INTRODUCTION TO SECTION 10

Women in Physics

Aim: To explore the reasons that some young women are attracted towards the study of physics, and some of the issues facing women who pursue careers in scientific professions.

Contents:

Methodology: Within Section 1 of the portfolio, I investigated reasons why young people chose not to study physics. For this study, I wanted to consider the other side of this issue and explore the reasons that some people are attracted to physics. I chose to explore four young women as case studies, one of whom was a former student at the FEC and the other were research students at a local Russell Group university.

The latter part of this study explores some of the problems that women face in scientific careers and the various organisations that can support women entering scientific professions.

Conclusions: Despite the progress made by women in many traditionally male dominated careers such as law, medicine and business, there is still an under-representation of women in SET related careers. At each stage of the educational ladder, women are leaving STEM subjects (known as the ‘leaky pipeline’)

From the first part of this study, it was clear that all four of the women in the case studies had been interested in astronomy, and this had been the main reason why they had chosen to study physics. All of the case studies agreed that there were aspects of physics that were incredibly

difficult, but wanted to persevere to master the concepts. Another point to note is that all four of the case studies were from middle class backgrounds, where education was an expectation, not an aspiration. They came from families which supported, encouraged and promoted a love for learning.

Whilst none of the four women believed that there had been any barriers to their own education, they were concerned about career opportunities after their education, particularly if they wanted to remain in research or find lecturing posts. The three post-graduate students expressed concern that the only way to develop a career in astrophysical research was to be globally mobile, as they would have to move anywhere in the world to take up post-doctoral research positions.

It is clear that despite all of the progress that society has made in the past forty years with regards to equal opportunities, there is still a problem in attracting women to SET careers. The situation is slowly improving, with initiatives such as the Athena SWAN award for universities, and the SET Fair Standard award for companies, but there is still a lot of work to be done in order to redress this balance.

Dissemination of this study: After completing this report, I shared the findings with my team, who understood the attraction of astronomy, suggesting that perhaps this was due to astronomy still holding wonder and awe for young people. I shared my report with a lecturer in Cultural Studies from a local university, who has a particular interest in gender issues. I also shared the report with a logistics consultant who has found that there are still many barriers which prevent women having the same career progression as men.

Within education, whether in schools or in colleges, we perhaps do not see this ‘glass ceiling’ as much as in industry or business, however by encouraging more girls to break through these barriers can lead to more acceptable career pathways for women in the future.

Women in Physics
Marianne Hill

The low participation of girls in physics has been recognised as a problem for many years, particularly since the introduction of the Equal Opportunities Commission in 1975. Since then, there have been over thirty years of classroom intervention schemes, research projects and national initiatives in order to raise the profile of science, yet the gender imbalance in physics has persisted, despite positive legislation designed to encourage more gender equality in the world of work.

From the mid 1970s, the gender imbalance of science, in general, became an area of interest, for whilst barriers to women were being removed and society quickly adapting to equal opportunities for women, it was clear that there was a problem with women in science. In 1982, the EOC recognised that there when young people were making decisions about examination subjects or career options, there were several factors that were significant other than the school systems. The two most important groups were parents and peers. The EOC launched an advertising campaign in 1983 that was aimed at young people and their parents, placing the advertisements in teenage and women's magazines. The EOC believed the response to be very positive (Madden, 2000). Since then, there have been a range of classroom intervention projects and initiatives from external agencies in order to encourage girls to study science at GCSE, A level and as a university under-graduate subject.

Other traditionally male dominated professions have experienced an increase in the participation of women, for example: medicine, law and business, yet we have not seen the same increase in the number of women in science. As Phipps points out:

> '…after thirty years of gender equality initiatives, girls and women continue to be under-represented in SECT (Science, Engineering, Construction and Technology) fields. This points to a need to critically examine the array of attempts made to tackle the issue in order to reflect on why inequality has been so difficult to achieve,

> to imagine how new approaches can be informed and to chart the challenges which have been faced.'
>
> (Phipps, 2008, p.2)

At each stage of education, the gender gap within physics widens and leads to a disproportionately low number of women in physics-related careers. The problem is not confined to the subject content, or the quality of the teaching, but extends to wider extra-curricular influences that shape the decisions made by young people.

