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Women in STEM and the Laws That Enabled Diverse Innovation

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Women in STEM and the Laws That Enabled Diverse Innovation

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I. INTRODUCTION

This Article reviews select legislation at both federal and state levels since the ratification of the Nineteenth Amendment in 1920 and its influence on broadening opportunities for women to become educated and employed in the fields of science, technology, engineering, and mathematics ("STEM"). Legislation in the United States over the past one hundred years has played a significant role in increasing the participation of women in a society where they had previously been disenfranchised. From legal matters, to voting, to access to education, and equal opportunity for employment—this Article examines the relationship between legislation and opportunities for women in STEM.

Even though laws exist to ensure women are not prohibited from pursuing education or employment in any field of study, women continue to be underrepresented in STEM.[1] Thus, STEM-related fields were identified as a particular area of interest for this Article. There are many factors that may lead to this key finding, including instructor biases against girls, personal preference, encouragement, mentorship, and introduction to STEM activities at a young age.[2]

The diverse thought and innovation that women bring to the workforce have economic benefits.[3] This increases the importance of encouraging young women to pursue STEM-related fields and closing the gender gap. This Article explores research findings and shares feedback from interviews with two professional women about a number of potential solutions that may improve awareness and encourage young women to pursue careers in STEM.

II. SCIENCE, TECHNOLOGY, ENGINEERING, & MATHEMATICS

As mentioned, these STEM fields contribute significantly to America's innovation and economy.[4] However, women have been

1 *Science and Engineering Indicators 2018 Chapter 3: Science and Engineering Labor Force*, NAT'L SCI. BD. 106 (Jan. 15, 2018), http://nsf.gov/statistics/2018/nsb20181/assets/901/science-and-engineering-labor-force.pdf [http://perma.cc/3kxd-bz2r].

2 *Id.*

3 *See* CATHERINE HILL ET AL., WHY SO FEW? WOMEN IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS 2 (2010).

4 *Id.*

consistently underrepresented in STEM undergraduate degrees and careers.[5] Although women now make up over 50% of undergraduates, only about 30% graduate with a degree in a STEM-related field.[6]

There are many ways to specifically define STEM. For purposes of this Article, STEM refers to "the physical, biological, and agricultural sciences; computer and information sciences; engineering and engineering technologies; and mathematics."[7] It is also important to note the areas that are not included as STEM fields. The social and behavioral sciences, such as psychology and economics, are excluded, as are health workers, such as doctors and nurses.[8] College and university STEM faculty are included, when possible, but conversely, high school teachers in STEM subjects are excluded.[9]

Paying attention to the gender disparity in STEM fields is of particular importance. While women over the last fifty years have made impressive progress in many historically male fields—such as business, law, and medicine—these gains for women are not translating equally to careers in scientific fields.[10] As of 2015, women hold only 28% of STEM jobs.[11] Fewer women participating in STEM industries may dramatically impact America's ability to make new scientific discoveries, generate ideas, and design new technologies.[12] For example, the limited involvement of female scientists and engineers came at a great cost in the first generation of air bags.[13] "[A] predominantly male group of engineers tailored the first generation of automotive airbags to adult male bodies, resulting in avoidable deaths for women and children."[14]

The costs of exclusion of women from STEM fields is not only harmful to innovation, but to the women who are excluded as well. Women are "appreciably underrepresented" in high paying STEM fields and are, as a result, being financially hamstrung, which unnecessarily increases the impact on women because of

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5 *See* RYAN NOONAN, U.S. DEP'T OF COMMERCE, WOMEN IN STEM: 2017 UPDATE 1–2 (2017), http://files.eric.ed.gov/fulltext/ED590906.pdf [http://perma.cc/J63J-936R].

6 *Id.* at 1.

7 CATHERINE HILL ET AL., *supra* note 3, at 2.

8 *Id.*

9 *Id.*

10 *Id.*

11 *Science and Engineering Indicators 2018 Chapter 3: Science and Engineering Labor Force*, *supra* note 1.

