

Written Testimony of

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**Hearing on "Forty Years and Counting: The Triumphs of Title IX"**

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Chairman Harkin, Ranking Member Enzi and members of the Committee, thank you for inviting me to testify at this hearing on the 40th anniversary of Title IX. This landmark civil rights law has opened doors for women and girls on and off the field, and continues to be the source of new educational opportunities. There are so many who have taken the spirit of this law to heart, including many members of Congress such as yourselves who have championed the law over the years. I would also like to thank the advocacy organizations for their important efforts to educate the public about Title IX, and to work with Congress and the Administration to ensure its fair application. I'd like to extend a special thanks to the American Association of University Women for bringing me here this week, not only for this important hearing, but also for other activities celebrating the impact of Title IX at 40. While Title IX is most associated with increasing opportunities in athletics, I want to focus on the aspect of the law that is nearest to my heart. I grew up loving science and always knew that I would go into space someday, despite the barriers I faced as an African-American woman. My parents made sure I had the educational opportunities I would need to excel in academics, even moving to Chicago when I was very young, so that I could enroll in quality schools.

I am honored to have had the opportunity to be the first woman of color in the world to have flown into space. I flew aboard the Space Shuttle *Endeavor* on STS-47, an 8-day Spacelab cooperative mission between the United States and Japan.

I felt a strong, special responsibility to fly this mission on behalf of those who had come before me and who, because of gender or race, had been denied the opportunity I was now had. And I was also aware that in many ways I was making this flight on behalf of others who would come after me . . . Others who, with hard work and determination, would be able to achieve their dreams without the barriers of prejudice and misperception.

I imagine Dr. Sally Ride felt a little like I did when, in 1983, she became the first American woman in space . . . And Dr. Kathryn Sullivan when, in 1984, she became the first American woman to walk in space.

And I like to think so did Col. Eileen Collins when she shattered barriers twice in her Space Shuttle career . . . once as the first woman pilot in the world to pilot a spacecraft in 1995 and again in 1999 as the first woman in the world to command a Space Shuttle mission.

You see, Sally, Kathy, Eileen, and I all grew up at a time when there were no women in the Astronaut Program. There were also no African-Americans or Asian-Americans.

Even as a child, I was aware of this lack of inclusiveness.

When I was growing up in the 1960's on the south side of Chicago, I remember being so excited about space exploration! I wanted to be involved!

But, there was always just one type of person in earth orbit or in Mission Control. And they did not look like me. Even though, as a country, we would proudly rally and root for the Space Program, so many of us felt as though we were left out.

When I did finally fly in space, the first thing I saw from earth orbit was Chicago, my hometown. I was working on the middeck where there aren't many windows, and as we passed over Chicago, the commander called me up to the flight deck. It was such a significant moment, because ever since I was a little girl I had always assumed I would go into space. Looking out the window of that Space Shuttle, I thought if that little girl growing up in Chicago could see her older self now, she would have a huge grin on her face.

Today, although women still represent a minority of the Astronaut Program, our Space Program is more inclusive. And, as a nation, we accept women in space as a routine occurrence.

*It was not that way before Title IX.*

### **A Short Story of Space Exploration**

Please allow me to recall for you this morning what is perhaps a forgotten chapter in the history of American Space Exploration . . . a chapter that might have been written quite differently had Title IX come into effect far earlier than it did.

The story goes something like this . . .

In 1959, an Air Force Brigadier General by the name of Donald Flickinger and a forward-thinking Harvard medical school graduate by the name of Dr. Randolph "Randy" Lovelace II began contemplating an Astronaut Program that included women. Their reasoning was scientifically practical on a number of fronts.

From an engineering perspective, it made more sense to send a woman into space. Women have lower body weight and less oxygen requirements than men. Since there were concerns about how microgravity would affect the cardiovascular system, women were known to have fewer heart attacks than men. Also, it was believed that a woman's reproductive system was less susceptible to radiation than that of a male; and preliminary data suggested that women could outperform men in enduring cramped spaces and withstanding prolonged isolation<sup>1</sup>.

An independent researcher, Dr. Lovelace had developed the tests for NASA's male astronaut selection. He now decided to pursue the "Women in Space Program (WISP)."

