the bedroom. The meeting of needs, in this case, was impressive. The reuse zone placed the shelves where they were needed on exactly the right day.

Reused or second-hand objects do not always fit the context where they are intended to be used. When objects lose the value from their original use context they do not always easily acquire new value in the hands of new users. They are heterogeneous and exist outside universal and more standardised forms, but by ignoring objects and not taking the time to care we run the risk of continuing the production of new objects and of GHG emissions. Without "adaptation, tinkering, fine-tuning, and repair" (Arora et al. 2020: 251) an object will remain unwanted rubbish. Trine and Audun were enthusiastic when they found their preferred shelving system but adapting the shelves to their home required work. This was work that they happily took on themselves. Tinkering encourages the adaption of practices and objects to suit needs that are complex and continually shifting (Mol et al. 2010). Without care the need for extra parts and their lack of an easy fit, could have meant that the shelves were again defined as unwanted.

The treasure hunt

Care is not necessarily an easy or simple option. Reuse also requires work, whether it is tinkering to make something fit in its new location or engaging in new practices to find what is needed. Clarke (2001) tells us that a typical strategy for dealing with the

heterogeneity of a jumble sale or nearly new sale is to circulate at least half a dozen times around the stalls before identifying the key areas of interest. This strategy was applied by a student who turned up early to the third and last reuse zone. He was with a group of students who had a lecture in an auditorium close by. He spent some time looking for something to fit his needs before the lecture but only struck lucky when he took another look after the lecture was over. Then we heard him shout to his friends "I found a cable!!" at the same time as he lifted the cable triumphantly above his head. Later in the morning, when he went to the study room where other students were working, he showed them the cable and recommended that they also visit the reuse zone. In this way, he shared the joy he had experienced during his treasure hunt. We know this because we met one of his fellow students in the afternoon in the reuse zone.

A mathematics student had a similarly joyous experience when he entered the reuse zone and spotted two blackboards stacked against the wall. Having a blackboard in his own home had been on his wish list for a long time. He told us that it was a great tool for mathematicians. Not long after he left with one of the blackboards another math student approached the reuse zone and asked if this was the place where he could get a blackboard for free. He grabbed the last one and told us that all his flat mates were mathematicians, and that the blackboard was to be put up on the wall in their apartment and shared with his flat mates. During the next half hour, several math students stopped by, confirming that the rumour of free blackboards had spread. Their disappointment about being too late was obvious.

During the three days, we observed several people visiting the reuse zones texting and calling their colleagues or friends to inform them about available items. Many of them did not take home anything themselves but were still obviously inspired to help others to meet their needs.

Caring in an environment of second-hand objects means solidarity and collectiveness despite differences (Arora et al. 2020). It also means sharing the burden by active caring (Lucas-Healey et al. 2022). In this case it meant learning new practices and encouraging others to support and participate. The cable came out of a box of miscellaneous cables, computer mice, and unidentified mixed computer stuff that we found in our department copy room. When one colleague suggested that we put the box in the reuse zone, another asked, "Will anyone want this?" We decided to give the box a chance and the meeting of needs was thereby enabled. The incident highlights the lack of hierarchy in the world of second-hand goods. What our colleagues considered rubbish, was the student's treasure. The blackboard, which might be seen by many as an outdated technology, is still perceived as a useful tool by mathematicians.

The student interested in cables and the math students did not care about the age of the objects or the context in which they were found. Solidarity with the objects is part of the stories about cables and blackboards, but they are also about the sharing of joy and connecting new students to caring practices represented by the reuse zones. Solidarity and collectiveness despite differences and the active approach were also expressed through people's wish to match their friends and colleagues with items that they did not have any interest in themselves. This can be understood as caring for both objects and people.

Caring for the future of things

Caring practices are often unaccounted for, despite their importance for maintaining wellbeing (Martin et al. 2015). Giving and receiving care, if it is to become established and be meaningful practice, is not something that we should do alone. The two final stories include the technical staff from the Property Division. Lars, our designated driver, came and went throughout the three days and was constantly searching for more objects to fill the reuse zones. He listened to our needs - If we lacked office chairs, he found more chairs. He also spread the word, encouraging his colleagues to find us more unwanted inventory, and to join in with an activity which Lars believed was "the most important thing NTNU has ever done." Lars was conscious of fighting for unwanted objects. He has transported inventory around the university for a number (unspecified) of years and has seen many useful objects being thrown away. Lars has also heard colleagues talk about their frustration when they tried to save things from destruction. Being part of activities to test the interest among students and employees for the reuse of university inventory met a need. It gave Lars the opportunity to show that caring for the objects, for the university and for the environment was part of his job. He no longer felt alone in caring about what happens to things people do not want, he had become part of something that was attempting to change a university practice.

Lars was not alone in wanting to do more. During the second day of the reuse zone, a couple of janitors working in the building where the reuse zone was located showed up. They wondered if we were interested in more objects because they had some old office furniture in storage that was taking up space. We gladly accepted the furniture. Throughout the rest of the day, the janitors stopped by regularly to check on how "their" items were doing. They were very pleased to see that most of them were picked up quickly, confirming that they were not just happy to get rid of stuff, they cared for the old furniture. Experiencing that the objects were appreciated by others made them feel good and part of something that was attempting to change practices that they, in a similar way to Lars, were struggling with.

Care is vulnerable because it depends on others (Martin et al. 2015). Practicing care takes place within a network of interdependencies that make it possible for us to be part of the world (Puig de la Bellacasa 2011). Practicing care alone is a challenge, but Lars and the janitors were not alone in wanting to raise awareness about the problem of unwanted inventory and in the desire to change university practice. Our six experts from the Property Division

felt similarly, but the group also felt small and isolated. During a meeting where we evaluated the results from the experiments, they told us that the idea that what is old or damaged has no value is strong in the Property Division, but they wanted to change this. Godin and Langlois (2021) propose that if caring is prioritised by society, there is a chance that its position will be strengthened. Our team of experts believed that the experiments and activities that were part of the living lab would help them to highlight the need to change practices at the university and to establish a wider caring solidarity first and foremost among their colleagues, but also further up in the university hierarchy. Our experts from the Property Division also believed that there was a future for reuse zones at the university.

Discussion

Among the challenges of moving towards more 'circular' practices is overcoming the desire for newness. Perceptions of an object's obsoleteness are social and cultural drivers for exchanging one product with a newer and allegedly better one, which was identified in an extensive study of mobile phone replacement, repair, and reuse in Austria (Wieser & Tröger 2018). Objects that could have a long life, like mobile phones, chairs, or computer screens, become transient objects and end up being categorised as rubbish (Thompson 2017). This emphasis on newness and procurement within the university system has resulted in a large number of objects losing their place within the socio-technical system, becoming unwanted and uncared for.

Universities can be seen as representing a hierarchical and centralised structure, with top-down planning and reduced local autonomy for departments, employees, and students, that can limit the ability to make choices outside the system (Martin 2016). In our case, the opportunity to choose to reuse inventory rather than procuring new objects. Reused objects are heterogeneous and diverse, rather than universal and standardised (Arora et al. 2020), and as such are not currently prioritised by the university's procurement procedures. Through experiments in the context of a living lab, we found that reuse, in strong contrast to centralised administrative provision of furniture and equipment, encourages caring practices. The experiments broke down the dominant idea that university fixtures and fittings should have a homogeneous and standardised character. Experiments also provoked enthusiasm for previously unwanted objects and offered opportunities for new caring relationships. The living lab provided a space for people and objects, and their different needs to meet. Through interviews and experimentation, we found that there is widespread acceptance of the reuse of university inventory among employees and students. Participating in reuse provokes a mixture of rational and emotional responses that indicate a widespread critique of the lack of care for things and the environment.

The response to the objects in the three reuse zones showed that people are more than willing to engage with objects that have been used and discarded by others. Sustainable consumption is often dependent on relationships (Godin & Langlois 2021) and the objects from the reuse zones were often intended to be shared with others. Fisher and Tronto (1990) suggest that the knowledge, skills, and the capacity to organise resources involved in caring processes are developed and shared in collective contexts. By sharing the objects, visitors to the reuse zones are also sharing their interest in reuse practices with others.

Care in this context means making room for things that do not fit and are not standardised. Caring can take place between objects and people, allowing for differences and new kinds of relationships that are not hierarchical and pre-defined. In this way avoiding pre-established ideas (dichotomies) that new is best and old is bad and should be thrown away. The idea of care also draws attention to 'Who cares?' 'What for?' 'Why do 'we' care?', and importantly, 'How to care?" (Puig de la Bellacasa, 2011: 96; Martin et al., 2015: 626, Linden & Lidahl 2021: 5). The three stories presented highlight three different aspects of care: the need for tinkering in the performance of care, that caring is performed in the mode of sharing, and the paramount importance of professionals.

Trine and Audun's story shows how crucial tinkering is for the re-valuation of de-valued objects. Being discarded involves being removed from a previous context of use - both literally and in a symbolic sense. The object had a function before, but now only traces of the functions and related meanings remain. The traces from previous uses, then, are likely to become limiting aspects – e.g., in the shape of a worn-out hinge or the need to hide scratches. These limitations are likely to increase the need for tinkering. Trine and Audun invested quite a lot of time into caring for the shelves. They might have saved time by buying the shelves in its new form, but they seemed to enjoy the tinkering in its own right.

In the case of the cables and blackboards, we have encountered another aspect of care, which was related to its communal performance. A focus on sharing instead of competing and selling in a market (Price 1975) was inscribed into the fundamental frame of the experiment. The things on offer were not only decontextualised from their previous use but also "worthless" in the sense that they were not valued in terms of an expected demand. Instead, the objects were shared by the university with its students and employees without expecting any reciprocal activity. As the stories surrounding cables and blackboards show, the sharing continued in how the recipients' shared information about the objects on offer with their friends and colleagues. Re-valuing the object by sharing becomes a common effort in which the matchmaking happens alongside others.

The story of the driver Lars and the janitors was presented above as illustration for the need for collaboration and mutual help in the performance of care. Without their help, the experiment would have been impossible, they were the ones who knew where to find the objects that were given away. Their strong engagement demonstrates that they perceived this work as valuable and meaningful. They preferred performing the care work that took place in and around the reuse zones, rather than their more common participation in practices of waste disposal.

The team of experts from the Property Division even believed that the experimental actions were a success that is worth repeating. The experiments increased the reuse of objects on campus, made existing reuse practices at NTNU more visible and raised awareness among students and employees about the need for them. As a result, new temporary reuse zones were planned, but new zones and increasing sustainable circular practices at the university require resources, in the form of more people and space, and this will require economic investment. How the Property Division will gain access to the resources necessary to enable them to continue to do what they all consider important work is yet unknown. Establishing caring practices within a large organisation is a vulnerable position. Interconnectedness and dependency characterise care. One team of six enthusiasts in the Property Division is vulnerable and perhaps not enough to make the widespread changes necessary. There is the danger that they will lose their enthusiasm if no one from the university leadership or administration cares enough to offer support. Giving care also depends on the availability of resources, and who makes them available (Godin and Langlois 2021). The lack of resources can influence opportunities for developing and nurturing circular practices.

Conclusions

The caring practices uncovered through living lab activities could be useful in efforts to reduce consumption and achieve sustainability ambitions in universities. Universities are centres for the research and education that is necessary to enable society wide communication of the challenges and solutions to reducing GHG emissions and sustainable transitions. With this role comes the responsibility to make structural changes in the university organisation to follow-up the goals set by the Paris agreement to reduce greenhouse gas emissions. NTNU has stated that the Gløshaugen campus is to be a zero-emission campus, but recent state budget cuts threaten these ambitions.[7] There is little money for renewable energy production, ambitious energy saving systems, or even the recycling of building materials. We propose that the challenges this implies for the technical solutions to a sustainable campus offers an opportunity for the resource efficient low-tech ambitions found in reusing university inventory. Ambitions that in addition to reducing the production of GHG emissions also promote a more caring and inclusive approach to the sustainable future. The numerous small scale heterogeneous actions that care requires engages effectively with the challenges of achieving sustainability transitions and is an alternative to universal techno-centric solutions about energy efficiency often promoted by the University. Technical solutions that take the actions to reduce GHG emissions out of the hands of citizens and place them under the control of experts and technologies (Ellesworth-Krebs et al. 2015).

