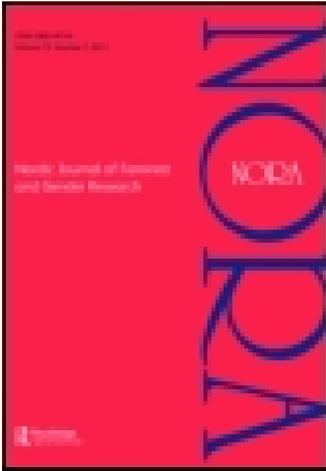


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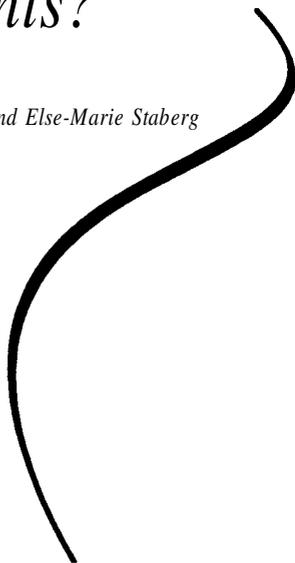
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Women in science: can they be disturbing elements?

Sylvia Benckert and Else-Marie Staberg



Sylvia Benckert, Ph.D. in Physics, Umeå University, is a senior lecturer at Umeå University. She teaches physics and has worked in the field of gender and science, often along with Else-Marie Staberg. She is currently creating a more gender-inclusive physics education through a pedagogical project and is interested in physics education research.

Department of Physics, Umeå University, SE-901 87 Umeå, Sweden.

E-mail: Sylvia.benckert@physics.umu.se.

Else-Marie Staberg, Ph.D. in Education, Umeå University, lives in Stockholm. She is currently taking part in a project on gender and mathematics financed by the Swedish Research Council. Her 1992 thesis focused on gender and science education in Swedish lower secondary school. She has also done a study of science education in upper secondary school and has worked along with Sylvia Benckert in the field of gender and science, e.g. developing courses for Centre for Women's Studies in Umeå University, where for some years she was Director.

Norrullsgatan 20, SE-113 45 Stockholm, Sweden.
E-mail: else.staberg@telia.com

ABSTRACT. The results from interviews with Swedish women chemists and physicists concerning studies and work in academia are discussed in this article, with an emphasis on working life. We examine the take-up of postgraduate studies, deal with women's experiences of male power and dominance in academia and relate some positive experiences. We discuss the gendered culture of science and the connection between this culture and the organization of domestic work, and end with the question whether women can be disturbing elements and change the culture of science.

There are male networks in the academy. Men help and support each other. A resistance towards women is seen most clearly in research positions, research resources, power and influence. The gendered structure of care work puts men at an advantage in their careers. The science culture is not women friendly.

These are some of the conclusions drawn from an exploratory interview study reported in full in Benckert and Staberg (2000a). Twenty-six Swedish chemists and physicists belonging to different generations, working at different universities and with different specialities, took part in the study. The interview study, which took place in 1995, was a follow-up of mapping we conducted earlier on the number of men and women who had taken a Ph.D. in chemistry or physics during the period 1900–1989. The oldest of the interviewed women was born in the early 1920s and the youngest towards the end of the 1950s. In this article, we have chosen to present only some aspects of the study, beginning with the take-up of postgraduate studies followed by women's views on resistance and support during working life. We then highlight the science culture image that stands out from the women's stories.

In discussing these aspects, we utilize some of the work in the fields "women in science" and "gender and science" that influenced us prior to, during and after the study. These studies were carried out mostly in the USA and are not necessarily applicable to Sweden; we have

therefore compared the Swedish situation with the results from this work. We were particularly interested in questions about culture, such as Sharon Traweck's (1988) description of the culture among high energy physicists in the USA and Londa Schiebinger's (1999) narration of the competitive culture of science in her book *Has Feminism Changed Science?*

We were also inspired by Jane Roland Martin, who uses the idea of women as "disturbing elements", e.g. in her book *Coming of Age in Academe* (2000, 120). Women can be disturbing in a negative way and be seen by the male establishment as not belonging in science; they can also be disturbing positively, however, and thereby promote change.

