The ECHO project summarized its goals, saying:

“Echo’s Women in Science and Engineering project at George Mason University documents the career experiences of women in science and engineering in recent memory. Our online survey allows women to tell about their careers in their own words, recording the experiences of women scientists and engineers permanently.

The ascent of women in science and engineering has been dramatic during the past decades. More women than ever enter undergraduate and graduate programs and pursue careers in science and engineering. Women's career experiences are still distinct, however, characterized by obstacles and various ways of discrimination.”

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Scientist A: Astronomer, PhD ‘69

Were you encouraged, as a girl, to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the nature of the encouragement / discouragement.

As a girl, I grew up on a ranch. My oldest brother was 6 years younger than I and there was much work to be done, some required mechanical training and logical problem training. I wanted to be a vet, which was greatly encouraged.

Did you receive any support from your college professors to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the type of support (or lack thereof).

In the 1950s I was frequently the only female in a class. Recognition and positive support depended on the individual professors. I was not aware that any of the students were being encouraged to look beyond the first degree,

Please describe your career experiences as a woman scientist, science educator, or scientist in training since completing your bachelor's degree. Did your work environment fully encourage you to pursue your career?

After completing a BA in Chemistry I taught Earth Science in the 8th grade in a grossly impacted Denver suburb (1959-63) and then returned to get adequate math and science to begin study for a PhD in Astrophysics. I received personal support and recognition that was a great help.

Was there a particular event or period in your career when you realized that you did not have access to the same opportunities as your male colleagues? If so, please describe. If not, please describe the experiences which have led you to feel that your career has not been hampered in this way.

After I entered graduate school in 1965 I received a lot of support. I married in my senior year and maintained that marriage through [graduate] school and went through the [trauma] of the 2 career family in 1969-73. I had no children and committed fully to my work. I found many who were willing to let me fork with them and for them on aspects that established my reputation.

Have your opportunities as a woman scientist changed over time? If so, was the change for better or worse?

My reputation as a manager became known and I have been offered opportunities that I did not explore. The older I get the more opportunities have shifted in this direction.
How important were networks of women scientists during the various stages of your education and career (e.g. grammar school, high school, college, graduate school)?

In my early career I had no network. In the past 20 years I have worked as a senior contributor, taking time and energy away from fame and fortune.

What advice would you provide to young women considering a career in science?

If you marry, marry someone [who] is not in a closely related field.

Consider the LIFESTYLE that you want and need, THEN plan you training and development plan to attain it.

When you attended college/university, did you encounter woman scientists and/or engineers whom you considered role models? Did you take any classes on the history of women in science and engineering? Did you learn about the accomplishments of women scientists/engineers?

No. No. No.

In your experience, did it seem that the demand of raising a family, either by you or by colleagues, affect the type of work that you do?

I had no children. I was aware of the huge demand that our work in Planetary Exploration put on the wives of my male associates and how little time those men had for their families.

Have you worked with a colleague or a limited amount of partners over a long time? How do you prefer to work, individually or as a team?

I have worked with many colleagues in small groups and large team situations.
Scientist B: Theoretical Physicist, Post Doc ‘86

Were you encouraged, as a girl, to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the nature of the encouragement / discouragement.

I grew up in a strange town where my mom and many of my [friends’ moms] were scientists. It was not until I left this town for college that I encountered someone who did not automatically expect that I would become a scientist.

Did you receive any support from your college professors to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the type of support (or lack thereof).

Since I was at the top of my class and had no doubts that I would become a theoretical physicist, I always assumed I had the support of my professors.

Please describe your career experiences as a woman scientist, science educator, or scientist in training since completing your bachelor’s degree. Did your work environment fully encourage you to pursue your career?

In general I’d say that the people I work with and have worked with were rather gender blind, although I think many subtle gender biases have hurt my career. For instance, I’ve never been at a working group meeting were a guy who [interrupted] to make a point was told not to interrupt, but this has happened to me several times.

Was there a particular event or period in your career when you realized that you did not have access to the same opportunities as your male colleagues? If so, please describe. If not, please describe the experiences which have led you to feel that your career has not been hampered in this way.

Again, it’s the subtle things not the blatant things, or the things you learn about years later like an individual not having given you a glowing reference when the indications were he should have - it’s the [cumulative] effect. Basically one has to be a lot more confident without the "societal expectation” that one will be [successful], especially when one encounters one of the remaining dinosaurs who actively discriminate. I find it interesting to note how a colleges reactions to me being a professional woman vary based on their [country] of origin - it reminds one how far the US has come, and also how far it has to go.

Have your opportunities as a woman scientist changed over time? If so, was the change for better or worse?
I had a dinosaur as a group leader and just got tired of fighting and started focusing on outreach.

**How important were networks of women scientists during the various stages of your education and career (e.g. grammar school, high school, college, graduate school)?**

In grad school and my current employment are the only two places I’ve really had access to a network of women scientists. I’d say when it works as a professional interaction it helps a lot, but when it becomes focused on career problems it’s almost more depressing than helpful.

**What advice would you provide to young women considering a career in science?**

Don’t let anyone tell you what you can’t do. Assume you are the best.

**When you attended college/university, did you encounter woman scientists and/or engineers whom you considered role models? Did you take any classes on the history of women in science and engineering? Did you learn about the accomplishments of women scientists/engineers?**

Despite having a mother who is a physicist and that my best friend’s mom when I was a kid was a chemist, in hindsight I don’t think I really focused on female role models - I wanted to be a theorist like my dad rather than an experimentalist like my mom. One thing I do notice in hindsight is that I always wondered why the few women in my physics classes were taking physics although I considered it "obvious" why I was taking physics classes and never really thought about why the guys in the class were taking physics.

