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DISCUSSION PAPER

ABSTRACT Gender must be taken into account in a full understanding of technologies. Equally, technologies must be taken into account in a full understanding of gender. This poses a challenge for the individual scholarships of feminist studies and science and technology studies (S&TS), which, for the most part, can competently theorize *either* gender relations *or* technological relations, but neither school has the theoretical wherewithal to tackle the co-construction of genders and technologies. This paper elaborates the developing theory coalition between feminist studies and S&TS in feminist technology studies. The discussion centres on four main points of tension between the disciplines that I have found particularly challenging in my study of the co-construction of masculinities and (domestic) technology. These points of tension relate to: research sites, analytic lenses, power relations and reflexivity. The objective of working through the points of tension is to elaborate the mutual learning process between the two traditions when conducting empirical research on gender and technology.

Keywords gender, masculinities, power, reflexivity, SCOT

Constructive Tensions in Feminist Technology Studies

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The objective of this paper is to elaborate the developing theory-coalition in feminist technology studies between feminist studies and science and technology studies (S&TS) as a means of studying gender and technology simultaneously.[1] The paper contributes to this coalition by bringing together four key challenges to a working coalition between S&TS and feminism, centred on:

1 Research sites (where and what we research);
2 Analytic lenses (the methodological and theoretical concepts we use);
3 Power relations (theorizing symmetry and asymmetry); and
4 Reflexivity (theorizing the creation of knowledge).

In examining these points of intersection, the paper focuses on *tensions* between S&TS and feminist studies. Drawing on theoretical debates within the fields, the paper describes how the tensions arise or manifest within,

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and especially *between*, the disciplines of S&TS and feminist studies. In addition, the paper draws together ways in which a developing body of feminist technology studies has been dealing with these issues, and identifies what I have found helpful and unhelpful in creating compromises between these disciplines.

My own empirical interest has been in masculinities and (domestic) technologies, and so, for the first part of this paper, I shall home in on developments in feminist-informed men's studies.[2] In S&TS, I will focus on the 'social construction of technology' (SCOT) approach.[3] I see this as a central fulcrum in scholarships that challenge technological determinism; I shall begin by outlining its background, and its relationship to some of the other approaches within science and technology studies. The process of examining the potential usefulness of the 'gelling', or mutual accommodation, of the two approaches (feminist studies and S&TS) follows Sandra Harding's writings, in which she advocates an evolving and open-ended approach to theory construction, tolerating the contradictions between paradigms and using them productively.[4]

Feminist/Gender Studies

Within this field of scholarship, I will summarize four important points emerging from feminist studies of men's lives that have informed my research on gender and technology.[5] The following points reflect shifts in feminist studies from structuralisms to constructivisms, and crucially to a middle ground incorporating elements of both.[6] They should also serve to illustrate that 'feminist men's studies' is not an add-on category to 'women's studies', but instead lies at the heart of developments in feminist studies more broadly.

1. Firstly, within men's studies, there is a focus on *men's lived experiences* and an opening up of 'contradictions, disjunctures and ambivalences in men's lives'.[7] The important difference in much of current men's studies is not to write about men as the self-declared representatives of humanity but, rather, to analyse the very processes by which men have been able to achieve this status. Gender, as Anne-Jorunn Berg says, 'sticks more easily to women'.[8] 'Yet, it is precisely men's status as "ungendered representatives of humanity" that is the key to their hegemony',[9] or the 'ruse to hold on to power'.[10] The argument of feminist-informed men's studies is that opening up the way men create and sustain gendered selves is an important way of examining how gender is implicated in power relationships. It is to theorize men's lives in a way which does not re-exclude women and femininities.[11]
2. Secondly, *masculinities are described in terms of being historically variable, or non-essentialist, and as a dialectical construction (in relation to femininities)*. Seeing masculinities as relative to femininities, and as historically constructed, is helpful as a critique of the concept of sex rôles – a concept which remains, especially outside of sociology, a most prevalent way of explaining gender relations. Michael Kimmel succinctly brings

together criticisms of the concept of sex rôles (pre-given socialized ways of knowing and being). Sex rôles, he claims, are firstly *overly static*, or do not allow sufficiently for change. They are secondly *normative*, often being concepts of what people *should* do, rather than reflecting their actual behaviour. Lastly, they are *minimalist on power*, ignoring the implicit asymmetry between male and female rôles, or between masculinity and femininity.[12] Therefore, simply looking at rôles does not explicate the gender process or, as Judith Lorber has argued: 'The roles women and men play don't explain society any more than the jobs men and women have explain the economy'.[13]

In my own research, I have replaced the concept of sex rôles with the feminist studies' concept of 'gender identities'.[14] The less stable positioning implied in the concept of gender identities allows us to highlight the historically variable and relational ways by which genders are produced. Gender identities of an individual or institution, according to Wendy Hollway, may be created anew in every social interaction (including those with technologies) through investment in, and active appropriation and negotiation of, symbolic and material discourses.[15]

