

CONTENTS

INTRODUCTION

- | | | |
|--|---|----------|
| Stine W. Adrian,
Lea Skewes and
Nete Schwennesen | Introduction to feminist STS at work:
challenging dichotomies and privileges | 3 |
|--|---|----------|

INTERVIEW

- | | | |
|---|---|-----------|
| Interview with Nina Lykke
by Lea Skewes and
Stine W. Adrian | Epistemology, Activism, and Entanglement
– Rethinking Knowledge Production | 15 |
|---|---|-----------|

ARTICLES

- | | | |
|---|---|-----------|
| Lisa Lindén and
Helena Tinnerholm
Ljungberg | The trouble of sex
Sex-determination, prenatal diagnosis and politics | 33 |
| Theresa Ammann | Nonhuman and Human
‘Victims’ and ‘Perpetrators’
Intra-active InSecurity Becomings
of the Ebola Outbreak | 47 |
| Karl Emil Rosenbæk | Olie som misfittende relation
En nymaterialistisk analyse af det sorte gulds
klæbrige karaktertræk i <i>Inferno</i> (2014) | 61 |

ESSAY

- | | | |
|--------------|---|-----------|
| Tara Mehrabi | Being intimate with flies
On affective methodologies and laboratory work | 73 |
|--------------|---|-----------|

BOOK REVIEWS

- | | | |
|--|---|----|
| Donna Haraway | Manifestly Haraway
<i>(Reviewed by Lis Højgaard)</i> | 82 |
| Ayo Wahlberg and
Tine Gammeltoft (eds.) | Selective Reproduction in the 21st Century
<i>(Reviewed by Lisbeth B. Knudsen)</i> | 84 |
| Adele Clarke, Carrie Friese
and Rachel S Washburn | Situational Analysis
Grounded Theory after the Interpretive Turn
<i>(Reviewed by Stine Willum Adrian)</i> | 86 |
| Cordelia Fine | Testosterone Rex –
Unmaking the myths of our gendered minds
<i>(Reviewed by Lea Skewes)</i> | 88 |

PHD NOTICES

- | | | |
|--------------------------|--|----|
| Michala Hvidt Breengaard | How to Mother?
Practices of infant feeding and
the formation of maternal subjectivity
among middle-class mothers in Beijing | 90 |
|--------------------------|--|----|

Introduction

Introduction to feminist STS at work

challenging dichotomies and privileges

BY STINE W. ADRIAN, LEA SKEWES
AND NETE SCHWENNESEN

What critical questions and potential worlds are emerging out of feminist STS today? What political agendas do we challenge when we draw attention to processes of inclusion and exclusion within the sciences, and what political work needs to be done and undone through science and technologies? These are the questions that have inspired us to propose and edit this special issue of *Women, Gender & Research* entitled *Feminist STS at Work*.

Feminist science and technology studies (feminist STS)¹ emerged out of second-wave feminism. At its core was a politically charged critique of the sciences and technologies, aimed at unmasking their suppressive effects and investigating the potential for rethinking the hierarchies of knowledge production and patriarchal power structures. This was achieved by posing fundamental questions such as: Who benefits? Whose knowledges counts?² These are questions which have unveiled the social inequalities embedded in both science and

the use of technologies. These questions are just as relevant today as when they were initially formulated because inequalities are still being produced through both science and technologies.

Feminist STS is a field that provides critiques which are aimed at reconfiguring epistemologies, methodologies and political futures by offering feminist criteria for how to produce knowledge, design and technologies in a more socially just manner. This is illustrated by inquiries into knowledge-making at various different sites as those in the natural sciences – more specifically in physics and biology (Barad 1996, Haraway 1988) – the technology of standards (Star 1991), and prenatal screening (Rapp 2000). From these inquiries into science and the use of technologies, reconceptualizations of both epistemology and ontology have followed which have pointed to a rethinking of feminist methodologies (Harding 1986; Haraway 1988; Lykke 1996; Barad 1996, 2007).

Although feminist STS is a small field, in recent years it has become part of the curriculum of various study programmes within the emerging field of science and technology studies (STS) in Denmark. However, feminist STS did not grow out of STS, but rather has had its own unique history.