12 *See* CATHERINE HILL ET AL., *supra* note 3, at 3.

13 *See id.*

14 *Id.*

the gender disparity.[15] Notably, the problem of women in STEM is not just in recruiting women into the field, but also in retaining them. Women are more likely than men to leave the STEM workforce.[16]

Many factors may contribute to this disparity. For example, a study on negative biases toward girls in early childhood STEM education shows that teachers underestimated the mathematical proficiencies of girls, and that the "teachers' more negative perceptions of girls' proficiency are substantially related to their future performance."[17] Other ideas have also been postulated, including the difference in choices that men and women tend to make, early exposure to STEM activities, and the availability of female role models.[18] Once women are in STEM careers, issues such as isolation, hostile work environments, ineffective feedback, and work schedule flexibility issues may cause women to leave.[19] These factors are independently explored to find possible legal solutions that would create more opportunities for women in STEM-related degree programs and careers.

Two of the most underrepresented STEM fields are engineering and computer science, where women represent only 15% and 26% of the workforce, respectively.[20] A woman from each of these fields was interviewed to examine how the laws have impacted their employment options, why they decided to pursue a STEM career, what advice they have for success in the workplace, and what they believe the future holds for women in STEM.

The interview subjects include Christine Szalai, a Systems Engineer, and Cora Carmody, who served as the Chief Information Officer ("CIO") of Fortune 500 companies. After introducing the legislation that is related to STEM, Szalai and Carmody's professional experiences will be compared to the legislation impacting women. The legislation reviewed in this Article lays a foundation for further exploration of the impact of the laws and the identification of the mechanisms that influence, motivate, and empower women to pursue careers in STEM.

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15 *Science and Engineering Indicators 2018 Chapter 1: Elementary and Secondary Mathematics and Science Education*, NAT'L SCI. BD. 26 (Jan. 15, 2018), http://nsf.gov/statistics/2018/nsb20181/assets/481/elementary-and-secondary-mathematics-and-science-education.pdf [http://perma.cc/JZ79-UYHZ].

16 Vitor Silva, *8 Statistics and Facts about Women in STEM*, BUILT BY ME (Apr. 20, 2019), http://www.builtbyme.com/statistics-facts-women-in-stem/ [http://perma.cc/5R6Q-LBCT].

17 *Science and Engineering Indicators 2018 Chapter 1: Elementary and Secondary Mathematics and Science Education*, *supra* note 15.

18 CATHERINE HILL ET AL., *supra* note 3, at 41.

19 Silva, *supra* note 16.

20 *Science and Engineering Indicators 2018 Chapter 3: Science and Engineering Labor Force*, *supra* note 1.

III. HISTORY AND IMPACT OF LEGISLATION

There is a broad consensus in literature that laws permitting equal rights and prohibiting discrimination have expanded opportunities for women to work in previously male-dominated industries. Taking a reflective look at the history of our nation's Constitution and the legislation of the past 100 years reveals the impact that these laws have had on the employment of women in STEM related industries. Although the legislation does not pertain directly to women in any particular field, it has opened doors to women in previously male-dominated industries, including STEM.

Prior to the passage of the Nineteenth Amendment, the Voting Rights Act of 1965, Title IX of the Education Amendments Act of 1972, the Equal Employment Opportunity Act of 1972, and California Senate Bill No. 826 ("S.B. 826"), women faced barriers to advancement in their careers simply because they had no voice. The passage of the Nineteenth Amendment changed that.[21] Although not specific to women's rights, the Voting Rights Act of 1965 gave a voice to women of color who were subject to disenfranchisement simply because of their race.[22] Title IX and the Equal Employment Opportunity Act of 1972 further opened doors to opportunities previously denied to women due solely to their gender.[23] S.B. 826 takes measures to provide balanced leadership on California boards of directors by ensuring mandatory gender diversity in incremental steps.[24]

A. Women's Right to Vote

In writing the U.S. Constitution, the Founding Fathers empowered a previously disenfranchised group of settlers to forge a path toward freedom in hopes of forming a more perfect union.[25] Built on grit, hard work, and persistence, the legislation that followed the signing of the U.S. Constitution has considered all aspects of civil and social freedoms, including race, color, religion, and sex. Where there has been inequality, brave Americans have pursued intellectual discussion, campaigns for equality, and justice for all.