3. The third point is that in feminist men's studies there is *a pluralizing of masculinities, an opening up of diversity in men's lives*, and a breaking down of the binary oppositions between male and female on which patriarchy relies.[16] There is, as Robert Connell has pointed out, politics *within* masculinities.[17] By this Connell means that there is gender power between different groups of men in society. Further work in this area also suggests the salience of conceptualizing not just difference between masculinities, in terms of different male individuals in different social locations but, rather, of differing masculinities *within individuals*.[18] The subject may be seen to be constituted of multiple and fractured masculinities. This understanding of fractured masculinities, according to Lynne Segal, can create political spaces for tolerance of gender differences between men, and between men and women:

> Men will only stop displacing their fears about themselves into contempt for women and antipathy and loathing for excluded and subordinated groups of men once they are able to recognize and accept their own multiple and conflicted masculinities, able constantly to question and complicate the notion of 'masculinity' itself.[19]

4. The fourth point of *power* is also connected to this pluralizing. Here it is important to conceptualize beyond the context of differences between men to include in the analysis the power that can sometimes hold these differences in place, *or* the power to effect change in the way differences are conceptualized. Michael Kimmel, drawing on the philosophy of Hannah Arendt, points out the contradictions between the experience of social power that men might hold as a group, and individual power.[20] That is to say, not all men link to power equally: instead, there are

hierarchies of power subject to a form of *hegemonic masculinity*,[21] which is itself constructed through changing inter-relationships, such that the experiences of power by individual men may also vary in terms of context, and in relation to others.[22] To suggest, however, that power within and between gender relations is complex, fluid and contradictory, is not to ignore the asymmetrical relationship of masculinities to femininities in western society.[23] That which makes men's seemingly slippery power 'sticky' may be theorized as a form of cultural power, or 'a stranglehold on meaning',[24] an ability to define social ordering of people and artefacts. Again, according to Lynne Segal:

> Of course it is only *particular* groups of men in any society who will occupy positions of power and influence. But this is precisely what secures rather than undermines the hierarchical structuring of gender through relations of dominance: the *symbolic* association of masculinity with power and femininity with powerlessness.[25]

Within the body of scholarship of feminist studies of masculinity in general, there has been a call for research which could lead to a better understanding of the contextual bases of masculinities, and to explore further how masculinities are constructed in relation to constructions of femininities. Such theoretical shifts have beckoned my move into studies that looked at the construction of gender in a particular context – technology – and to explore how gender and technology are constructed in relation to one another. However, such an approach not only owes its origin to feminist social theory, as outlined above, but also to the newer studies of science and technology. Below is my version of the story of science and technology studies.

What is the Social Shaping or Constructivist Approach to Technology?

A 'social shaping' or 'constructivist approach' [26] to technology means locating technology as a heterogeneous network of the technical and social, or as 'sociotechnical ensembles'.[27] Technologies are thus viewed as part of the social world which we inhabit, subject to socio-cultural understandings, and are thus open to sociology or 'sociotechnology'.[28] This differs substantially from mainstream understanding of technology, in which technology is perceived as being distinct from social life, but as something which can radically change our lives in a utopian or dystopian manner. This latter ('technological determinist') standpoint remains a powerful and prevalent way of thinking about technologies. From this standpoint, the potential for change lies in the invention of the technology, the technical breakthrough which, when launched, will impact upon and change our society.[29] The imagery contained within this view of technology is one of 'autonomy', 'internal dynamics' and 'being beyond control'.[30]

The same theorizing of technology has predominated within sociology until recently. Technology was seen to determine, or even cause, the development of social structures and, as Ann Sætnan has said, sociologists

were just left with the ensuing modernity to be explained.[31] A social shaping perspective on technology, in particular and by contrast, radically turns the mind-set of linear deterministic technological forces around, saying that technologies are embedded in the social: as Graham Button puts it:

> By stressing how technology is shaped by social forces, such as economics and gender, an attempt was made to ground the technical in the social. Thus, technology was to be thought of through and through as a social phenomenon.[32]

According to Button, the social shaping perspective also sought to develop an interest in the organization of the technology itself. According to Robin Williams and David Edge,[33] this movement was given a coherent focus and identity by the publication, in 1985, of Donald MacKenzie and Judy Wajcman's reader, *The Social Shaping of Technology*.[34]

One criticism of the so-called social shaping approach, however, is that it replaced one kind of determinism (technological) with another (social).[35] According to Knut Sørensen, for example, 'technology, the social world and of course the history, should be analysed as rather messy contingencies'.[36] The challenge of creating a more symbiotic understanding of technology and society has been taken on more substantively by the Social Construction of Technology (SCOT) model advanced by Bijker, Hughes and Pinch, and later expanded upon by Bijker and Law;[37] and, more radically, in other branches of constructivisms such as the post-structuralist Actor-Network Theory (ANT).[38] The argument that the technical is as socially constructed as the social is technically constructed is perhaps the most prevailing argument of this constructivist-oriented research, summarized by the principle of the 'seamless web' of sociotechnology.[39]

The genealogy of these more constructivist social theories of technology was located in an outgrowth of the empirical programme of relativism in the sociology of scientific knowledge (SSK). As in analyzing scientific claims in SSK, sociologists working in this area analyzed the articulation of technologies not as a sudden 'leap into existence, as a result of a momentous act by heroic inventor: rather as a gradual construction in the social interactions between and within relevant social groups'.[40] Concepts such as *closure* are widely used in SCOT to describe the reduction of interpretative flexibility by different actors, and consensus through the articulation of the artefact.

