

Chapter 22

Learning About Matter and the Material, Struggling with Entanglement and Staying with the Trouble to Raise Up Feminist Science Education



Kathryn Scantlebury, Anita Hussenius, and Jenny Ivarsson

In this chapter we use metalogue to share and discuss our experiences as feminist science educators using our voices to critique science education, especially its power structures, and each other's thinking while remaining true to an ethic of care that adheres to feminist principles. Kate's feminist pathway began as a secondary school student in Australia and continued through her studies in chemistry and research in science education. For over 20 years she has existed as an 'outsider' in her department, but in the last 7 years, as a visiting research professor at the Centre for Gender Research, Uppsala University (hereafter referred to as the Centre), she has found an academic home and the intellectual space to grow as a feminist researcher.

Anita's feminist awakening occurred through her leadership experiences as head of a chemistry department, which contributed to a major shift in her research interests toward gender and feminist perspectives on science and science education. This includes a problematizing of "science culture", specifically how scientists' conceptions about the discipline and its practices are implicitly and explicitly communicated with students, and its consequences for students' feelings of inclusion/exclusion (Hussénius 2017). Jenny's background is in particle physics and she has spent several years working at CERN. Her move into teaching physics at a Swedish university caused her to reflect on how to make physics more accessible to all learners, especially girls. Karen Barad's groundbreaking book *Meeting the Universe Halfway* (2007) inspired Jenny to explore the influence of new materialism on

K. Scantlebury (✉)
University of Delaware, Newark, DE, USA
e-mail: kscantle@udel.edu

A. Hussenius
Uppsala University, Uppsala, Sweden

J. Ivarsson
Department of Natural Sciences, Bessemerskolan, Sandviken, Sweden

learning in physics and science education. Though we have taken different pathways, over the decades we have stayed with the trouble through our engagements in science education and feminist research.

There are different feminist theoretical frameworks (e.g. radical, liberal, Black, Chicana) and what they have in common is critiquing how societal power structures oppress females and other marginalized groups. Through our experiences and involvement with feminist research, we are engaged with examining gender issues. While, gender is always a component of research, our research is not only about gender. Mari Matsuda (1991) raised these questions

When I see something that looks racist, I ask, “Where is the patriarchy in this?” When I see something that looks sexist, I ask, “Where is the heterosexism in this”? When I see something that looks homophobic, I ask, “Where is the class interest in this?” (Matsuda 1991, p. 1189)

Matsuda (1991) captures the multifaceted complexities that may arise, when the discrimination target needing visibility and attention, always could be something else. Today, the intersections between several social categories are central to contemporary feminist research, which thereby contribute to new insights that had not been possible to achieve by addressing one category at a time (Hill Collins and Bilge 2016). In this chapter, a feminist stance provides common language for our discussion of engaging with material feminism, the entanglement we have experienced in connecting with this post humanist theory and how it has enabled us To “Stay With The Trouble” (Haraway 2010).

22.1 Movement: Space: Language: Discourse: Culture: Matter

Kate: As a feminist, I examine whether science education is moving forward on issues related to girls and women and at the Centre I found an academic home/department/place that I had never experienced before. My metaphor for the Centre is a ‘feminist paradise’, a space where one moves beyond explaining that gender is a social category, or that there is no ‘one’ feminism to engage in challenging conversations to critique one’s ideas. As an intellectually diverse, rich and interesting space, the Centre’s researchers come from humanities, social and natural sciences, and medicine with a range of research interests. They bring to the Center a strong theoretical grounding in the discipline commensurate with a commitment and passion to engage in gender research with an open mind for various theoretical frameworks (for example feminist, masculinist, queer, human-animal, post-modern/structuralist/humanist, technosciences, and new material feminism), methodological approaches and cultural views. The scholars are supportive of one’s ideas, producing an intellectually safe space to think aloud, to seek critique, and to share perspectives and direction on one’s research.