By addressing this problem and determining the reasons why girls do not choose to study physics, despite all of the initiatives that have been aimed at encouraging more girls to engage with the subject, would not only help to understand the problem but ultimately lead to a greater gender balance within the subject. As Laura Grant, one of the lead researchers of the Girls into Physics: Action Research Project points out:

> 'Physics is the underpinning scientific discipline, yet the subject's importance and appeal has been missed by thousands of young females who haven't been able to connect with it. If the number of girls dong physics at A level matched the number of boys, among whom it's the sixth most popular subject at A level, we would very quickly approach the national targets for a scientifically trained population and, just as importantly, girls would have an equal opportunity to enjoy a fascinating field of study from which many are currently excluded.'
>
> (Physics Education News, 2009, p.325)

Government reports acknowledge that there is a national skills shortage of scientists and that it may be necessary to recruit scientists from abroad in order to fill vacancies. 'Taking Stock: the CBI Education and Skills Survey' (2008) claimed that 59% of companies that employ graduates of STEM (Science, Technology, Engineering and Mathematics) subjects are experiencing difficulties with the recruitment of qualified staff and that some of the larger firms have to recruit internationally. Whilst it is important to encourage all young people to make informed decisions about their selection of subjects, increasing the number of girls who study Physics could

contribute significantly towards the economy at a time when trained scientists are in demand (p.26).

Whilst many reports have focussed upon the issue of what deters young people from the study of science, with girls as an important subset of this group, I would like to consider the converse, that is, to conduct an investigation into the women who have chosen careers with physics. For this report, I intend to consider the personal as well as academic qualities of those women who have chosen to study physics, to determine their most significant influences and the reasons that have shaped their decisions

Part 1: Since 2004, there has only been one girl from the college (which shall be referred to as the FEC) who has chosen to study a degree course involving physics. Having maintained contact with this student throughout her degree and subsequent Masters programme, I have had the opportunity of conducting an interview with this young lady in order to determine the interests, motivations and influences that shaped the decisions of this young lady.

Part 2: This will feature interviews that I have conducted with three women who are each pursuing PhD courses of study in the field of astrophysics. Through these interviews, we can determine what appeals to the girls who do choose to study physics, and take their studies further towards post-graduate qualifications.

Part 3: This section will explore some of the wider issues that women face working in science related careers and highlight some of the schemes that can encourage and support women working in these fields. The UKRC uses the expression ‘the leaky pipeline’ for the way in which women are being further under-represented at each stage of the educational and professional ladder.

PART 1: Case Study of a Former Student

Since 2004, there have only been seven students from the FEC who have progressed to study physics at university, with only one of these students being female. It seemed important for this study to interview this young lady

in order to determine the interests, motivations and influences that shaped the decisions made by this student.

R studied at the college between 2004 and 2006, achieving A levels in Physics, Mathematics and Drama. She then progressed to study Physics with Astrophysics at a Russell Group University, graduating in the summer of 2009. She is now studying for her Masters degree in Energy Studies. Unlike the majority of students who attend the college, R is from a middle class family that encourages and fosters a deep passion for education. Her father is a lecturer in Mathematics and her older brother studied Mathematics and Physics at university.

1) When I asked R about why she chose to study a degree in Physics and Astrophysics, she provided this response:

> ‘I chose to study Physics because it was the most exciting and fun subject that I studied at the FEC, and because it would lead to a wide variety of career options after leaving (name of university). I chose (name of university) because the department is well known for astrophysics, with the Space Research Centre being at (name of university). This meant that I would have lecturers that were interested in subjects that I was interested in, space.’

2) R was asked about her experiences of the degree programme and what she enjoyed about the course:

> ‘I had to study a range of core Physics modules, but could choose the option courses that I wanted, from planetary exploration and extreme stars to medical physics and nanotechnology. I was always able to study the courses that I has chosen. In my first year, I participated in a week long course at Umeaa University in Kiruna, Sweden. We studied topics such as cold arctic phenomena and the aurora. We conducted practical experiments that involved digging in snow that came up to my shoulders and standing on a hill in the middle of the night watching the Northern Lights. This course

spurred an interest in magnetospheres, which I followed through the rest of my degree by choosing projects and option courses about magnetospheres.

Throughout the course there were modules in maths and computing, so that we had all of the skills necessary to be able to understand the Physics within the course. For my final year for project, I used data from the satellite Cassini and the programming language IDL to investigate a disturbance in the data and try to figure out what was causing it. Once we had found the current that had been causing the disturbance, we then had to use all of our well learned presentation and report writing skills to present our findings to the department. It was exciting to investigate something that no-one else in the world knew about.