SCOT studies have also more recently shown how technologies are actively created/recreated in the diffusion and consumption stages, opening up analytical tools of 'interpretative flexibility' of technologies, and their unintended consequences in the hands of users.[41] This brings SCOT closer to Cultural and Consumer Studies and is, in part, due to a response from criticisms by these schools for its previous neglect of the user-context as a site of the negotiation and, I should add, *production* of technologies as culture.[42] Theories of semiological encoding and decoding,[43] and

theories of domestication (integration of artefacts into the home), especially those of the Sussex school,[44] therefore, can be combined with SCOT.[45]

As researchers with the resources of these constructivist approaches, we are equipped with a way of studying society and technology together, and as mutually shaping forces. Such a theoretical framework directs us in our data collection towards asking questions about the *content* of technology, and about the complex and varied *uses* to which technologies become sensible in our everyday lives – in sum (to use Wiebe Bijker's phrase) about 'sociotechnical ensembles'. The question remains however, *can gender stick to constructivism, and particularly to constructivist studies of technology?* This is the question I address in the remainder of my paper.

Towards a Technogender Theoretical Framework

In my own work I have found conversing between these formerly separate schools of feminist studies and science and technology studies (S&TS) creates a productive convergence for researching genders and technologies, but also much tension. The challenge of creating a dialogue between the formerly mutually-exclusive scholarships of feminism and constructivist studies of technology has been taken up by feminist technology studies.[46] Writers in this tradition have pointed out that an approach of 'add gender and stir' is inadequate.[47] Rather, if these scholarships are to be used creatively together, the points of overlap and tension need to be tackled. In the remainder of this paper, drawing from this literature, I discuss how I have encountered four such intersections between the two theoretical schools in key areas of gender-technology research.

Research Sites

The question of research sites is the question of where to look and what to focus on. However, we could say that we are already off to a bad start in bringing the two traditions of feminist studies and S&TS together here. One of the first criticisms feminists have made of S&TS research (particularly of its ANT branch) is that the preferred location for much of technology research has been in the innovation and design laboratories.[48] As I have discussed above, constructivist studies of science (and later of technology) were founded on researching empirical questions (raised originally in philosophy) about the basis and status of scientific knowledge claims: these studies defined the topic that came to be known as 'the social construction of science'.[49] It is for this reason that much of the *science in action* in the early days of this field took place in design and science laboratories, where facts and artefacts might begin their lives. This exclusivity is arguably one of the primary reasons why gender has previously been integrated little into S&TS analyses. According to Anne-Jorunn Berg and Merete Lie, R&D laboratories are spaces primarily occupied by men, and as gender is not normally seen until women are present, they are also regarded as spaces where gender is not relevant:[50] 'The program of

following the actors seems to imply that as long as *women* do not appear as important actors or a relevant social group, *gender* is not a relevant category'.[51]

A compromise within S&TS has already been established here, however, by spinning the web a bit further,[52] or moving downstream,[53] to take users and the media into account.[54] In addition, quite apart from the greater integration of users as an added domain, gender can be found in many sites, not only those to be found downstream. The scholarship of men's studies, in particular, has highlighted that the vision of women only as gendered and 'other' *is* part of male hegemony. Men's studies draws our attention to the relational construction of gender not only between men and women, but also between men.

More intractable for a discursive coalition with feminist studies in relation to the 'research site' is the prescription of S&TS to avoid all *a priori* assumptions: this entails that gender cannot be assumed to be a fact in a technology's career; instead, it will emerge if relevant. According to Ann Sætnan, the avoidance of all *a priori* assumptions is a well-known vortex into which one can sink, never to surface again – and, furthermore, it is internally inconsistent with the relativist programme of science and technology studies. It is scarcely tenable in an epistemology that argues that scientific facts are created rather than discovered:

> This [avoidance of all *a priori* assumptions] is reminiscent of positivist enjoinders of not allowing one's personal or political interests to affect one's selection or interpretation of the data.[55]

Feminists push this point, arguing that gender needs to be operationalized as an analytic category in order to be seen.[56] This is the position I am also adopting in this paper.