Anita: Also I appreciate the interdisciplinary and open-minded atmosphere at the Centre, although for me it is not mainly a place to “rest” as a feminist. Rather it is an environment challenging disciplinary boundaries and as such a place to rest from

narrow-minded scientific put-downs on what “real” research is and how it should be conducted. Unlike Kate, who regularly visits the Centre and then returns to her chemistry department, I have permanently moved from a chemistry department to a natural sciences department (biology, chemistry, physics, mathematics and computer science) and then to this environment with a majority of humanities and social sciences scholars. It has definitely broadened my mind and introduced new methodologies and theoretical frameworks in my research. Even more importantly, it has opened up an increasing awareness of culture characteristics that differ among disciplinary domains as well as among separate disciplines within the same domain. This awareness goes beyond things that are visible, audible and perceptible, what Edgar Schein (2006) called artefacts and is the more easily recognizable aspects of a culture. Instead it concerns shared norms, values and core presumptions, where the latter are so deeply rooted that those belonging to the culture take them for granted (Schein 2006).

Through Cathrine Hasse, I learned about the method of culture contrast (2015). We use this method in a research project, *In the borderland between academic disciplines and school science – Science faculty as teacher educators*, to examine how science epistemology, content, and practice is reproduced and transformed when scientists engage in teacher education. We collect empirical data by shadowing science faculty in their daily activities and conducting individual and cross-disciplinary focus group interviews. The culture contrast method is theoretically underpinned by a conceptualization of practices as cultures, with implicit and explicit rules, and different values and underlying assumptions. With this method it is possible to see the dominating or ignored cultural values and norms. The different actors that are part of a culture are understood as “carriers” of the culture’s underlying ideas, which in different ways are manifested in their actions and through these actions possible to get sight of (Hasse 2015).

Kate: There is limited science education research using feminist and queer theories. This chapter focuses on our struggle to engage with post-human theories and push our thinking into ways that science education research could use material feminism. Barad’s simple sentences introducing her article on post-humanist performativity encapsulated these concerns.

Language has been granted too much power..... Language matters. Discourse matters. Culture matters. There is an important sense in which the only thing that does not seem to matter anymore is matter. (Barad 2003, p. 801)

Anita: I know that these sentences are often cited and capture in a condensed way a critique of the strong influence the linguistic turn has had in the humanities and social sciences. But is this criticism accordingly directed towards natural sciences and science education? For me it has been, and still is, hard to understand the way in which the language has gained more power at the expense of matter within science, including science education. As a former chemist and chemistry educator, everything concerned matter – my practices in the laboratory and the content I taught. Of course language was important, but mainly the chemistry language: the concepts and the ability to communicate through chemical formulas. Upon moving to the Centre I widened and shifted that focus to include language, discourse and

culture. I am not troubled by the emphasis on discourse – for me it has opened my eyes and made me aware of aspects I did not notice before.

Kate: During a sabbatical leave at the Centre, I was updating a 2007 handbook chapter focused on the research in gender and science education (Scantlebury 2014). I thought material feminism had something to offer to science education. But what? In the late spring, our group went to Skagen for a writing retreat. Over the centuries, artists have travelled to Skagen to paint the landscape, and revere the beauty of where wind and water intermingle to produce a salty spray when water from the North Sea becomes entangled with Denmark’s straits. Walking along beaches and over sand dunes or into the surrounding forest placed one ‘of the world’ and the experiences began to help me understand Barad’s sentences and the implications of accepting matter’s agency.

I had struggled to understand Barad’s concepts of material-discursive practices, agential realism, phenomena, apparatus, spacetime-mattering, and onto-logical-epistemology (Barad 2007). Fortunately, several scholars at the Centre used Barad’s theory and were happy to discuss these concepts. I continued to struggle with the ideas but decided the way forward was presenting my initial thoughts about how science education could benefit from material feminism at an informal presentation to my colleagues involved with the writing group at Skagen. My initial argument did not convince them, they raised questions and posed challenges, some I could answer, many I could not. After we left Skagen, I prepared a seminar for the Center’s spring series on “how to make matter matter to science education”.