The degree course took three years to complete, and they were the most enjoyable I've had yet. I have never regretted choosing to study Physics as my degree subject. It was very difficult, and I had to work hard, but this was overshadowed by the fun that I had, that I would not have had in any other subject. I have chosen to stay in education and now studying for a MSc by applying my knowledge of Physics towards designing low carbon buildings.'

3) When asked which topics she enjoyed studying at school or sixth form, R provided this reply:

'Space was my favourite topic because it is exciting. I enjoyed studying the Cosmology module (A level) and learning about stars. I also enjoyed the simple everyday things, for example, projectile motion in dynamics. I like to be able to understand the world, and the more mechanical side of Physics enabled me to do this. Space is more exciting and adventurous, but mechanics and dynamics are more useful topics.

> I prefer laboratory work to theoretical work, there is no contest here, as I learn by doing. I preferred individual work in the laboratory, because I could do whatever I wanted with the experiment. The fact that I do better with practical work is illustrated well by my module results for my degree course. I would get approximately 70% for laboratory work but achieved 55% overall, so my examination marks were not as good. I think lab work in Physics is particularly good, because the whole subject is learning about how things work, and being able to see it first hand is a great way to learn.'

4) When asked if there were any influences outside of the classroom that supported or encouraged her decision to study Physics, R provided this reply:

> 'There may have been a subconscious recognition that people like Dara O'Braian and Ben Miller have Physics degrees and are cool. Brian May is an astrophysicist, and although I don't like Queen, I have always wanted to be a musician, so he may also have inspired me. I can't think of any practicing scientists that have inspired me. I think it was the knowledge that I wanted, rather than the academic career. Also, of course, 'Doctor Who' was a great inspiration.'

5) The subject of the under-representation of girls in physics was approached and R provided an interesting insight:

> 'I think there is a culture of physics being male-dominated that is affecting the decisions of school girls, so that they take more female dominated subjects. I have not experienced sexism in physics, however, there were significantly less female students in the department than male ones, and there was only one female member of the academic staff. There was a more even ratio of males and females within the postgraduates, which suggested to me that the girls that do study physics are those who are really keen.

> The IOP has a 'women in physics' group that holds meetings for women only. I have never attended these meetings but received all of the e-mails about them. Some of my female physicist friends enjoyed participating with the group and clearly felt that it helped. There is a similar group for engineers, which I discovered this year, but again, I don't feel that I need a special support group for girls in order to do my MSc.
>
> I don't really understand why more girls don't do physics, although I think the decision is made in year nine of school. That is the first time that a student makes a decision about what they will learn. I studied the separate (triple) sciences at GCSE, whereas most of my female friends took art or music instead. I'm fairly sure I wouldn't have taken physics at A-level if I hadn't taken separate sciences at GCSE. I believe that if girls are to be encouraged to take subjects like Physics and Engineering, then it has to be done with pupils who are about twelve years of age.
>
> I might suggest that coming from an academic family that encouraged me to study sciences at school was most important, whereas other girls perhaps don't have that encouragement. I can't think why else girls wouldn't want to do physics, nor can I think of a real difference between me and the rest of the students at the college that would lead them to miss out on a physics degree.'

R is clearly a strong, determined and focused young lady who has shown a strong interest in science from a young age. She has the support and encouragement of a well educated family that have helped to shape her intelligent and independent character. R expressed that she did not see any differences between herself and other students at the college, however from a teachers' perspective, there were considerable differences. R had a wide range of extracurricular interests and activities that were educational and self-improving, whereas many of the other girls who attended college were

influenced by peer pressure into the ‘socialising with friends’ culture. R was a popular student who could relate well with students of all abilities and backgrounds, but she had a greater appreciation and enthusiasm for learning and the purpose of education than many other students at the college.

PART 2: Case Studies of Three Research Students

Through regular contact with the physics department at a Russell Group University (located ten miles from the FEC), the Schools Education Officer, suggested that it may be useful to make contact with three young ladies who were pursuing PhDs in astrophysics at the university. These three research students were keen to work with schools and colleges in order to promote the study of physics at university. In November 2010, the three young women came into college and provided a series of talks for our students. After the event, I asked these women if they could be willing to contribute towards my work on case studies of physicists. They were very enthusiastic about this initiative and each provided a brief outline of why they found physics to be appealing.

