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Current issues for Gender and SET: Perspectives from Research, Policy and Practice

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ABSTRACT

This article, based on conversations, aims to reflect the broad perspectives of policy makers, practitioners and academics about where we are and where we should be going in research, policy and practice related to gender science and technology. It thus aims to capture the essence of this new journal by introducing the key concerns of stakeholders from different dimensions in the Gender and SET environment. The idea for the article came from a desire to introduce the diversity of experience and knowledge of the editorial board, and ensure that not only academics but also practitioners and activists were interested and motivated to read and contribute to future issues. We also wanted to ensure that the journal reflects the interests and concerns of a global audience.

KEYWORDS

Science; Engineering; Technology; Research; Policy; Practice



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INTRODUCTION

In this article, we draw on a series of conversations with some members of the editorial board and others about where we are and where we should be going in gender and SET (science, engineering and technology) research, policy and practice. We felt this would offer an excellent introduction in this first edition of the journal to some of the issues and concerns that inspire and motivate us all to work in this area. We start with some reflections on the paths that took our participants towards an interest in this field and what has motivated them in their work. We then discuss how this journal could help to achieve some of the goals that have been identified and examine what our participants feel are some key issues that are of significant concern at this time, namely work life balance and sustainability. We end with some thoughts on a vision for gender and SET which we hope will prove inspirational and thought provoking.

FROM PERSONAL EXPERIENCE TO PROFESSIONAL INTEREST

For many Gender and SET activists and academics becoming involved in working towards gender equality in Science, Engineering and Technology has been a lifelong project. This involvement in gender and SET has often had its roots in personal experiences which have then become formalised in a professional framework. In the case of academic researchers this often results in an interdisciplinary perspective, encompassing both traditional SET disciplines and a social science perspective. **Marja Vehvilainen** for example is a senior research fellow at the University of Helsinki who describes how her interest in empowering women led her from working in computer science to adopting social science methodologies to analyse strategies that women could use within the workplace. She discusses this perspective below:

I came to gender and technology research because I had background first in computer science and after that I studied also social sciences and women's studies. I wanted to do research on how women would be able to develop information technologies for themselves in their workplaces. I think that this original background influences how I have remained interested in citizens' uses of various technologies and I am still interested in this kind of active use and agency perspective.

Early experiences have had formative impact on the emphasis that individuals have given to gender and SET in their own working lives. **Peter Main**, Director of Education and Science at the Institute of Physics began his career working in a university physics department and was shocked at the attitude of male colleagues towards female students:

When I started as a lecturer I remember I was utterly appalled at the

attitude of the then all male staff to the female students and so on. You would regularly see what could only be described as grossly sexist behaviour in examiners' meetings, and that had a profound affect on me. I mean I was genuinely shocked to hear not only that people were doing it, but that it was seen as almost an acceptable way of carrying on.

This experience led him to take on gender equality work at the Institute of Physics including the Project Juno audits of UK Physics Departments which are described in more detail in the case studies section.

Gill Kirkup, now Head of Research at the UK Resource Centre for Women and SET also reflects on the behaviour she encountered when starting her own academic career. Similarly to Peter, she observed an acceptance of sexist behaviour within that environment.

In the 1970s I was a research assistant in London and very involved with that 1970s women's movement. At the time I was doing an MPhil on the education experience of sandwich course students in an engineering department, in what was then a poly and is now a university. It became very clear to me that gender was invisible in the sense that there were hardly any women - if there were two in one year, that was astonishing. It was nearly 100% men. There were a few more women teaching. There was no conception of gender; it was a really old-fashioned engineering department with the girlie calendars on the wall, men being very nice calling you pet and patting you on the head. All meant very well, but that was when I realised there's a real problem, and I couldn't even use gender as an explanatory variable in the research I was doing because I had no women in my sample of engineering students.

Ann Holmes now runs her own research consultancy company after many years being highly active in Gender and SET issues in Canada and globally. During her early professional life teaching in primary education she became, like Gill, involved in the women's movement and this started to shape the kind of work she was doing. And similarly to Peter Main, a change in work environment provided the catalyst for direct engagement with gender and SET issues.