Dr. Lovelace began medical and physiological testing of 19 accomplished women pilots in 1960. Over 700 women pilots had applied, but no candidates with fewer than 1000 hours of flight experience were selected.<sup>2</sup> Many of the women selected for testing had more flying time experience than their male counterparts because several of them had been employed as flight instructors. The women were subjected to the same tests as were the original Mercury astronauts, with the addition of gynecological examinations.<sup>3</sup>

Of the 19 women who underwent these rigorous physical and physiological tests, 13 (or 68%) of the women passed with “no medical reservations.” In comparison, of the men who underwent the testing, 18 of the 32 men (or 56%) passed the testing.<sup>4</sup>

According to Donald Kilgore, a doctor who evaluated both men and women for space flight, “They were all extraordinary women and outstanding pilots and great candidates for what was proposed. They came out better than the men in many categories.”<sup>5</sup>

On August 19, 1960, Dr. Lovelace announced at the Space and Naval Medicine Congress in Stockholm, Sweden, “We are already in a position to say that certain qualities of the female space pilot are preferable to those of her male colleague.” He added, “There is no question but that women will eventually participate in space flight; therefore, we must have data on them comparable to what we have obtained on men.”<sup>6</sup>

However, despite the promising results, further testing was suddenly stopped. The Women in Space Program terminated in 1962.<sup>7</sup>

This is not meant to be, nor should it be construed to be, a story about, “Who is better, men or women?”

This story is really a story about how different the history of the American Space Program might have been had Title IX been in effect in the late 1950’s.

Indeed, one might argue that this is really a story about how different the course of American science, technology, engineering, medicine, environmental science, art, literature, sports . . . I could go on and on . . . would have been if Title IX had been in effect long before it was finally passed.

No, there was no Title IX in 1959 or in 1962.

Interestingly, in July of 1962, Republican representative Victor Anfuso from NY convened public hearings before a special Subcommittee of the House Committee on Science and Aeronautics to investigate the possibility of gender discrimination in astronaut selection.

These hearings were a testament to how discussions about women’s rights were more strongly emerging on the political landscape two years before the Civil Rights Act of 1964. Yet, it was a long 10 years later before Title IX declared:

*No person in the United States shall, on the basis of sex,  
be excluded from participation in, be denied the benefits of,  
or be subjected to discrimination under any education program  
or activity receiving federal financial assistance.*

And it is important to point out that Title IX offers no special advantages or benefits for women and girls. Because it is gender-neutral, Title IX actually benefits men and boys who also want equal access to all education and career options.

As a matter of fact, as a medical doctor, I can tell you that since Title IX, men have made significant gains within healthcare in several areas that have been historically dominated by women.

What Title IX specifically did for the Space Program is help create an environment in which incredibly talented, intelligent, dedicated, courageous, qualified, and success-oriented women like the Mercury 13 could no longer be arbitrarily excluded from career positions within our country's Space Program simply because they happened to be a group of people who happened to be women.

In the 1970's, when once again the subject of women in the Space Program came up, had it been up to NASA management at the time, women might not necessarily have been given the opportunity to compete in the Astronaut Selection process.

Title IX made the difference!

In 1977, NASA did announce that it was looking for qualified scientists, technicians, and pilots to compete for positions within the Astronaut Corps.

*8000 people responded.  
1000 were women.  
35 Astronaut Candidates were chosen.  
6 of them were women.*

In what perhaps was regarded as the most demanding career in science, engineering, and technology, women would now be given the opportunity to fly in space.

That opportunity did not exist before Title IX.

Indeed, the world before Title IX was dramatically different from the world after Title IX.

### **The Impact of Title IX**

Before Title IX, because of the *sanctioned* lack of educational opportunity combined with the gender stereotypes that permeated classrooms and textbooks, most girls could only see themselves as women who were full-time wives and mothers, secretaries, nurses, or teachers—portrayals that restricted the career choices.<sup>8</sup>

With Title IX, though gender stereotypes continued to exist, broader arrays of opportunities were made available. Girls were now able to think of themselves in future careers not only as full-time wives and mothers, nurses, secretaries, teachers but also as full-time scientists, doctors, engineers, and lawyers. (One might ask when we last saw terms like "full-time husbands and fathers?")