In this introduction, we seek to illustrate why the genealogy of feminist STS matters. Furthermore, we wish to show how and why feminist STS is relevant to gender studies in general. Our hope is to spark interest in the field among gender studies scholars more broadly, as we believe that feminist STS has important contributions to make to gender studies, particularly regarding discussions of sex/gender, epistemology and methodology. In this introduction we zoom in on how sex/gender has been reconfigured within feminist STS. We have chosen this particular focus because it illustrates why the dichotomies between nature and culture, the material and

the discursive, are reconceptualized when feminist STS goes to work, as are epistemologies.

In the following text, we begin by laying bare the genealogical roots of feminist STS and its initial feminist critiques of science, technology and epistemology. We follow this up with a discussion of how feminist STS has enabled a nuanced reconceptualization of sex and gender, as well as the dichotomous perception of nature and culture implicit within it. This is followed by a description of how this rethinking of fundamental concepts is entangled within an epistemological critique of how knowledge ought to be developed and acquired in the university. In doing so, we underline that feminist STS invites the undoing of disciplines in the university, or rather a move towards transdisciplinarity, in order to enable an analysis of complex phenomena such as sex/gender.

Finally, we introduce the contributions to this issue. They all offer different entry points into feminist STS and demonstrate how these theoretical tools can help us in reconfiguring science and technologies from a feminist starting point. Our hope is that this introduction and the various contributions can serve as an inspiration to learn more about feminist STS.

GENEALOGIES OF FEMINIST STS

Second-wave feminist critiques of science and technology grew out of the Cold War, a time when the negative consequences of heavy industrialization became evident and its environmental consequences started to emerge. In response to these political challenges at the time, this led to radical and eco-feminist critiques of technologies that were conceptualized as an extension of suppressive patriarchy. However, technologies also made possible feminist opportunities and political debates on topics such as abortion, contraception and a woman's right to her own body, which were core po-

litical issues at the time. This is illustrated by the feminist health collectives in California in the 1970's, which:

“appropriated, revised, and invented reproductive health care techniques: making photographic diaries of cervical variation, crafting politicized health manuals, examining menstruation with a microscope, building an abortion device with a canning jar and aquarium tubing, forming artificial insemination groups, or turning a living room into a health clinic” (Murphy 2012, 2).

These health collectives aimed to empower women to understand and work with health issues in their own bodies independently of what was perceived as a suppressive medical industry. This politically charged empowerment by means of an alternative distribution of forms of medical knowledge also took place in Denmark, where the book *Our Bodies, Ourselves*, initially written by the Boston Women's Health Collective, was rewritten by Danish women. This book has since been rewritten multiple times, the latest edition being published in 2013 (K. Vinder, 2013).

As technologies, such as in vitro fertilization and sonography, emerged and became more widely available in the 1980's, critiques and debates regarding potential theoretical frameworks of inquiry evolved alongside them. However, within feminist discussions disagreements arose regarding the continuum between technophilic (Firestone 1970) and technophobic perspectives (Corea, Klein and Hamner 1985). In particular, a radical feminist movement, the Feminist International Network of Resistance to Reproductive and Genetic Engineering (FINRRAGE), became a prominent critical voice in respect of the development of new reproductive technologies.

While this radical feminist critique was taking place, in 1985 Haraway published her cyborg manifesto, which challenged the gendered and essentializing perceptions of

technology. Her figuration of the cyborg challenged the distinction between the human and the non-human, as well as the binary perception of nature and culture. As part of her critique, she also argued that the technophilic and technophobic positions were problematic. Instead technologies ought to be analyzed as situated in the practices that were unfolding (Haraway 2016b). Expressing the entanglements of science, theory and politics, the emergence of new reproductive technologies has since provoked various other theoretical developments within gender studies and feminist STS (Adrian 2014). Furthermore, feminist activism over reproductive health with respect to questions of abortion and contraception was transformed, as these agendas were incorporated into health politics around the world (Murphy 2012).

At the same time as critiques of technology and science emerged from feminist activists and radical feminists, feminists within the natural sciences also began challenging the premises of science. Anne Fausto-Sterling (1985), Lena Trojer (1985), Lynda Birke (1986), Donna Haraway (1987, 1988), Evelyn Fox Keller (1992), Nelly Oudshoorn (1994) and Karen Barad (1995) all voiced a fundamental epistemological critique of modern Western science, in particular the Cartesian distinction between nature and culture. This epistemological critique was an important contribution to the critique of the dichotomous perception of discourse and bodily materiality in Western science.