I became involved ... because I was in the classroom at what we call the intermediate level, junior-high sort of thing, and I was teaching visual arts, which has a lot of technology in it. It's not particularly non-traditional, and while I was doing that work I was also doing a lot of volunteer work. My professional service work was around women's issues and women in leadership and so forth and I was casting around for other things to do because I didn't want to go into elementary leadership and ended up doing a flip by getting a job working in a government agency, the Ontario Women's Directorate, which specifically focused on women's issues. So I flipped from earning my living focused on arts and culture and volunteering in women's issues, to trying to figure out how I could volunteer in art and culture and

make my living in women's issues.

What made me get involved in this area of work was really the transition from doing women in leadership on a voluntary basis to actually getting a job where I could combine my adult education interests,(my educational, pedagogical background) that at least let me think that I could support my own political social justice agenda to a certain extent. It wasn't the best, most beautifully positioned political work in the world but nonetheless, it gave me an opportunity to shape the position as I went on, the needs as I saw them and as people expressed them to me within the professional community.

Lynda Armstrong is Vice President Technical at Shell. Her early experiences of entering the workplace were also instrumental in shaping her involvement in gender and SET issues.

I think it came as a shock, but it was a long time ago! I went to an all-girls' school, so doing double maths and physics didn't seem extraordinary. It didn't seem unfeminine. At university there were very few women who were doing the physics and geology, but still there were some women. They all went off and did teaching and more mainstream jobs afterwards and I joined this technical industry and I was just appalled at... such things as the standard practice when you joined as a geologist was to go out and do well-site work, in my case in the North Sea. They said "oh no, no, no, you can't do that. Women aren't allowed on the rigs". I'm left thinking "how do I get the experience?" However over the years these issues like women working offshore have been solved. But it did come as a shock to me and at 22 you think "how on earth do I cope with this". So one of my aims has always been since then to make sure that that shock is not there anymore for new recruits.

One common thread that runs through all these experiences is the significance of networks.

Networking within organisations and externally has been important in the Gender and SET community and actively promoted by those working to support women in the workplace. This is not a new phenomenon - the UK Women's Engineering Society, which this year celebrates its 90th anniversary, has long played an important role in supporting women in SET – but now as well as face to face networking, increasingly women in SET have been turning to online networks for social and professional support (Donelan et al 2009). Being involved in various networks has affected and shaped the work of many of those involved in Gender and SET. Indeed one of the drivers for the development of this journal was to develop and extend the network of researchers that had come together through the ['Moving Gender and SET Forward'](#) conference in November 2007.

Lynda Armstrong recalls that as her mentoring role developed, networking

within Shell enabled her to have an influence on gender issues within the company:

I think from that time as a practitioner in what was an overwhelmingly male world, I became interested in supporting women and carving career paths for women, and solving some of the practical issues around women who practice science, engineering and technology. Policies, for example, around part-time working are now enshrined in the company policies. So it's really coming from working as a practitioner and then more recently, as I've got comfortable with working in that environment, to make sure that young women that are coming in find a supportive environment. Hence I've done a lot of mentoring. I'm a sponsor of our internal Shell Women's Network.

The role of professional bodies in creating and sustaining networks is also highlighted by **Peter Main**, who describes how the Institute of Physics has successfully built networks across companies and the institution:

I also think that professional bodies can play very important roles on gender issues in a way that it's rather difficult for others to do. I think that the reason for that is that we generally, OK sometimes we have the reputation for being fusty old bodies, but generally we have a reputation for being independent and trustworthy, like our brand if you like. So that's the upside of being a bit old-fashioned in terms of image. We're also known to our members and to senior people, so if we go to companies, you know you might go to Rolls Royce, and they will know of the Institute of Physics, and they will respect it, but we will also have members for whom it will be their professional body and they will trust us and feel some ownership of it.

I think it's very difficult to think of another organisation that would be able to operate with that degree of trust almost immediately without building up trust over a very long period of time. So I do think that the professional bodies have, in fact, responsibility, but also have the opportunity to play a very special role in this type of activity.