Title IX has changed the expectations women and girls have for themselves . . . the expectations and possibilities fathers now have for their daughters.

Unfortunately, today Title IX is still needed.

It is instructive to note that when children in the United States are asked to draw a picture of a scientist, overwhelmingly most draw a man in a white coat. Few draw a picture of a woman.

Just a few months ago, the Bayer Corporation released the study the “Bayer Facts of Science Education XV”, a survey of chairs of the science, technology, engineering, and mathematics (STEM) departments of our nation’s 200 top research universities.<sup>9</sup>

As an astronaut, medical doctor, chemical engineer, and Ivy League college professor, I believe the crucial story that emerges from this survey is the failure of universities, STEM departments and professors to recognize and understand the role they play in undermining or promoting women and underrepresented minority students’ success in seeking and completing STEM degrees.

By department chairs’ own account, women students arrive at college the best prepared academically of all students for STEM degree success, but graduate with STEM degrees at lower rates than their male counterparts.<sup>10</sup> And while half the chairs considered underrepresented minorities less well prepared, these chairs acknowledged that even minority students well-prepared academically for STEM success graduated at lower rates.

So clearly, there is something about the interaction and engagement of women and underrepresented minority students in college that affects these students adversely— whether it is courses that disproportionately “weed out” students, few women professors, or discouraging those who are not the stereotype of a successful STEM student.

A prior study, Bayer Facts of Science XIV, surveyed women and minority members of the American Chemical Society. These were professionals who had successfully completed degrees in chemistry and chemical engineering. Yet, more than 40% of these STEM graduates stated that they were actively discouraged from pursuing STEM fields in college by a college professor, the most commonly cited instances of active discouragement. Conversely, these individuals also noted that internships, mentoring and hands-on experiences in science throughout K-12 and college where positive influences in their choice of a STEM career.<sup>11</sup>

College STEM departments are critical chokepoints in education – that point early in students’ lives where they make important decisions about their careers.

Interestingly, my own personal academic experiences echo these studies.

### **Personal Reflections**

In my high school, I was the first and only girl to take drafting classes. But when the drafting instructor, Mr. Okelpec saw my name on the roster, he asked my homeroom teacher Mrs. Roberts if this was a joke. Yet no such question was posed when my brother signed up for the class.

Mrs. Roberts explained that I intended to pursue science and engineering and, to his credit, Mr. Okelpec made sure that I did all the kinds of machine drawings, blueprints, and designs that an engineer would expect to encounter.

While in high school, I also took advantage of a two-week program sponsored by the Junior Engineering Technical Society (JETS) at the University of Illinois at Urbana that exposed urban students to engineering. It was on that campus when I really learned about engineering and made the decision to pursue engineering in college.

I was 16 when I entered Stanford University and I was full of all of the arrogance that a 16-year old who left Chicago to go to California on her own might have. That extra dose of confidence proved critical, however, because it got me through STEM courses in which some of the professors did not seem to want me. Professors outside the sciences seemed far more welcoming to me and this enabled me to emotionally re-charge and surmount the challenges posed by the poor reception I received from my professors in STEM courses — hurdles the male students did not encounter. For the record, I value my Stanford experience and consider it the best engineering and science research university I could have attended and I am happy to have attended. I am a proud Stanford alumni. Yet, I regret to say, that I may have earned that engineering degree in spite of, rather than because of, some of my professors.

Fortunately, while I went to Stanford, I had a scholarship from Bell Laboratories that provided me intense research environments in science and engineering, as well as a host of supervisors – engineers, computer programmers, and scientists – who clearly expected me to do well.

### **The Facts of Women and STEM**

Although debunked by scientific research, stereotypes about male and female abilities in STEM persist and are seriously sabotaging women's success.

Implicit gender biases can have a major influence on a girl's or woman's decision to remain in a STEM field. Gender biases may directly or indirectly determine whether a woman is hired. Gender biases may also directly or indirectly impede the promotion rate and career advancement of female employees.<sup>12</sup>

Early on, such biases may prevent a female student from even considering an academic pursuit or career in STEM. These biases have also been shown to influence whether parents and faculty encourage a female student to pursue a career in science or engineering, or any of the other STEM disciplines.<sup>13</sup> What seems obvious has also been scientifically proven over and over again. These biases negatively affect a female student's academic performance in a STEM course.