A crucial phase

"It is not a straight road such that in upper secondary school you can decide now to do research on the basic problems of physics, on the contrary it is a winding road – for most women. Much more for women, I think. It is much more common among boys to opt for a research career early. 'That I will do' and they go straight ahead."

This is a view shared by many women. The usual was that a number of decisions – or coincidences – during undergraduate studies led to postgraduate studies. "I only slipped to and fro on banana peel", a woman says. She, like several others, continued with teacher training after graduation. After these studies, or after a period of teaching, they went back to university to take higher undergraduate courses, either in order to become better teachers or because they did not enjoy teaching. One of the women had been asked to continue with postgraduate studies before she completed teacher training, but chose for reasons of security to finish teacher training first.

In fact, most of the informants were in different ways asked to begin postgraduate studies. We present two examples of women who narrate that they became graduate assistants. This was for many years the usual entry to postgraduate studies. One of the oldest of our informants, then the only girl studying

physics at high level, was asked by the professors if she wanted to become an assistant in the course laboratory and she thought: "can I manage?" They reassured her and, believing them, she "naturally became very happy to be able to continue" because she saw "how the boys continued and planned". A chemist tells us about the expansion of the universities at the beginning of the 1960s as a possibility to go further: "As there was an enormous number of students at that time they took in many new graduate assistants and so there were some girls as well." They both clearly formulate that normally the assistants were men.

But a few informants took the initiative themselves. Towards the end of the 1970s, one of them chose a biochemistry research group for her undergraduate examination work, which was possible as "they fought a little over students". This work became the start of her road to postgraduate studies.

The three examples reflect women's entry into the academy, but also hint at differences between and within disciplines; there are more women in chemistry than in physics and the percentage of women highest in biochemistry. We can also see that it was easier for women during periods of university expansion. An overall conclusion is that it is important for departments to inform female students about postgraduate studies and to encourage them and show that they are welcome. This is independent of the structure of the postgraduate studies, which changes over time and can be more or less apt for gender equity. It is also in accordance with a Danish study of recruitment of researchers today (Reisby 1999, 220), who state that women make decisions about postgraduate studies only when others certify their own qualifications. But are women always welcome?

Male power and dominance

The women tell stories about hurdles and about resistance from men. Some of the older women were openly confronted with comments about "taking the job from a breadwinner" and "there were men who needed the job. I had my husband

and he could care for me". The right for women to obtain research positions was questioned.

A physicist who finds herself opposed, but does not want to talk about it, says that it is known that women have difficulty getting a job at the university where she works and the reason is that "the men form a club". "There is a kind of pal thinking and maybe more so here", she says. A chemist, very early in her career, was given both administrative responsibilities and a huge teaching load. She was told that teaching and administration gave merits, but later she realized that the only merits that counted were research merits and you "had to use the elbows to get them". She criticizes the professor for not being fair and for treating men and women differently: "He has never supported women in the way he supported men. He had an ability to bring forward crown princes and followers. And the manner they were supported, they were excused from teaching and they had advantages in different ways never applied to women."

An experienced physicist says "normally about half of the professors in chemistry should be women as there have been so many women chemists in undergraduate studies for such a long time". She thinks that there is something wrong with the system and that many, men too, have difficulties in looking through advertising of posts and post descriptions. But in her opinion it is women who fare badly. "There is so much intrigue", she says.

It is noticeable that most women who advance far in their careers tell about problems with posts, with research money, with opportunities to get into positions of power and to be taken seriously and be respected in such positions. It has been painful for many of them to realize that they are not seen as worthy members of the scientific community. Some put the blame on themselves, while others say they have discovered a pattern. What kind of pattern do they mean?

Men have well-developed networks, they form a club, they help each other forward; older men have crown princes, there is intrigue, positions are tailor-made, men get more research positions than women and men have

the power in research councils and over research money. These are situations that women have experienced. Gender obviously makes a difference. In the academy, in the departments and faculties of physics and chemistry, there is a structure with men in the majority of the leading positions, at the same time as there is an ideology that merits and only merits are important for success. The norm is that men are in leading positions and have the power over resources, nominations and allocation of duties, and from the ideology it follows that men are most merited or suited. This normalization makes it difficult to identify discrimination of women.