Networking is also highly valuable in crossing international boundaries and building a global response to gender and SET issues. Indeed **Marja Vehvilainen's** current research work is specifically focused on such transnational networks:

We have discussed the dialogue between research, policy and practice generally, and I think that that is always very important. I'm also interested in ideas about sustainability that are being developed through dialogue between scientific knowledge and practitioners in NGOs. But if you think about global market issues, it will be important to ensure that we have dialogue between local and global actors and also EU or other transnational actors. Global actors involve global companies and with global companies we are developing various ethical codes and policies, specifically sustainability policies which may influence gender policies

Similarly **Ann Holmes**, has extensive experience of how internal networking has driven some of the most innovative work in the Gender and SET field

Once I'd attended the GASAT (Gender and Science and Technology) conference in Ann Arbor¹ it began to open up all these international networks of people working around gender and SET issues. So I met a load of people, including some of the founders of this journal, and that is how I became involved - through the conferences and then networking among the various connections I'd made at these events.

I saw my task as supporting those people on the edge, to try and provide them with the arguments and the rationale for them to pursue for themselves and then to persuade their leadership that this should be supported. Also to network and develop resources and to spread them as widely as possible so that those who are already doing the work knew that they weren't alone, knew that there was support and knew that there was a group of people out there who believed that what they were doing was important

That is when I became more aware of work being done in the global south. Even more broadly than that, because of the work I've done in GASAT and WIGSAT², and my experiences of how those processes went forward and problem-solving was seen as important because the international task force on women and ICTs was being formed. So I was then in Baltimore in 2005 when that was kicked off and now I'm a member of that international steering committee. So it sort of grows organically.

A ROLE FOR THE GENDER SCIENCE AND TECHNOLOGY JOURNAL

This journal aims to play a role in developing and maintaining dialogue between different stakeholders interested in Gender and SET. Board members recognise the challenge that lies ahead in bringing together those from varied perspectives and disciplines who have historically worked in separate silos. As **Peter Main** illustrates, there are often mutual suspicions between those coming from different disciplinary or professional backgrounds.

I think another issue for those working in gender and SET is really looking at the evidence base. What I've found, and this won't win me any friends, but what I've found going around the place and talking to people who have been working in these areas, particularly in professional bodies actually and the scientists themselves is that they, if you like " know the answer ". Often they just assert things without any real evidence base for what they're asserting. And as someone who used to be what is called a hard scientist, working with electrons and things, I find that an odd approach. Now I don't pretend that it's always easy in social sciences to manage to take a more hard-nosed approach but I do think that asserting something and striving to do something just on the basis of that assertion is something that has bedeviled work in this area over a period of time.

Peter's view is that the journal can play a role in bringing diverse perspectives together.

I was thinking about this, and clearly it needs to develop an identity... I think if it can link research with the practitioners then it will be enormously beneficial. The way it feels to me is that there are sociologists that do work in this area and so on, but often, all too often, that work doesn't get translated into the workplace. I think that, with the remit that you've set up where both sets of people should be interested in this journal, then I think that this can be a very key role to play. Even having articles that join the two up, and even possibly making policy recommendations. From the point of view of the professional bodies it's really quite interesting. It fits with the IOP rather better almost than anyone else.

From **Lynda Armstrong's** perspective the journal also has an inspirational role to play in providing support and solidarity for those actually working in SET who might find themselves isolated or lacking like minded colleagues:

When I think about when I joined, I was very isolated. You think it's you: "I don't get this, why do they behave like this? It must be me". One thing I find from the mentorship groups, and I still run them now, is that that still pervades a bit. And you can say "No, it's not you. It's the environment you're working in. Hang on to this because things aren't going to change if you change to behave like the men". So I think that the journal can highlight the supportive side. It's not you, hang on with it. You have a valid point of view.

The sharing of good practice and ideas and building a repository of initiatives and projects is also crucial - as **Ann Holmes** stresses, "it's important to make sure that the information is spread out as widely as possible because I can't stand the notion of people re-inventing the wheel."

And that documentation (of initiatives and projects) is crucial, and one of the things we found valuable with the GASAT work is that papers that people in various regions wrote in the last two decades can be of benefit to, people who are starting the work in other regions. GASAT has been going since 1981, so Sophia Huyer, the executive director of WIGSAT, has hosted links or actual papers of GASAT work on the WIGSAT site and during her travels and networking she has discovered that people in other regions are using work that we might say "oh snore, we've done that for years and so on and so forth" but because the GASAT work is documented and somewhat analysed others can benefit from it.