For example, in one landmark study, girls who were made to feel inadequate performed significantly worse than their male counterparts on a challenging math test. However, girls in the control group who had not been influenced by a negative stereotype threat condition scored similarly to their male counterparts.<sup>14</sup>

Some 300 additional studies supporting this finding have been published since this precedent-setting 1999 study.<sup>15</sup> One such study (Kane and Mertz) was just published in January of this year and it further confirmed that the cultural influence of gender stereotypes and biases against women in STEM disciplines is related to gender differences in performance.<sup>16</sup>

Scientific research has not demonstrated what the stereotypes would have us believe – that there are innate differences between boys and girls when it comes to mathematical or scientific abilities. Study after study has shown that spatial reasoning abilities are not pre-ordained by gender. Instead, exercise of these abilities is influenced by social context and the degree of gender equality in a society.<sup>17</sup>

This investigation further demonstrated a strong link between the implicit gender-science stereotype of a country and the subsequent gender difference in test performance.<sup>19</sup> The study evidences that differences between male and female students' performance in math and science are caused by cultural, rather than innate or biological factors.<sup>18</sup>

By focusing on the varying percentages of participation by women in science, technology, engineering, and mathematics in different countries, the study effectively documents the impact of culture on performance.<sup>19</sup> For example, 40% of the students at the University of Puerto Rico at Mayaguez's engineering programs are women.<sup>20</sup> In Romania, 44% of researchers in engineering and technology are women. Yet, in the United States, only 11% of engineers are women.<sup>21</sup>

### **The 3 E's**

The critical importance of culture and learning environments on student abilities, interests, and performance must not be overlooked, ignored, or underestimated. The factors that I see as key to women and girls and minorities succeeding in STEM fields are, in fact, supported by the core values of Title IX.

I call those factors "the 3 E's -- Exposure, Expectation, and Experience."

For students, "Exposure" means knowing what careers in the STEM fields entail, and interacting with individuals in these various disciplines to develop a level of comfort with the fields.

"Expectation" means seeing oneself as a potential member of the discipline, recognizing that one has the right to participate in STEM courses, and that one should have expectations of success and contributions.

Students who gain "Experience" in the STEM fields will have the opportunity to compete with their talented counterparts and build the confidence necessary to meet challenges effectively.

When President Maria Klawe, Ph.D. arrived six years ago at Harvey Mudd College in Southern California, 33 percent of the student body was female, but only 10 of the computer science majors were female. She took several deliberate steps to address this problem, including making small changes to the curriculum to require more introductory classes and ease the practice of "weed out" classes. Today, 42 percent of the student body is female, and 40 percent of computer science majors are women.

Girls who grow up in an environment that cultivates their success in science and math will be more likely to develop skills and confidence, and to consider a future in STEM.

That is why the Dorothy Jemison Foundation for Excellence engages girls and boys in science through programs like our four-week residential summer camps specifically designed for middle school and secondary school students, ages 12-16. These camps successfully increase our students' science literacy, their problem-solving skills, their knowledge of the impact of science and technology on society, and their understanding of societal and environmental impact on science endeavors. Their learning occurs in an encouraging and exciting atmosphere where they are supported, while being challenged to reach

their greatest potential. Interestingly, our *The Earth We Share*<sup>TM</sup> international science camp receives far more applications from girls than boys!

Women make up over 50% of our population. Failure to seek, nurture, and develop their talent is a failure to capitalize on a great national resource. Notably, the attrition rate of women and girls from academics and careers in science, technology, engineering, and mathematics does not benefit their male counterparts.

Rather, the loss of talent and contribution by a significant segment of our population seriously endangers our nation's economic competitiveness at a time when our nation needs to take advantage of our country's intellectual resources and full capacity for innovation.

In a global marketplace increasingly driven by technology, promoting the talents and contributions of women and minorities is an essential strategy to maintain our nation's scientific vitality, economic prosperity, and national security.