**In your experience, did it seem that the demand of raising a family, either by you or by colleagues, affect the type of work that you do?**

I have not raised a family. As far as colleagues, I’ve seen examples where this lead to the woman basically giving up here career, but I’ve also seen examples where the woman took a more managerial path which led to her being the main wage earner. I’ve also seen a few examples where the husband gave up his professional career to be the home parent – although still atypical, I think this is becoming more acceptable. Although again in our society anything that goes against the expected norm is that much harder due to the subtle questioning and lack of expectation of success.

**Have you worked with a colleague or a limited amount of partners over a long time? How do you prefer to work, individually or as a team?**
I prefer working individually as part of a focused team, by which I mean I have an aspect that I am fully responsible for but there is well defined set of people interested in the answer and actively working on other aspects of the general problem.
**Scientist C: Astronomer, Post Doc ‘89**

Were you encouraged, as a girl, to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the nature of the encouragement / discouragement.

No. 1950's/60's for elementary and high school. Active family discouragement - very negative. Active school and social DIScouragement with one exception: My 7th/8th grade science teacher who actively ENCouraged me by encouraging me to be the lab [assistant], grade labs, etc.

Comment: The enforced isolation, therefore, I turned to a positive effect by ignoring all the negative comments (since they were almost universal) and concentrating on my studies. As a result I became a good student, although the lack of study partners was a detriment. I became a better theorist than experimentalist.

Did you receive any support from your college professors to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the type of support (or lack thereof).

No, active DIScouragement. 1960's. Again with one exception. My freshman calculus professor who wished to put me in a special advanced program. (It was not possible, but he tried) All other professors were vocal in their disapproval, including the physics professors "well, maybe you can use it to teach your kids some math." At least they let me take the courses! And since this was almost universal it was easy to ignore.

Fellow students: active dislike "I won’t have a girl for a lab partner"

Please describe your career experiences as a woman scientist, science educator, or scientist in training since completing your bachelor's degree. Did your work environment fully encourage you to pursue your career?

After B.S in physics I went to work as a woman in astronomy.

1966 - Lick Observatory - work as a research [assistant]: no [discrimination], active and full encouragement.

1970 - RPI grad student - active encouragement. Discrimination yes because I was a faculty wife and therefore unwelcome in classes as a serious student until I showed them my published journal articles, and they did a 180 change in attitude.

1974 - KPNO work as a research [assistant] in astronomy - active encouragement from everyone there.
1980 - US Navy civilian, meteorologist, oceanographer, programmer [analyst]. The LEAST discriminatory place I have ever worked and very encouraging. There were many women who mentored. There were many role models who were women and also role models who were men. FYI - the MOST discriminatory place I have worked has been the university.


1991 - NASA/Marshall - scientific programmer - mixed support, no ENcouragement


1997 - NSF - extragalactic astronomy and cosmology program officer - very supportive.

2000 - current employer - active discouragement

I became very interested in the history of women in science and technology and maintain a web site devoted to the 4,000 years of women in science and technology.

Women as well as men have contributed to all aspects of science and technology. The women with the same passion and dedication as the men. We were there at the beginning: men alongside of the women.

Was there a particular event or period in your career when you realized that you did not have access to the same opportunities as your male colleagues? If so, please describe. If not, please describe the experiences which have led you to feel that your career has not been hampered in this way.

No there was not. The social indoctrination my younger days was complete enough that a woman always accepted the blame for her failures and did not place it on gender issues.

I did not come to this realization until very, very late - about 1995 when the discrimination became obvious and easy to spot. I suspect that older women spot this easier than younger women do, although that is purely speculative.

Have your opportunities as a woman scientist changed over time? If so, was the change for better or worse?

The change for me has been for the worse. Part of that I put to age discrimination, part
to increased backlash. The younger women I feel have a better set of choices that we did 50 years ago. Part due to the -- sorry about this -- social reality that looks and age make a difference in everything we do.

**How important were networks of women scientists during the various stages of your education and career (e.g. grammar school, high school, college, graduate school)?**

They were never important in mine. They did not exist for me. They are most helpful to have, they ease one's path, but are not necessary.

**What advice would you provide to young women considering a career in science?**

(1) Ignore those who tell you not to do it.
(2) Do what YOU wish to do. It is your life and career.
(3) Take math. If you fear math then your teachers are not good ones. Math is easier than poetry. Math is aerobics for the brain just as a treadmill is exercise for the heart. One is as easy as the other. Physical practice and mental practice - they are both practice.
(4) Thinking is fun. Puzzle solving is fun.

The mystery of the universe is exciting.

**When you attended college/university, did you encounter woman scientists and/or engineers whom you considered role models? Did you take any classes on the history of women in science and engineering? Did you learn about the accomplishments of women scientists/engineers?**

Undergrad: 1960's. No scientists who were women, no mentors. I don't know what a 'woman scientist' is, any more than I know what a 'man scientist is'. A scientist who is a man or woman, yes I know what that is. I would like to see language change away from this unconscious discrimination.

In those days there were no courses in history of women in science, etc.

Grad - MS: 1970’s. Active encouragement by faculty once I was accepted into grad school, excellent support in thesis work.
Grad - PhD: 1980's Active encouragement.

No professors in science, math who were women. I did know a few women in astronomy, and was privileged to work with them.

Astronomy is rare in that it includes more of the history and more of the actual people who did the work in the classes, undergrad and grad. Astronomy has had women active
in research for a very, very long time. So it was easy to find historical role models.

**In your experience, did it seem that the demand of raising a family, either by you or by colleagues, affect the type of work that you do?**

I did not raise a family. I saw that raising a family usually is a detriment in the US. It is not a detriment in other countries to the extent it is in the US.

In the US the salary differential between a woman with and without family responsibilities still remains (NSF statistics). Many women succeed quite well. Many do not.