As one of the most extraordinary feats by number, over ten million women received the equal right to participate in general elections through the ratification of the Nineteenth

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21 U.S. CONST. amend. XIX.
22 *See infra* Part III(B).
23 *See infra* Parts III(C) & III(D).
24 *See infra* Part III(E).
25 U.S. CONST. pmbl.

Amendment.[26] Much can be gleaned from the journey to this pivotal point in history. Future civil rights campaigns succeeded based on similar strategies, which are discussed in this Article.

Civil liberties for women had not been equally defined and granted following the signing of the U.S. Constitution. In 1848, the first women's rights convention was held in Seneca Falls, New York, with the purpose of discussing women's rights, as well as religious, social, and civil conditions of that time.[27] Historians mark the Seneca Falls Convention as the beginning of the women's suffrage movement.[28]

The voices of Susan B. Anthony, Lucy Stone, and Elizabeth Cady Stanton were the battle cry of the women's suffrage movement.[29] Women lobbied politicians, marched, picketed the White House, endured jail, and made speeches to inform Americans nationwide.[30] In the last words of her speech in 1916, Inez Milholland Boissevain asked of Woodrow Wilson, "Mr. President, how long must women wait for liberty?"[31]

Seventy-two years had passed from the Seneca Falls Convention to the ratification of the Nineteenth Amendment. All but one person who had been in Seneca Falls had passed away before knowing that the efforts of their nearly 500 campaigns had succeeded.[32] What began with one generation was brought into fruition by the next generation. Decade upon decade since, women have continued to pick up the gauntlet to write, promote, and vote for legislation, and this has reshaped American history and equal opportunities for women.

Change in legislation has never come all at once or without a fight. On the path to passing the Nineteenth Amendment, several state governments promoted the change by passing state-wide laws granting women the right to vote.[33] This sectoral approach was considered preferable to garner support and bring attention to

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26 AKHIL REED AMAR, AMERICA'S CONSTITUTION: A BIOGRAPHY 419 (2005).

27 Meredith Worthen, *The Women's Rights Movement and the Women of Seneca Falls*, BIOGRAPHY (June 17, 2019), http://www.biography.com/news/seneca-falls-convention-leaders [http://perma.cc/3J4J-VRV9].

28 *Id.*

29 *Lucy Stone*, NPS.GOV, http://www.nps.gov/wori/learn/historyculture/lucy-stone.htm [http://perma.cc/V74C-TCU4] (last updated Mar. 27, 2015).

30 *Women of Protest: Photographs from the Records of the National Woman's Party*, LIBR. CONGRESS, http://www.loc.gov/teachers/classroommaterials/connections/women-protest/history3.html [http://perma.cc/M8K3-29W9] (last visited Jan. 30, 2020).

31 DEBORAH KOPS, ALICE PAUL AND THE FIGHT FOR WOMEN'S RIGHTS 71 (2017).

32 WINIFRED CONKLING, VOTES FOR WOMEN! AMERICAN SUFFRAGISTS AND THE BATTLE FOR THE BALLOT 269 (2018).

33 CONST. RTS. FOUND., *How Women Won the Right to Vote*, CRF-USA.GOV, http://www.crf-usa.org/bill-of-rights-in-action/bria-20-2-a-how-women-won-the-right-to-vote [http://perma.cc/5T9E-5465] (last visited Jan. 30, 2020).

the cause until the amendment could be passed.[34] It also aided the passing of the amendment, which required ratification by three-fourths of the states.[35] This approach can be found replicated in other legislative campaigns.