These critiques of science were developed in conversation with the work of the standpoint theorist and feminist philosopher Sandra Harding. In particular, Harding's book *The Science Question in Feminism* (1986) had a significant impact on feminist STS. She initiated a cartography of different feminist epistemologies, including her own reconceptualization of doing standpoint feminist research, which focused on how we might do better science from

the position of the subordinate. Haraway's classic article, *Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective* (1988), entered into conversation with Harding's work by both critiquing and developing further a new epistemology for feminist knowledge-making. Although Haraway was sympathetic to the idea of knowledge being produced from the standpoint of the subordinate, she criticized the notion that this was enough to secure better knowledge production. Haraway questioned the relativism implicit in Harding's theory, arguing that, like the god trick performed by the neutral observer, it lacks accountability. Instead, Haraway argued the need for a situated knowledge which could only produce partial truths.

While this feminist critique of science was unfolding, feminists of color and post-colonial feminists problematized feminism as being predominately white and middle class. They rightly pointed out that white feminists had overlooked the fact that the production of knowledges was deeply tainted by race (Hull, Scott and Smith 1982; Anzaldúa and Moraga 1983; Mohanty 1984; Hill Collins 1991). As part of this critique, Crenshaw coined the term 'intersectionality' to underscore the need to analyze gender as a category that intersected with the categories of sex, class, race, ethnicity and age (Crenshaw 1994). These critiques from both critical race and postcolonial scholars shaped both Harding's developments of standpoint theory and Haraway's conceptualization of situated knowledges (Haraway 1987; Harding 1998). Today, feminist postcolonial STS is emerging (M'Chareck 2005; Tallbear 2013; Subramiam 2014), and feminist STS is becoming a field in which critiques of science and technology intersect with postcolonial theory and critical race theory.

THE CORE CONCEPT: SITUATED KNOWLEDGES

In practice, situated knowledges and standpoint feminist aspirations were put to work in studies inspired by both Harding's and Haraway's new methodologies. In these studies, the illusion of science as the unbiased production of knowledge was questioned, and new critical perspectives on scientific practices were initiated.

One example of this critical approach to science, specifically biological research about sex/gender, was Anne Fausto-Sterling's work, *The Myths of Gender* (1985). In this work, she systematically debunked highly respected research on biologically based sex/gender differences. This move made her a part of a scientifically based, but also politically motivated questioning of what sex/gender can tell us about an individual's character and abilities. Along similar critical and politically motivated lines, Emily Martin's work *The Egg and the Sperm: How Science Has Constructed a Romance Based on Stereotypical Male-Female Roles* (1991) revealed how stereotypical perceptions of men and women biased what medical scientists were able to perceive in their research on the sperm and the egg. Once again, unwrapping the highly politically charged message implicit in scientific knowledge about a gender-stereotypically *passive* egg and a gender-stereotypically *active* sperm which implied that gender stereotypes were biologically based and therefore immutable. In this way, feminist STS made explicit that culturally based gender stereotypes framed results in biological science that had until then been assumed to be objective and unsituated. In other words, feminist STS facilitated an awareness that even very basic social categories such as 'women' or 'men' were highly charged political categories. This means that, when we lay scientific claim to what a woman's or a man's body *is*, we are implicitly also laying claim to what a woman's or a man's body *ought* to be and

what sort of action this female or male body *ought* to be initiating or participating in. Therefore, feminist STS brings to the fore that one can never achieve knowledge of the gendered body, nor of any topic for that matter, from a neutral standpoint. Knowledge is always situated or entangled within assumptions about epistemology and political preferences. When we are doing research, we are therefore always *also* doing politics and including or excluding certain bodies from certain spaces. And, contrary to traditional perceptions, it is not that feminist STS *introduced* a political agenda within scientific practices, but rather that feminist STS make explicit that political agendas were already *embedded* in the ways research was carried out and is still being carried out today.

THE POLITICAL WORK ON PERCEPTIONS OF SEX AND GENDER

In order to illustrate this entanglement of research practices, epistemological research critiques and politics, it might be useful to provide a few concrete examples of the latent political potential of different scientific understandings of sex and gender.