**Have you worked with a colleague or a limited amount of partners over a long time? How do you prefer to work, individually or as a team?**

I prefer to work with a small group, not individually. Except on a very few special projects that are done solely by me.
Scientist D: Geophysicist, Post Doc ‘96

Were you encouraged, as a girl, to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the nature of the encouragement / discouragement.

I was not encouraged nor discouraged.

Did you receive any support from your college professors to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the type of support (or lack thereof).

I attended a science only college, so I did not need any support to pursue a science career because I was already pursuing it. I did receive [encouragement] afterwards, to pursue a PhD.

Please describe your career experiences as a woman scientist, science educator, or scientist in training since completing your bachelor’s degree. Did your work environment fully encourage you to pursue your career?

After my bachelor degree I decided to switch fields, from basic physics to geophysics. I did so by enrolling in an [American] university, where I was encouraged to go for a PhD. I did it fairly fast up to when I had a baby, this and an [unsuccessful] return to our home-country caused me to slow down and eventually I finished with my PhD after 5/6 years. In all those years, even if I was one of a few women students in Geophysics at the University I was attending, I did not think much of being a "woman" in science up to the moment I had to fill up a form about my gender and ethnicity, where knowing the low percentage representing women, I felt proud to add a 1 to female-gender and a 1 to [Latina]. After getting my PhD I found a post-doc position and a year ago a staff position in the same place.

Was there a particular event or period in your career when you realized that you did not have access to the same opportunities as your male colleagues? If so, please describe. If not, please describe the experiences which have led you to feel that your career has not been hampered in this way.

I think the first time was in my post-doc/actual position place. I am not sure if because it is not Academia, but a national laboratory, with an overwhelming majority of males, or because it lacks the open-minded way of universities/colleges. It is not obvious, and not so bad that depresses me, but I think sometimes I am treated in a condescending manner. I also notice that when opinions or ideas in [scientific] topics are presented, sometimes mine are not listen to or weighted as other's are (the others are all males), like if I am invisible in some sort of way. Eventually I am heard, but it is not
straightforward. It is weird that this situation happens in groups not at individual level when then I have a no problems.

**Have your opportunities as a woman scientist changed over time? If so, was the change for better or worse?**

I notice there are many, many young women scientist coming fresh from college, well prepared and with good postures. I belong to the "in between group" so my seniors are 99% males, but I hope the distribution will change if these group does not perish. It will be so much nicer and rewarding!

**How important were networks of women scientists during the various stages of your education and career (e.g. grammar school, high school, college, graduate school)?**

My earlier years were not in America. I attended an all-girls school, may be that helped .At college, we were 50% 50%, so again I did not need to think or to ask for help for being a woman. At graduate level, in America, I did it on my own, the professors were males, but [that] were friendly enough so I did not think of reaching out for help because of my gender.

**What advice would you provide to young women considering a career in science?**

Science does not have a gender. Even if demographics show different. This depends on cultural fashions. It is changing, may be when the time comes for you, this topic of "women scientist" may not be [necessary]. Right now, at staff levels, there is a majority of men. My personal experience that may not be yours because, hopefully demographic is changing, is to deal with the images people project about themselves or how people [perceive] you, which determines to some level the success of your career and your self-esteem And this is what I learned: Do not compare yourself with others, focus on you only .In terms of gender, I think men tend to present themselves and think on themselves as so smart and so intelligent that you may think you cannot [compete]. But if you go deeper, you will be surprised to learn some of them are not as much as they think they are, it is just a posture that they may have [inherited] from other times that women did not. Do not weight your success by some of these standards, focus on what you are doing and think why you wanted to do science in the first place. Was it for adulation? Or was it because it is fun and interesting? Bet for the later and you will enjoy your choice.

**When you attended college/university, did you encounter woman scientists and/or engineers whom you considered role models? Did you take any classes on the history of women in science and engineering? Did you learn about the accomplishments of women scientists/engineers?**
It is funny, because at the time I met them (women in science) I did think them as role models. It is now I [realize] some of them were

In your experience, did it seem that the demand of raising a family, either by you or by colleagues, affect the type of work that you do?

When people talk about "raising a family" I think it varies from person to person. My "raising a family" definition means, for instance to be with my [daughter] and husband not 24 [hours], but a good 12 [hours]. Implying I will not come to work [nights] as I used when I did not have her, or to work at home after leaving work. Many scientist work 24 [hours], they live and think of science. In this later frame the "family" issue is certainly a big problem. But not for me, I do not think that not following a "100%" dedication pattern means I am jeopardizing my career.

Have you worked with a colleague or a limited amount of partners over a long time? How do you prefer to work, individually or as a team?

I would love to learn how to work as a team. But for one reason or another I think I am working individually almost 80% of my time.
Scientist E: Theoretical Physicist, PhD ‘97

Were you encouraged, as a girl, to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the nature of the encouragement / discouragement.

Yes and no. I was encouraged by my parents mostly (they both have scientific advanced degrees). I was discouraged by several high school teachers and encouraged by some of my college professors. I do have the feeling that I wouldn’t have studied physics if I hadn't been very stubborn.

Did you receive any support from your college professors to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the type of support (or lack thereof).

Yes and no again. My advisor advised me to not take physics courses that I knew I would need for graduate school, but a few other faculty members encouraged me to continue.

Please describe your career experiences as a woman scientist, science educator, or scientist in training since completing your bachelor's degree. Did your work environment fully encourage you to pursue your career?

After completing my bachelor's degree, I felt somewhat encouraged by my work environment in graduate school (or at least not discouraged enough to quit). I attribute this mostly to having a thick skin and not letting things deter me from my goals.

Was there a particular event or period in your career when you realized that you did not have access to the same opportunities as your male colleagues? If so, please describe. If not, please describe the experiences which have led you to feel that your career has not been hampered in this way.