The Nineteenth Amendment, granting women the right to vote,[36] did so much more than that. For the first time in American history, it gave women a serious voice in politics by the simple action of casting a vote. The Nineteenth Amendment also gave women the ability to run and hold public office because they were now, finally, legal voters.[37]

B. Voting Rights Act of 1965

It took another forty-five years before the right to vote reached all minority men and women. With the Voting Rights Act of 1965, Americans expanded and protected voting rights by prohibiting discriminatory laws and practices.[38]

When the Nineteenth Amendment was passed, it specified only that the right to vote could not be denied or abridged "on account of sex."[39] As a result, an entire group of men and women were still denied their right to vote on other grounds—typically on the basis of their race or color.[40]

The Voting Rights Act of 1965 was originally challenged as unconstitutional on the grounds that Congress had exceeded its power by attempting to regulate States' rights—specifically, South Carolina's right to implement literacy tests.[41] However, the Supreme Court, by an eight to one decision, held in the seminal case *South Carolina v. Katzenbach*, that the Voting Rights Act of 1965 was deemed constitutional because it helps accomplish the goals of the Fifteenth Amendment.[42] The Amendment states, "The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of race, color, or previous condition of servitude."[43] The Court in *Katzenbach* concluded their decision by stating, "Hopefully, millions of non-white Americans will now be

34 *Id.*

35 *Id.*

36 "[Woman Suffrage.] The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of sex. [Power to enforce amendment.] Congress shall have power to enforce this article by appropriate legislation." U.S. CONST. amend. XIX.

37 *See* Preston v. Roberts, 110 S.E. 586, 586 (1922).

38 52 U.S.C. § 10101 (2020).

39 U.S. CONST. amend. XIX.

40 52 U.S.C. § 10301 (2019).

41 *See* South Carolina v. Katzenbach, 383 U.S. 301, 323 (1966).

42 *Id.* at 337.

43 U.S. CONST. amend. XV.

able to participate for the first time on an equal basis in the government under which they live."[44]

Congress passed the Voting Rights Act of 1965 with the intent to stop racial discrimination in the voting process,[45] yet the impact was far more prescient for women. For the first time, women of color, for whom the benefits of the Nineteenth Amendment had been out of reach, were admitted to the franchise. The Voting Rights Act of 1965, which disallowed any voting prerequisite that results in a denial or abridgement of the right of any citizen of the United States to vote "on account of race [or] color,"[46] including such means as literacy tests, finally granted the right to vote to all women.

C. Title IX: Equal Access to Education

Title IX was signed by President Richard Nixon in 1972 with the purpose of prohibiting discrimination on the basis of sex in any education program or activity that is federally funded.[47]

Title IX of the Education Amendments Act of 1972 specifically states, "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 . . . ."[48]

According to the Supreme Court, this title was passed for two main purposes. In 1979, the court, in *Cannon v. University of Chicago*, stated that the purposes of Title IX are to "[f]irst, . . . avoid the use of federal resources to support discriminatory practices; second, . . . provide individual citizens effective protection against those practices."[49]

The Court in *Cannon* expanded on their explanation of the first purpose. The Court described it as a "statutory procedure," where federal financial support would be terminated to institutions that are discriminatory.[50]

The second purpose of effective protection could be achieved by the termination of federal funding to a discriminatory institution. Yet, the Court in *Cannon* noted that, in the case of an isolated incident, such as the denial of admission to an educational

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44 *Katzenbach*, 383 U.S. at 337.

45 *Id.* at 315.

46 U.S. CONST. amend. XV.

47 Uncle Sam, *Title IX and Its Benefits*, COMSWIKI, http://coweb.cc.gatech.edu/PubPolicy/693 [http://perma.cc/MH2G-9EWA] (last updated Apr. 19, 2005, 4:28 PM).