22.2 Struggling to Understand Material Feminism

Anita: I was one of those not convinced. In my initial reading of *Meeting the Universe Halfway* (Barad 2007), I interpreted her critique of the linguistic turn as a criticism that did not concern natural sciences, as most scientists do not know what the “linguistic turn” is. That Barad, as a physicist, wanted to challenge the non-scientists who had become captivated by the linguistic-turn rhetoric and discourse. Secondly I interpreted that her theory included a criticism of the neglecting of “discourse and culture” within natural science. In that, I was thrilled and challenged through discussions with a particle physicist, Jenny. What Barad provides, leaning on Niels Bohr, is an empirical basis by reintroducing the importance of matter, but with the phenomenon as the foundation instead of atoms, molecules and natural forces (Ivarsson 2016). In addition to our discussions, Jenny gave a seminar at the Centre for Gender Research. One thing led to another and half a year later both Kate and Jenny were involved with an international graduate course on gender and science education, *Intersectional perspectives on science and science education* and our discussions continued (Fig. 22.1).

Jenny: Classical physics is based on essentialism, the assumption that the world is composed of independent objects with intrinsic properties. It is also based on representationalism, meaning that the observer studies the object from a distance, without affecting or being affected by it and then produces a representation, having

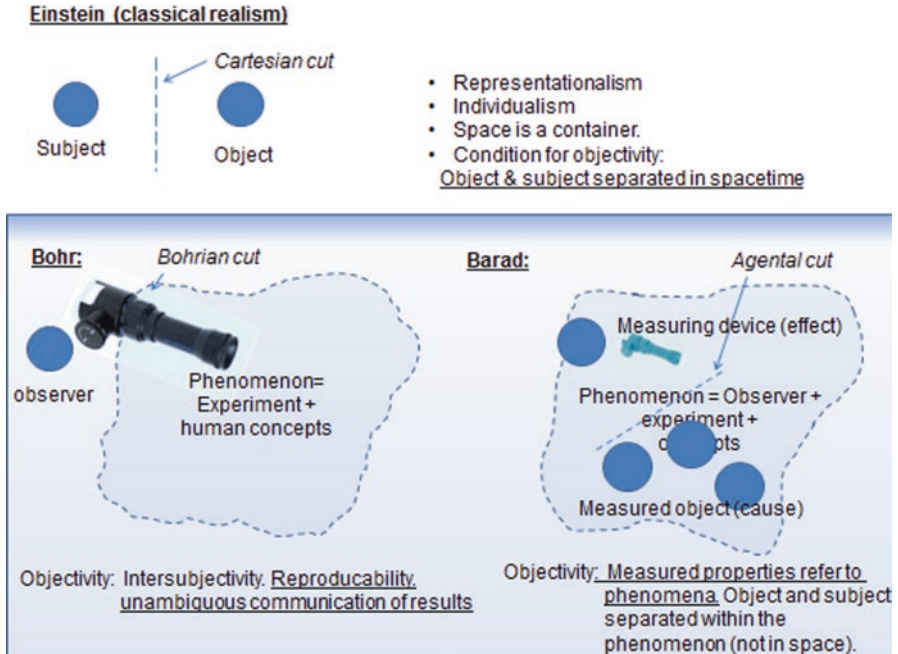


Fig. 22.1 A slide from Jenny’s seminar

no direct access to the object itself. The requirement of objectivity is irrefutable in science and in classical physics, which means that object and subject must be separated in space-time. Thus in a classic measurement, there is a clear distinction between the observer and the observed.