One example is in this issue's interview with Nina Lykke, where she presents us with an illustration of the original political potential in the separation of sex and gender. She illustrates the usefulness of the distinction between sex and gender with the fact that her parents both were full-time doctors, yet only her mother took on household duties. The point is that this division of labor was perceived as natural at the time. Against this backdrop, a distinction between sex and gender offered a critical view of socio-cultural norms. In other words, by driving a wedge between biological sex and perceived gender roles, a new feminist perspective on the everyday conditions of family life was unveiled, a perspective that invited the question: if biological sex does not determine gender roles, why

have women been given greater responsibilities in the home than men?

This ability to 'trouble' norms by distinguishing between sex and gender exposed a significant asymmetric attribution of value between stereotypically feminine-defined tasks in the home and the stereotypically masculine-defined tasks in the workplace, which were valued highly enough to be paid. To challenge this asymmetry between men and women in their everyday lives, new theoretical approaches started to place an emphasis on the value of stereotypically feminine over stereotypically masculine values. This theoretical and political move was expressed in different variations within radical feminism (Firestone 1970), eco-feminism (Mies and Shiva 1993) and sexual difference theory (Irigaray 1985). However, these approaches never succeeded in boosting the feminine values to the level of the masculine ones, and therefore they inadvertently fed into the discourse that women are biologically determined to do different and less significant tasks than men.

In the 1990's Judith Butler took up the political battle over sex/gender by making the reverse move, that is, fighting against the separation of sex and gender. She did this because, in her view, this separation had led to a privileging of sex *over* gender. In her iconic book *Gender Trouble* (1990), she emphasized that, as long as we speak of sex and gender as two separable entities, we are reiterating sex as the biological cause of gender, thereby contributing to the power hierarchy we are striving to challenge.

Many misinterpreted Butler's work to mean that the body could be reduced to discourse. However, Butler herself did not intend to deny that bodies do exist (as illustrated by her follow up work, *Bodies That Matter* of 1993). She merely pointed out, in agreement with such writers as Fausto-Sterling, Martin and Haraway, that we can never achieve access to an uncultured body.

WHAT THE BRAIN CAN TELL US ABOUT SEX/GENDER

The highly politically charged debate about whether sex (represented by biology/nature) and gender (represented by culture) can be separated continues to this day. Already in the mid-1980's, Fausto-Sterling was commenting on how scientific myths that explained away the possibility of gender equality were always replaced by new myths when the earlier ones had finally been debunked scientifically. Later she also elaborated on how cultural interpretations of the brain seemed to reintroduce gender-stereotypical interpretations: "despite the many recent insights of brain research, this organ remains a vast unknown, a perfect medium on which to project, even unwittingly, assumptions about gender" (Fausto-Sterling 2000, 118). Similarly, Cordelia Fine, in her book *Testosterone Rex* (2017; see book review in this issue), talks about what she humorously labels the immense "staying power" of myths with deterministic interpretations of biological sex.

This highly politically charged battle over sex and gender can be illustrated by the scientific discussion over what neuroscience and the brain can tell us about nature/culture, or more specifically sex/gender. This debate seems to keep occurring exactly because it intersects with political attempts to silence gender-equality initiatives. This is because, if brain scans can reveal fundamental biological differences between male and female brains, these differences can be used to explain away cultural inequalities between men and women, the implication being that any interventions would be working against 'nature' and therefore be pointless. However, this claim – that if men and women have radically different brains, this is a reflection of just *sex*, not *gender* – is flawed. One of the most famous studies showing the interconnection between brain anatomy and cultural influences (Maguire, Gadian and Johnsrude et al., 2000) looked at the brains of London

taxi-drivers. The research team chose this target group because London taxi-drivers are trained to avoid using maps or GPS systems and must therefore memorize routes and locations in the city. The researchers found that taxi-drivers' brains had adapted to the cultural requirements of driving taxis, meaning that the part of the brain that processes spatial layout (the entorhinal hippocampus) was enlarged. In other words, the taxi-drivers' brains had been reshaped in order to accommodate the socio-cultural requirements of taxi-driving. If one applies this insight directly to sex and gender, it implies that, when we study the human brain in order to seek information about fundamental sex differences, we are not studying a purely biological reference point. Therefore, any conclusions we draw about sex differences from studies of the brain will necessarily provide information about both sex *and* gender, and never just sex. To insist otherwise, we would need to assume that men and women lead identical lives and are treated identically in all social interactions.