Women experience that the resistance from male-dominated surroundings is based purely on the fact that they are women. Women are evidently still not seen by men to possess the virtues of thought and reason required of natural scientists according to notions formed in the 17th century (Haraway 1997, 24). It is obvious that what we have here is an expression of the asymmetrical construction of gender, interaction of gender symbolism, the division of labour by gender and individual gender (Harding 1986, 52–57). But this construction changes with time. Perhaps the resistance concerns only the older generation?

One shift is that only older women talk about hurdles during their time as students. This is in contrast to a study by colleagues in Britain, who detected resistance to women already during undergraduate and postgraduate studies (Hodgson et al. 2000). In other aspects they draw similar conclusions to ours. Another shift is that it is not possible today to openly question women's rights to positions. But without denying that the situation for women is changing, resistance still prevails. We found that women born in the 1940s or 1950s have experienced the men's problem with accepting female colleagues. The older women also comment on the actual situation. Their common understanding is that resistance increases when women take part in the competition for power, positions and resources. There are younger women who say that it is more difficult for

women than for men to get research positions. A chemist talking about a department where, according to her, they do not hire women reflects:

The women that have reached the level of professor are very few. Those I know of have either a husband or a father who has been able to help them forward. I do not say that they are not as good as the men but ask if this is the extra net needed in order that equally good women can succeed. Is that what is needed?

Other women talk about difficulties with laddish jargon or the culture of meetings. 'I cannot play their game', says one chemist, and continues: "I have felt many times that I cannot affect them, I do not know by which means to play, I cannot meet them in confrontations, that are often subtle ... instead I draw back." "I am convinced that there is a real positive interest in young female researchers", she also says. "But the interest is abruptly ended when she enters into competition with men." This is in accordance with one of the conclusions drawn in a report concerning the situation of women researchers in six natural science departments at the Massachusetts Institute of Technology (MIT 1999). The report was laid out on the Internet in March 1999. The report states that every generation, including the now older one at MIT, has believed that the problems with the discrimination of women were gone, solved by the older generation. The resistance towards women is most obvious concerning posts, research resources, power and influence. In another part of the academy in Sweden, medicine, it has been shown that the Research Council judge men and women differently, and thereby discriminated against women (Wennerås and Wold 1997). In a report from the European Commission (chapter 3, 2000), they point out that 'Gender is a key organising principle in scientific institutions to the detriment of science'.

People, places and positions

At decisive moments in daily work, for example

appointments to posts and to boards, committees and research councils, students and researchers need the support of fellow students, teachers or colleagues. This applies especially in the case of women, for the reasons shown above. A positive atmosphere in the department where the female scientist works can be supportive, as can affirmative actions.

Several chemists talk about the importance of female colleagues during research studies. One of them for example says that they were four women sticking together "and as there were very few women at that time, it meant a lot". The physicists were often lonely without female colleagues. But one of them has, both when studying and later, a woman friend and colleague to work with and emphasizes the significance of this friendship. Later they worked in big groups, but could still collaborate, and she says "it has been very pleasant as we know each other so well and can support each other".

Role models are often talked about as a means for women or girls to choose science. Only a couple of our informants mention any women they looked up to or admired. All our informants had male supervisors during postgraduate studies and mostly men as teachers and heads of department. But even when there were older women colleagues or teachers they mostly did not support younger women. Could it have been dangerous to clearly express solidarity between women and thereby mark the deviance from the male norm? Today, when at least in some chemistry departments there are quite a few women, the female students are choosing women as supervisors. Several of the informants are also actively supporting younger women.

Most of the women do not talk about mentors either. But one of them, born in the 1930s, who herself had a mentor and realizes the significance, says that having "some kind of mentor" is very important and that many women who do not feel discriminated do not realize that they really have had a mentor who helped them. Another woman of the same age says: "I think women need mentors in order to at all survive in these environs. The mentor should be somebody

close who really backs you up. I think this is true also today.” In fact several talk about men who have backed them up or been supportive, without using the word mentor. This man could be the professor or the head of the department. A few of the women, mostly chemists, speak positively about departments where they think male professors have been as supportive to men as to women. These men showed overall good leadership and were considered by these women as kind people. One example, given by a very successful chemist: “In his department there was a very good social atmosphere. There were parties and there was solidarity. There was a family feeling, you wanted to take part. It was nice to be part of it. I think that played a crucial part.” She also found him a good supervisor who trusted her to work independently when he was away, which he often was as “he was very well known internationally”. She says that she herself “was often given the opportunity to go to conferences and meet other people and present my research”.