If you observe subatomic particles you enter the world of quantum physics. It will become clearer what an act of measurement actually is and it will not conform to the classic notion of objectivity. Quantum effects are admittedly difficult, or practically impossible to detect on a macroscopic level, but in theory, quantum mechanics applies at all levels. From an ontologist’s perspective, it does not matter if the object being measured is a macroscopic object or an elementary particle. So, let us look at a simple position measurement. Position measurement means that at least one light-particle, a photon, must strike the object and then be recorded. The photon’s position must be registered by a rigid photodetector. If the photodetector is not fixed, the image becomes blurred and the position will not be exactly determined. However, from a classical perspective the photon disturbs the object by means of a momentum transfer. The momentum of a particle is related to its motion. Whenever momentum is transferred from one particle to another, the speed and direction of motion is changed. The exact position of the object cannot be known unless this is compensated for. But in order to determine the momentum transferred, the momentum of the photon must be recorded. Such a measurement requires a photodetector, sensible to motion – not a fixed one. The requirement of the equipment to be able to measure the photon’s momentum cannot meet with the requirement for measuring its position. In other words, the photon cannot simultaneously be part of the object

and part of the instrument. There is no way to measure both position and momentum of a particle at the same time. Position and momentum are examples of complementary concepts that are intertwined, entangled.

Anita: That is part of what you learn at undergraduate level both in physics and chemistry. But as a student you are usually left there. I cannot remember that these conflicting demands on the apparatus and what consequences it has for essentialism and representationalism, was ever explicitly addressed. I was convinced that one could make experiments and through them gain access to intrinsic properties of matter, in principle without other limitations than those of the human mind. That scientists could make experiments and study an object without affecting or being affected by it, was a core presumption deeply rooted and taken for granted.

Jenny: The advent of quantum physics shook the foundations of science at the time and several distinguished physicists, including Albert Einstein, could never accept the implications. Another way to look at the problem is that the photon needs to be a particle to make possible the measurement of its position, and a wave for determining its momentum. But, the photon cannot simultaneously be both a particle and a wave. The only solution, as Niels Bohr (1963) saw it, was that human concepts like position and momentum do not refer to individual objects but to an experimental setup including the apparatus as well as the object. Thus, Bohr abandons essentialism, representationalism and the requirement of objectivity, in the classic sense.

Barad (2007) reintroduces objectivity with the notion that measurements refer to phenomena, which means that they are reproducible and communicable and put permanent tracks – the photon “becomes” either a particle or a wave, depending on the experimental setup. At a first glance this may seem paradoxical, but the paradox arises only in a representational paradigm that assumes an abstraction of a photon, existing before the act of measurement. If we let go of our ‘cultural backpack’ and try to focus on what is really going on, it is just measurements and the only things observed are phenomena. The idea of a pre-existing photon is a model that was never confirmed by observation. So, if phenomena are all we observe, then why not consider phenomena to be the stuff the world is made of? You might still object that we don’t know what is going on when matter is left alone, if no one is measuring on it. Such an argument relies on a distinction between human and the rest of nature. Denying such a distinction leads to the understanding that our interaction with particles is not different from when particles interact with each other. In this respect, post-humanism actually renders human a higher status and a direct access to the ontology of the world.

If science would embrace post-humanism’s view, there would be no need to learn how to compensate for the influence of the observer and more effort could instead be spent on investigating and understanding the role of the observer as an operative part of the phenomena. The scientist would be an integrated element in science education and science would, I believe, appear more accessible to non-scientists.

Anita: In science education we use and talk about models, stressing that it is a model. But in my (former) view a model was something that could be improved, that over time would develop and eventually reach a true description of some intrinsic property of matter/nature. For me the Baradian view of phenomena, opened my mind to the possible usefulness of feminist materialism in science education. Through my discussions with Jenny, I became gradually more interested in Kate’s