No. There are very few women in physics so our existence was definitely noticed, which may not always be a positive thing.

Have your opportunities as a woman scientist changed over time? If so, was the change for better or worse?

I would say it has stayed about the same.

How important were networks of women scientists during the various stages of your education and career (e.g. grammar school, high school, college, graduate school)?
None existent. I only recently have several close female friends who do what I do.

**What advice would you provide to young women considering a career in science?**

Be tenacious, without changing your personality too much.

**When you attended college/university, did you encounter woman scientists and/or engineers whom you considered role models? Did you take any classes on the history of women in science and engineering? Did you learn about the accomplishments of women scientists/engineers?**

No - I found no female role models as an undergraduate or graduate student. There were only 3 women who could have served as role models (during my 10 year education), but I found it difficult to identify with any of them.

**In your experience, did it seem that the demand of raising a family, either by you or by colleagues, affect the type of work that you do?**

No. The women I knew that had families worked harder than most but turned out quality research.

**Have you worked with a colleague or a limited amount of partners over a long time? How do you prefer to work, individually or as a team?**

Yes - I enjoy working with others mostly. I am a theorist by training, which is very solitary, so I work with others whenever I get the chance!
Scientist F: Physics Teacher, Some Graduate School ‘98

Were you encouraged, as a girl, to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the nature of the encouragement / discouragement.

Yes. I come from a family of educators and engineers. In all aspects, whatever I decided to be interested in would be entirely supported by my family. When I became fascinated by physics and astronomy they found ways to encourage me and assist my desire to know more.

Did you receive any support from your college professors to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the type of support (or lack thereof).

As an undergraduate, yes. My professors would be available to assist any of us (almost any time of day). If I became discouraged I found that several of them were there to support me and help me find success again.

In grad school, absolutely not. It was a very competitive atmosphere and I found that my questions were shunned with a "you should already know this" attitude. No matter what I did successfully, all but 2 professors would find something that was incorrect.

Please describe your career experiences as a woman scientist, science educator, or scientist in training since completing your bachelor’s degree. Did your work environment fully encourage you to pursue your career?

I am now a science educator. I teach high school courses in computer science and programming, mathematics, and physical science. I found that, once I acknowledged my enjoyment of teaching that I have been able to be successful. The school at which I currently teach was the first place I ever felt entirely encouraged to be successful since being an undergraduate. This, naturally, contributes to a sense of accomplishment and a feeling that I am "where I belong".

Was there a particular event or period in your career when you realized that you did not have access to the same opportunities as your male colleagues? If so, please describe. If not, please describe the experiences which have led you to feel that your career has not been hampered in this way.

In graduate school I went to get assistance on a mathematical problem with [Schrodinger’s] equation that I had encountered. A male student and friend of mine encouraged me to do so because the professor had made the problem crystal clear to him when asked. When I arrived and asked the question the professor became upset that I would ask such a "simple" question and was wasting his time.
Have your opportunities as a woman scientist changed over time? If so, was the change for better or worse?

Yes. Because I went into high school teaching I find that more places are open to bringing me in so that I can share their "workplace" with students and they feel they can influence public education.

How important were networks of women scientists during the various stages of your education and career (e.g. grammar school, high school, college, graduate school)?

Very. My primary support has always been my family. The only time I had a network of women was as an undergrad at a woman’s college - and they were my fellow students. This was the only time I felt comfortable working with the "pure sciences". Otherwise, as a faculty member, my network is about 50/50 male/female for [colleagues].

What advice would you provide to young women considering a career in science?

Find someone who believes in you and hang on tight.

When you attended college/university, did you encounter woman scientists and/or engineers whom you considered role models? Did you take any classes on the history of women in science and engineering? Did you learn about the accomplishments of women scientists/engineers?

No. All but 1 aid and 1 professor in my entire college career of physics were male. No classes were available on history or accomplishments of women scientists/engineers.

In your experience, did it seem that the demand of raising a family, either by you or by colleagues, affect the type of work that you do?

Yes. I waited until after switching to a teaching career because I had the impression that to have children as a post-doc would [severely] hamper my chances for advancement.

Have you worked with a colleague or a limited amount of partners over a long time? How do you prefer to work, individually or as a team?

Both. Individually I work better when I already understand the material and am putting together lesson plans so that I can share the information with my students.

As a team when I am researching and discovering the how and why of a problem because I can share in so many different view points.
**Scientist G: Physicist, PhD ‘99**

**Were you encouraged, as a girl, to pursue a career in the sciences or applied sciences?** Whether you answer yes or no, please elaborate on the nature of the encouragement / discouragement.

Not really. When I investigated applying to MIT for my undergraduate degree, I was told by my school counselor that she would prefer me to apply to a place that was not so "masculine". Unfortunately, I listened to her.

**Did you receive any support from your college professors to pursue a career in the sciences or applied sciences?** Whether you answer yes or no, please elaborate on the type of support (or lack thereof).

Yes, I ended up going to an all-women liberal arts college and being the first graduate in physics. My physics professor was most encouraging and supportive.

**Please describe your career experiences as a woman scientist, science educator, or scientist in training since completing your bachelor’s degree. Did your work environment fully encourage you to pursue your career?**

Only to the extent that I have pushed it. At my first job interview after my B.S. I was told that although they had advertised for a B.S. in physics, they were looking for someone "more worldly". While working as a research associate during graduate school I was not allowed to participate in shallow water field research because "the principle investigators wives might resent women on the ship". Title 9 was passed that year, and when faced with a law suit, the policy was changed. Less than two weeks ago I was called a "pushy broad" because I was advocating a co-operative effort between my agency and a local university.

**Was there a particular event or period in your career when you realized that you did not have access to the same opportunities as your male colleagues?** If so, please describe. If not, please describe the experiences which have led you to feel that your career has not been hampered in this way.