By taking objects from the reuse zones in the living lab, people were also participating in circular consumption practices that say something about their expectations toward the university. A university that introduces new circular practices can avoid "Armageddon" and receive support from its students and employees. A convivial university offers a caring circular-economic context that supports its employees and students in actions that are autonomous, diverse, adapted to the context, rather than standardising in their efforts to achieve sustainability. The democratic politics of social-environmental activism and public policy are essential to such a process (Arora et al. 2020). We propose that modest acts such as reusing objects could also help to steer large organisations like universities towards a more caring and sustainable future.

Care emphasises a long-term commitment, which is largely what the circular economy is about, i.e., extending product lifetime. The more mainstream sustainability efforts centre around strategies of efficiency and product substitution (new objects), which is necessary for the continued value creation within a growth-based and technocratic paradigm. A convivial approach to sustainability opens different avenues for engaging more personally with objects, which is required to reduce the need for newness and enable an extension of a products lifetime. Our contribution emphasises how a shift to more circular forms of organisation in universities can be achieved, and how engaging students and employees can facilitate and promote care practices.

7 https://www.universitetsavisa.no/anne-borg-campusprosjektet-ola-borten-moe/ola-borten-moe-varsler-kutt-i-campusprosjektet-pa-mange-millarder-kroner/360172

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THE POLITICS OF VALUATION:

Value Disjunctures in Bioethics and Fetal Research During the 20th Century

by Francis Lee, Solveig Jülich & Isa Dussauge

This article has two aims: First, the article proposes to sensitize our analytical minds to what we dub "value disjunctures"—clashes, in practice, between different valuations. The article proposes a strategy for analyzing value disjunctures—paying attention to how different value worlds de-cohere. We ask: What happens if we highlight the periods and situations when versions of the world are pulled apart? Second, the article aims to highlight how today's bioethics can neither be read as a tale of democratization of ethics, nor as a tale solely driven by ethical disasters. What we offer is a story of how the bioethical yardsticks of today were established as dominant in fetal research. The sensitizing concepts we propose shine a light on how bioethicalization is a historical process that intertwines what is good, with what objects are seen as important, as well as how these objects are understood. Bioethicalization is a struggle about valuations, which yardsticks for the good that become salient, but also a struggle about which objects should be valued, as well as the nature of these valued objects. This article highlights how all matters of value—the ethical, the epistemic, and the economic—are intertwined with changing ontologies, thus highlighting how ontologies and values are enacted together.

Keywords: Valuation, enactment, ontological politics, valuography

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Introduction

Fetuses are valued in many ways. They are often valued in terms of non-quantified scales such as emotional and ethical value. Sometimes they are valued in terms of their epistemic potential—as raw material for laboratory research. At still other times they are valued as economic objects. However, the value of fetuses is often so controversial that the very idea of fetal research leads to controversies for researchers, politicians, and organizations.

This paper attends to a space—fetal research—where the study of valuation practices is met by a multitude of controversies and hotly contested values. In biomedical research on fetuses, we can observe the intertwining of epistemic work, ethical quandaries, economic transactions, as well as debates about the sanctity of life and abortions. Biomedical research on fetuses becomes something of a balancing act for the involved actors, and switching between different yardsticks and practices of valuation is common. Discussions are sometimes shifted to something "globally more important" than the performed values and ethics of fetal research. For instance, global vaccination campaigns to eradicate disease, family planning to solve pressing issues of overpopulation, or aborted fetuses as waste which becomes possible to value as research material. These examples point to an interesting dynamic in studying value practices: the constant shifting of valuations and their objects.

"The fetus is a fetish," the political scientist Rosalind Pollack Petchesky wrote in 1987. By this, Petchesky meant that fetuses and pregnant bodies are a political arena in which cultural and social negotiations take place (Petchesky, 1987). Shared and contested meanings are projected onto the fetus—projections made and unmade by different actors. Some of these meanings draw on mundane imaginaries of where we come from, while others draw on scientific or political yardsticks. Often, and not least historically, these yardsticks of value are profoundly entangled with one another, in argumentation and in practice (Morgan, 2009). Petchesky's now classic feminist argument intended to politicize any debates over pregnancy and abortion, and to lift fetuses away from strictly moral or scientific playgrounds. Or, rather, Petchesky like many of the 1980s' feminists reminded their audiences that moral and scientific arenas were, and are, always already political. In other words, practices surrounding the fetus take place in nested and intertwined valuescapes.

Elsewhere, we and other scholars have attended to how actors in biomedicine deal with competing kinds of values in their scientific and mundane practices (Dussauge et al., 2015a; Thompson, 2015). In this article, we want to hone in on what we call "disjunctures of value" in order to foreground conflicts over values in practice. Our argument is theoretical, methodological, and empirical. However, it is grounded in empirical work we have conducted in the history and sociology of biomedicine. The empirical work we draw on in this article come from the history of ethics and fetal research in the 20th century in Sweden. Much of the research stems from a broader research project "Medicine at the Borders of Life: Fetal Research and the Emergence of Ethical Controversy in Sweden," which has investigated fetal values in Swedish medicine and biomedicine in long-term (Jülich, 2024a). The empirical examples are drawn from empirical studies in the project, as well as other empirical work from mainly the Swedish context.[1]

Theory: valuographies & value disjunctures

This article employs what we have elsewhere dubbed a valuographical research strategy (Dussauge et al., 2015a). In this, we join in the pragmatic turn to values, which argues that we attend to value as value practices (cf. Muniesa, 2011). The valuographical perspective takes a performative stance to values, going from values as held or given to values as made in practice (Dussauge et al., 2015c). Our aim is to render emergent the different values, machineries, hierarchies, categories, and boundaries, in order to highlight the multiplicity of values in the world and allow us to attend to several sets of values in our analysis.

Thus, rather than seeing values or norms as drivers of action, values are seen as made in practice. We don't ask "how do we know what values really are?" but rather how actors locally produce, negotiate, and contest values in practice (cf. Lynch 2013 on ontography). The valuographical strategy aims to avoid pre-established perspectives and normative judgment in order to attend analytically to the production of values in practice. It stresses the agency of human and non-human actors, and how categories and limits to valuation are made, enacted, and performed.

This strategy aims to decenter the dominance of particular yardsticks for value and to highlight how values are negotiated, contested, and hierarchized in practice (Dussauge et al., 2015c). In particular, we aim to decenter ethical (bioethics) and economic (biocapital) modes of valuing the world to highlight and analyze how multiplicities of values coexist, clash, and are negotiated. We want to analyze the performance of multiplicities of values alongside each other.

Value disjunctures

In this article we propose that we can attend to what we have here termed value disjunctures. "Reality disjunctures" is a term coined by

1 All translations from Swedish are by the authors.

Melvin Pollner (1975) to talk about the fundamental unsettledness of human experience. Taking "hallucinations" as a counterpoint to "real experiences," Pollner writes: "Some persons see what other persons do not . . . [C]ontradictory experiences of the world—reality disjunctures as we shall call them—are puzzling events" (Pollner, 1975: 411). A disjuncture is a separation or disconnection—in Pollner's case a disjuncture of realities—in our case a disjuncture of valuations. The focus on disjunctures highlights the situation of puzzling unsettledness of what version of reality should prevail as a reference for the others—and thus can be seen as an expression of ontological politics (cf. Mol, 1999). According to Pollner "there is a fundamental equivocality inherent in certain disjunctures which renders problematic the determination of which of the parties to a disjuncture is a deficient witness of reality" (p. 411).

We, in turn, want to suggest that we can deploy the concept of value disjunctures as a sensitizing analytical concept, which attunes our analyses to separations and disconnections between values—to disjunctures in valuations (cf. Blumer, 1954). We propose that attending to value disjunctures—puzzling disconnects that lead us to think about the fundamentally unsettledness of valuation—can be a productive strategy for sensitizing ourselves to separations or disconnections different modes of valuing. We choose to call value disjunctures the moments when it is not settled which value-world or value-principle should prevail over the other.

This strategy of sensitizing ourselves to separation and disconnection, we believe, is especially fitting in a hotly contested domain such as fetal research—which is filled with actors who believe that their set of values are the right ones—and that other sets of values are fundamentally flawed. Attending to disjunctures is a valuographical strategy that is not different in kind, but in degree. By introducing the concept of disjuncture we want to stress the separation or disconnection of valuations—where one way of valuing the world does not seem to exist in the same value universe as another. They exist where different versions of the world do not seem to meet.[2]

Attending specifically to disjunctures helps us to analyze how different valuations fundamentally decohere, clash, or collide. We take these disjunctures as potentially being both synchronous and asynchronous. That is, value disjunctures can happen in the meeting of two valuations in a particular situation, but they can also happen when valuations shift over time, or when valuations from different places meet.

For example, take the hotly contested debate about abortion in the USA: where worlds seem to decohere rather than cohere. Each side wholly convinced that their version of the world is the right one. This is a matter of disjuncture, disconnect, and separation. The concept thus draws attention and sensitizes us to the dynamics of disconnection and separation—rather than negotiation or interaction. Value disjunctures as a concept allows us a window into how people argue about what to do, about priorities, and about the making of the future. As Thévenot (2007) asks: "Which road to follow?"

An anatomy of value disjunctures

In this paper we propose that we can attend to three different aspects of value disjunctures in the valuations of fetal research. We suggest that we may productively pay attention to (1) the clashes of multiple yardsticks for value, (2) to the shifting objects of valuation, and (3) to how objects are performed. These aspects of valuation are often intertwined in practice, one aspect shaping how the other can be performed. As such, they are meant to sensitize us to particular facets of valuation (cf. Blumer, 1954). They are meant to help us analyze and understand the anatomy of value disjunctures—not to make the final ontological statement about the world of valuation.

Yardsticks: The first dimension of value disjunctures that we highlight here are disputes over the *yardsticks* of value.[3] Analyzing clashes of yardsticks of value means paying attention to the metrics that are used to measure value. This can entail paying attention to if it is an ethical, economic, or epistemic yardstick that is being performed as relevant. These disjunctures are centered on the ways of measure the value of an object. For example, is the worth of a fetus the inalienability of protecting its rights, or the capacity of its aborted tissues to help produce vaccines that can save millions?

Objects of valuation: The second facet of value disjunctures that we deal with below is the analysis of *objects* of valuation. Analyzing value disjunctures about objects means paying attention to which objects are performed as valuable. In any given situation, it is often not given which objects should be valued. That is, there are often clashes in which objects are deemed valuable in practice. The objects of valuation also change from situation to situation, and from time to time. For example, do we value animals' lives over the safety granted by the testing of vaccines for humans? In one situation or time, the sanctity of animal life might trump medical testing. In another situation or time, the opposite might be true.

Nature of objects: The third element of value disjunctures is the nature of objects. Analyzing collisions of the nature of objects means paying attention to how the same objects are performed in multiple and different manners. This could for example mean

2 This does not mean that we want to analyze "worlds of worth" in Boltanski & Thévenot's (2006) fashion. In our view this a much too cumbersome and philosophically burdened way of approaching actors' value practices. This—just like ethics or economics—reifies particular value worlds as the dominant ones. We want to remain open to actors' production of values in practice. We want to take an emic stance to value (cf. also Dussauge, Helgesson, Lee, and Woolgar, 2015).

3 A note on the language of yardsticks. By using this particular term we follow some of the valuographical language that is outlined in Dussauge et al., (2015c). It would also be possible to call it registers, measures, gauges or criteria.

that a fetus at one particular time and place is performed as a sacrosanct and inalienable subject while in other times and places it is performed as raw materials for research.

By attending to value disjunctures we want to stress the importance of tracing not only how one set of values comes to dominate another, but also to attend to the "indeterminacy, uncertainty, and disorder" that accompanies valuation situations (Vogel et al., 2021: 4). What objects exist and how these objects should be valued are often uncertain and contested in locally situated practices (Dussauge et al, 2015c).

This is important, not only because it is difficult but also because it shines light on how boundaries are drawn between good or bad, between us and them, between now and then. Value disjunctures let us attend to the politics of valuations: Which concerns and objects of concern should be given the most ethical attention? Which sets of valuation principles and interests come to govern what counts as good? How do ethics, epistemics, or economics come to dominate over one another? Which value worlds and tools should prevail over another?