48 20 U.S.C. § 1681 (2019).

49 Cannon v. Univ. of Chi., 441 U.S. 677, 704 (1979).

50 *Id.*

program,[51] terminating all funding may be too severe and may not be the appropriate way to protect an individual.[52] This is one of the reasons the *Cannon* Court found that a private right of action for enforcement of Title IX violations was a good means of achieving effective protection.[53] Indeed, terminating all federal funding to an institution could end up doing more harm than good in the interest of preventing discriminatory practices. Thus, the Court looked to other remedies such as a private right of action.

A private right of action was not specifically identified in Title IX. To conclude that a private right of action was permitted under Title IX, the *Cannon* Court had to look at the four factors of the *Cort v. Ash* Supreme Court decision which were necessary to imply a private right of action to a criminal statute.[54] The *Cannon* Court found that all four factors had been met to allow for a private right of action in Title IX compliance cases.[55]

First, the Court needed to determine "whether the statute was enacted for the benefit of a special class of which the plaintiff is a member."[56] Second, the Court considered the legislative history to see if there was an intent to create a private right of action by the legislator.[57] Third, the Court looked to see if a private remedy "would frustrate the underlying purpose of the legislative scheme."[58] Fourth, the Court contemplated "whether implying a federal remedy is inappropriate because the subject matter involves an area basically of concern to the States."[59]

After reviewing these factors, the *Cannon* Court held, "Not only the words and history of Title IX, but also its subject matter and underlying purposes, counsel implication of a cause of action in favor of private victims of discrimination."[60] Thus, the Court paved the way for a citizen to bring a private cause of action to enforce their rights under Title IX.

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51 [A]n educational institution means any public or private preschool, elementary, or secondary school, or any institution of vocational, professional, or higher education, except that in the case of an educational institution composed of more than one school, college, or department which are administratively separate units, such term means each such school, college, or department.

20 U.S.C. § 1681(c).

52 *Cannon*, 441 U.S. at 704–05.

53 *Id.* at 705–06.

54 *Id.* at 688.

55 *Id.* at 709.

56 *Id.* at 689.

57 *Id.* at 694.

58 *Id.* at 703.

59 *Id.* at 708.

60 *Id.* at 709.

For an educational program or activity to qualify to receive federal financial assistance under Title IX, the applicants are required to give affirmative assurances under the Code of Federal Regulations.[61] This provides that the institutions must "(1) give assurances to federal granting agencies that programs and activities comply with Title IX; (2) designate at least one employee to coordinate Title IX compliance efforts; (3) establish a Title IX grievance procedure; and (4) disseminate information about Title IX nondiscrimination policy."[62]

Enforcing compliance under Title IX can be dealt with in several ways. If it is determined that discrimination has resulted in a disparate impact on the basis of sex, the Federal government may initiate administrative action.[63] The Office of Civil Rights of the Department of Education may conduct an audit, either as a result of a private complaint or on its own.[64] Once an educational institution has been given notice of a Title IX violation, it has an opportunity to come into compliance or risk suspension of its federal funding.[65]

Additionally, Title IX, by its terms, cannot be:

> [I]nterpreted to require any educational institution to grant preferential or disparate treatment to the members of one sex on account of an imbalance which may exist with respect to the total number or percentage of persons of that sex participating in or receiving the benefits of any federally supported program or activity.[66]

The Eighth Circuit, considering equity in collegiate sports programs, has interpreted this section to mean that, "although Title IX does not require proportionality, the statute does not forbid it either."[67] Therefore, if an academic institution wishes to engage in gender balancing to remedy a disparity with respect to participation or benefit of a program, they may.

Furthermore, if an institution wants to use statistical evidence to analyze if there is a gender imbalance, it may do so because Title IX goes on to further clarify:

> [T]his subsection shall not be construed to prevent the consideration in any hearing or proceeding under this title of statistical evidence

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61 34 C.F.R. § 106.4 (2019).