Probably the landmark day was when I read the [inaugural] issue of Ms. magazine in 1978.

**Have your opportunities as a woman scientist changed over time?** If so, was the change for better or worse?

Opportunities have changed for the better over my 30 year career. I attribute this to the laws that have been enacted. I'm not sure that attitudes have changed very much.
How important were networks of women scientists during the various stages of your education and career (e.g. grammar school, high school, college, graduate school)?

Networks of women were not as useful to me early in my career, first because I wasn’t aware that there was such a thing and second because there weren’t very many women around in my [discipline]. They became much more important to me when I went back to [pursue] my Ph.D. 15+ years later.

What advice would you provide to young women considering a career in science?

1. In undergrad and graduate school, in your math and science courses, study and do problem sets in a mixed study group of successful men and women.

2. Never hesitate to take advantage of an opportunity or [challenge] that comes your way. It is likely that you are at least as sufficiently prepared and qualified for it as anyone else.

When you attended college/university, did you encounter woman scientists and/or engineers whom you considered role models? Did you take any classes on the history of women in science and engineering? Did you learn about the accomplishments of women scientists/engineers?

The role models that I encountered were the nuns with Ph.D.’s in the sciences that taught at the college. I received what I consider to be a mixed message by this. That is, a woman can go as far as she would like to in the sciences, but the successful ones are single.

In your experience, did it seem that the demand of raising a family, either by you or by colleagues, affect the type of work that you do?

[Absolutely]. Expectation of a quality performance as a full time employee and an involved parent is unrealistic for women OR men. Families with young children should be encouraged, not punished, for implementing flexible life styles and schedules.

Have you worked with a colleague or a limited amount of partners over a long time? How do you prefer to work, individually or as a team?

I need a mixture of both. Colleagues are necessary for a fertile exchange of ideas and experiences. But work alone is necessary for me to let ideas settle in and ferment.
Scientist H: Physicist, PhD ’99

Were you encouraged, as a girl, to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the nature of the encouragement / discouragement.

Yes, I was encouraged to pursue a career in the sciences. Both of my parents earned bachelor's degrees in chemistry. My father went on to earn a master’s and PhD in cellular biology. Later, my father made a career in food science. To me, it was natural to pursue science because I understood what a career in science could look like. I also grew up on a farm. Being around the farm I think was an encouragement toward the sciences. I was also the smartest kid in a very small rural school. That gave me a level of confidence that I probably didn't deserve, but it carried me through some tough beginnings in college.

Did you receive any support from your college professors to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the type of support (or lack thereof).

Yes, my college professors in physics and math were encouraging. I had to work very hard in their classes because I was not well prepared and was not a natural genius. They took an interest in my success, and I found myself wanting to do well to please them.

Please describe your career experiences as a woman scientist, science educator, or scientist in training since completing your bachelor's degree. Did your work environment fully encourage you to pursue your career?

I continued school and earned a PhD in physics. I am now an assistant professor of physics at a private liberal arts school. I have faced the highest level of frustration and [discrimination] in my job. I never felt so discouraged from this career in physics as I do now that I have a tenure-track job. I am hanging on for now but don't see myself doing this for the rest of my working life.

Was there a particular event or period in your career when you realized that you did not have access to the same opportunities as your male colleagues? If so, please describe. If not, please describe the experiences which have led you to feel that your career has not been hampered in this way.

I feel unfairly treated by students and colleagues in my job. I finally reached a point where I cannot be twice as good as the guys, so I might not be good enough to earn tenure. The expectations for my performance are different than for my (all) male colleagues.

Have your opportunities as a woman scientist changed over time? If so, was the change for better or worse?
I believe I have many [opportunities] that I have yet to explore.

**How important were networks of women scientists during the various stages of your education and career (e.g. grammar school, high school, college, graduate school)?**

When I could find these networks, they were invaluable. I think groups of women gathering to discuss their related careers and work is invaluable. I wish there was a national society of women physicists that [operated] like the society in Sweden.

**What advice would you provide to young women considering a career in science?**

Don't underestimate the effect that the working environment can have on your overall happiness and satisfaction in your job.

**When you attended college/university, did you encounter woman scientists and/or engineers whom you considered role models? Did you take any classes on the history of women in science and engineering? Did you learn about the accomplishments of women scientists/engineers?**

I did not know any women scientists. I wish there had been a class offered on women in science. In graduate school I took such a class. Learning about feminism was an eye-opener. As an undergrad it did not bother me to not know about the plight of women in science because I felt accepted by my peers in physics classes.

**In your experience, did it seem that the demand of raising a family, either by you or by colleagues, affect the type of work that you do?**

I am still unmarried and have no children. I realize I may be too old to bear children by the time I find a stable relationship. I do not think I would find myself in this unhappy situation if I had chosen a different career. This is a regret that I have.

**Have you worked with a colleague or a limited amount of partners over a long time? How do you prefer to work, individually or as a team?**

I prefer working as a team. I enjoyed working in a small team in graduate school. I find my current work environment unsatisfying because I am in a department of 8 individuals whose main concern is only themselves. They do not work together.
Scientist I: Astronomer, Some Graduate School ‘00

Were you encouraged, as a girl, to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the nature of the encouragement / discouragement.

Yes, mostly by teachers in elementary school and high school. (I knew at 10 that I wanted to be an astronomer) My parents weren't that impressed - they thought it would pass, like my desires to be a ballerina, a nun, etc...

Did you receive any support from your college professors to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the type of support (or lack thereof).

Yes, but by college, I was already into Astronomy. The problem was dealing with my freshman physics classes, which required a semester of Calculus I hadn't finished yet. My Calculus didn’t catch up to the Physics until the end of Sophomore year. My astro. advisor (male) pointed out that just about everybody had to take that class whether or not they’d had the Calculus and to tough it out and keep going unless I got an F. That was the only thing that kept me from dropping out of the major. I could handle the Astronomy and Calculus, I just hated the Physics. My advisor was the one who kept me going.