1) A’s response:

A told me that her enthusiasm for physics was driven by her passion for space: ‘I love exploring and space is so huge, it has always seemed the best place to start.’ When she was eleven years of age, she was taken on a family holiday to Florida, where she visited the Kennedy Space Centre which she identified as being the single most important influence upon why she chose to study for a physics degree, followed by her research in astrophysics. According to A: ‘In order to understand the universe we live in, studying physics won't necessarily give us the answers - but it may lead us there!’

2) B’s response:

B explained that her interest in physics began with developing an interest in astronomy at the age of twelve. She loved the way that physics could explain how things worked in a very simple and elegant manner. She admitted that

she did not find all aspects of physics to be of interest, but could see the importance of studying these topics. B was the only one of the three research students to mention the influence of a good teacher, whom she found to be very inspirational as well as encouraging.

B was very much aware that as a girl, she was in a minority: ‘There were some boys in my GCSE and A Level classes who would make me feel that I wasn't capable of doing University Physics and that, as a girl, it was a weird thing to want to do. I think there was a certain element of wanting to prove them wrong that made me want to succeed in it!’

Whilst at university, B enjoyed a course called 'Astrolab' where she spent a whole term using the telescopes on the Physics roof: ‘taking real data which we then learnt to properly analyse’. B is now thoroughly enjoying her PhD in astrophysics and gave this advice for teachers to consider:

> ‘Until I started my PhD, I don't think I realised how many unanswered questions there are in Physics and how much we still have to learn. I feel at school that physics is almost taught as if we know everything now, but I think if children were made aware of all the gaps in our knowledge and given more of an insight into the mysteries of the Universe, both on Earth and far away then Physics would become so much more exciting.’

3) C’s response

C’s journey into physics was different to the previous two research students in that she had pursued a career in accountancy before changing direction and studying physics at university. C said that she did not particularly like physics at school, as it seemed that it was a series of facts to learn rather than a subject to explore. C mentioned that her physics teachers were lacking in genuine enthusiasm, although one of her mathematics teachers encouraged the students to consider open ended problems, which she enjoyed.

C was in her twenties when she realised that she did not want to spend the rest of her life as an accountant, and admitted that it was at a

Tolkein Convention that she decided to change her life and become an astronomer:

> ‘I was at a Tolkien convention and an astronomer from Arizona gave a talk about Tolkien's lunar creation myth, linking this in to the development in the scientific community of theories about the moon's creation and showing that successive drafts of Tolkien's work very closely matched the changes in science that were ongoing at the time. She was an exceptionally good communicator, and the thing that really caught my attention was the way she described the scientific process, the way theories are proposed, disputed and honed as new evidence is presented. Prior to that, I'd never considered science as a creative process.
>
> That's still the aspect of science that appeals to me. I don't come in to work every day and follow pre-set procedures, which is what frustrated me about accountancy. I'm trying to come up with new ways of looking at the universe, and then, when we have data, constantly arguing with other scientists - and with myself - about what it means. It's dynamic and creative, and in the end it's all about the big questions - why are we here, etc. - and there's really nothing more inspiring than that!’

By considering the response of these four women who have chosen to study physics, it was clearly evident that they all have a genuine passion for astrophysics, with each one of them being enthralled by the fact that there is (still) so much to learn about our place in the universe. All of the women found the study of physics difficult at times but felt the importance of the subject made it worthwhile. All four of the women were very feminine and did not see any need to adapt to fit in with a male dominated environment.

The research students believed that they were well supported by the institution and colleagues, with no barriers to achieving their potential at the university. They did mention, however, that they were worried about developing their careers after completion of their PhD, as post-doctoral

positions in astrophysics would necessitate being internationally mobile in order to find work. They explained that a typical career path for a post-grad in astrophysics would be to find up to three temporary (one to two year) positions before being experienced enough to secure a lecturer's position at a university. These post-doc positions could be anywhere in the world, which is difficult if you wish to settle down and start a family.

The women strongly believed that if you wish to start a family, then taking time out whilst working through the post-doctoral positions would disadvantage your career opportunities and they felt that they must defer any intentions of motherhood until they eventually found permanent employment. One of the women said that current research in astrophysics advances at such a pace that you need to be absolutely up to date with all of the contemporary issues, and that being out of the loop for a year would be a significant problem.

Further research revealed that this particular problem is not confined to physics, but extends to a wide range of other subject disciplines as well. Whilst women can fulfil their academic potential, developing a career afterwards can sometimes present problems. Whilst there have been many initiatives, projects, research and actions to increase the number of young people pursuing STEM subjects at A level and university, the number of women who then actively pursue careers in STEM areas is even more of a problem and this led to further research into what support can be offered to women who choose to develop careers in science.