To be at the forefront of technology at the international level, the United States must continue to produce technological and scientific talent capable of meeting the challenges of tomorrow regardless of the gender or race of that talent—talent that resides as much in our female and minority population as it does in the more traditionally recognized STEM populations.

And Title IX has had an impact that goes beyond numbers, because it is also about the perspectives that women bring to an issue.

For example, when I was in medical school, breast cancer was treated by mastectomy. Not only was the procedure disfiguring, but it was also based on the paradigm that an invasive surgery with significant unpleasant sequela was the primary and best we could offer. It was not until women physicians, in significant numbers, insisted there might be other medical alternatives and investigated other options. Now, there are treatment options like lumpectomy, localized radiation, anti-hormonal therapy that lead to better success.

Accompanying me today is Dr. Ronke Olabisi, a biomedical engineer who is leading breakthrough research in growing new bone precisely where and when it is needed. Dr. Olabisi is a young woman whose scientific and athletic opportunities in college were positively impacted by Title IX.

I cannot emphasize enough the importance of culture, and a positive and encouraging learning environment to students' excelling.

I never forgot those childhood feelings and experiences. The lessons I learned about the need for inclusiveness stayed with me through my life, and even today, remain enduring principles that influence my beliefs, my attitudes, my behavior, and my ideals.

For example, recently the Dorothy Jemison Foundation for Excellence won a grant by the Defense Advanced Research Projects Agency (DARPA), to assist in the creation of what DARPA described as "persistent, long-term, private sector investment" to develop the technology and capabilities for long-distance space travel.



Called the *100 Year Starship (100YSS)*, the program is an exciting leadership initiative which emphasizes the importance of “inclusion” specifically as a primary means towards the achievement of such an audacious goal. The success of the 100 Year Starship Program requires we take advantage of the full wealth of talent, insight, experience and expertise our country has to offer. Just as 100YSS works across disciplines, it is very important to me that the Program also makes space travel more accessible to the public, both as beneficiaries and as participants. The Dorothy Jemison Foundation for Excellence is very excited about the 100 Year Starship Program and, through the 100 Year Starship Program, the ideals of Title IX will be represented.

Title IX has significantly closed the gap between male and female performance in science, technology, engineering, and mathematics. But cultural biases and persistent stereotypes continue to impede the advancement of girls, women, and minorities in these fields.

The female and minority attrition rate in STEM at every level of education is still unacceptably high, and these attrition rates occur at a dangerous cost to United States competitiveness in the global marketplace.

Knute Rockne, one of college football’s greatest coaches, once said, *“Your success in the future depends on the present. Build well.”*

Our country is rich with resources of talent, intelligence, and determination. Americans have great capabilities motivated towards success and a selfless passion for personal contribution.

But America’s success in the future depends on the present. As a nation, we must build well.

We need more scientists, technologists, computer specialists, mathematicians, engineers --- bright, well educated, and highly motivated.

And if Title IX achieves its full potential, we will one day be a nation not of female engineers or black scientists, but a nation of very talented engineers, scientists, and physicists who happen to be women or black or white or male, but who are respected for our talents and capabilities . . . and our commitment to our country’s successful future.

Title IX was designed to be a strong and comprehensive measure that would attack all forms of sex discrimination in education and, in so doing, provide educational opportunities formerly closed to women and girls. While Title IX has indeed succeeded in opening doors in the classroom and on the athletic field, inequities and barriers still remain. Through good enforcement and heightened public attention to these issues, even more progress can be made – the future is bright.

As we celebrate the 40th anniversary of Title IX, the message we send to young girls is one that encourages their interest in STEM and provides opportunities for them to fully develop and explore their interest. We must help young scientists become the astronauts and professional scientists, mathematicians and engineers of the future. They deserve the chance. And our nation needs them.

Thank you very much. I look forward to your questions.

## NOTES

<sup>1</sup>Kathy L. Ryan, Donald E. Loeppsky, and Donald E. Kilgore, Jr. "A Forgotten Moment in Physiology: The Lovelace Woman in Space Program (1960-1962)," Advances in Physiology Education (September 2009), pp. 157, 159.

<sup>2</sup>"Mercury 13," Wikipedia, p.1.

<sup>3</sup>Ryan, et al., op.cit. pp. 157, 160.