Yet the scholarship of feminist studies has largely ignored *technology* as a valid analytical category and, therefore, has also been unable to generate an adequate research framework for researching genders and technologies. Both the radical feminists and the eco-feminists view technologies as inherently masculine and antithetical to womanhood.[57] Such an essentialist position fails to take account of the diversity of technologies and technological practices and discourses in which men and women participate, and leaves only a politics of separatism.[58] Worse still, it accepts and reinforces the myth that women have been entirely absent from invention and research and design (R&D).[59] Finally, it is arguably untenable politically for us to adopt a position of outsiders, since technology is such a pervasive and political part of each of our everyday lives.[60]

A liberal feminist perspective has equally ignored technologies. Within this tradition, technologies are regarded as neutral, and women not wishing to be excluded from technological fields just need to 'catch up'. The technology or technological skill itself is not problematized, or even seen as social. There is no room for theorizing the relational ways in which masculinities and femininities are constructed, or indeed how technologies

themselves are constructed and known in relation to discourses of masculinities and femininities.[61] As such, Flis Henwood has argued that gender equality policies informed by liberal feminism have been 'ineffective as strategies for change'. Henwood's thesis starts from the social constructivist point of view on technology, as detailed above: that technological meanings are not given, they are made. She argues that in order to create more equal gender involvement in technology, we have to be involved at the level of definition, of making meanings and in creating technological culture.[62]

The challenge to feminist studies, then, was one of participating in the shaping of constructivist theories of technology, and moulding them into a format capable of dealing with gender, as an *a priori* category (as Ann Sætnan has suggested).[63] Such a programme of research – known as 'the mutual shaping of gender and technology' – is already being etched out by others in the field of feminist technology studies.[64] The underlying premise of this research framework is that it is impossible fully to understand technologies if genders are not taken into account, and it is impossible to understand genders if technologies are not taken into account. This implies that as the definitions of technology are being negotiated, and at times stabilized, so too are definitions of genders. In feminist studies of technologies, it is argued that technologies are cultural artefacts. As such, like all cultural artefacts and all natural phenomena, they are interwoven in our language and meaning systems; and this is also a gendering process.[65] The empirical inquiry into the mutual shaping of gender and technology assumes gendered spiders in the metaphor of the 'seamless web' of social and technical relations, as detailed in constructivist studies of technology.

Analytical Lenses

Such research into the mutual shaping of gender and technology requires analytical tools to examine the processes by which gendered meanings of technologies are constructed and maintained. Feminist studies of technology have been instrumental in bringing awareness of the importance of the interdependent symbolic dimensions of gender and technology.

> That is to say, technology has a symbolic dimension and what feminist analysis does is to point to the utterly gendered nature of that symbolism. Of course, gender also, itself, is seen today as having a symbolic dimension. . . . There is, therefore, an obviously fruitful convergence of ideas here. The form this has taken has been an insistence among feminist writers on the significance of technology in the formation of the subject identity, and this is something that has been almost entirely absent from non-feminist work on technology.[66]

The symbolic dimensions of technology have entered the vocabulary of feminist studies of technology as 'the masculine culture of technology' whereby masculinity and technology are symbolically intertwined.[67] This means that in the cultural constructs of masculinity, technology and technological competence constitute a core domain and discourse.[68] This

technological domain, in turn, is culturally allied to other key discourses of masculinity, such as its claim on rationality,[69] and alienation from the body.[70] The association between masculinity and technology also works in reverse: That which is considered technological is also perceived to be masculine, emphasizing the cultural association of technology/technological virtuosity with men, hegemonic masculinity and status. By contrast, women's everyday encounters with technologies are rarely recognized as representing technological competence.[71]

Already, in the masculine culture of technology, we have an analytical lens which brings the symbolic dimension of gender and technology together. The question, however, facing empirically-oriented feminist studies of technology, as Anne-Jorunn Berg has pointed out, is how to go beyond the stereotypical images of gender-technology in ways that, nevertheless, (where germane) take gender difference seriously.[72] As Flis Henwood argues, if we wish to go beyond the cultural coupling of masculinity and technology, it is important as researchers that we explore the 'lived experiences of technology'.

> Both technology and gender are constitutive of each other and we need to develop frameworks that are capable of analysing the diverse ways in which the two interact to produce a range of different subjective experiences and practices.[73]

Feminist studies of technology have, therefore, introduced analytical lenses from constructivist studies of technology as a means of studying the *processes* of technological change. In particular, I have chosen three key concepts which are proving to be particularly useful in feminist studies of technology: *interpretative flexibility*,[74] *scenario/script*,[75] and *actant*.[76] In short, interpretative flexibility refers to how technologies do not have inherent meanings with fixed boundaries. The concept is used to investigate the process by which each of us (not just designers/marketers) may reinterpret functions and meanings of technologies in our everyday lives. In fact, the technology I was researching, the domestic telephone, is a frequently-cited example of the interpretative flexibility of technologies. Sociable uses of the telephone are documented to have been largely popularized by women in the home, especially in the post-World War II period. This usage of the telephone ultimately subverted the original 'meaning' of the telephone as a technology whose natural roots were seen in telegraphy, built upon the need for transmission of urgent and 'important' information only, and economy of time and space; this 'subversive' usage resulted in the telephone's new identification as a sociable technology.[77]