A note on valuography, normativity, and materiality

Some notes about normativity and materiality: Is then any valuation possible? Can any horrendous act be construed as ethical, moral, good, or efficient?[4] The strategy of valuography pushes us to analyze how *actors* value the world. Throughout history various people have—in practice—constructed what some people today see as horrendous yardsticks for value.

For instance: The books of Leviticus and Deuteronomy in the Bible hold that certain crimes against Christianity should be punished by stoning. According to the Surah Al-Ma'idah (5:38) in the Quran stealing should be punished by cutting off a hand. Racist and patriarchal oppression seem like horrors to be fought against for many in the Nordic countries. However, with a growing intolerance against immigrant populations, it also seems that racism is a part of the lives of increasing numbers of people in the same Nordic countries. The killing and eating of animals for many seem to be ecological and moral failings—while for others it is just another day in the kitchen. In the Nordic countries abortion is not a political hot potato, while in the USA the question of abortion is hotly divisive. By looking at humanity in different times and places it indeed seems that it is possible to produce almost anything as ethical and valuable. From our point in history and culture these values and value practices often seem like horrors of a bygone barbaric era. True value disjunctures if there ever were any (cf. Pollner, 1975).

Is valuation then completely arbitrary? Like the arbitrariness of the sign, the relation between what is valued and the object of valuation indeed seems arbitrary (cf. Saussure, 2011 [1916]). However, importantly the arbitrary nature of valuation does not mean that it is solely discursive. Valuation practices are through and through material—and it is through material-semiotic practices that value is produced and changed by actors (cf. Law, 2007). The tools and materialities of valuation are numerous and have large effects: For instance, the abortion issue sometimes hinges on tools and materialities of measuring the start of life: heartbeats, breaths, brains—and these materialities shape how actors value the world, but they do not seem to in the end determine them.

In the valuographical perspective that we employ here, we believe that it is beneficial for our analysis to attempt to be agnostic (however difficult that may be) to the values that actors produce. To attempt to analyze how actors value the world does not mean that we must espouse these values—nor does it mean we must decry them. In the valuographical perspective, we want to stay true to the troubling facets of valuation and true to the question: "how do actors produce value in practice?" This entails remaining open to actors' value practices, but perhaps not to endorse them.

1. Yardsticks: disjunctures of measures

What counts as good has changed over time in fetal research, and as we discuss below bioethics seems today to have become the dominant manner in which what comes to count as good research is measured and defined in Sweden today. In the regulation and legislation of how fetuses are to be handled, ethics has competed with other yardsticks, such as scientific yardsticks and economic yardsticks. Attending to shifting yardsticks for value sensitizes us to how matters of concern are measured, evaluated, and calculated (cf. Latour, 2004 on matters of concern). Thus, we can analyze how ethical, epistemic, production-focused, and commercial standards are produced, hierarchized, and collide and how a particular standard today (bioethics) has become dominant in evaluating the other standards. By analyzing which yardsticks for value are constructed and performed as relevant we can become sensitized to how particular concerns become foregrounded in practice. (In a sense, we are here attending to the production of the "concerns" part of Latour's (2004) matters of concern.)

The first disjuncture we attend to here thus concerns yardsticks for measuring value. How should value be measured in practice?

4 Essentially it highlights the ways in which actors' value things, for instance epistemic value or economic value.
Thanks go to our anonymous reviewer for posing these questions.

Which technologies, metrics, scales, or tests are constructed by the actors and used to assign value? Just as Thévenot (2007) has observed, there are many ways of measuring the worth of an object. Our concern here is the struggle to decide which yardstick for value should be used to assign value in different situations. In each situation, a host of yardsticks might be enacted and contested as relevant.[5]

Historically, scientific yardsticks for good research have included epistemic yardsticks that measured the value of species specificity. For instance, in the late nineteenth century and early twentieth-century theories of evolution and development were investigated by comparing embryo features among different species (Morgan, 2009; Hopwood, 2015). Material from pregnant women was very rare and medical researchers used specimens from local farm animals as well as exotic vertebrate embryos to fill in the gaps in the knowledge of human embryology. Increasingly, however, embryologists such as Swedish Ivar Broman argued that these investigations were unreliable due to biological discrepancies between humans and animals. Investigations of "lower" animals could not sufficiently explain fertilization and reproductive processes in primates, even less in humans, and were therefore seen as less valuable for research. Human fetuses held the highest epistemic value in embryological research at the turn of the twentieth century (Jülich, 2022; Jülich, 2024b).

For most of the twentieth century, epistemic yardsticks were deemed more important than the ethical yardsticks, such as the protection of embryos/fetuses or women's consent to the use of material from miscarriages, ectopic pregnancies, and abortions for research.[6] Even after the establishment of the Nuremberg Code after the Second World War, Swedish medical actors continued to stress the epistemic value of using human material for research and drug and vaccine development, including the polio vaccine (Jülich and Dussauge, 2024). It was not until the 1960s that fetuses began to be portrayed as vulnerable and in need of ethical and legal protection. Issues around women's consent were less prominent and in practice not considered mandatory. In Sweden, it was the introduction of the Transplant Act in 1995 that for the first time regulated the use of aborted fetuses for scientific research, and from that point, it has required the consent of the woman (Jülich and Tinnerholm Ljungberg, 2019). Thus, epistemic yardsticks were the dominant manner of valuing fetuses in research for most of the 20th century in Sweden.

However, sometimes, epistemic yardsticks do not cohere well with other, economic, production-oriented, yardsticks. For instance, in the 1950s, in a climate of increasing fear of polio epidemics, and in an international vaccine race (Wadman, 2016), the Swedish virologists in charge of developing a national polio vaccine chose human fetal tissues from aborted fetuses as their substrate for growing, researching, and tinkering with poliovirus strains (Wadman, 2016; Jülich and Dussauge, 2024).[7] They deemed human fetal tissues as more suitable than monkey tissue for epistemic reasons: better immunological compatibility of vaccines with human recipients. Besides, human aborted fetus tissue was free, and the overall costs of vaccine production were another central yardstick, together with national security, in the choice between national production and an import of polio vaccines for the Swedish population. On the other hand, monkey tissue was seen as yielding better antigenicity (vaccine power); and the productivity and reliability of supplies were crucial to large-scale production, and in these yardsticks, human fetuses were not as valuable (not as productive, not as reliable) as monkey tissue.[8] Here, the value of using human fetuses was valued both using an epistemic yardstick, but also using a production-oriented yardstick, partly economic, partly volume-oriented, which was founded on a concern for large-scale vaccine production.

As we can observe through these examples different ethical, epistemic, and economic yardsticks were constantly in play throughout the 20th century. The yardsticks proliferate in practice. What was deemed to become the dominant yardstick was constantly negotiated in locally situated practices.

Bioethicalization and clashing yardsticks of ethical conduct

If we move our lens to the professionalization of bioethics, we can also observe how new yardsticks for good biomedical research and practice emerged during the 20th century. This also revisits the history of bioethics through a new lens, allowing us to discuss the temporal shifts of what comes to count as ethics. By doing this we aim to show how a manifold of yardsticks of value co-occur, clash, are settled or demolished. In this section, we shine our analytical searchlight on the development of professionalized bioethics and

5 Consequently, situations might also result, where multiple concurrent yardsticks co-exist with tension in the same practice (cf. Lee and Helgesson, 2020). That is, there can exist different levels of tension between yardsticks in a situation. From no tension, to incommensurability. But the level of tension is for the actors to negotiate. Furthermore, in a situation where a high tension between yardsticks is enacted, there might arise moments where there is never any resolution of which yardstick is the correct measurement of value. In such situations, actors need to constantly navigate these value disjunctures in practice, with results that vary. Actors are often aware and reflexive about these disjunctures between yardsticks, and negotiate how the yardsticks relate to each other in each valuation situation.

6 There is no evidence that neither embryologist Ivar Broman nor physicians in the network that he was dependent upon for accessing material ever thought of asking the women involved if they agreed that their dead fetuses be pickled for the purposes of study (Jülich, 2022). This practice was in accordance with existing laws as well as ethical standards of the profession that mostly sought to protect the medical confidentiality of the patients as well as the reputation of colleagues.

7 The discussions surrounding that choice mostly took place between medical experts, and focused on the advantages and drawbacks of fetal tissues as a tool for research (developing and testing a vaccine) and for a large-scale production of a vaccine. The main advantage of human fetal tissue was that they were sterile and human, therefore not exposing users to possible interspecies infections.

8 Eventually, human fetal tissue was chosen as substrate for virus production and was used as the tool for developing and testing the national vaccine; but human fetal tissue was finally abandoned and replaced by other substrates in the large-scale production of vaccine.

how it historically came to overshadow other yardsticks for value in a process we dub *bioethicalization*.[9]

Historically, bioethics, a discipline established in the 1960s, and the traditional medical ethics of doctors have been in conflict with one another. Bioethicists have tended to view the ethics of doctors as dominated by concern for professional interests rather than protecting patients (Rothman 1991; Jonsen 1998). In particular, it has been claimed that the principle of informed consent was an innovation of modern bioethics. However, as recent historical scholarship has shown, considerations about patients' welfare and the public good played an important role in the nineteenth and early twentieth century (Maehle, 2016; Maehle, 2021). Physicians of this period faced difficult situations indeed. For instance, in cases of severely obstructed labor, obstetricians had to decide whether to dismember a living fetus through craniotomy in the hope of saving the woman, or risk the patient's life in daring to perform a Caesarean section. In Protestant Sweden, most physicians stressed that the ultimate decision should be made by the woman alone. Yet, what consent meant and if it was without coercion from the medical practitioner is impossible to know (Franzén, 2020).[10] In effect, more than paternalism and the reputation of the profession were at stake. But this perspective was seldom acknowledged by the early bioethicists who wished to distance their "new" bioethics—driven by non-medical experts and enacted as "patient-oriented"—from the "old" doctors' ethics (Cooter and Stein, 2013).

The history of bioethics further emphasizes the "critical event narrative," positing that bioethics emerged in the United States as a response to research scandals around human experimentation in the 1960s and 1970s and new biomedical technologies (for a critical discussion, see Wilson, 2014). These scandals also encompassed controversies over the drug thalidomide, organ transplants, and the definition of death as well as the rise of civil rights movements including patient organizations. The nascent field of bioethics made itself relevant and became increasingly populated by analytically trained philosophers that viewed bioethics as a form of applied ethics, and formulated new central ethical principles for research, such as respect for persons, beneficence, and justice.[11]

As a part of this movement toward bioethicalization, research ethics committees were developed in the 1960s, first in the United States and then in the United Kingdom as well as in Sweden. From the 1970s these national research ethics committees became more and more invested in applying bioethical frameworks and legal reasoning, and associated yardsticks of value, to medical research.[12]

Thus, yardsticks from outside medicine and physicians' ethics were increasingly brought in via bioethical practices and institutions to value and regulate medical research. Bioethical yardsticks have since then become one of the dominant frames for valuing the ethical character of biomedical research. But as recent work on controversies surrounding research on surplus IVF embryos and new technologies such as genetic enhancement illustrates, bioethical yardsticks are not universal; national histories and sociopolitical contexts condition the dominance and the terms of bioethics in today's policy debates and legislation (Banchoff, 2011).

This section contributes with an additional historical narrative that emphasizes the contents of ethics over the professional struggles that drove them. We have illustrated the historical process that we coin "bioethicalization": 1) how a specific set of yardsticks for value were introduced and became part of defining good biomedical practice and research alongside other understandings of value; and 2) how a specific bioethical set of values were added to other existing value registers (epistemic, economic, etc.) insofar as they were not been made to overlap with bioethics' own yardsticks (such as scientific soundness and scientific necessity which have been integrated as parts of bioethics' yardsticks).

The point that standards for good research change over time is not new, as the scholarship in the history of ethics has shown. Rather, our argument here is that through the analysis of disjunctures in yardsticks—the historical spaces in which ethical yardsticks come to de-cohere from one another—we can analyze how actors value what is good research and good medical practice, "good," in practice, has shifted over time. We opened this article with a question: What comes to count as ethical practice in reproductive research and fetal medicine? In this section, we have answered that question historically by focusing on a first kind of disjuncture—the shifting yardsticks for medicine and biomedical research. First, we have highlighted how biomedical research is tied to a constantly shifting terrain of values, and how bioethics became a central frame for valuation in reproductive research practice over other measures of what is good research, and secondly, which principles have become hegemonic in settling whether something is valued as ethical or not. We refer to these measures and principles as yardsticks of value.