International guests could also be stimulating. To be given the possibility to meet researchers from other departments or from other countries is highly valued by the informants. It is often the professor and/or the supervisor who opens the way. But later they form their own contacts. In fact, several feel more accepted by colleagues outside Sweden than at home. “Sometimes I have to tell myself that things are not that bad, I might not be so disdained as I sometimes feel on home ground”, says a woman with a big international contact net.

Support can be given to women as a group through different government means. During the interview period an affirmative action project aiming at increasing the percentage of women professors was planned in Sweden which we have written more about elsewhere (Benckert and Staberg 2000b). In a bill to parliament in 1994/95, about 30 new professorships aimed at women were suggested through a non-recurrent bid (Prop. 1994/1995: 164, 35). When possible, there should be positive special treatment. Parliament accepted this proposal.

The women often spontaneously brought up

these professorships for discussion, as the bill was presented during the interview period. The comments often concerned the women not wanting to be singled out as women or be given advantages because they were women. But, as the following quotation exemplifies, many at the same time took up the difficulties for women in academy: “It is not right to be appointed just because you are a woman. But what we have had is that you have been hampered many times because you were a woman.” Another woman says: “I think the tendency now to have professorships aimed at women, that women shall have priority, takes away everything we have fought for.” But she also says women’s conditions are different from men’s as “women have children and stay at home and work part time and so on during the years when they ought to be most active in research in order to publish so much work as possible”.

These two women position themselves in two different ways. On the one hand they are negative to professorships, because they fear the women professors will be looked upon as less qualified than men professors and be marked out as different. On the other hand they are aware of men’s advantages in careers either, as the physicist says, because of the resistance to women in the academy or, which is the view of the chemist, because of women’s responsibility for children. Many of the women doubted the value of positive differential treatment, as they found it dangerous to highlight differences between men and women. As Evelyn Fox Keller writes: “any question about the role of gender in science is automatically regarded with suspicion and seen as likely to be counter to their interests as scientists” (Keller 1997, 16). There is a great fear of being looked upon as less competent than men, a fear that obviously is not without reason. Although many believe that women need support, they do not want the support in the way that they understood the proposition. Now we know, however, that none of the women who later received professorships met with negative comments, but rather with colleagues expressing satisfaction that they “at last” had been appointed professors (Jordansson 1999).

But there is a problem: the bid on governmental level is not followed up sufficiently locally. The new professors lack the resources needed to establish themselves properly. Besides, a few more women professors do not change the male norm and domination in the chemistry and physics departments. The culture of science is difficult to change.

A gendered culture of science?

“There is competition for money and positions all the time.”

“It is a competitive environment. It is hard and not always that fruitful.”

“You are expected to work in principle 16 hours a day.”

These quotations illustrate some of the thinking and acting in natural science research surroundings. Two quotations emphasize that the environment is marked by competition. Competition concerns material resources, positions in the hierarchy and status as a competent researcher. The third points to the notion that an excellent scientist works constantly. This acting and thinking can be looked upon as part of a culture of science. We use the concept of culture in a broad sense: culture is what people have, do and think, that is, material things, ways of acting and ways of thinking. The fact that there are, as we have mentioned, differences between different departments does not preclude an overall pattern.

The informants talk about the competitive research surroundings and about their own and other women’s attitudes or reactions. The competition is very important within research. To fit in you have to “elbow your way”, “to be pushing”, “to help yourself greedily”, “to be a bit impudent”, they say. One of them formulates the time as junior research fellow as a struggle in which only the fittest survive: “It is a very good selection, as only the strongest make it, have any chance. Because, after that, they all come out, these junior research fellows, after four years and then there are no research positions. And

then you have to compete with everybody applying for money.”