The concept of 'script/scenario' can be mobilized in research to suggest processes by which an interpretation of the technology in question may become inscribed as part of the material or symbolic aspects of that technology. In contrast to 'interpretative flexibility', scripts can thus help in the research process by accounting for some of the obduracy surrounding a particular definition of technology. For example, to continue with the

history of the domestic telephone, Claude Fischer argues that the successful re-interpretation of the telephone as a technology of sociability led to a resilient inscription of the domestic telephone as a 'feminized technology' – a technology predominantly used by, and associated with, women. This feminization of the domestic telephone has remained an empirical finding in media studies of the telephone.[78] Thus, even though the inscription process is usually attributed to powerful groups, such as designers/marketers, that process can also be realized in more broadly-based cultural stereotypes, or even amongst subcultures. The concepts of 'interpretative flexibility' and 'scripts' are usually operationalized in constructivist studies of technology concurrently, to capture both stability and change.[79]

Finally, I find the concept of the (non-human) 'actant' as the most illuminating challenge to both technological and social determinism of technologies. It is, firstly, a means of suggesting in research that all technologies are composites of sociotechnical relations.[80] This is perhaps also captured by the SCOT idea of 'sociotechnical ensembles'. Yet the concept of actant goes beyond recognizing technology as merely a composite of socio-technical relations: it also points to technology as a heterogeneous *agent* in everyday relations which may be seen to have *effects*. In particular, as Knut Sørensen has pointed out, the concept is useful as it creates a space in research to re-articulate concerns over the 'impacts' of technologies, but in a non-deterministic way. The technology can be conceptualized as an 'actor', but not the 'director'.[81] In this way, actants (technologies such as the domestic telephone,[82] the VCR,[83] the microwave oven,[84] or personal computers [85]) may be seen to enter into sites of socio-political relations (including gendered relations in the family) as though they were 'live objects', in that they can provoke a new set of relations. Also, as a live object, a technology such as the telephone or home computer may itself be transformed in terms of its functions and meanings and, therefore, effects within the household.

This analysis of technologies as 'live' objects is broadly similar to the cultural studies' approach to the *active* consumption of technology.[86] However, what is unique about the concept of the actant is related to the first point above, namely, its non-discriminatory approach to the technical and the social. This implies that, rather than assuming a distinction of the technical and social in advance, the process by which this distinction is constructed is rendered mutable, and so is open to empirical investigation. This is particularly useful to feminist studies of technology where the borderline between what is 'technical' and what is 'social' is frequently also a gendered border between the 'masculine' and the 'feminine'. The feminization of a domestic telephone was simultaneously a de-technologizing process. The same process may occur in relation to 'technical skills': the skills and expertise of home-economists in Cockburn and Ormrod's research on the development of the microwave oven were de-technicized through the 'smell of cooking' and domesticity,[87] whilst women in the home frequently do not identify their interactions with everyday technologies as 'technical skills'.[88]

I have joined other feminist writers of technology in recognizing the affinity of these constructivist technology studies' concepts with the politics of gender change. Reciprocal research lenses can help us disrupt the complacency of gender as a biological and deterministic category by emphasizing the processes, negotiation and obduracy of gender relations. Drawing from the scholarship of men's studies (as cited earlier), it is important to draw attention in our research not just to the 'masculine culture of technology', but to move beyond this into exploring diverse and contradictory masculine cultures of technologies – such that the seemingly natural relationship can be further questioned.[89] In practice, for me, this has meant incorporating into my research sample a diverse group of men, not just in terms of classical sociological guidelines on diversity (such as age, social class, urban/rural location and relationship status), but also in terms of approaches to masculinity. That is to say, I have also sought to include men who I felt might be pushing out the boundaries of what we understand to be 'masculine'. Included amongst my narrators are: a transvestite; a number of homosexuals; a priest; a number of men involved in consciousness-raising groups (sometimes referred to as 'new men'); as well as a number of more traditional family patriarchs. Furthermore, the study involved an analysis of the ways men's biographies and relationships to a domestic technology change over time, and between different relationship contexts.

Power-Relations

The starting points of the two traditions (S&TS and feminist studies) on the relative powers of structure and agency are seemingly divergent. Feminism is founded on the principle of the existence of asymmetric relations between the sexes. The *raison d'être* of feminism lies in seeking ways of transforming asymmetric relations between men and women. S&TS, by contrast, is founded on the principle of symmetry, inherited from the sociology of scientific knowledge.[90] The principle of symmetry has been taken to imply that a fact (such as patriarchy) may not be assumed to be relevant at the outset of empirical investigations. The *raison d'être* here is to avoid teleology and judgements of veracity in terms of what is currently accepted as 'truth',[91] or to avoid a flattening of the plot.[92]

This leaves the researcher, as John Law has discussed, with the difficult task of trying to carve out a place for research on gender and technology somewhere between, on the one hand, knowing gender patterns or the structural aspects of gender in advance; and, on the other, the opposite position of seeing gender as endlessly performed one-off occurrences.[93] To create a coalition between the positions here, I have been attracted to the principle of symmetry in a somewhat modified interpretation – the non-assumption of a particular shape to gender dichotomy and hierarchy, or at least in predictable and traditionally-defined ways. As Rosalind Gill and Keith Grint have pointed out, men's relationship to technology may not

always communicate power and control.[94] In practice in my research, this has meant leaning towards post-Foucauldian sensibilities within feminist studies, and viewing gender as a *verb* [95] – a process open to change, variation and renegotiation. Although, as I stated in the section on 'research sites', I am advocating gender as a legitimate analytical category at the outset of investigations, its shape and form should remain an empirical question.