Influencing strategic thinkers and leaders is also a role that many of us hope the journal will fulfill. Ann sees this as a marketing function:

That message however it gets framed, (and you need some good marketing people to figure that out,) is to get that message to leadership, industrial leadership and academic leadership. Also, in the process, to identify who are the allies in that leadership and engage them and then hold them responsible

for engaging their peers. This whole leadership thing - yes they have a whole range of issues on their plate but that doesn't mean that this one should fall off or not be there. In that whole process of engaging leadership and making sure that the issue stays on the agenda we also need to be sure that the people working at the grassroots,(the NGOs and the activists) know that they have support, whatever that looks like. So it's like a two-fold approach, making sure that the leadership are having their chains rattled regularly but that the grassroots are being supported. One feeds the other really.

One of the issues that faces any new journal such as this is establishing a reputation within the academic community. Researchers are under continual pressure to ensure their research is published in journals that have 'high impact' and are read by the maximum number of people. Without the benefit of a long track record, a new journal has to offer something different in order to attract contributors. **Gill Kirkup** believes that the academic climate is changing and this is driving researchers to actively engage in more dialogue with 'the public'.

I really hope that it can do something that is very difficult and I hope that it isn't impossible! Because I don't think we need another feminist academic journal full of peer-reviewed articles read by the people who wrote them, which is the case in most academic journals. So I thought the journal could be something that potentially bridged the academic area where people are thinking ideas and playing with theory and doing some empirical work but could also contain writing by other people, very much about case studies, about initiatives, about events and it would be interesting enough for academics and practitioners.... Now I don't know of another journal that attempts to talk to both of those audiences. I think that it may be before its time, but I hope it's not too far before its time, because I think that the agenda for all academic work now is, (apart from at the very top, top..) working at the coalface. Research is for the rest of us moving towards an engagement with public understanding. ...So I would hope that that would change academics' stand towards publishing in this kind of mixed-mode journal, because this is now going to be part of what they have to do. The challenge is how to make it something that a busy HR person or a practitioner or somebody working in industry who is mentoring some young women in her company, is going to find interesting enough to spend the time on.

For **Marja Vehvilainen** the international aspect of the journal's reach is paramount

I know you have already thought about not only having local Europeans but also having this dialogue between global actors and the local practitioners. I think this is very important. But I don't know who these people are yet who think about these environmental issues and sustainability issues. So far I have been researching in Finland what actors are really discussing and very few are still discussing issues about gender and sustainability and gender and

climate change. There are some openings, but they are very, very general. This is something that research should do - to activate more.

KEY ISSUES FOR GENDER AND SET

Despite 30 years of work by researchers, practitioners and activists trying to analyse and find ways forward for Gender and SET issues some of the key problems have not been resolved. Ideas have evolved and moved on but essentially the fundamental problems of recruitment, progression and retention of women in SET employment persist. While the focus has changed to emphasise culture change rather than simply focusing on numbers there is still a long way to go before equality is achieved. One danger facing Gender and SET work is the notion that many people have of feminist projects in general - that we have "been there, done that and worn the tee shirt". But as **Ann Holmes** is adamant to point out, this work needs to be reinforced again and again with every generation in order to achieve lasting change.

One of the things that I keep bumping up against and that needs to be combated in some way, if that isn't too military a verb, is the notion that the issues, however you define the issues, have been, in quotes, solved. We've done gender; everybody's awareness has been raised, blah, blah, blah, blah, blah. First of all that's not the case, but secondly it's not something you can stop. And I've been trying to illustrate this to people with a very simple example which is that if you teach all two-year olds to brush their teeth, that's terrific, but you haven't solved the issue. Every two-year old needs to keep learning and you keep getting more two-year olds so you need to keep teaching them to brush their teeth. It's so simple, it's a little bit stupid, but in another way it's trying to get people to get in their heads that it's not a one-off thing. It's not an awareness that permeates society and therefore people, once you have raised a certain level of awareness, then everybody's just going to get it. It's an issue that needs to be addressed much like any of the other equality issues. You are not going to stop racism just because some people get it. So that to me is a big issue because if people think, oh no, we've done this, then it doesn't liberate funding, it doesn't open up minds. It just closes things down.