Please describe your career experiences as a woman scientist, science educator, or scientist in training since completing your bachelor's degree. Did your work environment fully encourage you to pursue your career?

I had a hard time with grad school - I was told grad school was the only way to continue in Astronomy (which wasn't true then and isn't true now) and was encouraged to get into a program - preferably a PhD one - at any cost.

I got into the wrong one for me. I didn’t know what to look for - no one had given me guidelines for that - and unlike undergrad, it isn’t so easy to transfer.

I left grad school, feeling an absolute failure, found that there were an abundance of jobs - especially with the Federal Government (Patents, Dept. of Energy, etc.). I landed one with the Hubble Space Telescope – something I considered amazing luck because it was planned to be the premier astronomical research facility.

I worked on helping observers put together observing programs, which involved astronomy, spacecraft engineering and software testing and operation. The only thing I knew going into it was the astronomy and how to handle a computer.

Since then, I’ve worked on a calibration team for a science instrument (more astronomy
and lots more software coding) and then moved onto testing the software that drives the data archive - all for the same project, the Hubble Space Telescope.

The environment where I work is VERY supportive of astronomy - and there are many women working there. There aren’t many women at the uppermost levels, but we’re working on that. :) Our new CIO (Chief Information Officer) is a woman.

Was there a particular event or period in your career when you realized that you did not have access to the same opportunities as your male colleagues? If so, please describe. If not, please describe the experiences which have led you to feel that your career has not been hampered in this way.

I haven’t felt hampered, myself, but I have felt frustrated that certain women were promoted and others weren’t. The ones that got promoted weren’t the ones I looked up to and respected.

I decided to be my own role model and take what good things I observed from my male bosses and synthesize them for myself.

Have your opportunities as a woman scientist changed over time? If so, was the change for better or worse?

There is more visibility to various issues over the last 10 years - I think the changes enacted have been for the [better], not just for women but for men too.

How important were networks of women scientists during the various stages of your education and career (e.g. grammar school, high school, college, graduate school)?

There weren’t any back then.

What advice would you provide to young women considering a career in science?

Do NOT give up. Find someone who will listen to you and support you emotionally (e.g. "EVERYBODY hates classical mechanics") and keep going.

When you attended college/university, did you encounter woman scientists and/or engineers whom you considered role models? Did you take any classes on the history of women in science and engineering? Did you learn about the accomplishments of women scientists/engineers?

No, unfortunately. There wasn’t anybody female & senior at the departments, until I was
a senior and there was one female grad student. There were no history of women in science classes that I knew of.

I'll tell you, though, one of my male professors told us the story of Hypatia and that made a big impression on myself and the other female undergrads. There were quite a number of us ladies; the Astronomy Dept was more balanced than the Physics Dept for undergrads. We talked about the Hypatia lecture afterwards - it seemed to hit all of us.

In your experience, did it seem that the demand of raising a family, either by you or by colleagues, affect the type of work that you do?

No, my work environment seems pretty accepting of family life.

Have you worked with a colleague or a limited amount of partners over a long time? How do you prefer to work, individually or as a team?

No, I've worked with a large variety of staff. I enjoy working with a team - it seems that that's the paradigm for accomplishing enterprise class projects in the real world.
Scientist J: Astronomer, Post Doc '02

Were you encouraged, as a girl, to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the nature of the encouragement / discouragement.

I was always encouraged to succeed in academic pursuits by both family and teachers. I did not focus on science until high school, though I always loved math and was encouraged in that area.

Did you receive any support from your college professors to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the type of support (or lack thereof).

I was enrolled as a physics major, and I had very little contact with professors outside of class. These were all lecture-based, and so there was little interaction. They were never particularly positive or negative - there was no community at all. My first [positive] encouragement was from the professor of an astronomy course I was taking as an elective. He actively encouraged me to pursue graduate studies and gave me some advice on how to prepare for graduate school. The open and friendly nature of this encounter as well as the excitement and growth in the science (something I never felt about physics) were significant factors in my decision to [choose] astronomy over physics.

Please describe your career experiences as a woman scientist, science educator, or scientist in training since completing your bachelor’s degree. Did your work environment fully encourage you to pursue your career?

As a PhD student, my only other classmate was another woman. We encouraged each other through the tough times in graduate school, and our department clearly wanted us to succeed. We had access to great opportunities and were expected to seek a career in astronomy. There were few senior women scientists, but many post-docs and research associates, and the grad student ratio was quite good (about 30%). The apparent friendliness of the program as well as the substantial numbers of women were significant reasons for me choosing astronomy over physics (I applied to both types of graduate programs).

Was there a particular event or period in your career when you realized that you did not have access to the same opportunities as your male colleagues? If so, please describe. If not, please describe the experiences which have led you to feel that your career has not been hampered in this way.

I am at the postdoc phase right now, and I cannot point to any particular events that have indicated that I would not have access to the same opportunities as my male
colleagues. I am more concerned about the next stage - finding and keeping a permanent job. At that point, I think issues of balancing family life with career will become more important. I have been personally fortunate with my own two-body situation, but I know for many this is a huge problem that takes energy away from work and can contribute significantly to dissatisfaction personally and professionally.

**Have your opportunities as a woman scientist changed over time? If so, was the change for better or worse?**

No, though I haven't been in this business for too long. There is the general perception by other young scientists that it's easier to get on a short-list or get a job if you're a woman, but I don't think the data bear this out.

**How important were networks of women scientists during the various stages of your education and career (e.g. grammar school, high school, college, graduate school)?**

Networks of women scientists have been most important to me from the end of college through to the present. I mostly count on them for encouragement/advice rather than career networking - there just aren't that many women (especially senior ones) in my subfield.