In spite of the fact that it by now is common knowledge that the brain is plastic, meaning that it changes anatomically when exposed to external stimuli, this has not stopped the scientific and political search for the biological essence of sex in the brain. The battle that Fausto-Sterling took on in 1985 to challenge the dichotomous distinction between sex and gender is still being fought today by psychologist and neuroscientist Daphna Joel. Twenty years after the publication of Fausto-Sterling's first book, Joel still finds it necessary to 'trouble' a similar notion of the sexed brain through the use of neuroimaging studies. Joel, Berman and Tavor et al. (2015) do this by taking the binary perception at the core of biological essentialism literally. If sex hormones like testosterone and estrogen really do create two radically different types of brain, then it should be possible to show what a typical anatomical *male brain*

looks like and what a typical *female brain* looks like on MRI scans. However, after analyzing more than 1,400 MRI scans, they find that people who have one feature in one area of the brain which has been associated with the male or the female sex rarely have matching sex-differentiating features in other parts of the brain. They conclude that people do not have *male* and *female brains*, but rather “gender ‘mosaic’ features in the brain”, meaning that some parts present like a male brain and some parts like a female brain. Thus, it turns out that the brain, the typical reference point for essentialist biological theories, is in fact the ideal example of the complex entanglements of nature/culture and sex/gender.

FEMINIST MATERIALISMS, AND THE CONSEQUENCES OF THE COLLAPSE OF NATURE/CULTURE

When sex/gender in the brain is shown empirically to be plastic and entangled in culture, the disciplinary distinctions between the sciences are also challenged. This point had already been voiced by many feminists in the 1980's, including Lykke, Haraway and Barad. They all aimed a fundamental critique at the multiple dichotomies that arose out of the Cartesian divide between nature and culture, or bodily materiality and discourse. This is a critique that aims right at the heart of the idea of a division of labour, which leaves the social dynamics to the social sciences, the understanding of the culture to the humanities, and the objects of the natural and the material to the natural sciences.

If one insists that the body can be explored by the biological and medical sciences in isolation from the social sciences and the humanities, then it leaves sex in the hands of the biological scientist and gender in the hands of the humanities, thereby reiterating the Cartesian mind/body split.

The emergence of new materialisms came out of a rejection of the idea that

gender can be studied separately from sex and nature from culture (Alaimo and Heckman 2008; Adrian 2016). ‘New materialisms’ or ‘feminist materialisms’ are umbrella terms grouping together a number of very different theories. What they share is a premise of a relational ontology in which analytical attention is pointed away from the essence of entities and towards relational dynamics. In this way, feminist materialist theories are all reconceptualizations of the world based on the premise that the world came into being through an entangled material and discursive process. Both Haraway's (2016a) and Barad's (2007) theories, as well as developments within sexual difference theories (Braidotti 1994; Grosz 1994; and Shildrick 1997), were key players in these theoretical developments. In practice this has led to experimentation with the development of new transdisciplinary methodologies, as well as of new politics and interventions. For example, scholars have been involved in rethinking social justice in the sciences through developments at the Center of Science and Justice at UCSC, established and co-directed by Karen Barad and Jenny Readon. Together they have developed methodologies and offer training to facilitate graduate students in rethinking science and social justice across the natural sciences, social sciences and humanities (Reardon et al. 2015). The Interdisciplinary Unit of Gender Studies at Linköping University in Sweden is another example of how research and teaching can ‘trouble’ the disciplinary boundaries in order to facilitate knowledge production in new and progressive ways. In the interview with Nina Lykke in this issue, she explains why she believes that the new methodologies she is developing with a medical scientist will produce better science. Another example of a methodological development is Adele Clarke's methodological work on situational analysis, reviewed in this issue by Stine W. Adrian (see Clarke, Friese and Washburn 2018). Although Clarke's

method has been developed for interdisciplinary qualitative work, it enables knowledge-making of the entanglements of the human and the non-human, being a method that puts feminist STS to work in relation to both science and technologies.

FEMINIST STS AT WORK IN THIS ISSUE

As already demonstrated, feminist STS has emerged out of a politically motivated need to break down dichotomies such as nature/culture, mind/body and sex/gender. In this introduction, we have shown this by pointing to the entanglement of feminist epistemological critiques and the evolving politically charged concept of sex/gender.