62 Laura Marini Davis & Victoria Geyfman, *The Business of Title IX—Using the Law to Improve Gender Equity in Undergraduate Colleges of Business*, 46 J.L. & EDUC. 163, 176 (2017) (footnotes omitted). *See also* 34 C.F.R. § 106.4.

63 *See* CONG. RES. SERV., TITLE IX AND SEXUAL HARASSMENT: PRIVATE RIGHTS OF ACTION, ADMINISTRATIVE ENFORCEMENT, AND PROPOSED REGULATIONS 19 (2019).

64 *Id.* at 20.

65 Zachary Nathan Klein, *STEMing Out Disparities: The Challenges of Applying Title IX to the Study of Sciences, Technology, Engineering, and Mathematics*, 64 RUTGERS L. REV. 895, 912 (2012).

66 20 U.S.C. § 1681(b) (2019).

67 Chalenor v. Univ. of N.D., 291 F.3d 1042, 1047 (8th Cir. 2002).

> tending to show that such an imbalance exists with respect to the participation in, or receipt of the benefits of, any such program or activity by the members of one sex.[68]

Relating specifically to athletics, the Eighth Circuit stated that the use of data in determining the "gender make-up of athletic participation is certainly relevant to a determination of whether a school is in compliance with Title IX."[69] Thus, the application of Title IX to educational programs is clear.

Nonetheless, it appears that awareness of Title IX compliance is relatively unknown in STEM fields, despite evidence of gender disparity.[70]

D. Equal Employment Opportunity Act

Furthermore, in 1972, the Equal Employment Opportunity Act was signed, which prohibited discrimination in the workplace on the basis of race, color, religion, sex, and nation of origin.[71] Again, the position of women in the workplace was advanced.

The Equal Employment Opportunity Act of 1972 as amended prevents discrimination on the basis of several things, including sex.[72] An employer failing to hire, fire, or limit employment opportunities on the basis of sex are only a few examples of discriminatory practices that are presented under the law.[73]

In more detail, the Act also prevents employment agencies from refusing or failing to refer an individual for employment on the basis of sex.[74] It prevents labor organizations from excluding, expelling, limiting, segregating, depriving labor opportunities, or "caus[ing] or attempt[ing] to cause an employer to discriminate against an individual" on the basis of sex.[75] Furthermore, the Act prevents individuals from being discriminated against regarding training programs on the basis of sex.[76] Also, the Act prohibits the use of sex as a "motivating factor for any employment practice, even though other factors also motivated the practice."[77]

Under the Equal Employment Opportunity Act, women entered the workforce and could focus on productive business work with reduced employment process difficulties and an

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68 20 U.S.C. § 1681(b).

69 *Chalenor*, 291 F.3d at 1047.

70 *See* Klein, *supra* note 65, at 913.

71 The Equal Employment Opportunity Act of 1972 also prevents discrimination on the basis of race, color, religion, or national origin. *See* 42 U.S.C. §§ 2000e–2000e-17 (2019).

72 *See id.*

73 *See id.* § 2000e-2(a).

74 *See id.* § 2000e-2(b).

75 *Id.* § 2000e-2(c).

76 *See id.* § 2000e-2(d).

77 *Id.* § 2000e-2(m).

improved workplace environment. However, the fact that women are still underrepresented in the executive office roles, and on the board of advisors for foreign and domestic corporations based in California, was a motivation for California State Senators to push for new legislation in 2018.