arguments and wonderings about how science education could benefit from material feminism. Actually, writing this narrative piece, forcing myself to critically listen to my own inner voice, has been an awareness opening process. I have asked myself why I initially reacted with skepticism instead of a non-judging open-minded interest, where the latter is something characteristic of most scholars at the Centre for Gender Research. My conclusion is that I found it a bit strange that I came in contact with a physicist's theoretical construction in a research environment where a majority of the scholars are humanists and social scientists. Before Kate raised it, others had embraced this agential realism and "materiality turn", making it a topic for discussions and seminars. I am embarrassed to admit that these scholars probably did not have sufficient legitimacy in my eyes, regarding Barad's work. But more important, I did not understand their interpretations and explanations, the way they talked about her theory; I did not understand their language. This inability to understand was the base that shaped my resistance, which Kate met when she wanted to share her growing interest and wonderings about material feminism. In retrospect I can see the crucial impact of the physicist Jenny, to guide me into Barad's text. I needed someone that catalyzed the dismantlement of my initial wall of resistance, someone who spoke about matter and material feminism with a language familiar to me from basic physics. I realize that my science cultural backpack was and still is a blinder that I need to scrutinize. For my own part, I also think it is important not to rule out the power of language. Maybe, if we think of Barad's critique of the linguistic turn "Language has been granted too much power" (Barad 2003, p. 801). But we must not forget the power that language does have. Language is a part of the culture; language is a part of the discourse. So, what if we consider the entanglement between matter and language?

Jenny: I recognize myself in Anita's resistance. The suspicion among science scholars against any research in discourse probably depends on the strong opposition between spoken language and matter. Should matter itself "merely" be a concept? To me the crucial point was when I realized that an experimental setup is a kind of discourse too. The instrument is the missing link between matter and discourse as well as between social sciences and natural sciences. Bohr had an understanding of the status of measurements. For example, there is no "position". The only thing there is, is a position measurement. Bohr did not express those insights within the science discourse as stringently as Barad did, supported by the post humanism theoretical construct. Whether Bohr actually thought the way Barad argues is irrelevant. What is interesting is the ontology Barad produces through her interpretation.

22.3 Staying with the Trouble: Challenging Science and Science Education's Meta-Narratives

What is to be learned in our narratives? There are few feminist voices in science education research, and to have critical colleagues with this stance supporting us to stay with the trouble is helpful. It is an on-going and daily challenge to live, work and enact feminism (Ahmed 2017). Academe is well documented as a structure that

reinforces masculine hegemony, and the culture within science departments is often hostile to theories that challenge the assumption that these disciplines are rational, logical and value free. By engaging gender scholars with science education, we establish a research space to focus on how material feminism can make matter matter in science education, offering an enriched understanding of matter.

Kate: For me, the next step in this narrative was the opportunity to write a ‘wonderings’ paper as my ‘ticket’ to enter into a Cultural Studies of Science Education (CSSE) workshop at the University of Luxembourg. I wrote on material feminism and how matter should come to matter. During the workshop, I talked with Cath Milne about my ideas and struggles with understanding “Baradian” concepts. Cath suggested we propose symposia to NARST and the American Educational Research Association (AERA) on the role of matter and materiality in science education. Her interests focused on the role of instruments, she knew of other scholars who were also engaging with the material. Cath led the preparation of the symposia proposals, bought her own copy of *Meeting the Universe Halfway* and an outcome of the ongoing conversations with Cath, and the other scholars involved in the symposia, was an edited book. The supportive networks at the Centre, and also through the scholars involved with CSSE, have provided multiple opportunities to discuss my understanding of how to use material feminism in science education research.

Anita: My moving from ‘pure’ natural science departments to an environment hosting mainly scholars from humanities and social sciences made me a carrier of other practices and perspectives that differed from the majority of those belonging to this research milieu. I ended up in an interstitial space that provided me an opportunity not only to experience but also challenge this, for me at the time, new culture. But maybe even more important for my individual scholarly development, it offered me a possibility to acquire new practices and cultural awareness. I do not mean that it is consequently necessary to move, to get sight of one’s own cultural backpack. Although this has been my journey, I do not think that this is a necessary condition for gaining awareness of those core presumptions that are taken for granted. However, norms, values and core presumptions shared by members within a discourse, within a culture, need to be made explicit in one way or another; this is especially important if they are part of power structures that ostracize potential participants depending on gender, ethnicity, sexuality, functionality or any other basis for categorization.