<sup>4</sup>Ibid., p. 161.

<sup>5</sup>Brandon, Keim, "Right Stuff, Wrong Sex: NASA's Lost Female Astronauts," Wired News (October 6, 2009), p.1.

<sup>6</sup>Ryan, et al., op.cit., p. 160.

<sup>7</sup>"Meet the Women of Mercury 13," CBS NEWS Video, (July 15, 2009)  
According to Jerrie Cobb of the Mercury 13, "I finally got to talk with Vice President Johnson and he said, 'Jerrie, if we let you or other women into the space program, we have to let blacks in, we'd have to let Mexican-Americans in, we have to let every minority in and we just can't do it.' "

<sup>8</sup>"Learning Environment," Title IX Info , The Margaret Fund of the National Women's Law Center. (Washington, D.C: 2012).

<sup>9</sup>"STEM Education, Science Literacy and the Innovation Workforce in America: Analysis and Insights from the Bayer Facts of Science Education Surveys 1995-2011," Bayer's STEM Diversity And Higher Education Forum (Washington, DC: April 18, 2012).

<sup>10</sup>Ibid.

<sup>11</sup>"Female and Minority Chemists and Chemical Engineers Speak about Diversity and Underrepresentation in STEM," Bayer Facts of Science XIV (March 2010).

<sup>12</sup>Title IX at 40, American Association of University Women, The National Coalition for Women and Girls in Education, (2012), p. 18.

<sup>13</sup>Ibid.

<sup>14</sup>S.J. Spencer, et al. "Stereotype Threat and Women's Math Performance," Journal of Experimental Social Psychology, 35 (1), 1999.

<sup>15</sup>Title IX at 40, op.cit., p.19.

<sup>16</sup>Jonathan M. Kane and Janet E. Mertz, “Debunking Myths and Gender and Mathematics Performances,” Notices of the AMS (January 2012).

<sup>17</sup>Title IX at 40, op.cit., p.18.

<sup>18</sup>Ibid.

<sup>19</sup>Kane and Mertz.

<sup>20</sup>Catherine Pieronek, “The State of Women in Engineering,” Presentation given at the University of Notre Dame (October 12, 2011).

<sup>21</sup>Title IX at 40, op.cit., p.18.

## Bibliography

- Ackmann M. The Mercury 13: The True Story of 13 Women and the Dream of Space Flight. New York: Random House, 2003.
- Freni, P. Space for Women: A History of Women with the Right Stuff. Santa Ana, California: Seven Locks, 2002.
- "History of Title IX," Title IX Info , The Margaret Fund of the National Women's Law Center. Washington, D.C: 2012.
- Kane, Jonathan M. and Janet E. Mertz, "Debunking Myths about Gender and Mathematics Performance." Notices of the AMS, January 2012.
- Keim, Brandon. "Right Stuff, Wrong Sex: NASA's Lost Female Astronauts." Wired News. October 6, 2009.
- Maatz, Lisa. (NCWGE Chair, American Association of University Women). Title IX at 40. The National Coalition for Women and Girls in Education, 2012, pp. 1-26.
- "Meet the Women of Mercury 13." CBS News Video. July 15, 2009.
- Nosek, B.A., et al. "National Differences in Gender-Science Stereotypes Predict Sex Differences in Science and Math Achievement." Proceedings of the National Academy of Science, 106 (26), 1999, pp. 10593-97.
- Pieronek, Catherine. "The State of Women in Engineering," Presentation Given at the University of Notre Dame, October 12, 2011.
- Ryan, Kathy L., Donald E. Loeppsky, and Donald E. Kilgore, Jr. "A Forgotten Moment in Physiology: The Lovelace Woman in Space Program (1960-1962)." Advances in Physiology Education. (September 2009), 157-164.
- Spencer, S.J., et al. "Stereotype Threat and Women's Math Performance," Journal of Experimental Social Psychology, 35 (1), 1999.
- "STEM Education, Science Literacy and the Innovation Workforce in America: Analysis and Insights from the Bayer Facts of Science Education Surveys 1995-2011." Bayer's STEM Diversity And Higher Education Forum. Washington, DC: April 18, 2012.