E. California Senate Bill No. 826

In September 2018, then Governor Jerry Brown signed into law S.B. 826, which required that, by the close of the 2019 calendar year, domestic and foreign general corporations having their "principal executive offices" in California must have at least one female director on their board.[78] By the end of the 2021 calendar year, unless the number of directors is less than four, that number must increase to two women board members.[79] For larger boards of directors (six or more seats), the Bill requires a minimum of three female directors.[80]

Citing studies that conclude publicly held companies perform better when women sit on their boards of directors, the Senate passed a resolution in 2013 urging that by December 2016 public companies increase the number of women directors on their boards, ranging from one to three depending on the size of the board.[81] Despite this, as of June 2017, among the 446 publicly traded companies indexed and headquartered in California, women held only 15.5% of seats on their boards of directors.[82] The legislature went on to cite performance studies by MSCI and Credit Suisse which found that boards with women performed better, including reported higher earnings per share, higher average return on equity, and increased price-to-book value.[83] The legislature found that a 2012 study by the University of California, Berkeley determined that companies with more women on their boards were more likely to "'create a sustainable future'" by instituting strong governance structures.[84] S.B. 826 went on to note significant economic benefits reported by the 2014 Credit Suisse study, including increased performance and return, risk aversion, and a tendency to carry less debt on average than companies with no women directors on their

78 S.B. 826 (Cal. 2018).

79 *See* CAL. CORP. CODE § 301.3(b)(2)-(3) (Deering 2019).

80 *See id.* § 301.3(b)(1).

81 *California Enacts Law Requiring Public Company Boards to Include Women*, DAVISPOLK (Oct. 1, 2018), http://www.davispolk.com/files/2018-10-01_california_enacts_law_requiring_public_company_boards_to_include_women.pdf [http://perma.cc/7KS6-LTSR].

82 *See* S.B. 826(e)(1).

83 *Id.* at 826(a).

84 *Id.* at 826(c)(3); *see also* Kellie A. McElhaney & Sanaz Mobasseri, *Women Create a Sustainable Future*, U.C. BERKELEY HAAS SCH. BUS. (Oct. 2012), http://www.ibe.org.uk/userfiles/women_create_sustainable_valueoct2012.pdf [http://perma.cc/JYT6-LK7N].

boards.[85] Despite this, the legislature cited multiple studies showing that it will take decades—as many as forty to fifty years—to achieve gender parity among directors.[86]

Because California corporations failed to achieve gender parity with the resolution passed in 2013, efforts were undertaken to enact affirmative steps to reduce the disparity on California boards. The passage of S.B. 826 authorized the Secretary of State to publish public reports of compliance on its website[87] and imposed fines beginning at a minimum of $100,000 for the violations.[88]

What is of particular interest in this case are findings in the public record that illustrate the lack of gender parity, citing that "[n]early one-half of the 75 largest IPOs from 2014 to 2016 went public with NO women on their boards."[89] Even more concerning with regard to women in STEM, is another 2017 study by 2020 Women on Boards that reported that many technology companies in California have gone public with no women on their boards, which was also referenced in the legislation.[90]

There are genuine concerns that mandating quotas can undermine equality and reduce the benefits of having women on boards of directors. The dangers to the legitimacy of a woman's role on the board was addressed by the legislature, which cited studies that illustrate that at least three women on a board of directors are needed to take full advantage of the "critical mass" often required to interact and exercise an influence on the processes of the board.[91]

Mandating a quota system runs the risk of downgrading the experience of women and their merit. So too are concerns that a quota system runs the risk of being overturned by the Supreme Court in a manner reminiscent of the *Bakke* Court decision on affirmative action in 1978.[92] And what of gender biases in the other direction—does the same hold true of men? Should there be

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85 S.B. 826(c)(5).

86 *See id.* at 826(f).

87 *See* CAL. CORP. CODE § 301.3(d) (Deering 2019).

88 *See id.* § 301.3(e).

89 S.B. 826(f)(3).

90 *See id.*

91 *See id.* at 826(g)(1)(A).