These issues are most explicitly mirrored in the interview with Nina Lykke, where she introduces the epistemological critique of science at the heart of feminist STS. In this way, her narrative serves as an introduction to feminist STS and feminist technoscience. Her interview also offers a genealogical tale of how the field has emerged since she started putting feminist STS to work with the primary goals of challenging existing epistemologies and rethinking disciplinary methodologies. She exemplifies this through a discussion of both the concrete and abstract challenges of breaking down dichotomous perceptions of nature/culture and sex/gender, as well as disciplinary boundaries.

Lisa Lindén and Helena Tinnerholm Ljungberg's article *The trouble of sex. Sex-determination, prenatal diagnosis and politics*, taps into the already encompassing literature on reproductive technologies that has been a central issue in feminist activism and feminist STS since the 1980's. In the article, the authors explore how reproductive selection regarding the prenatal determination of sex is shaped by moral concerns voiced in political debates.

In the following article, *Nonhuman & Human 'Victims' & 'Perpetrators'. Intra-active InSecurity Becomings of the Ebola*

Outbreak, by Theresa Ammann, we follow feminist STS at work within the field of Human Security Studies where feminist STS has yet to make a breakthrough. Ammann seeks inspiration in Karen Barad's theory of agential realism and unfolds a critique of the clear-cut distinction between 'victim' and 'perpetrator' during the Ebola outbreak in Liberia. Agential realism helps Ammann to open up the possibilities in seeing not only human but also non-human agencies, while her approach also draws attention to the fact that victimhood and perpetrator-hood are not exclusive states but relational processes of intra-active becomings.

Similarly to Ammann's work, Karl Emil Rosenbæk's article, *Oil as a misfitting relation: a new-material analysis of the black gold's sticky character in Inferno* (2014), draws on feminist materialist theory. He puts the theory to work in a literary analysis of Ida Marie Hede's novel *Inferno* (2014). This analysis taps into one of the most heated issues within feminist STS at the moment, the question of climate change and environmental disasters, which, it has been argued, have been caused by the anthropocene (Haraway 2016a; Alaimo 2010; Murphy 2006; Åsberg, Neimanis and Hendrén 2015). While these ecological issues were primarily discussed by eco-feminists in the past, today both post-human and feminist materialist theories are joining in the conversation about the environment. Rosenbæk's analytical focus on the role of oil is a great example of this new trend. Throughout the text he explores the agency of the oil, illustrating its disabling effects on both people and the environment with which it is entangled.

This is followed by Tara Mehrabi's essay, in which she reflects methodologically on her experiences during participatory observation in a fly lab engaged in the study of Alzheimer's disease. In her essay, Mehrabi vividly shows how science is embodied and relational by describing the emotions that

arose during her work, and what kinds of ethical dilemmas these emotions bring forth. In feminist STS, relations with animals often have positive connotations, as, for instance, expressed by Haraway's term 'companion species'. However, Mehrabi shows how human-animal relationality can be loaded with negative connotations of disgust in breeding and killing thousands of genetically modified flies in the lab.

Finally, the review section of this issue offers reviews of a number of newly published books in feminist STS. Lis Højgaard reviews *Manifestly Haraway* (2016b), in which Højgaard revisits Haraway's cyborg and companion species manifestos.

Lisbeth B. Knudsen contributes with a review of Ayo Wahlberg and Tine Gammeltofts edited volume, *Selective Reproduction in the 21st Century*, which focuses on how selective reproductive technologies are being used and developing.

Stine W. Adrian reviews the second edition of *Situational Analysis*, co-authored by Adele Clarke, Carrie Friese and Rachel Washburn (2017), a book that sets out the method of situational analysis, modified to carry out feminist situated knowledges in practice.

Finally, Lea Skewes engages with Cordelia Fine's recent book *Testosterone Rex – Unmaking the myths of our gendered minds* (2017), which debunks the myth of a biologically deterministic sex. As Skewes concludes: "Fine frees her fellow feminist researchers, or rather, she empowers them to free themselves with the knowledge that even something so apparently essential as differences in our sex hormone levels are the product of everyday social and cultural practices, and not just our extinct evolutionary history."

NOTES

1. The field of feminist STS is also called feminist technoscience. As science and technology studies or STS is an emerging field in Denmark, this is the notion we have chosen to use in this introduction.
2. Who benefits is a question asked by Star as *cui bono?* in the classic text *Power, technology and the phenomenology of conventions: on being allergic to onions* (Star 1991).

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