Thus, in relation to power, I see a compromise position between the scholarships of feminist studies and S&TS in the form of *methodological relativism*.[96] In contrast to substantive or ontological relativism, structural meanings may enter the debate, but not in a way in which (as Susan Ormrod puts it) the dice are already loaded. In this way, structures such as patriarchy are not seen as determining at the outset. Or, as in Knut Sørensen's *pragmatic constructivism*, cognitive and structural explanations are, to some extent, bracketed: 'This does not mean that they are considered false, only that constructivist analysis represents an effort to push action-approaches to see how far they go'; structural properties may enter the analysis, by making institutions and organizations into actors/actants; we are enjoined to bring to research 'an open mind, not an empty one'.[97]

Methodological relativism is not only useful in terms of opening up variation and contingency in gender and technological relations, but also in theorizing complexity in the same. For example, in my research I was looking for a wider and changing sense of masculinities in everyday life that would simultaneously challenge understandings of the domestic telephone as a feminized technology. Using a small sample of men (20) living in Ireland as the basis of the research, I did, in fact, find that many of my interviewees reported using the domestic telephone in ways traditionally defined as 'feminized' use of the phone, in terms of caring work within family networks and chatting sociably (intrinsic calls) to male as well as female friends. At times, the interviewees distinguished themselves from older generations of men in this respect. That is to say, new and counter-hegemonic technological and masculine identities were being constructed in relation to each other. Nevertheless, throughout the interviews, I was also struck by the extent to which men, as part of this domestication/masculinization of the telephone, drew on traditionalist discourses which ridiculed women's talk. The male interviewees reintroduced gender dichotomies and forms of gender hierarchies by distinguishing their use of the telephone from women's usage in general, or sometimes from particular women in their household. Women were accused of using the telephone overly frequently, especially for sociable telephony with other female friends, which was regarded as using the telephone inappropriately (*nattering*).[98] One can recognize in this a form of symbolic domination,[99] inhibiting interpretative pluralism of a technology. It is precisely because relationships between gender and technology are flexible and changing, that feminist research needs flexible analytical theories in order to be aware of enduring gender asymmetries in a changing world.[100]

Reflexivity

The fourth and final dilemma I encountered in my engagement between feminist studies and S&TS concerns 'reflexivity'. I have found both feminist studies and constructivist studies of S&TS to be 'reflexive' in the sense that both approaches depart from positivist understandings of objectivity, and instead seek to understand knowledge as politically contested. However, I would like to distinguish between what I refer to as the 'plain reflexivity' of S&TS and the 'responsible reflexivity' of feminist epistemologies.[101] I regard constructivist studies of science and technology as lacking *responsible* reflexivity because the analytical narrative remains essentially an 'objectivist' account in which the 'others are marked whilst the narrator is allowed the only innocent position'.[102] Feminist science, by contrast, has generally eschewed detachment in favour of participation.[103]

The plain reflexivity of S&TS is again part of its legacy from SSK, in the principle of symmetry. This requires a detachment on behalf of the researcher to map impartially the scientific claims of truth and falsity symmetrically. None the less, I feel that this reflexivity of S&TS lacks a 'rigour',[104] in terms of *epistemology*. It is not enough constantly to stress that it (the scientific fact or technology) *could be otherwise*,[105] and that it is socially constructed between different actors without taking into account the involvement, or the account, of the researcher him/herself.[106] Joseph Rouse has outlined the approach to knowledge by feminists as being an approach which encompasses multidimensional relationships between knowers and known. He distinguishes this from the SSK polemics on the production of knowledge, which he describes as a more simple relation of representation and correspondence, or, in Woolgar's terms, 'intertextuality': 'Feminist theorists have been suspicious of attempts to escape (metaphorically, methodologically or theoretically) from the concrete particularity of bodies and social relationships'.[107]