9 In a similar manner, Maria Hedlund uses the term "ethicisation" to describe the tendency to frame scientific and technological issues as bio/ethical and to call for bio/ethics expertise to resolve dilemmas and controversies (Hedlund, 2023).

10 Another dilemma concerned confidentiality in cases of out-of-wedlock pregnancies and illegal abortions. Ivar Broman's reluctance to reveal information about where the fetuses in the embryological collection came from can at least partly be understood as a commitment to protect the anonymity of the female patients involved (Jülich, 2022).

11 These three principles are identified in the 1979 Belmont Report by one of the federal bodies conducting such work (The National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979).

12 Critical work in the history of ethics has pointed out that this shows that "the critical event narrative" does not adequately explain the establishment of bioethics (Hedgecoe, 2009; Stark, 2012; Jacobs, 2021 Tinnerholm Ljungberg, 2021). Critical historians of ethics have also stressed that there are examples of how doctors handled issues in reproductive medicine as moral dilemmas centered around the patient|s interest in the 19th century already, i.e. within the frame of traditional medical ethics (Maehle, 2021).

2. Disjunctures on the objects of valuation

Our second disjuncture deals with the *objects* of valuation. In reproductive research, there are a host of different objects—things, people, ideals—that are valued at different junctures; for instance, women's autonomy, fetal life, and vaccine production. At times, these different objects of valuation (and the values actors attach to them) come to clash with each other. It is often not self-evident which objects are up for valuation, nor which objects are valuable in a given situation. The core of these controversies is often a conflict about which object the conflict really should be about: first, about which objects of value exist, and then about which object of value should be acknowledged as most valuable over others. At one point in time, it might be the sacred life of the fetus that is the object that matters, at other points in time, it might be the value of aborted fetuses as research objects or vaccine production, and still, at other points, it might be female autonomy that is prioritized over other concerns.

In this section, we explore two historical examples in which value disjunctures of objects are an effect, and a part, of specific actors' actions. That is, how different actors attempt to change the focus of valuation to their object of choice.

Dichotomies: lifesaving vaccines for the living on the basis of aborted fetuses

In 1952, Sven Gard, the head of the national, and public, polio vaccine development project, and an internationally renowned virologist, was quoted in an interview saying that although possibly morally disturbing, the large-scale use of fetal tissue cultures to produce the national polio vaccine must be seen as the "bright side of the abortion's medal" (Bernholm, 1952). In its context, this assertion was realizing a difficult rhetorical balancing act: It promoted the systematic use of aborted fetuses in virology while at the same time acknowledging that that practice did have a backside (for a discussion, see Jülich and Dussauge, 2024). Through the use of metaphor, Gard was indirectly implying that abortions had a dark side.

During this time, when abortion and abortion laws were highly controversial in the public eye and amongst physicians, aborted fetuses were used for polio vaccine research and polio vaccine production without the consent of the pregnant persons. Fetal tissues from aborted fetuses were used on a large scale in specific sectors of Swedish medical research, especially vaccine research in the 1950s and 1960s. In the 1950s' vaccine research, a group of scientists under the leadership of Gard set up an infrastructure of supply, organizing the transfer of newly aborted fetuses from gynecological clinics in the broader Stockholm region, to produce tissue cultures from the fetuses' organs, in order to cultivate the poliovirus, use it and research it (Jülich and Dussauge, 2024).

The development of a national vaccine against polio using fetal bodies from legal abortions could have become the object of controversies–but at the time it did not. Quite the opposite. The press portrayed the research team and the trials of the vaccine in heroic ways and emphasized the brand new technological ways of production: culturing the poliovirus in fetal tissue cultures, emphasizing the national uniqueness of the method. The involved team of virologists promoted this method as an exceptional asset in the national mobilization against polio, and brought most attention to the goal of the enterprise rather than its methods. In the press, it was reported that the Swedish vaccine was better than its American counterpart because it was produced from human material instead of tissues from other species (monkeys), thus reducing the risk of side effects (Jülich and Dussauge, 2024).

So, when talking about how the new method was the "bright side of the abortion's medal," Gard placed the emphasis on vaccination strategies and the national duty to save the lives of children in the fight against polio. In Gard's remarks it was the benefit to future children that was enacted as the main reason for using fetal bodies. The press supported this view: "One may of course oppose, on emotional grounds, the method of 'making medicine' of unborn children, but concretely this means that the unborn support the living against a disabling, terrible disease" (Svenska barn).

Lennart Nilsson, the fetoplacental unit, and the birth of a new object of valuation

During the 1960s a new object of valuation was born and with it new ways of valuing fetuses and fetal research. In the research conducted by endocrinologists at the medical university in Stockholm, a group of researchers developed a perfusion technique that made it possible to keep human fetuses "alive" for a short period of time after the abortion operation.[13]

These researchers created a new object in reproductive research: the fetoplacental unit (Jülich, 2018; Jülich 2024c). Earlier on, the pregnant woman, the fetus, and the placenta had been considered as functioning separately from each other. The new object of the fetoplacental unit marked a disjuncture from the previous enactment of the fetus as simply nourished by the placenta. In the performance of "the fetoplacental unit," the fetus was enacted as an active biological contributor to the functioning of the placenta, pregnancy, and fetal development. A new ontological object emerged through this new enactment of fetuses-placentas as a biological entity. However, this new

13 This research was supported not only by the Swedish Medical Research Council but also by American federal and philanthropic funding. In Sweden, due to the fairly liberal abortion legislation, the access of aborted fetuses for medical research was less limited than in most other post-war European countries and the United States (Jülich, 2018).

ontology of the fetus was ambiguous and entwined with ongoing value-laden body-political conflicts, as the fetoplacental unit not only became a key concept in fetal physiology but also, in a perhaps more unforeseen way, entered the visual culture of reproduction. Just as Haraway's (1997) analysis of the image of the earth from space entered a new object into our cultural awareness—Lennart Nilsson's images brought the fetus into living color in the cultural awareness. One might argue that a new object of valuation was born.

During this time, photographer Lennart Nilsson collaborated with medical researchers that conducted perfusion studies on fetuses and placentas. Drawing on the more conventional technique of placing specimen in liquid, he produced his soon worldwide famous images of human development in connection to abortions performed at the women's clinics of the Karolinska Institute (Jülich, 2024). The fetoplacental unit played a prominent part in the series of pictures that were published in the 1965 Life-story "Drama of Life before Birth." These pictures were soon mobilized by anti-abortionists to promote the view that the fetus was an individual with its own rights (a statement that is both ontological and value-laden).

On the other side, many sex educators and supporters of abortion rights used the same pictures to promote women's empowerment over their pregnancies and possible abortion decisions. Many feminist scholars interpreted Nilsson's photographs within that context of contemporaneous politics of reproduction and argued that the lack of pregnant bodies in Nilsson's pictures was erasing women's experiences of pregnancy, portraying the fetoplacental unit as an independent entity, and thereby supporting the anti-abortion standpoint that the fetus was an individual with its own rights (Jülich, 2024). Thus, the emergence of this new ontological object was inherently ambiguous and tied to clashing yardsticks of value.

Eventually, the medical researchers' "fetal experiments" were disclosed to the public and became the center of an ethical controversy mobilizing both the media and the medical authorities. Was it ethically defensible to inflict such experimental methods on aborted fetuses? Clergymen, religious politicians, and representatives of the thalidomide victim's association condemned the experiments and argued that the human value and rights of the fetuses must be protected at any cost. For instance, a pastor and member of the Liberal People's Party claimed that an aborted fetus at the age of 20 weeks was to be considered as a unique form of human life, even a child. Free church debaters also asked if no consent from the female patients was required to use their aborted fetuses for medical research (Jülich, 2018).

In response to the criticism directed from religious and other groups, medical researchers and authorities stressed the benefits for health and welfare that the studies were expected to bring (Tinnerholm Ljungberg, 2024). In particular, the researchers foreshadowed that a new thalidomide disaster could be prevented by investigating how and with what effects drugs were transferred from the pregnant woman to the fetus. In this way, the medical researchers attempted to shift the focus away from the experimentation on the aborted fetus to the protection of the unborn child.

Thus, different actors struggled to shift the focus of the controversy to the objects that they valued as most important: the health of upcoming generations of unborn children, vs. the protection of the pregnant woman.[14]

Moreover, in the 1960s and 1970s Swedish reproductive research seemed to provide a tool for solving a perceived global overpopulation problem (Ramsey, 2021). In a collaboration between medical researchers and pharmaceutical companies a new abortion method—abortion pills—was developed at the Karolinska Institute. Women that had been granted abortion were included in clinical trials of a specific compound that was seen as a promising abortifacient. These mid-1960s trials were unsuccessful but led to new legislation that opened possibilities for prostaglandin research, which supported the development of new abortifacient compounds.

However, first a proposition had to be decided by the Parliament. Several parliament members who felt uneasy about this research positioned their concern for protecting fetuses' (and women's) human dignity against the research and its goals to save the future of humanity. Proponents stressed the potential humanitarian value of such work for controlling overpopulation by means of family planning. Thus, what mattered most in this context was humanity at large and less the fetuses and women in the clinical trials. This is a schoolbook example of a disjuncture of objects of value: pitting objects of concern against each other as competitors in a global valuation.

Disjunctures of objects and temporalities

If the analysis of disjunctures of *yardsticks* showed us how actors establish *concerns* in matters of concern, a focus on disjunctures of *objects* of value sensitizes us to which things come to matter, or come to count as matters to care about—matters of concern—and the contestations around these matters (cf. Latour, 2004).

The examples deployed above illustrate situations in which actors in the field of reproductive research shape valuations to focus on the future purposes of their activities rather than the methods for them and ethical considerations related to these—the objects of valuation are shifted. Read sympathetically, this kind of disjuncture sometimes aligns with a frame amplification of the object of concern mobilized by the actors (cf. Epstein, 2016). However, it might also be read as obscuring the objects of valuations that

14 Perfusion studies on aborted human fetuses were finally abandoned in Sweden in the early 1970s for a range of several reasons, primarily the lack of availability of fetuses from late abortions after the new abortion law of 1974 (Jülich, 2024c).

the actors wish to deflect the attention from, backgrounding contemporary debates concerning fetuses. In doing so, one might read actors as enacting a temporal disjuncture, by mobilizing and valuing specific future objects (e.g., the lives of future children in a world without polio; the future safety of pregnant people and newborns; the expected public health improvements enabled by a new technology) rather than contemporary objects of concern.

3. Disjunctures on the nature of objects

Our third disjuncture takes on the nature of objects as a part of value practices. It deals with how shifting yardsticks and objects are intertwined with how objects are performed. The nature of objects is often an unsettled matter that is intertwined with practices of valuation in both expected and unexpected ways. In practice, the purposes of objects, their ontological status, as well as how they might be measured are a matter of contention.

The nature of objects is not about conflicts about what objects to value, but of what an object is *performed as being*. In a sense, it is related to Law's (2002) and Mol's (2002) work on the ontological multiplicity of objects in practice. An object might be enacted in different manners in different situations or might even be enacted in different manners in the same situation. This means that the nature of an object of valuation is performed by actors in practice. The nature of objects is meshed with the yardsticks that are used to value them, as well as which objects are performed as valuable. What we deal with here are actors' struggles with the nature of objects.

Sometimes disjunctures about the nature of objects can be unproblematic and passed over as the natural multiplicity of a thing and in others can give rise to disjunctures—and a need to handle these disjunctures in practice (cf. Mol, 2002). The point is that the nature of objects, and their valuation, is not a settled matter. In the field of reproductive research, enacting the multiple nature of the fetus gives rise to disjunctures of value.

Performing the nature of the fetus

During the twentieth century, the perceived nature and meaning of aborted human fetuses have shifted over time and place in significant ways (for perspectives on the US; see Morgan, 2009; Schoen, 2015; and for the UK see Pfeffer and Kent, 2007). The nature of embryos was ambiguous in the contested field of contraception and abortion as is the ontology of compounds with a contraceptive/abortive effect.