PART 3: Women in STEM careers

Hall and Sandler (1982) claimed that the low participation of women in STEM related careers was due to the rather 'chilly climate' that careers in these disciplines presented for women. They found that masculine workplace cultures, inflexible long hours and often the need for frequent travel that made childcare difficult, all led to a perception that the workplace was not friendly towards women.

Historically, one of the first organizations that recognized this problem was the National Association of Women Pharmacists (NAWP), which was established in 1905. They organized short courses for women who wished to return to work after career breaks, as well as producing career packs for women. By 2001, women made up half the members of the Royal Pharmaceutical Society and 60% of pharmacy graduates. (Phipps, 2008, p.69)

The Women's Engineering Society (WES) was founded in 1919, producing a magazine *The Woman Engineer.* Membership of WES rose to almost 300 women during the Second World War however after 1945 there was a marriage bar to many professions. By 1984, the designated WISE year, there were 800 members of WES. By the mid 2000s, the number of members had decreased to 700, with the quarterly journal of *The Woman Engineer* still being actively published. (Phipps, 2008, p 72)

Women's groups within existing professional associations have been arguably more influential as they can affect attitudes from within the organisation, and hence potentially have more impact than separate women's groups.

The Women in Physics Committee of the Institute of Physics was formed in 1985 to advise the IOP on gender issues. The IOP Women in Physics group was set up in 1995, in order to encourage and support women members. The current concerns of the Women in Physics Group of the IOP (2011) are:

1) Education at primary, secondary and tertiary level
2) Women in research positions, particularly those engaged in research or on short term contracts
3) Women who seek career breaks
4) Career management workshops

(IOP, 2011)

Other organisations include The Royal Astronomical Society, which set up a women's group in 1989, followed by the Women Member Network of the Royal Society of Chemistry in 1991. The Daphne Jackson Trust was established in 1985, specifically to help 'women returners' to academic STEM

careers. Professor Jackson was the first female professor of Physics in Britain and developed the scheme with support from industry, such as British Gas, British Telecom and the Institute of Physics.

At present, the UKRC (UK Resource Centre for Women) appears to be the most significant organization that can support women in SET careers. According to the UKRC website, they are 'The government's lead organization for the provision of advice, services and policy consultation regarding the under-representation of women in science, engineering, technology and the built environment. The organization is currently funded by the Department of Business, Innovation and Skills, and offer support for women at all stages of their career.

The UKRC document 'STATISTICS: women and men in science, engineering and technology (2010)' explains that whilst there are some pleasing improvements, such as the increased proportion of girls who are studying the separate sciences at GCSE, there is still a serious concern with what they refer to as 'the leaky pipeline' or 'attrition'. The document shows that at each stage of education, women are being 'leaked' from STEM subjects. The document claims that only 29.8% of all female STEM graduates of working age in the UK (185,00) are working in SET careers. (p.7) It also claims that there are over 100,000 female STEM graduates who are 'unemployed or economically inactive'. (p.7)

The SET Fair Standard campaign was launched in 2009 and is an award which is given to companies or organizations that encourage gender equality in the workplace. Another of the UKRCs projects is the Athena SWAN Award for institutions that deliver higher education.

The Athena Project: Scientific Women's Academic Network (SWAN) was set up with London Metropolitan University, initially to provide information, resources and guidance for universities in the south east of the UK. The Athena Swan Charter was introduced in June 2005, which asked universities to address the under representation of women by exploring some of cultural attitudes of the organization. As of January 2011, the charter had been signed by over 50 institutions, including Cambridge (2005), Durham (2010), Newcastle (2009), Oxford (2005) and Sunderland (2005).

The Athena SWAN website holds the applications from the universities, as it believes that they should be made public. Whilst they make general claims about promoting good practice, two of the specific issues that face women are:

1) Short term contracts, which affects the retention and progression of women in science.
2) 'The personal and structural obstacles' that women encounter in making the transition from PhD to academic careers in science.

(Newcastle University, 2011)

GetSET Women is another project funded by the UKRC in which women working in SET careers can register and take advantage of a range of initiatives, such as coaching, a blog, newsletters, bursaries and training courses.

Conclusions

This report started by outlining the changes that have occurred within society over the past forty years, in order to encourage equal opportunities in all aspects of employment. Despite the progress made by women in many traditionally male dominated careers such as law, medicine and business, there is still an under-representation of women in SET related careers.