Taking reflexivity seriously leaves researchers with, I think, two alternatives in doing research. One is that we abandon any realist discourse in our research – since our claims are also socially constructed – for an epistemological anarchism or 'post-post essentialism'.[108] *Or* we integrate this point of the non-value-neutral – but otherwise legitimate – position of the researcher and the research account *as part of the research project*. In practice, responsible reflexivity in our research means incorporating forms of what Donna Haraway refers to as 'situated knowing',[109] from feminist epistemology – namely, attempts to make explicit the value systems on which the claims of our knowledge are based. It is the latter which I have tried to do in my research project, by opening up as part of the research analysis my voice as interviewer and analyst. In my own study, the integration of feminist methodologies occurred initially by accident, when I began with a pilot case-study of the construction of gender and telephony in my own home. The case-study was designed to examine the gendered construction of public and private space around telephony within the household. However, it began an epistemological discussion in my research

on the construction of 'public' and 'private' *within the research process*. The result of including myself and my home as a case-study was to practise a form of 'situated knowing' which includes auto/biography.[110] I see the inclusion of autobiography as an interesting method of theorizing an in-between space in the sociological process, a space in which to explore the process of composing public research from private lives. Minimally, this involves an understanding of the mutual shaping of readings of our own lives and that of others in research, and maximally, that epistemology is also a politics of ontology.[111]

Conclusion

In this paper I have attempted to elaborate on the work of feminist technology studies which, through a body of empirical studies on genders and technologies, has been developing a working theoretical coalition between science and technology studies and feminist studies. The coalition is first of all necessary because feminist studies and S&TS can competently theorize *either* gender relations *or* technology relations, but neither school has the theoretical wealth to theorize the co-construction of genders and technologies. Researching gender and technology requires blending feminist studies and science and technology studies together. Although both fields of study reflect the broader disciplinary current of compromises between structuralist and constructivist postulations, it has not followed from this similarity that parallel approaches from the two fields can be smoothly mapped on to one another or harmoniously combined.[112] In this paper I have been re-visiting the tensions which face the empirical researcher when trying to work simultaneously with both feminist studies and science and technology studies. The objective of concentrating on the points of tension is to elaborate the mutual learning process between the two traditions for researching genders and technologies. In addition, the creative and political value of living with tensions in our research constantly recalls epistemological pluralism. I have selected four important research issues on which to concentrate in this paper: research sites (where and what we research); analytic lenses (the methodological and theoretical concepts we use); power relations (theorizing symmetry and asymmetry); and reflexivity (theorizing the creation of knowledge).

In summary, and as a starting-point for researching genders and technologies, I conclude as follows:

- In relation to research sites, the main challenge is to be able simultaneously to research genders and technologies. S&TS can facilitate a gender analysis more readily if it relaxes the prescription of S&TS to avoid all *a priori* assumptions (for example the relevance of gender in a technology's career), in favour of its more underlying ethos that all knowledge is 'created' (subject to cultural categories) rather than 'discovered'. On the other hand, feminists also need to integrate technology in from the margins of research. Much more successful in this regard has been feminist studies of technology's understanding of

the mutual shaping of genders and technologies. This implies a shift in feminist studies to integrate a more complex knowing of technological cultures, and reciprocally a move in science and technology studies to integrate a more thorough and complex knowing of gender relations. Constructivist approaches to technology understand technologies as being non-essentialist – as not what a technology *is* but rather what it *becomes* or 'means' to people in different contexts. Feminist writers have brought to this school an understanding of how technologies are constructed in relation to genders. Furthermore, the question of research sites can sometimes be as simple as where to look when researching gender and technology, and studies which examine the gendering of men as well as women, and the 'entire circuit of technology',[113] make the relevance of gender more difficult to elude.

- Whilst the feminist studies' concept of 'the masculine culture of technology' has been successful in raising awareness of the interdependent symbolic relationships between gender and technology in research, analytical categories from constructivist studies of technology appeal to feminist studies of technology as a means of opening up the content of the lived experiences of technology. Particularly noteworthy in this respect are the analytic categories 'interpretative flexibility', 'script/scenario' and 'actant'. In addition, analytic categories from men's studies open up ways of understanding important and significant variations and differences within a (broadly speaking) masculinized culture of technology.
- The grounding principles of the two traditions have differed in terms of their conceptualizations of the relative weight of structure and agency. Here, again, the principle of symmetry in S&TS, implying a radical astructuralist position, clashes with the grounding assumption of asymmetric gendered social structures within feminisms. A working compromise for researchers wishing to work within both disciplines lies with methodological relativism. Methodological relativism focuses the orientation of the research project towards ambiguities and change in the relational categories of gender and technology, but is also wary of the intricate and sometimes stable hegemonic interconnectedness between genders and technologies.
- Finally, a 'responsibility for one's actions and position as inquirer and authoritative knower',[114] is what I have referred to as the difference between the 'responsible reflexivity' of feminist studies and the 'plain reflexivity' of S&TS. Responsible reflexivity in research seeks to identify the researcher, and frequently the research project, as an actor in the content of the research, by integrating the relationships of researcher, researched and research process into the production of science. This is compatible with the constructivist S&TS claims that all knowledge is produced somewhere by somebody. However, it moves beyond the plain reflexivity of S&TS in that knowing is placed in the context of interrelationships between the knower and the known. Thus, responsible reflexivity must also incorporate the feminist rigour

of 'situated knowing', namely the inclusion and positioning of the researcher and research project as a precondition of scientific knowing.[115] In practice too, this means a form of 'epistemological modesty',[116] and recognition of the partial and necessarily collective character of knowledge-making.[117]