In Sweden, research on contraceptives and abortion pills in the 1960s constantly led to the mobilization, clarification, and blurring of the biological boundary between anti conception and abortion; and between the fetus as an abortable object and a subject worthy of protection (Ramsey, 2021). Chemical compounds and how they worked in relation to conception had an ambiguous status. Not only the researchers, but also the Swedish Parliament, negotiated a range of ontological-value questions: Was the compound a contraceptive or an abortifacient? Were the reproductive medical trials legal according to the Swedish abortion laws? Were the researchers harming fetuses or just preventing eggs from implanting? Were these fetuses biological objects which could be discarded through abortion, subjects worthy of protection, or both?[15]

In Sweden, a waste regime was established around 1900 by the active work of leading embryologists (Jülich and Tinnerholm Ljungberg, 2019). According to them the material from interrupted pregnancies was nothing but waste for the female patients. In the hands of the scientists however, it was converted into valuable research material. This seems to be a common feature of biomedical work—but was also part of a wider trend of valuation in biomedicine (cf. Bahadur et al, 2011).

However, the notion of aborted fetuses as medical waste became increasingly challenged from the 1960s and in the early 1970s, as the fetus became more publicly visible through Lennart Nilsson's spectacular photographs and the media reporting on medical experiments on aborted fetuses (Jülich and Tinnerholm Ljungberg, 2019). According to critics, such as religious parliament members, the fetuses were living humans with heartbeats and breathing worth protecting (Jülich, 2018). Medical experts and authorities on their part maintained that the fetuses had no independent life and were to be seen as dead tissue, similar to amputated organs and tumors. When pressed, some researchers claimed that the fetuses were brain-dead and could not feel pain or any sensations (this new conception of death would not be established until later).

Thus, for these different actors, the human aborted fetus was performed in very different ways which had consequences for what kind of protection and rights it was attributed with. Medical researchers performed aborted fetuses as equivalent to dead organs that were treated as waste. For instance, gynecologist A. Ingelman-Sundberg, described the Swedish praxis: "Where foetuses do not fulfil the criteria for live-born infants according to the regulation, or have not reached a size, or come from a stage of pregnancy where they would not be regarded as still

15 From the late 1930s in Sweden, abortion was permitted, but submitted to the approval of a board of experts, on medical, humanitarian and eugenical grounds (1938), on socio-medical grounds (1946) and in case of risk of serious fetal damage (1963). In 1974 a new law was created that stated that it was for the woman to decide for an abortion until the end of the eighteenth week. During the latter part of the twentieth century women's legal right and access to contraceptives methods and contraceptive education increased (Jülich, 2024c).

born infants, they can, as in the case of tumours, etc. be examined for the cause of death or used in research and teaching" (quoted by Tinnerholm Ljungberg, 2024). Religious critics, on the other hand, enacted the fetuses used in endocrinological research as living and worthy of protection—or even individuals with rights: "A number of authorities in the field of Christian ethical thought [...] have all declared in unison that it is unthinkable to use human beings on a lower level as objects of research [...], even if it means helping human beings on a higher level" (Gustafsson, 1960, 42).

In sum, disjunctures on the nature of objects

By attending to disjunctures on the nature objects we wish to open a route to analyze how the enactment of ontology (performing the nature of things) is intertwined with processes of valuation (attributing value to things). By zooming in on disjunctures about the nature of objects, we can trace how different yardsticks become salient in valuing objects of different natures, how different worlds become realized, and how different performed ontologies of an object are pitted against each other.

This disjuncture points to the possibility of the multiplicities in the objects of valuation. The fetus was performed both as waste and as sacred and the biological processes of pregnancy were performed in different manners. New objects were also performed: the consenting women and the fetoplacental unit, also affecting the multiple natures of the fetus. An important point, however, is that such objects of valuation do not need to be physical objects: they might be processes, people, issues, or anything else. Any thing that actors make valuable (or conversely worthless) in practice is an object of valuation. For instance, an object of valuation might be the process of ethical review in the biosciences, or it might be women's rights.

Yardsticks, objects, and valuations: an analytical summary

Above, we have traced a few disjunctures of value around "the embryo/fetus" and fetal research. By doing this we have been able to sketch various disjunctures of value in fetal research and medicine. Through the analysis of disjunctures of values surrounding the fetus, we highlight how what counts as valuable has shifted over place and time. This has entailed tracing several different values: including ethical, epistemic, and economic values.

Through tracing these disjunctures, we have analyzed how what came to count as valuable, important, and ethical has shifted over time and place. During most of the 20th century in Sweden, the dominant manner of valuing fetuses was epistemic. In the first half of the century, the human fetus was performed as being uniquely valuable for researching human reproduction, at the same time as economic ways of valuing fetuses were enacted as undesirable. However, the hegemony of epistemic yardsticks started to shift in the mid-century, and a specific set of values centered around the ethics of consent became dominant. As a result of this shift the protection of the rights of human subjects—both in the form of pregnant women and human fetuses—became central to the performance of values.

We have also observed how different objects were performed as valuable at different times. During the first half of the 20th century, fetuses were valued not as human subjects, but rather as epistemic objects for research or tools for producing vaccines. In these performances, other objects replaced the unborn fetus as the objects of valuation. For instance, the safety of infants through the production of vaccines was valued over the fetus. Fetal tissue was also valued as a tool for polio research. The value of the fetus was not inherent, but as a tool for research, experimentation, or biomedical production. It seems that, in Sweden, the larger good of the population and society, including unborn infants—the collective—trumped individual or fetal rights. Thus, different objects than the fetus-as-individuality were the objects of valuation.

During the 20th century, the nature of objects also shifted. For different actors, the human aborted fetus was defined in very different ways which had consequences for what kind of protection and rights it was attributed with. Medical researchers performed aborted fetuses as equivalent to dead organs that—to other than researchers—were mere waste. Critics enacted the fetuses used in endocrinological research as living and worthy of protection—even individuals with rights. If considering access to abortion and contraceptives, women's rights have been increasing over time and, somewhat contradictory, in tandem with increased rights for the fetus.

Only at the end of the twentieth century was a new subject position, the consenting woman, established. Postwar reproductive research also created a new object in reproductive research: the fetoplacental unit, which entered the visual culture of reproduction with Lennart Nilsson's images. The fetoplacental unit marked a disjuncture from the previous understanding of the fetus as simply nourished by the placenta; the fetoplacental unit emphasized the biological contribution of the fetus to the functioning of the placenta, pregnancy, and fetal development.

Conclusion

In this article, we have introduced disjunctures of value as a crucial analytical concept for understanding valuation processes amid disruption, especially in domains as contentious as fetal research (cf. Pollner, 1975). By adopting this framework, we shed light on the intricate ways, values are performed, contested, and negotiated within biomedical practices. Attending to these disjunctures—which include yardsticks of value, objects of valuation, and the nature of these objects—allows us to analyze the multifaceted and often conflicting nature of value practices.

By tracing these disjunctures historically and contextually, we highlight how what is considered valuable shifts over time and place, demonstrating that ethical, epistemic, and economic values do not operate in isolation but are deeply intertwined and mutually constitutive (cf. Dussauge et al., 2015). In the Swedish context, the transformation from valuing fetuses primarily as epistemic objects to emphasizing ethical considerations underscores a broader shift in societal values and the increasing prominence of rights and consent.

Our analysis underscores the importance of recognizing these disjunctures as moments of ontological politics where the clash of value systems illuminates broader societal negotiations over what counts as ethical, valuable, and right (cf. Mol, 1999). These moments of disconnection and separation are not mere anomalies but fundamental aspects of how values are constructed, maintained, and challenged. By attending to value disjunctures, we gain a deeper understanding of how different worlds and value systems collide, coexist, and shape each other.

Importantly, this approach also highlights the spatiotemporal dimensions of valuation, where imagined futures and historical changes play a crucial role in shaping contemporary value practices. The dynamic interplay between past, present, and future valuations demonstrates that value is not static but constantly evolving through practices of negotiation and contestation.

In emphasizing disjunctures of value, we offer a methodological toolkit for STS scholars to engage with the complex and often contentious nature of valuation. This approach not only enriches our understanding of the politics of valuation but also provides a lens to critically examine how different values and ontologies are enacted in practice (cf. Lynch, 2013). By foregrounding these disjunctures, we call for a more nuanced and critical engagement with how values are unmade and clash in the contested terrains of science and technology.

Ultimately, understanding value disjunctures is essential for grasping the ongoing negotiations that shape our world. These disjunctures reveal the underlying tensions and conflicts that actors struggle with, highlighting the importance of critically examining the processes through which values and ontologies are constructed and contested. In doing so, we aim to contribute to a more reflexive and informed discourse on the politics of valuation, urging scholars and practitioners alike to attend to the clashes, complexities, and nuances that define our multiple realities.

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TOWARD A BRIGHTER FUTURE: CONFRONTING THE SHADOWS OF STS

Interview with Claudia Gertraud Schwarz

by Birgitte Nygaard & Kim-André Myhre Arntsen

Introduction

As part of the Nordic Journal of Science and Technology Studies' 10th anniversary, we want to end the anniversary issue by reflecting upon the future of the field. To do so, we invited a young scholar in the STS field to partake in an interview with us. We think it is fitting to end with a young critical voice, as it is the next generation who will shape the field and ultimately decide the future of STS. We had the pleasure of interviewing Claudia Gertraud Schwarz who earned her PhD from the University of Vienna in 2014. She currently works as a postdoctoral researcher at the Karl Landsteiner University of Health Sciences, where her research and praxis focus on generating and studying interventions to improve wellbeing in society, especially for young people. She is also one of the co-founders of the STS community known as the FeminiSTS Repair Team.

In 2022, November 4th, Claudia Gertraud Schwarz posted her testimonial on the Harvard STS programme during the programme's 20th anniversary celebrations on the website 'Medium'. Her post was also shared via social media and inspired an extensive online discussion on Twitter/X. The post sent shockwaves throughout the STS community as it brought to light her experiences with sexual harassment (she later added an addendum that this did not include physical infringement or unwanted touch—of course, this does not minimise her account in any way), abuses of power, and disillusionment at the Harvard STS programme and within its network. In this interview, Schwarz brings attention to the STS community, the value of emphasising decolonial and feminist scholarship as theoretical perspectives and as tools to face field shadows and improve the living conditions within the research field of STS.

Growing up on a farm in the South of Austria, Schwarz introduces two storylines of her way into the field of STS. The first starts at university and is narrated as a stepping-stone approach from English and American studies, over media and communication studies to sociology, where she first was introduced to STS during a small seminar led by Karin Knorr-Cetina. The methodological approaches and empirical discussions drew her to the STS department at the University of Vienna where she embarked on her PhD.

An alternative storyline of being drawn to STS starts out much earlier. Here, she identifies the pivotal moment when an elementary school teacher asked her class to map out their TV consumption in the weekly TV-guide. Experiencing that her extensive consumption of TV was valued negatively sparked a realisation that entrenched practices around technology use are not a given, 'I learned for the first time to think critically about my own practices and the practices in my family', she states.

Challenging the orthodoxies of a field

When asked about which new developments within the research field of STS, she has found particularly exciting, Schwarz responds,

> *'For me, the question about exciting developments in STS is tough to answer because I've been quite disillusioned with STS due to my personal experiences. But of course, for survival reasons, I'm always looking for where there's still exciting things happening and developments I can contribute to or can start myself. In general, I think the most exciting developments in any field happen at the margins and are driven by those people who are trying to challenge the orthodoxies of a field. For me, broadly speaking, this includes all the critical STS approaches that are not catering to the legitimization of state-driven, industry-focused, techno-scientific agendas and that embody critical self-reflection.'*

Pointing to the evolution of STS over the last few decades, she continues,

> *'STS has become more integrated into the existing capitalist machinery and has lost some of its potential for a more fundamental critique of the Western techno-scientific progress narrative. This is why I find any fundamental critique more exciting. For me, this means looking*

towards areas of decolonial, feminist scholarship and disability studies. These lenses allow for a deeper questioning of the more imperialist, patriarchal, and ableist underpinnings of knowledge creation and technology development in the Global North. I try to look more towards the epistemologies and histories beyond US-European regions and to do so with respect to avoid problematic appropriations. That is always difficult in these engagements.'

These perspectives have inspired Schwarz to dive into South American and other cultural practices with psychedelic plants and fungi throughout the world and question the novelty of currently emerging Western psychedelic-assisted psychotherapy in her research.