**What advice would you provide to young women considering a career in science?**

Be stubborn and be professional. I think I stuck with physics in undergrad out of sheer will once I saw I was the only woman in a couple of my classes. At that point, there was no way I was going to quit. I also always assumed that I was among the worst in my classes. When I learned I wasn't, it was a pleasant surprise. This is where networks of students are really helpful - to give you some perspective as well as support. As far as being professional, given the level of immaturity of so many “famous” senior scientists, this will serve you especially well as you develop your career.

**When you attended college/university, did you encounter woman scientists and/or engineers whom you considered role models? Did you take any classes on the history of women in science and engineering? Did you learn about the accomplishments of women scientists/engineers?**

There were very few women in senior positions, and I would consider few of them to be role models. That is, they were generally not people whom I would want to emulate. Of course, this is true of most of the male professors as well. I had much more support from a community of students I met my last year in college. One of them was a very accomplished and confident woman, and she was more of a role model than any of the professors. I never took a course in the history of women in science, but it has been a
casual interest that I have pursued independently.

In your experience, did it seem that the demand of raising a family, either by you or by colleagues, affect the type of work that you do?

I think people with families (both men and women) tend to work more efficiently than people without. Having children (as opposed to just a partner) is certainly a challenge, and I don’t see how it can’t affect your career at least in the short term. The timing of having a baby must be planned strategically and significant support from your partner is essential.

Have you worked with a colleague or a limited amount of partners over a long time? How do you prefer to work, individually or as a team?

As an observer who primarily works with space observatories, my projects tend to be collaborative. On a day-to-day basis, I tend to work independently, but I confer with colleagues regularly. I enjoy working with others, but I prefer to be in charge of my own projects. As a student, I definitely preferred working with other students on problem solving. Given the generally poor teaching in university physics departments, these student networks were essential.
Scientist K: Physicist, MS/MA date unknown

Were you encouraged, as a girl, to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the nature of the encouragement / discouragement.

No. Although in the top 10 in my class of over 650 in high school and taking an accelerated track with college placement classes, the mind set in the public school and at home was that further education was a temporary activity until marriage and babies [happened]!

Did you receive any support from your college professors to pursue a career in the sciences or applied sciences? Whether you answer yes or no, please elaborate on the type of support (or lack thereof).

There was no stated encouragement or discouragement, but an assumption that I would teach (though I was in a research [environment] as a physics major).

Please describe your career experiences as a woman scientist, science educator, or scientist in training since completing your bachelor's degree. Did your work environment fully encourage you to pursue your career?

After graduate school I taught for two years, and learned about opportunities working in industry through my husband. My husband was working at a small research lab outside of Boston, and weekends and summers I helped him out (he always seemed to have extra stuff to do!). I quickly realized that the life of an engineer or scientist was far more to my liking than that of a high school physics teacher! With my husband’s help (yes, my new boss extracted a promise from my husband to help me if I had trouble with the job) I moved to industry in 1976, starting out as an individual contributor, moving to running projects, then programs, managing departments, and so on. Today, I manage a few hundred people and a budget of more than $70M a year developing leading edge technology for the semiconductor industry.

I received NO encouragement (and actually a fair amount of discouragement) in the work environment until about 12 years ago, when I had a boss that told me that I had all the skills and knowledge to take me to the top, but that given the world we were in, I would have to do far more than anyone else (all male of course!) if I wanted to get there.

All the encouragement I have had has been from my husband, and as stubborn as I am, without his support, I might not have gotten to where I am today.

Was there a particular event or period in your career when you realized that you did not have access to the same opportunities as your male colleagues? If so, please describe. If not, please describe the experiences which have led you to feel that your career has not been hampered in this way.
I can remember a few things. I am providing dates so that you can see the trends.

Late 70’s - my husband got asked if it was ok for me to travel to a customer with some of my (male) co-workers before I even knew of the trip

Early 80’s - I got told that although qualified for a Asst Director’s job it would not happen since the guys would not be able to take direction from a woman; I was expected to understand why this was “ok” and be satisfied with helping someone else do the job rather than getting the advancement for myself

Mid 80’s - I got told that my long blond hair was not right for the image of an engineering manager, and if I was serious about my career, I would cut it (this came from the only woman executive in the company) (stubborn person that I am, I did not cut it and I continued to dress with my own style!).

Late 80’s - Accomplishments finally counted for [something], and the company awarded me the President’s Award (first time it went to a woman) and also sent me to Executive Management training (one of those condensed/partial MBA type courses done over a 6 month period).

One thing about being a woman in a "man's" field - you stand out. This can be good and it can be bad. When you are young and learning, your less than perfect accomplishments are very visible, which can intimidate someone whose confidence is a bit shaky or who is in an environment that is not supportive. You can also get more recognition, and potentially accomplish more with your successes, because you are easy to remember!

**Have your opportunities as a woman scientist changed over time? If so, was the change for better or worse?**

From looking at a few of the other responses, it looks like things have gotten better. There are certainly more women around as role models, and I have often been given the great compliment that I am one of them!

**How important were networks of women scientists during the various stages of your education and career (e.g. grammar school, high school, college, graduate school)?**

They did not play a role.

**What advice would you provide to young women considering a career in science?**

Go for it! Be sure though, that you do what makes you happy.

**When you attended college/university, did you encounter woman scientists and/or engineers whom you considered role models? Did you take any classes on the history of**
women in science and engineering? Did you learn about the accomplishments of women scientists/engineers?

I do not remember any women teaching any of the science, engineering, or math classes at the state university I attended. I certainly did not encounter any in undergraduate or graduate school.

And although I took the necessary course work to get certified to teach, I do not remember anything being offered on the history of women in science and engineering (this was the early 70s and the definition of a minority was not based on gender).