Yet within industry especially, but also in educational environments, old issues such as the glass ceiling are still very much apparent. **Peter Main** has found evidence of this in the Institute of Physics salary survey:

When we look at the glass ceiling, it is most certainly still there, and there are massive disparities in pay, which we pick up with our own Institute salary survey. Beyond the age of 40 average women's pay seems to flatten off whereas men's pay seems to carry on. I'm sure that's part of this problem.

While the glass ceiling phenomenon is widespread across many sectors, it is particularly acute within the SET industries because of the low numbers of women even at lower levels, and the subsequent persistence of male working

cultures that do not take account of life outside of the workplace. **Lynda Armstrong**, talking about the cultural norms and role models that persist particularly in technical aspects of her industry.

I still think that, despite the fact that it isn't as bleak as when I joined, I look around my technical organisation and, certainly at the senior levels, there is still less than 10% representation. So I think the SET environment is still a male one and that comes with cultural norms and with role models and I think both of those are still an issue.

While most large organisations now have extensive diversity and equality policies in place, these are not always so effectively translated into practice further down the organisation. **Peter Main** has observed this in organisations that he has worked with.

Quite often, and I think this is a big issue, people pay lip service to diversity in general. There is a difference between what people say is the case and what is really the case on the ground. I think you often have companies, that will tell you (if you talk to their HR departments), about all sorts of stuff about equal opportunities and so on. But when you look on the ground, the imposition on the staff is perhaps not quite the same as what they're saying. I think that's a very big issue.

Primarily this is because organisations have not changed the cultural norms that were established when the ideal worker was the male breadwinner who had no childcare or other caring responsibilities (Bailyn 2006). Peter's view is that only when men become proactive in taking more responsibility for family care will the cultural changes take place that will enable women to achieve equality in the workplace.

Another big area of course, is, and this isn't new, coping with the fact that people have children; it's always the women that have the children. But both men and women are involved in making them and in having a family. And it's nothing really new but until our work structure really takes that on board and accepts that if we are going to have families it should not be at the expense of the career of the woman. Real progress is going to be very hard and these issues like over-hours working and so on are part of that issue.

Two key issues which are of particular relevance for discussions about Gender and SET are explored further.

One of these is the notion of work-life balance. This phrase has become one of the buzz words of the past few years and has come to symbolise and encompass the difficulties that mothers in particular face in combining work with family care as well as a whole raft of measures that companies or other organisations have introduced to support more flexible working lives. Discussions about work life balance also provide an opportunity to think more fundamentally about the way work is organised, the assumptions that underlie the way organisations go about their work, and the roles of work

and care in all of our lives. For **Peter Main**, one of the main issues in most SET workplace cultures is the expectation of long working hours.

There is a real problem with over hours working and I think this feeds through in all sorts of ways. I mean the world that I am most familiar with, academia, there is almost a 'presentee' culture. The over hours working issue has a big effect on part-time working, and we know of course, particularly at certain times of their careers, women often like to have high-quality part-time jobs. The problem with that is, that if the full-time job, (which might be defined as I don't know 37 hours) is actually 60 hours a week, then what's a part-time job? This is the reason, of course, why many companies don't like part-time jobs because they are actually abusing the hours of their full-time people. So I see this as a very, very big issue for society at large, and for gender and for women in particular...It's no different in STEM than in some other areas. So in terms of the employment level that's a very important issue. When we've looked at women who've dropped out, quite often it has been that issue that's been the problem. The inability to get back into a good, demanding job at a part-time level, because, in the words of the old Bob Dylan song, "I give you my heart, you wanted my soul. You work hard for them, but they want more".

This long hours culture is one of the key factors which drives many women to slow down or even abandon their SET careers after maternity. It often requires supreme efforts of organisation and commitment to be able to keep up with the high time demands of many jobs in the sector. This 'brain drain' is of major concern to companies and other organisations many of whom have developed a wide range of measures to try and retain and re-employ their women staff (Hewlett 2008). Technology for example offers the possibility of flexible working or working from home. However **Lynda Armstrong** has some concerns that such solutions to the issue of Work Life Balance might actually reinforce gender divisions.