Risk of exceptionalism and the necessity to confront 'field shadows'

Developing the notion of orthodoxy in the field, Schwarz criticises how it seems increasingly necessary for STS researchers to subscribe to a single school of thought, adopt its concepts and research practices to achieve a sense of belonging or remain a legitimate member in the STS community. This streamlining and distancing from other research fields and scientific disciplines results not only in a reduced openness to other epistemologies, but also in, what Schwarz calls, attempts to claim epistemic superiority. She argues,

'I think it's really important for the field of STS to recognise what I would call a kind of 'epistemic superiority complex'. Just because you're going out and studying other research fields and gain a lot of knowledge on how the 'science game' is played in that process, you certainly are not exceptional. So, it's really time to usher out any sort of STS exceptionalism. We have to get rid of that to move to a new stage of reflexivity in STS.'

Schwarz points to a risk of hubris if STS scholars exploit the knowledge of how to 'play the science game', as this is then still about 'playing the game' within a field of epistemic hierarchical thinking, and that is countering STS ambitions to illuminate black boxing processes. She states,

'Because then you're still playing this 'game' where you try to make yourself feel better about yourself by dominating other fields by studying them. It's not seeing that the game itself is illusory because it's built on a distorted self-concept. Playing such a game is futile and leads nowhere, except to suffering. I find valuable advice in Audrey Lorde's famous phrase that "the master's tools will never dismantle the master's house". Of course, the slaves are not happy, but neither is the master. For me, the master's house is a state in which your own self-worth is intrinsically built on external measures of success, power, and status. My point is that if you want to use the master's tools in the best way possible, you first must leave his house, leave this understanding that external measures of power and so on will help you. In the end, it's not going to do that. I think the only hope lies in us recognizing this tendency that's active within each of us because we all grew up in this society. In STS, we must confront our own 'field shadow' to move beyond it.'

On the concept of *field shadow*, Schwarz elaborates,

'With this concept, I'm pointing towards all the disowned and neglected parts in a field that we often don't want to see because they counter our constructed self-image. I really want to highlight that it's essential to confront this shadow in terms of our evolution as a field and individually. We need to integrate the field shadow to evolve into better versions of STS and ourselves. I see that it's particularly active in those areas of the field where there's a lot of shining. Too much light focusing on outside appearance, so that this bright shining is covering up deeper, unresolved elements of the field. I'm now also interested more in looking at the work that is done in STS and in other fields to deny this shadow. I think we need to find new approaches, new ways, new tools to bring this shadow into the light, so we can grow as a community and as a field. That is also what I hope to achieve by sharing my own story of encountering the 'darker', let's put it like that, sides in STS. The research tradition I'm starting in STS is about studying field shadow work. I currently conceive this shadow work as two-fold: dark shadow work that is trying to cover up the shadow, and light shadow work that is illuminating it and in doing so allowing for the integration of the power inherent in any energy formation. Dark shadow work is of the past and light shadow work is creating a better future in the present. We need to know about the first and fully embody the second.'

Integrating field shadows and inspiring change

When Schwarz is asked to reflect upon the responses she got from the STS community after her Medium post, where she talks about her experiences at the Harvard STS programme, she tells us that,

'In general, the responses I got were very positive. For me, it was a big moment to again feel part of the STS community. I got the strong sense that there are a lot of people in the field who take these issues seriously now and don't want to sweep them under the rug.

And I think you are part of that community of people actually, you inviting me to talk with you now is showing that. It's also helping me to reintegrate myself into the community and see myself as someone with a valuable voice and perspective on the community. So, I want to thank you for this opportunity. This is really important. So, you matter in my story a lot. So... Maybe first, yeah, there's of course continuing attempts to discredit me and my perspective from the programme I accused of committing these mistakes. The programme that I think is unconscious, that has an unconscious programme running that it's not able to confront, and that programme is continuing. So, it seems like within that programme and that subcommunity in STS, the capacity for integrating its own shadow isn't really there. This is a sad reality, but we need to accept it and focus on creating a better programme in STS.

Further, she highlights some concrete changes that have been happening (both prior to and after her Medium post) within the broader STS community,

'[...] what I've seen mostly, and most notably, is that the STS associations have recognised the need for ethics policies and codes of conduct, so that we create STS ethically and make it a safe and inclusive space for all members and to not marginalize some groups of people. 4S already has an ethics and code of conduct policy in place for their events—that already was the case before I came out with my story and now after my going public this issue of creating these guidelines, policies, and codes has become more prominent for other STS associations. So EASST and several national associations such as stsing in Germany are now working on similar policies and codes of conduct. This can, hopefully, change the culture and what is seen as acceptable and unacceptable conduct within the community. Another change I see is happening also at the level of STS departments to change research culture there. The best example here is coming from my former academic home, the STS department at the University of Vienna, where I was employed when the Harvard incidents happened. There, a student group formed under the name of '#WeDoSTS_Vienna', after I came out with my story. They've been really pushing for institutional change to create a culture of accountability and more care-centred practices at the department. They were able to establish a student council to have a voice on important issues and have even started a research project on the effects of #MeTooSTS/#WeDoSTS among the students at the department.'

Schwarz also tells us that for her inspiring younger people is the most important aspect of her work as an activist-researcher,

'[...] I see that what I did made a real difference already for some, especially younger people, and I'm mostly moved by younger people coming up to me and telling me that what I did showed them that you can do things differently and that you can be strong enough to speak out about powerful actors in our own field. This is for me the most important thing that I wanted to inspire a new generation of STS researchers to stand up for their own values and their own voices.'

Lastly, we asked her about her thoughts on what the future of STS may entail, Schwarz responds that there has been a recent push towards making STS a more established discipline. Doing so could potentially bring some benefits, however, for her, and undoubtedly many other scholars within the field, what made STS so interesting in the first place was its interdisciplinary, even undisciplined nature. The STS field has taken pride in not having a 'cannon' it adheres to, so streamlining the field too much would go against its very own principles. Therefore, Schwarz thinks it is imperative that STS does not shield itself from influences from outside its current field boundaries.

'I think we are at a bit of a juncture now. I notice a strong urge towards making STS a more established discipline and I see this urge running a bit up against its critical potential that I see rooted in an interdisciplinary, antidisciplinary movement. For me, this was what I found fascinating in STS. Of course, there lies some merit in making STS more institutionally stable, to have STS departments for instance, and to really ensure career tracks for STS scholars and getting more resources for doing research and so on. But I think there's also a danger here of streamlining what STS is, to say 'this is now our cannon, these are our research perspectives, and this is what we are about'. The main challenge here is to enable STS to remain open to influences from other fields and other communities, and to not close STS off from these other influences and become too rigid. That's also what from my own experience contributed to the problems I identified in the Harvard STS programme, where there is this strong urge to say, 'we are this and we are just that and everything that's not subscribing to this narrow understanding of what STS is supposed to be is unacceptable'. This is for me not something I want to subscribe to and consider as good STS. Again, what I said before, I see this strong need for reflexivity within our own community, to understand our own internal power dynamics and to integrate the field shadow. I think what it takes is that we STSers become more aware of our own practices and the unconscious biases that we hold and that then negatively impact others in our immediate environment. In particular, STSers in positions of power need to remain open to critique and not assume a special status for themselves. We must acknowledge that every one of us has biases, and we need to develop processes and mechanisms that can allow us to address and work on our own limits. Because if we don't do that there's a real risk here of drawing on tactics of shaming and using projection to avoid our own response-ability. You cannot say that other scholars with different opinions are 'crazy' to avoid engagement with their perspectives. Scholars who resort to such tactics just reveal their own epistemic limits. Enlightened young people don't fall for such cheap tricks. I mean STS of course is all about how science and technology are fundamentally social, this means for me that STS has this inherent potential to create and practice a new research culture in which what we see as good scientific practice is no longer seen as separate from good interpersonal conduct. This would be the ultimate improvement of any community. What is necessary now is to merge the public

image with what is going on behind the scenes and to not have this distinction between the public and the private anymore that allows scholars to present themselves as something in the public light that they are not living behind closed doors. This means to look behind the scenes in our own community and to address the problematic issues that we encounter head on. Of course, this is a hard problem, but are not these the most interesting ones to solve? If we manage to do that, STS could actually model a more integrated scientific life, and this is something I would like to be and see. This is the #WeDoSTS ethos I stand for. In such a world, STS can serve as a positive example for how we can do science differently by being fully honest with ourselves. We then can look at ourselves in the mirror with a true smile. This is the world I want to live in and want to help co-create.'

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NORDIC JOURNAL
of Science and Technology Studies

THE EMERGENCE OF FEMINIST TECHNOSCIENCE IN THE NORDICS

Interview with Cecilia Åsberg

by Maria Kirpichenko & Sofia Moratti

Introduction

Our second interviewee for this special issue is Professor is Cecilia Åsberg, a leading figure in Feminist STS. She is a professor at the Department of Thematic Studies (TEMA) at Linköping University (https://liu.se/en/organisation/liu/tema) and the founder of the Posthumanities Hub (https://posthumanitieshub.net). Her research revolves around the natural or non-human as opposed to the human, in a world shaped by technoscience and environmental change. Her career narrative was incredibly engaging, prompting us to collaborate with her on editing the interview to give it a more cohesive and speech-like flow. Our pleasant one-hour conversation revolved around the themes of Feminist STS in the Nordics and academia as a community.

The critique to scientism and the social impact of STS

We opened the interview by inquiring about her formative years in academia. This aspect is particularly enlightening for young scholars, as it illustrates the evolution of Nordic STS in the past two decades. Cecilia first joined the TEMA Department in 1997 and witnessed an era of exceptional scientific optimism.

> *There was, of course, a lot of optimism, I would say, at that time. This optimism of the late 1990s was especially evident in the new Big Science projects in the USA, like the huge efforts to map out the human genome, which was said to be revealing the recipe of what makes a human. There were many dreams about big tech, about creating new marketable solutions at the intersection of Medicine, Science and Engineering, in the so-called Life Sciences.*

Cecilia was cautious, as were other feminist STS scholars.

> *A lot of feminist STS scholars in the Nordic countries, in the UK and the US were apprehensive and critical to these new developments, having new reproductive technologies and "designer babies" in mind in a very ideological landscape.*

Simultaneously, a sense of optimism infused the field of STS. There was a belief in the capacity of STS scholarship to influence societal developments, empowering scholars with the confidence to actively participate in public debates and perceive themselves as catalysts for change.

> *The idea was that the critique from STS would permeate society and have a real impact on the development of Medicine, Science, and Technology.*

Pushing the theoretical and disciplinary frontiers of Feminist STS

Increasingly guided by her "passion for feminist theory and practice", Cecilia pushed the theoretical frontiers of Feminist STS. Strikingly for young STS researchers today, the work of certain scholars – now considered pivotal – was not accepted among academic circles at the time. One example is Donna Haraway, whose scholarly contributions have been central to shaping Cecilia's intellectual development.

> *In some places within the Scandinavian and Nordic contexts, Haraway's work was barely accepted... many of my peers in Technology Studies thought that Haraway's ideas were utterly suspect, even crazy. ... There were all kinds of preconceptions. ... These feminist theories had one thing in common that made them utterly intellectually suspicious in interdisciplinary Scandinavian scholarship: they all took the body very seriously.*

The arrival of Nina Lykke at Linköping marked a turning point in the reconfiguration of disciplinary boundaries.

> *She positioned Gender Studies firmly within the Feminist Technoscience*

domain. ... I must say, much kudos is due to Nina Lykke for her generous intellectual legacy, which she created here through her integration of Cultural Theory, STS, and Feminist Theory.

In 1999, Cecilia and her colleagues founded Tema Genus, a section of TEMA. Genus is the Swedish word for "gender". Nina Lykke developed Tema Genus substantially. Cecilia makes fascinating remarks about inter- and cross-disciplinarity.

At Tema Genus, we embraced interdisciplinary to a larger extent than in other places... we have always been questioning the parameters of disciplinarity in our scientific practices. ... To me, it became clear over the years that feminist research can function as a scientific engine of discovery.

Witnessing times of growth

Cecilia feels "incredibly fortunate" to have witnessed the birth of Tema Genus and to get "one of the first jobs as a PhD student" there, as "there were so many applicants from all over". The new division had received much support at the political level:

All the parliamentary parties in Sweden agreed that we needed an interdisciplinary Gender Studies unit at a Swedish university.