Working in interdisciplinary collaborations has raised my cultural awareness. Kate’s friendly, feminist and persistent voice has not left me unmoved but pushed my thoughts in new directions, that otherwise had been closed. Barad’s theoretical contribution has broadened my understanding of matter and phenomena; it has added a discourse dimension to my view of basic chemistry research. Or as Jenny puts it, an experimental setup is also a kind of discourse; the instrument/apparatus the missing link. Research into science discourse, in laboratory settings, has previously failed to engage with, examine, and understand the influence of instruments. The power of instruments is rarely examined, yet the instruments are an important aspect of the discourse in a research group. This discourse is also changed when new instruments are added to the setting (Pettersson 2011). Moreover, the instrument, and the discourse produced can differentially reveal matter, producing unique

and varying phenomena. This understanding of the laboratory discourse and the power of the instrument presents a challenge of science and science education.

Kate: While post humanities research seeks to decenter focus on the human, much of the current research and writing does not succeed in this regard. Science education research has not engaged with the post human and in particular with how these theories could influence a culture that remains masculine, white and Western centric. The challenge is to “stay with the trouble” and identify ways to use material feminist theories as a framework for re-directing science education research. **Jenny:** Many theories of identity formation presuppose that humans have a special position in nature. There is a human essence, according to which only humans have agency and ethics. As a consequence many standpoints will be highly dependent on what should be classified as human (When does the fetus become a human? Can a robot be human?). Barad (2007) argues that there is no distinct boundary between human and non-human. This applies to all boundaries (human-animal, life-death, object-subject). Boundaries are defined within a phenomenon. As such they are real, well specified and not arbitrary, but they are not given from above and not fixed once and for all.

22.4 Raising One’s Voice

It is important for feminists to raise our voices whenever systems of oppression come to the fore, especially within educational settings. There are issues that impact the lives and opportunities for girls and women and delay the progress toward an equitable society. Disfranchising power structures will continuously need to be identified, challenged and dismantled. The multifaceted complex of problems and the new insights on these problems gained by intersectionality studies have added a new dimension of knowledge compared to more narrowly defined studies. This analytical perspective brings to the fore the diversity and complexity of female’s social context. The various axes of social division can reinforce disenfranchisement of females from science and science education. Yet as white, middle class, educated women we are aware of the privilege and position. But this privilege should not be taken as a motif to silence our voices, just like the Matsuda quote, in the beginning of this chapter, should not be interpreted in a way that silence voices. From our point of view the main problem is the lack of feminist research in the wider research community as a whole and in science education specifically. Every voice addressing this deficit is an important voice.

In order to reach acceptance in science culture it is helpful to illustrate how feminism can contribute to the progress of science itself. The relevance of feminist perspectives is obvious in connection to biological concepts that are associated with ethology, interpretation of behavior, species reproduction etc. By challenging what is natural, scientists have increased opportunities to study biological phenomena. Traditionally, observations of nature were interpreted through a gendered stereotypical lens, which focused on studying males. This myopic view resulted in scientists being oblivious to other phenomena such as females establishing territories or the

implications of female coloration (McLennan 2000). The introduction of feminist perspectives has opened up new fields of research and has led to a higher acceptance of feminism in biology (Ah-King 2013).

We see a potential for an analogue progress in other areas. Barad's contribution to the philosophical interpretation of quantum physics would be an example from the field of physics. Unfortunately, those insights are difficult to access, so a catalyzer from other areas in physics, chemistry or related disciplines is needed, where a feministic stance would put traditional scientific issues in a different light and lead to progress in the understanding of particular phenomena. Could the Baradian perspective of the instrument be a part of that catalyzer?

Virginia Wolff articulated the importance of an intellectual and physical space for women to write, think and agitate in her essay *A room of one's own* (Wolff 1991). And Adrienne Rich's feminist essays remind us to claim our education and the responsibility to one's self and others from that education (Rich 1979). We will continue to motivate researchers to engage with gender perspectives by taking the responsibility to raise our voices, offer critiques, identify opportunities for collaboration and exploration into new research areas where gender and feminist perspectives are included and taken seriously.