There are those who say that the competition in Sweden is not as hard as it is in some other countries. A young chemist tells about a group in Germany during her postdoctoral period where the researchers were “in the age when they climb upwards”. “They are stony. They have no moral limits or anything. It is awful”, she says. However, she finds the male researchers at her department at home very influenced by American researchers concerning competitive thinking: “And we (women) do not compete with each other. But the guys do. It feels like that. It is my disappointment. It is yet a little as in Germany. That you are not willing to make an effort and ad-lib and be philosophical instead of keeping your ideas to yourself.”

The image the informants give of the competitive science culture is in accordance with the images given by Traweek (1988) and Schiebinger (1999, 85). Postdoctoral physicists, writes Traweek, have to display a convincing faith in their own powers, to show self-assertion and bravado. In particular, they have to learn to talk about their own work in ways that will convince others of its significance. They are extremely competitive. She also writes that there is a “discrepancy between the official description of group work as cooperative and the persistent, disguised message that only competition and transgression will prevail sets up a ‘double bind’” (ibid., p. 89). “Today many women scientists characterize science as aggressively competitive and many of their male colleagues as discourteous and rude, pushing others aside in their effort to be first”, writes Schiebinger.

One part of the competitive work culture is that you have to work very long days, as one of the quotations above illustrated. “It is a hard course. You work long evenings and you don’t have weekends in the same way as you perhaps have in other types of work. And the children think you are not at home enough”, says another informant. But there are some who think it is a myth that you have to work such long hours, even if there are those who work constantly. One

woman points to the dependence on the USA. “There is only one solution”, she says ironically, “and that is to force American researchers to be on half time”. The competition is international and the studies are measured with international measures, she points out.

Another ideal flourishing in the culture of science, also built on competition, is to make great discoveries when you are young. It is looked upon as a proof of brilliance. A physicist sees a danger in this concentration on young doctoral students and researchers: “In this way you only get one kind of scientist as you for example cut out people who have got children as they are already too old.” Another who was 29 years old when she began postgraduate studies says: “We were not young and bright, but old when we began, while we were excluded from Cern scholarships and things like that because we were too old, as there are age limits on all such things. It is that hard. You have to be young and bright when you begin. Otherwise you have no place here. That was the signals we got.”

The success of researchers is to a great extent measured by the number of scientific articles they publish per unit of time – so-called productivity. “Publish, publish and publish and never have time for anything else”, one informant described the system. Another informant considers the number of articles to be an erroneous base for judgements as there are good articles and bad ones and you have those who repeat the same thing in one article after the other. A chemist argues:

But of course a lot of rubbish is written. The system is built for that. As everybody is preoccupied by writing this rubbish, peer review does not work either, as you have not time enough to read. /... / I do not have anything better but the system is falling down. I think you should find a way to get people to write less. But as long as this is what counts, you cannot expect people to write less.

As men are more successful than women are, and productivity is a measure of success, differences between women and men concerning publication volume and productivity

have been studied. The importance of family and children has been suggested as a cause for the lesser productivity of women. Cole and Zuckerman (1992) in a much cited study found instead differences between very successful women and those who are more ordinary, and concluded that responsibility for family and children was not an overall explanation for men’s greater academic success.

Our informants maintain that this unpaid work is one important reason for women’s difficulties with the competitive culture of science. According to them, men overall take less responsibility for family and children than women do and this fact has considerable effects on women’s careers (see also Benckert and Staberg 1998). The 26 women who are fairly unanimous in this view are married (23), divorced (1) or unmarried (2).

One physicist says: “But this is exactly the problem, that some of the men who have wives who do all the ground service, can work forty percent more than other people can.” Another physicist says about her professor: “He is to be sure a person who engages himself in his children but at the same time I am sure that it is the wife who has the responsibility and devotes herself to them. So he doesn’t quite understand that I cannot work as much as he can.”