Since the introduction of the National Curriculum in 1988, the study of science has been compulsory up to GCSE in all state schools. The proportion of girls taking the separate sciences has increased markedly over the past ten years (JCQ, 2011). There are more girls taking A levels in biology and chemistry, although physics still remains a problem.

The UKRC has serious concerns about the fact that at each stage of the educational or professional ladder, women are leaving STEM subjects and few women progress to actual careers in these areas. The UKRC refers to this as 'the leaky pipeline' and endeavours to improve this situation.

Whilst considerable research has been conducted to explore the reasons why girls choose not to study physics (Murphy and Whitelegg,

2005), I wanted to explore the reasons why girls do choose physics. All of the case studies agreed that there were aspects of physics that were incredibly difficult, but wanted to persevere to master the concepts.

Each of the four case studies showed a genuine passion and enthusiasm for astrophysics. This could be a coincidence, however, my own decision to study physics at university was fired by my interests in astrophysics, so I empathized with the four case studies. There are so many unanswered questions in astrophysics, and trying to find meaning for our existence is the most fundamental question of all.

Another point to note is that all four of the case studies were from middle class backgrounds, where education was an expectation, not an aspiration. They came from families which supported, encouraged and promoted a love for learning.

Whilst none of the four women believed that there had been any barriers to their own education, they were concerned about career opportunities after their education, particularly if they wanted to remain in research or find lecturing posts. The three post-graduate students expressed concern that the only way to develop a career in astrophysical research was to be globally mobile, as they would have to move anywhere in the world to take up post-doctoral research positions.

In part three of the report, I considered the various organisations that can support women who chose to develop careers in science, engineering and technology. It is clear that despite all of the progress that society has made in the past forty years, with regards to equal opportunities, there is still a problem in attracting women to SET careers. The situation is slowly improving, with initiatives such as the Athena SWAN award for universities, and the SET Fair Standard award for companies, but there is still a lot of work to be done in order to redress this balance.

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Report Evaluation Form

REPORT:

Women in physics

Name of Reviewer:

Lecturer in Cultural Studies, university within the region

Comments on the report:

It was interesting to read that all of the women featured in the case studies expressed an interest in space or astronomy. This could provide a useful means of engaging young people with physics. Perhaps this topic should be studied more within schools, particularly if it leads to different types of class activity than traditional physics (discussion, creative writing, making models?)

The women identified the challenges presented by their studies, such as the need to be not only nationally mobile, but internationally mobile. This presents more problems for women than men, particularly as some of the world's best astronomical facilities are in remote areas of Australia and Africa, which presents problems for women who have young children to look after.

Are there things that could be added or removed to improve it?

In what way could the contents of this report influence the wider profession?

While Marianne has considered careers in physics, there are problems in pursuing academic careers in all disciplines at present. There is no formal recognised career structure following doctorate level, with many positions on temporary contracts. Career paths for academics in this country need urgent attention.

Signature:
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Report Evaluation Form

REPORT: Women in physics

Name of Reviewer: Logistics Consultant

Comments on the report:

In industry, it is easy to be accepted as an efficient, productive, reliable and professional individual, someone that people rely on and look towards leading the teams and to be a good boss, but are women equal? Unfortunately the answer is mostly no. Women in industry tend to have to work harder and are often under paid compared to their male counterparts.

Many women forfeit their own lives and children to become equal, others are relegated if they do not want to put career and money before their family. Either way, there is a glass ceiling, cemented by the football, drinking and golfing bonds which the male teams have outside of the office.

The pace of work differs immensely, the majority of women in senior business positions can deliver twice as much in half the time. Part time working can deliver full time results, if the hours are organised efficiently. A woman who is in control of a situation is appreciated, but not necessarily promoted.

But there are advantages to being a woman – it is often easier to get things done because you are respectful and polite and genuinely interested in people's welfare. If you work hard and deliver results you will be respected and rewarded, the path is just a bit tougher and takes longer but you can get there! You don't have to be a male, you just have to do great work, outshine the opposition, and stay true to your own personality and the results and rewards will come eventually.

Are there things that could be added or removed to improve it?

It is important to note that in every science industry, the higher you progress up the promotion ladder, your career takes you out of science and into management. While it would be outside of the scope of this report, it would be interesting to conduct a study of a science-related company and explore all of the careers within the company. It may be that many of the more senior positions are filled with graduates of business or finance related disciplines.

Signature: Supplied