Observing the emergence of a field where resources are dedicated to its growth, witnessing its early stages, and having the chance to contribute intellectually to its establishment is a significant and enticing opportunity. However, young researchers may find it challenging to access such opportunities, given the funding constraints in higher education, heightened reliance on external funding, and the necessity to assess and justify risks associated with research projects. Innovative ideas inherently involve risk and thrive on openness, rather than being confined to narrow assessments of industry applicability or profitability.

One of the indicators highlighting her pivotal role in the establishment of the field is the fact that the subject of her PhD thesis, very much avant-garde at the time, has since become a classic posthumanist motif in Feminist Technoscience Studies. Her work, developed under the supervision of Nina Lykke, is at the intersection of cultural media studies, STS and Feminist Theory:

I wrote my PhD dissertation on the new Life Sciences and the "genetic imaginary" it created in public media, exploring the broad cultural fantasy landscape and visual culture surrounding the new genetics in popular science, in everyday media and science communication. ... For instance, the human genome and human diversity projects, were to a large extent, in their stories and phantasmic imagery, changing our ideas of our bodies, ourselves for a genetic sense of selfhood. The genetic imaginary of the time, at the turn of the millennium, was replacing biological racism as an explanatory model with a form of cultural racism.

Feminist Technoscience: the "wow!" machine

Cecilia describes Feminist Technoscience as

a 'wow!' machine; it teaches us to be surprised – not just once, but many times. It harbours so many methodological opportunities, empirical studies and theoretically nuanced critiques of bodily determinism and scientism and of the objectification of bodies and disembodiment, challenging the idea that the body is passive, inert, modifiable at will.

Cecilia highlights how feminist STS owes much to early feminist scholarship, which laid the groundwork for what are now core principles of STS.

Not everybody in STS remembers that this first was very much a feminist critique, stemming from, for instance, the eco-feminist philosophy of Val Plumwood. There exists a kind of undulating corpus of thought that is both speculative and extremely political (e.g. Deborah Bird Rose), rooted in an ethics of vulnerability and in 'worldings' and aligning well with the thinking styles of Haraway, Barad, and Braidotti.

Towards a feminist academia

Another key theme Cecilia explores is the academic environment as a workplace and its impact on the knowledge produced, with a focus on gender and class dynamics.

Still today, in gender-equal Sweden, almost 80% of full professors are men, and they are asked to communicate their research in public. This is why it was highly important to me, particularly as someone with no academics in the family, to work my way into the relative security of a full professorship. I became a professor at 41, and I am now 50. It is still challenging... to be taken seriously: I am still very much coded as feminine, and that inevitably detracts somewhat from the authority of what one says.

While she was a lecturer at Utrecht University in 2005, Cecilia learned from Gloria Wekker about the importance of women scholars citing each other´s work. Reflecting on her experience at Utrecht, where she collaborated with key figures in the Dutch feminist community, and Lancaster, where Sarah Franklin and Jackie Stacey supervised her work and Sarah Ahmed was the Head of Department, Cecilia highlights the significance of being exposed to different feminist perspectives and practices, and of

> *internationalisation as opposed to methodological nationalism, new encounters, and bringing onboard the strange, the alien, the other within ourselves. This was incredibly transformative...*

She advocates for a future academia and feminist STS where

> *Transversalism, connecting things, interdisciplinarity, even post-disciplinarity if you wish–thinking in terms of our embodied subjectivity as a process of coming together, and coming apart–is the name of the game.*

She argues that Swedish academia – and scholarship – are still largely organized into disciplinary silos rather than theme-based approaches. We believe that this might also be the case in other Nordic contexts.

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NORDIC JOURNAL
of Science and Technology Studies

A PRAGMATIC APPROACH TO BUILDING A FIELD AND DOING STS

Interview with professor emeritus Knut H. Sørensen

by Kristine Ask, Shan Wang & Nora Kristiansson

Introduction

The first scholar featured in our anniversary issue is professor emeritus Knut H. Sørensen. Sørensen has a decades long history working in science and technology-studies and played a key role in establishing the Centre for Technology and Society at the Department of interdisciplinary studies of culture (KULT) at NTNU. Sørensen is one of several key contributors to STS and in this interview, we will draw insights from his long career and explore STS as a changing field.

Sørensen has witnessed the starting point, the development, as well as many changes in this field throughout his career. In this interview he reflects on how the field has developed and how it is a story about building STS institutions, and the many strategic choices it involves. We are reminded of how the making of science involves specific people, doing specific things at specific times and places. It is a chance to see behind a name put in as "standard citation" and see a person who combined ambition and pragmatism with hard work to make something happen. Revisiting the history of our field is also a chance to remind ourselves of how different things could have turned out; if they hadn't come across that specific paper or hadn't received funding at that time.

In this interview we will touch on important contributions, about being pragmatic with external funding and research topics, how STS has changed as a field, the importance of advising and investing in students and what life is like now as an emeritus.

Vying for external funding with pragmatic constructivism

During his career Sørensen has studied a wide range of topics including sustainability transitions, gender balance among professors, gender and technology, innovation and technology policy, ICT and the internet, universities, working life, the engineering profession, and interdisciplinarity. These topics touch on several core themes in STS, yet also represent a highly diverse set of research interests. While they do reflect Sørensen's natural curiosity, he explains this variety in research topics as a pragmatic approach to research and the need for external funding to build an STS centre.

> *Because the need for acquiring external funding meant that you needed to have a certain flexibility in terms of research topics. So it was not a situation where I, for example, could pursue my particular interests. It was a situation where the interest had to be adapted to the funding opportunities.*
>
> *I think our department would not have existed without that kind of entrepreneurial effort to acquire external funding, which then implied a kind of flexibility in terms of what kind of research at the end that you pursue.*

Sørensen and colleagues discovered that STS was a productive field for applying for external funding. When we ask why, he states the development of technology as something that bonded engineers and scientists, and STS thus provided tools for analysing these kinds of relationships.

> *I think the most important part is that with STS, you ask questions about development of technology and, to some extent, science that also are of interest to engineers and scientists.*
>
> *In addition, of course, STS provides tools for analysing these kinds of relationships. But I think that the ability to formulate questions that would resonate with engineers and scientists sitting on the program boards in the research council was a vital thing.*

Meanwhile, the continuous search for external funding meant that Sørensen and his colleagues had to be flexible and move on to new things even though he would have liked to stay longer with some research topics. One such area, he points out, was the research on cars he and colleagues did in the early 1990s, about how the adoption of cars shaped society and our everyday lives. Looking back, he sees it as a possible trajectory he missed out on:

> *We were actually very early on in focusing on mobility. But we didn't take it far enough to get the attention. So then that was left to somebody else.*

While flexibility has its advantages, it also entails certain costs. It is hardly surprising for an STS audience to see the research institution develop in tandem with research funding and organization. Across the many topics, Sørensen considers "pragmatic constructivism" to be a recurring feature in his research combined with a strong empirical focus.

> *It means being not very principled in one or the other way of understanding constructivism. So, it's, what should we say, a softened version or amalgamation of dominant theories like SCOT and ANT. So the pragmatism is in pursuit of the empirical evidence and less in pursuing particular theoretical assumptions.*

In line with STS culture, such strong empirical focus for the department has become partially a legacy of Sørensen and the strategies chosen for funding and building the department.

The growth of STS as a field and the value of new generations

STS has grown much since its beginnings in the late 1970s and 1980s. For someone like Sørensen who has followed the field through almost 40 years, the growth of the field is what stands out as the biggest change – while noting that perhaps there hasn't been as much theoretical development.

> *The obvious change is the growth. When I attended my first meeting in the Society for the Social Studies of Science, I think there was something like 100 participants. And the more recent conferences are going from 2,000 to 3,000. The number of academic centres and departments at STS has also grown substantially.*

Sørensen experiences that STS has evolved into a community where people explore science and technology from a range of different positions, while also noting that the theoretical frameworks developed in early STS has largely remained relevant and have been a key factor contributing to the growth of STS in their capacity to bring together people from diverse fields who share a common interest in the subjects that captivate those involved in STS.

> *Another aspect is that STS kind of perspectives have diffused into a lot of other settings. That means also that there's a lot of people attending STS conferences that do not necessarily have an STS identity. But they go there because that is a place where they can present research on science and technology.*

The STS field captures a wide range of research topics and allows people from other disciplines to present their research that is related to science and technology. However, Sørensen describes the current scenario as a generation shift, where the initial creators of STS are retiring, and their active participation is diminishing. On the other hand, PhDs and master students play an important role for the growth of the field. In addition, this opens for younger thoughts and perspectives to emerge. NJSTS organized a panel on young scholars' perspective on STS exactly because we want young scholars to decide the field, to avoid only established voices deciding the future of the field.

The competence of graduates with higher education is considered to play a central role in innovation activities (Sørensen, 2022, p. 165). During his career Sørensen has played a central part in supervising. In fact, he has supervised 31 master students and 55 PhD candidates, and supervision has been his main interest as educator. While acknowledging the innovation potential of PhDs, Sørensen believes that one does not necessarily have to be young to generate new ideas.

> *Some people argue that you have to be young to think new thoughts. I'm not completely convinced about that from my experience. And I don't think the empirical evidence is very strong on that either.*

Resonating in his answer is the rejection of the "the genius scientist", which often is tied up to notions of young singular minds pushing the field forward. In his work, but especially in his advising, Sørensen has always pushed for a collaborative approach where sharing ideas and insights should be done freely, having little qualms sharing his own concepts and ideas with graduate students.

Domestication research – a key contribution and coincidence

One of the key contributions of Sørensen is his work on domestication theory. Domestication is a user-oriented theory about how technology is appropriated into everyday life. The approach highlights the active role users have in shaping technology, and how important context for use and practice is in defining what a technology "is" and "does". One of Sørensen's most cited works is "Making technology our own: domesticating technology into everyday life" (with Merete Lie), and his interest in domestication reflects a longstanding interest in use and users.

Sørensen was looking for new ways to get a better grasp of the user – technology relationship. And then, almost by coincidence, he came across an interesting paper by Silverstone and the concept of domestication.

The reason why I became interested in domestication was that I was interested in studying the use of technology. I had a long-standing interest in the relationship between technology and work, in working life but also in housework. But I was also a bit dissatisfied with what was then the current understanding of that relationship. So, together with some other colleagues, we were searching for ways to get a better grasp on the user – technology relationship.

And then I, by accident, discovered an unpublished working paper by Silverstone and others at a table at a conference, It introduced the concept of domestication. First, we sort of appropriated that version of domestication, but we increasingly became a bit dissatisfied with parts of that approach. So, we revised the media studies version of Silverstone and colleagues' to adapt it to STS.

For Sørensen, this was a starting point for using and developing the concept of domestication in an STS manner,

I think that the twist we made on the domestication concept was to make it STS-like. Drawing also on STS understanding of technology and the social relations related to technology. I think many of the main features are similar, in-particular the insistence on users' agency in relation to technology.

Domestication has grown into a versatile concept used to study a range of different technologies, from automated milking systems, households' energy use, decommissioning of oil tanks, electric scooters, and information technology. This illustrates the usefulness of the concept in its STS articulation that goes far beyond its initial conceptualization as a way to understand household's media use.

Emeritus life as decoupled freedom

Sørensen retired January 1, 2021. In the closing of the interview, he reflected on his new role as a professor emeritus and what it entails, and particularly on how the emeritus position means he has more freedom than ever, while also being less tied into the everyday life of the department.

As emeritus Sørensen is formally freed of all obligations to the department and at liberty to pursue whatever projects he sees fit, a way of doing research that is easily idealized when the calendar is fully booked and time to do actual research is scarce. However, as he points out, this also means he has to work harder to remain part of the scientific community around him.

So, the retiring is of course a life changer. It means that you are a new person. You are to some extent disconnected from all the stuff that you used to be linked up with. So that means there is more work to be done, that you have to do the linking. There is much less sort of automatism in what you are supposed to do.

Sørensen explains how his new role is characterised by less expectations and how this affects his relationships with other persons/individuals. Reflecting on what expectations means Sørensen state that:

Having expectations means that there are some kind of links to some other actors. So, when there are no expectations, that means also that the links are much weaker. So sometimes you could say that freedom is overrated. Because as the Janis Joplin's song goes, "freedom is just another word for nothing left to lose". There is something about that. But it doesn't worry me that much at the moment.