I do have a worry that women will opt for this 'offline' working because it will give them the flexibility they need. Men don't and hence are seen more, and it puts women at a disadvantage. So back to the uniform culture again. I would be careful about saying this is a tool that only enables women. I think women have to match the pace of the uptake if you like of men. Or vice versa. I do see that. A lot of my women work from home one day a week, and I'm very flexible and I encourage it. But the men don't. They come to the office still. I think there may be a step-change soon. We're experiencing it, this cutting down on costs and travel and, at the same time, globalising the business, is actually forcing us to hold more virtual meetings, which means you can be anywhere and be visible. So I actually see for the first time in a long working career that there is actually a push to get everyone online - net meetings and so on. And the whole climate change agenda about not flying all the time, as well as the cost-cutting, might actually mean that there is a step-change.

Gill Kirkup stresses that we should be looking at a broader perspective on work life balance:

I think the real problem is out there in industry and the whole kind of meaning of people's lives and their relationship to work. We talk a lot about work-life balance but that often comes down to things like can I take some time off when the children are ill or should my husband take time off when the children are ill, and I think that's a bit too crude. I think we need that flexible working, but I'm worried about this flexible working because ... it depends on who's in control of the flexibility because for many people flexible working turns into always available, always on. I do my emails on a Sunday because otherwise I'm not ready for what's going to hit me on Monday morning, kind of thing. So I think that we do need to get more back to some of the stuff that people like Sandra Harding were writing about. Some of the more theoretical stuff about the meaning people make for their lives through the things that they do and the identities that they create and just giving them more time off to have children or to look after their children is a good thing, but in itself I don't think that its going to solve the problem....I don't see the long hours culture disappearing or being attacked significantly by what we might say about it. So I want to believe something that an old feminist friend of mine said years ago. She said that she always believed that you should try to have your cake and eat it and that's what feminism is for, realistically I'm not sure that in some situations it's possible. There are some jobs that just make such demands on people because of the nature of the project that there are times in people's lives, men and women, when they just don't want to do it, and that's bound to then have an impact on how fast they get to the top. But it is saying that there are sometimes choices and those choices are positive choices and they're positive choices not to pursue the next promotion, the bigger project, the more high-profile job. We do tend to sometimes talk in this area as if you're a failure, you've failed if you've hit a barrier, if somehow you haven't got to the top. So I think a lot of women kind of, we start to try to explain to people why we haven't got to the top whereas, in fact, life will be much more comfortable if we said "you know I never really wanted to! I just wanted a good salary, some interesting work and to do Morris dancing on Saturday".

Discussions about work-life balance also link closely to another major concern, that of sustainability and global development. For **Marja Vehvilainen** this links closely to her own research area.

Currently there are so many worries and concerns about sustainability and climate change, so that I think it would be very important not only to think about the mutual shaping of society, gender and technology, but to broaden it to include also nature... and to include in this, climate change and sustainability questions. . ICT also has a role that has not been articulated so much in the context of climate change and sustainability. It has both possibilities and it has also threats. The other thing is going to be food, but

even food is technology mediated.

The second thing I was thinking about was the global market which is shaping gender locally - I think it would be important to consider this global market in all our usual contexts. Like in education, work, culture, NGOs, policies, companies and to constantly think about the dialectic between the local and global markets. I think those issues crucially shape gender and how local educational institutions or companies can work and develop within these issues, the way they connect to these global issues.

The impact of the current economic downturn on gender and SET is not yet clear although there has been plenty of speculation, both positive and negative about what might be happening. **Gill Kirkup** has noticed a worrying return of essentialist arguments as the gender and SET community has searched for a gender angle to the recession.

The thing that's worried me about this present discussion is that a number of people in SET have resorted to crude biological arguments, such as men have got us into this problem because they've got too much testosterone, women will get us out because they are nice and cuddly. That's always dangerous, so I think it is the case of seeing the opportunities without creating biologically-determined arguments that will come back to bite us. Because if things pick up and there's a boom, we'll be told boom times are no good for women because they are risk averse so we're only going to employ testosterone-fuelled men. So I think the problem for us in this field is how to tread a careful path to keep the gains we've made...