References

- Ah-King, M. (Ed.). (2013). *Challenging popular myths of sex, gender and biology*. Crossroads: Center for Gender Research, Uppsala University, Springer Publishing. <https://doi.org/10.1007/978-3-319-01979-6>.
- Ahmed, S. (2017). *Living a feminist life*. Durham: Duke University Press.
- Barad, K. (2003). Posthumanist performativity: toward an understanding of how matter comes to matter. *Signs*, 28(3), 801–831. <https://doi.org/10.1086/345321>.
- Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning*. Durham: Duke University Press. <https://doi.org/10.1215/9780822388128>.
- Bohr, N. (1963). *The philosophical writings of Niels Bohr. Vol. 2. Essays, 1933–1957, On atomic physics and human knowledge*. Woodbridge: Ox Bow Press.
- Haraway, D. (2010). When species meet: Staying with the trouble. *Environment and Planning D*, 28(1), 53–55. <https://doi.org/10.1068/d2706wsh>.
- Hasse, C. (2015). *An anthropology of learning: On nested frictions in cultural ecologies*. Dordrecht: Springer. <https://doi.org/10.1007/978-94-017-9606-4> 10.1007/978-94-017-9606-4.
- Hill Collins, P., & Bilge, S. (2016). *Intersectionality*. Malden: Polity Press.
- Hussénius, A. (2017). Forming bonds – breaking bonds. In L. Bryan & K. Tobin (Eds.), *13 questions for science education*. New York: Peter Lang Publishing.
- Ivarsson, J. (2016). Agentisk realism, en genusvetenskaplig formulering av kvantfysikens lagar. *TGV*, 37(3), 96–113.
- Matsuda, M. (1991). Beside my sister, facing the enemy: Legal theory out of coalition. *Stanford Law Review*, 43, 1183–1192. <https://doi.org/10.2307/1229035>.
- McLennan, D. A. (2000). The macroevolutionary diversification of female and male components of the stickleback breeding system. *Behaviour*, 137(7), 1029–1045. <https://doi.org/10.1163/156853900502411>.
- Pettersson, H. (2011). Making masculinity in plasma physics: Machines, labour and experiments. *Science Studies*, 1, 47–65.

- Rich, A. (1979). *On lies, secrets and silence: Selected prose, 1966–1978*. New York: Norton.
- Scantlebury, K. (2014). Gender matters: Building on the past, recognizing the present, and looking towards the future. In N. Lederman & S. Abell (Eds.), *Handbook of research on science education* (Vol. II, pp. 187–203). New York: Routledge.
- Schein, E. (2006). *Organizational culture and leadership*. San Francisco: Wiley.
- Wolff, V. (1991). *A room of one's own*. New York: Harcourt Brace Janovich.



Kathryn Scantlebury is a professor in the Department of Chemistry and Biochemistry at the University of Delaware, Director of Secondary Education in the College of Arts and Sciences. Her research interests focus on gender issues in various aspects of science education, including urban education, preservice teacher education, teachers' professional development, and academic career paths in academe. Scantlebury is a guest researcher at the Centre for Gender Research at Uppsala University, Co-Editor in Chief for the journal *Gender and Education* and co-editor of two book series for Sense Publishers. Her email is kscantle@udel.edu.



Anita Hussénius is director of the Centre for Gender Research at Uppsala University and associate professor in Organic Chemistry at the University of Gävle, Sweden. Her main research interest is about gender and feminist perspectives on science and science education. More specifically, her research focuses on issues connected to gender awareness in science and in science teaching. This includes a problematizing of the “science culture”, that is what/how conceptions about the discipline and its practices are implicitly and explicitly communicated in the meeting with students, and its consequences for feelings of inclusion/exclusion. Her email is anita.hussenius@gender.uu.se.



Jenny Ivarsson holds a PhD in high energy physics. She has spent several years at the European research center for high energy physics, CERN. Her current research interest is in science education and gender perspectives. Ivarsson has also a secondary science teacher degree. She has six years of experience as a lecturer at Gävle University and is currently teaching in upper secondary school, Bessemerskolan, Sandviken. Her email is jenny.ivarsson@edu.sandviken.se.