Retirement for professors is perhaps a bit unusual, in that so many choose to continue their work as emeritus/emerita. One motivation Sørensen for continuing working is a wish to "wrap up" and tie together a lifetime of research.

I know some retired professors prefer to chop wood or do something completely different. I do chop a little wood during the summer, but not that much. I think it's a widespread academic disease to not let go. So, what am I doing? One way of thinking about it is that I'm trying to do some wrapping up.

I think I will spend some time in the search for commonality in previous work by returning to the questions you asked earlier, that what should I have learned from delving into very different research areas?

When asked about his current projects, Sørensen did however not seem to be "wrapping up", nor does he appear alone, instead he has been making new work and setting up new tracks of research with his research on universities with Sharon Traweek (Sørensen and Traweek 2022).

At the moment I'm pursuing university studies. I did publish a book with Sharon Traweek. We have organized a lot of sessions and conferences. I think we hosted something like 40 plus papers in 2023. We had five sessions in the 4S Honolulu meeting, which is probably a kind of record. So there is a kind of resonance.

It is also, I think, politically important to do studies of universities. We see more or less every day how little university leadership actually knows about what is going on in the different parts of the university. So somebody has to try to explain a bit more about that.

Closing remarks:

Sørensen's reflection on retirement can possibly bring some solace to current scholars who feels like "too little butter scraped over too much bread" as Bilbo articulated it in Lord of the Rings. When the calendar is filled to the brim, it may (rightfully) be difficult to tap into the freedom we have as academics. On one hand, these busy schedules do limit us from doing the research we are passionate about; on the other hand, such heavy demands also manifest the expectation from others and the connection with other actors which we may appreciate.

With STS continually growing, the field brings together more and more people from diverse fields and non-Western countries to explore science and technology and STS grows ever more branches and sprout new leaves of inquiries over time. We hope to continue to support the growth of this towering tree, making sure that it is not just about reaching the tallest top, but also to provide shade for future scholars.

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NORDIC JOURNAL
of Science and Technology Studies

BOOK REVIEW

More-Than-One Health: human, animals, and the environment post-COVID

Edited by Irus Braverman, Routledge 2023

Reviewed by Bernardo Couto Soares

One Health is a global health approach that emphasises collaboration across disciplines in response to diseases. It has gained popularity in recent decades, with the most recent definition by One Health High Level Council (OHHLEP) being: "an integrated, unifying approach that aims to sustainably balance and optimise the health of people, animals and ecosystems." (Braverman, 2023, p. 80). According to Steve Hinchliffe, this human-animal-environment triad premises on specific ontological commitments to a one-world metaphysics. His Foreword sets the stage for the volume's contributions through the question: "What is gained and what might be lost when one adopts the One Health signature?" (Hinchliffe, 2023, p. xx).

The book brings together scholars from multiple disciplinary orientations and case studies with a broad geographical scope. The thirteen contributions are grouped together in a way that allows for a progressive build-up to the editor's main argument. Irus Braverman envisions modes of governing health that recognise the interdependence between living entities and plurality of knowledges within more-than-one-healths. In this review, I have focused on chapters that illustrate the overarching theme of each Part (I, II, III and IV) and speak to my own research interests and expertise.

The volume's Part I begins by situating One Health with an initial medical history followed by three contributions of healthcare professionals that provide an insider perspective. Two leading figures within One Health, Chris Walzer and John H. Amuasi, are interviewed in Chapter 3 and 4 of the book. They discuss COVID-19 pandemic's impact on global health stakeholders's ways of thinking about health and disease, and preparedness for future epidemiological events. Providing an overview of the current One Health agenda.

The book emerges in a timely manner in this post-pandemic era, with contributions providing important reflections about One Health's ways of governing lively entities according to notions of disease and health. The volume is divided into three sections: Part II focuses on One Health expansion, Part III is concerned with ways of othering and potential new forms of more-than-human justice, and Part IV speaks about decolonization process within One Health and integration of indigenous knowledges.

The chapters in Part II consider materialities and spaces that have until recently remained relatively marginal in One Health. Elizabeth R. Johnson and Hannah Dickinson's chapter explores One Health expansion into ocean governance through case studies about jellyfish overpopulation and shrimp aquaculture's biowaste. The authors outline how these marine organisms are constituted within capitalist regimes of extraction and One Health's boundary-defining categories of pathological and healthy.

Through biotechnological practices, shrimp-shell chitin and jellyfish bodies are reconfigured from ecological and economic stressors into pharmaceutical resources. These marine organisms are integrated into Western-centric visions of "healthy bodies" as products, such as antioxidant and fat-loss supplements. The chapter demonstrates how One Health's idealized notions of interconnectedness are rooted in particular understandings of "good health" and economic growth.

The volume's Part III considers potential alternative ways of caring. Bjørn Ralf Kristensen's chapter provides an appropriate reply to Johnson and Dickson's concerns by re-conceptualizing One Health's focus on pathogenic organisms. The author explains how One Health human-animal-environment interconnection is unidirectional with animals only being considered in their relation to human wellbeing.

Through the case studies of common murre birds in Stora Karlsö and urban Rock Hyraxes in Jerusalem, Kristensen considers codependency between humans and wild animals in situations of zoonotic spillover. During the COVID-19 pandemic, due to the lack of tourists in Stora Karlsö, white-tailed sea eagles emerged within the island, leading to the worst breeding season for common murre birds. Meanwhile, Jerusalem's urban development has brought rock hyraxes into the city inhabiting in poor areas with lack of sanitation services or Hasidic neighbourhoods, where food waste is left outside due to religious beliefs.

These cases demonstrate that humans are implicated in other animals' lives in ways that the unidirectional disease spillover fails to consider. The author proposes *relational spillover* (Kristensen, 2023, p. 194) to illustrate the entanglement between human and animal lives within a specific disease situation. In the same section, Deborah Nadal's chapter discusses the idea of interspecies camaraderie (Nadal, 2023, p. 186) as a way to encourage mutual care and togetherness among different living entities. The concept contributes

to Kristensen's relationality by calling attention to the need to reflect empathetically about more-than-human entanglements.

The volume's last section, Part IV, remains focused on the shared multispecies vulnerabilities and calls attention to One Health's colonial legacies. Kiheung Kim and Myung-Sun Chun's chapter traces the origins of preventive culling as a zoonotic disease control measure to Korea's colonial and postcolonial history. The authors demonstrate how culling practices are violent both towards human and nonhuman animals and put vulnerable humans at risk. They advocate public health practices to break away from embedded neoliberal forms of governance and colonial legacies.

During Korean annexation to the Japanese Empire (1910 – 1945), quarantine measures were implemented that focused on the disease spatiality instead of pathogenic microorganisms and infected individuals. Sanitation policy was guided by the fact that Korea stood as a buffer zone to Japanese mainland. During the quarantine process, humans and nonhumans were strictly controlled in order to prevent disease spreading towards the rest of the Japanese Empire.

The current day public health system still involves a state-led aggressive approach focused on containment with preventive culling. The process involves the mobilisation of a temporary labour force with variable levels of training and whose work has had associated mental health effects. Both domesticated and wild animals at risk are targeted with no clear demarcations between infected and uninfected. The authors consider that One Health disease control strategies should not focus on a containment model to secure health but on the linked biological, geographical and cultural vulnerabilities between humans and nonhumans in a shared ecosystem.

This edited book brings particular attention to the social science and humanities contributions to One Health's current debates. The chapters expose power dynamics related to neoliberalism, anthropocentrism and colonial legacies. At the same time, the chapters help to rethink One Health principles of interconnectivity and interdisciplinarity. Irus Braverman brings these contributions together in a logical manner which illustrates the arguments for more-than-one healths, while concluding with an afterword that brings further potential for critical engagements with One Health.

Warwick Anderson's Afterword considers One Health as borderland and calls attention to concepts that define boundaries between lively entities. The "animal" category is oriented towards eukaryotic organisms (animals and plants). Meanwhile, prokaryotic organisms are only recognised as transmissible items in disease ecology. This eukaryote-prokaryote divide separates the living world while maintaining the illusion of the singular human body. These well-defined entities shape our understanding of disease risk.

The author proposes a "post-animal process ontology" (Anderson, 2023, p. 169) that considers "animal" not as a boundary but as no-unitary and interconnected. This moves beyond the volume's previous contributions towards an epistemic decolonisation of "thinking otherwise" about heterogeneous entanglements between lively entities. As Anderson mentions, while citing author Arundhati Roy: "historically, pandemics have forced humans to break with the past and imagine their world anew" (Anderson, 2023, p. 170). We need One Health that is not afraid to ask questions about how more-than-human relations are being formatted and is part of ongoing debates about what counts as health.

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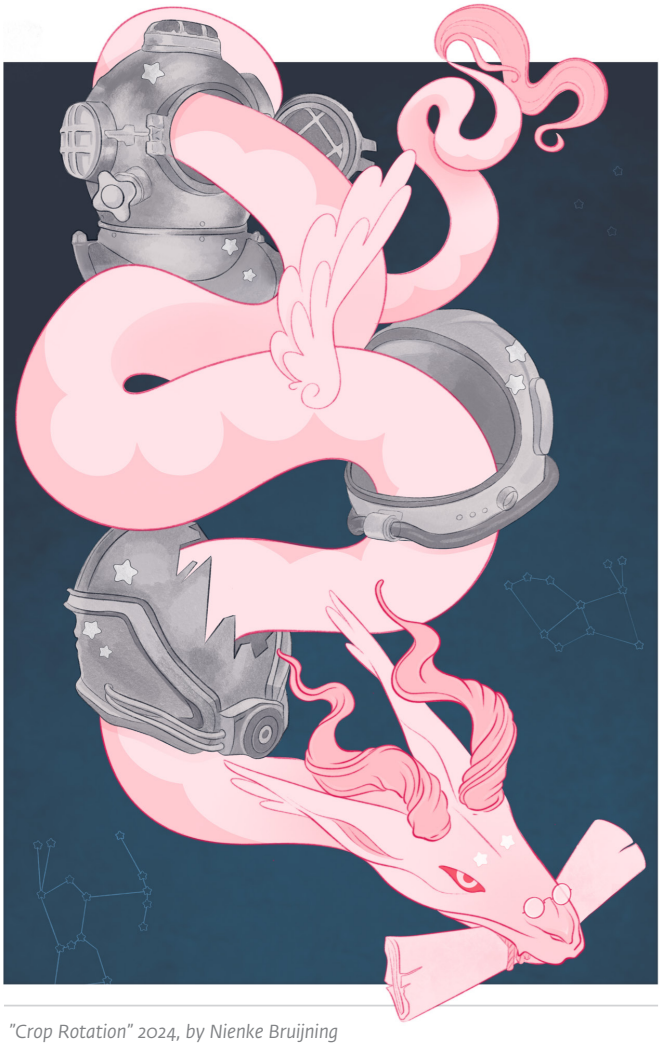

"Crop Rotation" 2024, by Nienke Bruijning

Nienke Bruijning is a research assistant and illustrator with an academic background in science and technology studies (STS) and media science, through which she developed an interest in studying the intricate relationships that form between humans and the technologies we surround ourselves with on a daily basis. She has illustrated two published books within the field of STS, using drawings to visualize stories that emerge from the empirical research of her colleagues. Through visual storytelling, she has turned technological 'black boxes' into fairy tale characters and processes of digitalization into traversing unknown landscapes looming with anthropomorphized tech creatures.

In the early 2000s, Nienke moved to a rural farm in Norway from the Netherlands, finding herself mesmerized with the folklore and myth that surrounded Scandinavia. At the same time, she grew up being interested in online spaces and early internet communities. This has resulted in an eclectic art style drawing on many sources of inspiration – including the cross sections between animals, nature, pop culture, science fiction, horror, the occult, internet subcultures, virtual worlds and urban legends.

About the piece – "Crop Rotation"

The front cover art of this issue, *Crop Rotation* (2024), is inspired by the pursuit of knowledge in the career of a researcher. Going from curiously navigating an unfamiliar field, to expertly soaring the skies and eventually breaking the mold. These stages aren't tied to any linearity or timeframe, as the artist herself has experienced, they can easily occur on the same day while writing a paper. The liquidity of the dragon's body represents this state of flexibility in the face of changing demands, long working hours and bouts of self-doubt. Yet, as we enter the year of the dragon, we know it also represents wisdom and strength.

You can see more of Nienke's work on her Instagram page @bruyning.art

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