A VISION FOR GENDER AND SET

In this final section we asked our contributors to set out their vision for the future. **Marja Vehvilainen** is cautiously optimistic about the potential impact of ICTs for women in the global market

Perhaps my vision is both positive and negative, and even that it is impossible to know. When I have been thinking about these global market issues related to women in ICT, I actually became rather pessimistic because it seems that it becomes even more difficult for women to work as experts in this flexible ICT business with its profits for investors. Women would need to be traveling all over and staying in various cultures so many gender cultures and not even being able to be an 'expert' in many cultures, particularly in many Islamic countries. I have been interviewing women here and have heard about these problems. Now, on the other hand when I have been looking at various policies in NGOs about the sustainability question, I have found, for example, the WWF strategy for IT, which was a systematic strategy and not thinking about short-term choices but thinking about various structural and institutional settings that will need to be developed. They used video-conferences as an example and how it should be developed structurally and institutionally. This may have a reverse gender impact

because that would mean that women working in global companies wouldn't need to travel so much and perhaps it would be easier for women to work as experts for example - at least we could say that there are also openings which we haven't seen before. That could be a little optimistic but on the other hand, this is the third point I think, it is nearly impossible to know how these will actually develop.

For **Peter Main** the evidence suggests a momentum of change that is now taking hold especially in the academic world and could one day mirror the transformation of the medical profession.

I'm cynical, but optimistic. With these matters one tends to have gradual change. There is never a revolution in sociological change like this. One shouldn't lose sight of the change that has occurred. When you look at the % of lecturers, % of readers, % of professors in physics who are women they are going inexorably up, and that's good. You can't expect a step change from 5% professors being women to 20%, which is what the graduation level, is because it takes time to become a professor and history has to feed its way through. So I'm cautiously optimistic about those things.

My vision for SET and gender is, if you like, the medical vision. No-one is surprised anymore when the doctor is a woman, they would have been 50 years ago. So what we want is that no-one is surprised when the physicist is a woman. That's my vision. I tend to think more in terms of physics than in terms of SET, and within SET there are ...biology at university level where there are more women than men. They have other issues of course, why aren't there more women professors for example. Why is the % of female biology professors every much the same as the % of female physics professors. That's a big question for them and for mathematics, and chemistry actually, where the number of undergraduates is much higher.

From the industry perspective, **Lynda Armstrong** has a vision of diversity as a positive force in industry that will benefit not only women but the whole organisation

For there to be a broad representation of women in SET organisations at all levels that means that the structures are supportive and that their creativity and different ways of working are recognised, and valued. For the creativity clients need, it is recognised that a diversity of viewpoints and a diversity of approaches is paramount. In that sort of environment, women will thrive and then the goal of having equal representation across the sciences and across the structures will happen automatically.

Ann Holmes' vision spans both the education and employment sectors but also challenges the nature of SET itself.

Well I looked at it from three points of view. One from the point of view of education, and the students themselves. My goal has always been, and I would hope this would continue, well I hope that the goal would be reached

that students would have sufficient information so that when they are making their educational choices and their career choices, it truly is an informed choice. I've been accused in the past of social engineering, and you can't force different careers on people obviously, or different subjects or choices, but if they have access to the information and access to knowledge about what a variety of what job opportunities there are and how much creative opportunities there are, that would be my vision for that part.

As far as the workplace goes, an engaged leadership obviously I have mentioned, but I was at an OECD conference a couple of months ago and it was the first time, it was on women and science, and it was the first time that I heard members of the scientific community themselves express the goal and an interest and a recognition of the value of having more perspectives involved as scientists. So my vision is that all people working in SET are engaged in the project of diversity of viewpoints. For me, and it may be a bit essentialist, that then leads to the last bit of my visions, which is the outcomes.

My vision here is that the contents of SET policy, and the contents of the products that are produced by the industry, would change. Some of it doesn't need to change, but some of it does, to advance or to progress to be, as the way one of my heroes describes it, Ursula Franklin who is a brilliant Canadian scientist, talks about the practice of SET 'as if people mattered'. So it's not how efficient it is, it's not the cost/benefit analysis, all of those things have to be in there, but also factored in there is the impact on people, on the organism itself. So that would be my ultimate vision for the context of SET.

And, when asked whether she felt positive at the moment about achieving her vision Ann responded:

Well, my usual answer to this question is I wouldn't be doing the work if I didn't. What would be the point?

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¹ 4th International Conference of the Gender and Science and Technology Association (GASAT 4), Ann Arbor, Michigan 1987

² WIGSAT is a consulting group which promotes innovation, science and technology strategies that enable women, especially those living in developing countries, to actively participate in technology and innovation for development