There were no role models and no one described the opportunities in terms of fields and work one could go into, and I do not know if this was done for the men, either. Not too surprising, although I got a BS and MA in Physics, the first thing I did was teach!

In your experience, did it seem that the demand of raising a family, either by you or by colleagues, affect the type of work that you do?

The path I wound up in would not have tolerated the pulls that come with raising a family. Even now, I travel >30% of the time. This is [extremely] hard on you as an individual, and I think jobs with travel require a strong support network when raising a family in order for all to be ok.

Have you worked with a colleague or a limited amount of partners over a long time? How do you prefer to work, individually or as a team?

I have worked the entire range. Today, it is hard to image myself as an individual contributor as compared to leading a group, so I guess that means that today I prefer a team.
**Scientist L: Physicist, PhD date unknown**

**Were you encouraged, as a girl, to pursue a career in the sciences or applied sciences?**
**Whether you answer yes or no, please elaborate on the nature of the encouragement / discouragement.**

Yes, once I was in high school. My math and science teachers encouraged me to compete on academic teams (quiz bowl, math team, junior engineering and technical society team, etc.). My physics teacher especially encouraged me, telling me that he thought I’d be a good physics major. That was really the first time I consciously thought about going into science, and it was some time in my junior year. My parents also supported me in whatever my interests were - building parade floats and theatrical sets, competing in quiz bowl and math contests, studying Shakespeare, taking over a room for my photo darkroom, editing the year book, teaching myself typing and German in the summer, etc. They didn't make me feel as if any of my interests were inappropriate for girls.

**Did you receive any support from your college professors to pursue a career in the sciences or applied sciences?**
**Whether you answer yes or no, please elaborate on the type of support (or lack thereof).**

Not particularly; at a large university, professors didn't seem to want to get personally involved with their undergraduate students too much. My "match" with an advisor was particularly unfortunate - he was a nice old man, but he didn't push me to explore certain areas (like computer programming and electronics) that I much later found out I really enjoyed. I think of this as a missed opportunity for me to have learned that earlier, but as it has turned out, I'm happy with where I am now, so the outcome has been good. And I have now taught both electronics and computer programming in some form to undergraduates myself!

**Please describe your career experiences as a woman scientist, science educator, or scientist in training since completing your bachelor's degree. Did your work environment fully encourage you to pursue your career?**

I went to grad school in physics immediately after my B.S. degree. I did pretty well in my classes (As and Bs), got married after the first year, and immediately became pregnant. People in the department reacted in various ways, but thanks to the leadership of the one woman in the department, who basically said, "So what? She can still keep on working even with a baby," I was able to stay in the program, complete my coursework (with occasional baby-watching help from lab-mates while I attended my last class or two), and eventually complete my Ph.D. So, while my environment didn't necessarily "fully encourage" my pursuit, key people (the professor and my fellow students) did fully encourage and support my pursuit of my career, and my husband did, too, by working nights in order to be home with our child most of the day. My child, too, has supported my career, by learning to be flexible and independent and accepting of the
idea that everyone deserves time and space to do the many different things that are
important to them.

Was there a particular event or period in your career when you realized that you did not
have access to the same opportunities as your male colleagues? If so, please describe. If not,
please describe the experiences which have led you to feel that your career has not been
hampered in this way.

Sometimes I have felt more pressured by responsibilities to my family than some of my
male peers seem to be. In a sense, then, the opportunity I to which I think I have less
access is the freedom to travel for business more, to shut out distractions, to align
priorities in a certain way. But I think that I choose to respond in the way I do because of
my priorities. I don't think I have missed opportunities because of someone else's
perception of my gender role.

Have your opportunities as a woman scientist changed over time? If so, was the change for
better or worse?

Yes, they've changed as I've moved up in my career. I had lots of uninterrupted time for
science as a grad student, much less as a new professor, and even less now that I have
more administrative responsibility with committees during the year and various
summer programs I direct each summer.

How important were networks of women scientists during the various stages of your
education and career (e.g. grammar school, high school, college, graduate school)?

I've never found networks to be important to me; I have, however, relied on strong
friendships with people at each stage, and some of those friends are women in science,
medicine, etc.

What advice would you provide to young women considering a career in science?

Find something you love doing; there's no point in spending your life on something you
don't enjoy. Work hard; building any career, from full-time mom to university
researcher, will be difficult at times. Never let anyone tell you that you shouldn't be in
science - guys who get Cs (or worse!) sometimes go on to grad school in science and
even end up contributing useful things. Remember that you're never trapped unless you
let yourself be; if something isn't right for you, don't keep at it just because you feel you
should.

When you attended college/university, did you encounter woman scientists and/or
engineers whom you considered role models? Did you take any classes on the history of
women in science and engineering? Did you learn about the accomplishments of women scientists/engineers?

Yes, I encountered some role models - grad students who graded for courses when I was an undergrad, and one faculty member in the department when I was a grad student. I did not take any courses on women in science and engineering, but I did learn through reading here and there about women’s accomplishments in astronomy (my field).

In your experience, did it seem that the demand of raising a family, either by you or by colleagues, affect the type of work that you do?

Yes - see above. I have made choices to skip conferences, decline observing opportunities, and spend less time on research in order to be present in my child’s life. I haven’t forgone any of these opportunities entirely, but I have decreased the frequency with which I’d participate in them if I weren’t spending time being a Mom.

Have you worked with a colleague or a limited amount of partners over a long time? How do you prefer to work, individually or as a team?

In grad school I was in a group of about 7 - 10 people, but my work was mostly individual (except during observing runs, when we all worked together). I think I prefer to work individually, but I enjoy talking frequently with others doing similar work (both in my research and in my teaching) about how we do things and what we find works for each of us.