Notes

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9. Sally Johnson, 'Theorizing Language and Masculinity: A Feminist Perspective', in Johnson and Ulrike H. Meinhof (eds), *Language and Masculinity* (London: Blackwell, 1997), 8–26.
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13. Judith Lorber, *Paradoxes of Gender* (New Haven, CT & London: Yale University Press, 1994), 2.
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15. Hollway, op. cit. note 14.
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18. Lisa Dominelli and Tim Gollins, 'Men, Power and Caring *Relationships*', *The Sociological Review*, Vol. 45 (1997), 396–415; Bird, op. cit. note 14.
19. Segal, op. cit. note 7, xxix.
20. Michael Kimmel, 'Masculinity As Homophobia: Fear, Shame and Silence in the Construction of Gender Identity', in Brod & Kaufmann (eds), op. cit. note 2, 119–41, at 136.
21. Connell, op. cit. note 7, 67–81.
22. Bird, op. cit. note 14; Johnson, op. cit. note 9.
23. See also Harding, op. cit. note 4, esp. 56–61.
24. Edley & Wetherell, op. cit. note 16, 107.
25. Segal, op. cit. note 7, xi (emphasis in original).
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31. Sætnan, op. cit. note 1, at 3.
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39. Thomas P. Hughes, 'The Seamless Web: Technology, Science, Etcetera, Etcetera', *Social Studies of Science*, Vol. 16, No. 2 (May 1987) 281–92; Pinch & Bijker, op. cit. note 3; Bijker, op. cit, note 27.
40. Bijker, op. cit. note 27, 270.
41. Ruth S. Cowan, 'The Consumption Junction: A Proposal for Research Strategies in the Sociology of Technology', in Bijker, Hughes & Pinch (eds), op. cit. note 3, 261–80; Madeline Akrich, 'The De-Scription of Technical Objects', in Bijker & Law (eds), op. cit. note 3, 205–24; Cockburn & Ormrod, op. cit. note 1; Bijker, op. cit. note 27; Hedi Gjøen and Mikael Hård, 'Technology Policy from Below: User Scripts in the Area of Electric-Vehicle Transportation', paper presented to 'Cultural Politics of Technology' Workshop (Trondheim, Norway: NTNU, Centre for Technology and Society, 25–27 June 1998).
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44. Roger Silverstone, Eric Hirsch and David Morley, 'Information and Communication Technologies and the Moral Economy of the Household', in Silverstone and Hirsch (eds), *Consuming Technologies* (London: Routledge, 1992), 15–31.
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61. Van Zoonen, op. cit. note 58; Henwood, op. cit. note 58.
62. Henwood, op. cit. note 58, quote at 44.
63. Sætnan, op. cit. note 55, 241.
64. For example, by several works cited in note 1: Cockburn & Ormrod; Cockburn & Fürst-Dilic; Berg & Lie; Sætnan; and Berg.
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81. Sørensen, op. cit. note 36, at 16.
82. Lohan, op. cit. 79.
83. Gray, op. cit. note 47.
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102. Berg, op. cit note 88, quote at 11; see also Donna Haraway, *Simians, Cyborgs and Women: The Reinvention of Nature* (London: Free Association Books, 1991).
103. Joseph Rouse, 'Feminism and the Social Construction of Scientific Knowledge', in Lynn H. Nelson and Jack Nelson (eds), *Feminism, Science and the Philosophy of Science* (Dordrecht: Kluwer, 1996), 195–215.
104. Here again I use Berg's definition of 'rigour' as 'systematic attempts to make clear how and why I do as I do when conducting research' – thus disembedding rigour from its usual bed-partners of positivism and quantitative research: Berg, op. cit. note 88, quote at 6.
105. Law, op. cit. note 38, 16.
106. Sætnan, op. cit. note 55; Berg, op. cit. note 88.
107. Rouse, op. cit. 103, at 208.
108. Grint & Woolgar, op. cit. note 35; Steve Woolgar, 'The Turn to Technology in Social Studies of Science', *Science, Technology, & Human Values*, Vol. 16, No. 1 (Winter 1991), 20–50. See Collins & Yearley, op. cit. note 96, for arguments against this route within science studies.
109. Haraway, op. cit. note 102, 183–201.
110. Lohan, op. cit. note 101.
111. Liz Stanley, 'Introduction: Lives and Works and Auto/Biographical Occasions', *Lives and Works*, Special Double Issue of *Auto/Biography*, Vols. 3.1 & 3.2 (1994), i–iii, at i.
112. Sætnan, op. cit. note 6, 7 (in draft).
113. Cynthia Cockburn, 'The Circuit of Technology: Gender, Identity and Power', in Silverstone & Hirsch (eds), op. cit. note 44, 32–47.
114. Haraway, op. cit. note 102, at 105.
115. Berg, op. cit. note 88.
116. Law, op. cit. note 38, 15.
117. Berg, op. cit. note 88.

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