There is a big difference between the experiences of the oldest and the youngest women in the study, so that the men in younger generations take much more family responsibility than the men in older ones. But even so the young women find themselves having to bear the greater share of the unpaid work. “Domestic arrangements are *part* of the culture of science”, writes Londa Schiebinger (1999, 93). Professional culture has been structured on the assumption that a professional has a stay-at-home wife and benefits from her unpaid work, which means that the conflict many women encounter between family and career is not just a private matter. The very successful women whose productivity according to Cole and Zuckerman is not affected by marriage and children are no less than “Superwoman”: highly organized, efficient,

professional, loving wife and perfect mother (ibid., p. 95).

Several studies point to the conflict between the science culture and family. When interviewing women – and men – in science, Linda Grant and her co-workers (2000) found a conflict between career and family for many of the scientists, especially the women. They describe both family and research as “greedy institutions” requiring the undivided loyalty of their members. A rigorous time planning and great efficiency is needed in order to manage both a scientific career and a family. The authors are of the opinion that the science culture has to be changed and become more women friendly (ibid., p. 84). In the concluding chapter of Gomard and Reisby (2001), it is pointed out that postgraduate chemistry students are negative to the work culture, which makes it difficult to combine research with other important things in life, such as the family. Also in the recommendations of the European Commission (2000) to the member states and their institutions the authors highlight the problem of what they call the “long hours culture” that can be a “chill factor” for some women (and some men). The solution they suggest is flexible working hours and better arrangements for childcare.

In Sweden, as in the USA, to be competitive, self-assertive and pushing are seen to be traits more suited to men than to women and women more than men become victims of this competitive environment. To fit in as a researcher in this culture with its construction of symbolic gender, as one of our informants reflects, “you have to be almost like a man”. If you are not pushing and go-getting and draw attention to yourself you are not considered a good researcher. “The climate and the sharp elbows you have to have, suits men better”, says one woman. Another is of the opinion that women do not have the habit of asserting themselves and to fight for success. Women do not praise themselves and do not boast of what they have done. A chemist finds women positive in the research environment precisely because they are not as career-minded as the men. She

also thinks that they are not as envious as the men. If women are positive in the environment, can they also bring about change?

To be disturbing elements

We do not think that women as women necessarily create change. As we have shown, many women in science shun talk about gender differences. This is not surprising, when it is borne in mind that men still show resistance to women. Our opinion, however, is that gender-sensitive or feminist women scientists can be in a positive way disturbing and changing elements. They can protest against unjust treatment, diffuse methods of judgement and men’s advantages. These advantages can, as we have seen, also be made visible by affirmative action through government means. But what about the science culture?

As we have shown, some of the interviewed women criticize the prevailing culture of science with its strong emphasis on competition and its values and measuring systems. They also point out the asymmetric division of the unpaid work, associated with this culture, which together with the insistence on long hours and the notion that you have to be “young and bright” make a science career problematic for many women. Can women disturb this culture? Martin (2000) makes an analogy between immigrants in the USA and women in the academy, *The promised land*. She distinguishes between assimilation, a one-way process and acculturation, a two-way process, characterized by the equations $A + B = A$ and $A + B = C$, where A stands for the dominant group and B for the immigrant or in some other ways new group (ibid., p. 117). In assimilation, the culture of the host group is not affected. A remains A. Women are to a certain extent assimilated in Academia, says Martin, otherwise women would not have been able to graduate or publish scientific articles or books (ibid., p. 151). But the assimilation has not been unproblematic, as women bring other cultural experiences with them. In acculturation, the host group culture is affected. Can women change the dominating culture within natural science research and

thereby reach real equity? Can women disturb and change A to C?

Women certainly can make visible that the domestic arrangements are part of the science culture and that the gendered division of the unpaid work is not a private matter but part of the gender construction. Thereby they can point to the necessity also for men scientists to take their share of the unpaid care work. The gendered division of labour is not static. It must be possible to combine a career in science with family and children. This implies for example that it should be conceivable to take a pause in the career or during other periods let the work progress more slowly and this must apply to both men and women.

Women can also question the prevailing science culture formed by men. The ideal to work long days and be totally engulfed by work and to do as much as imaginable when you are young can be changed, as can the organization of work in the academy, the standards for a good researcher and the view of the ideal career. The notion that competition and competition only brings forward good science seems to be doubted by many women and can therefore be challenged.

Changes from A to C are surely neither easy nor rapid achievements but still possible.

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