92 Regents of Univ. of Cal. v. Bakke, 438 U.S. 265, 310 (1978) ("[T]he purpose of helping certain groups whom . . . [are] . . . perceived as victims of 'societal discrimination' does not justify a classification that imposes disadvantages upon persons like respondent, who bear no responsibility for whatever harm the beneficiaries of the special admissions program are thought to have suffered. To hold otherwise would be to convert a remedy heretofore reserved for violations of legal rights into a privilege that all institutions throughout the Nation could grant at their pleasure to whatever groups are perceived as victims of societal discrimination. That is a step we have never approved.").

complete gender parity on California boards of directors? And does that lead to an "us vs. them" scenario pitting men against women in the boardroom? Since studies consistently show that women on boards result in increased profitability and more productive boards,[93] these questions should become moot, regardless of the future of the legislation.

IV. INTERVIEWS WITH STEM PROFESSIONALS

To obtain a direct perspective from prominent women in the STEM professions, two interviews were conducted. The interview subjects included Christine Szalai, a Systems Engineer with Jet Propulsion Laboratory ("JPL"), who notably was one of only two women who successfully manned the landing of the Mars InSight in November of 2018, and Cora Carmody, who has served as the CIO of Fortune 500 companies for over twenty years, including, most recently, at Jacobs Engineering Group ("Jacobs"). Both women followed their passion for math and computer programming in an era before the acronym "STEM" was coined. Rather than consciously opting for a STEM career, they did what they were good at—math and engineering—and doors opened for them because of their skills.

Early on, Szalai navigated her career with an aptitude in math and encouragement from her family of engineers. Carmody embarked on her path by virtue of recognition of her extraordinary prowess in math and the doors that those skills opened. It is interesting to note that neither of the women interviewed for this Article attribute their success in STEM fields to anything but an overwhelming passion for math and engineering. Both are trailblazers in STEM careers that have been opened to them by virtue of legislation, which was passed to, if not protect, at least enable women to participate in fields that were traditionally male. Both interviewees also encountered few women in their ranks as peers, and fewer still available to serve as their mentors. During their interviews, their shared experiences as women in engineering, mathematics, aerospace, and computer programming reflect the paucity of women in these fields. After providing more details of the journeys of these two women in STEM, the impact of legislation on their careers is discussed.

A. A Conversation with Christine Szalai

As mentioned above, Christine Szalai is a Systems Engineer at JPL and was one of only two women who worked the main console in mission control during the successful landing of Mars

93 *Id.*

InSight in November 2018.[94] In addition to her engineering responsibilities for the mission, Szalai was part of a team that was unusual because half of the core team were women. It is not possible to practice landing on Mars, so the success of the mission is extraordinary. Only two landings in the last decade have been attempted and the U.S. is one of only two nations to have successfully landed on the planet.[95]

After the successful landing of InSight, Szalai and the women on the team at JPL were featured in *Rolling Stone Magazine*,[96] one of the things of which she is most proud—not because of the fame, but because she believes that the popularity and notoriety of *Rolling Stone Magazine* will encourage young women to pursue careers in aerospace and engineering.[97] Szalai believes that her parents, particularly her father, a NASA engineer, encouraged her fascination with the mysteries of space. She stated:

> [G]rowing up in the Antelope Valley with a father who worked at NASA really got me interested in [the] technical and engineering field. We would see the space shuttle land at Edwards Air Force Base on a regular basis[;] see it get towed by my house[;] see things like SR71 or the B2 Bomber flying overhead on a regular basis. It's things like that that I think really excited me.[98]

Szalai went on to say:

> Certainly, both my parents encouraged me to pursue a technical career path, and I never felt like it was out of reach, if that is what I wanted to do. I have two brothers and both of them also are engineers, and I never felt any different. You know my dad encouraged us each; helped us each throughout school. I never felt any different than my brothers. If I wanted to go into engineering that's something I could do. I always felt like if that's what I wanted to do, I can do it.[99]

Responding to a question about female role models, Szalai said that one that stood out to her occurred when she was working at NASA Ames, her first aerospace engineering job.[100] She was influenced by a female engineer who had immigrated from Vietnam, where she was born and raised.[101] This engineer encouraged her to approach problems by thinking outside the box,

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94 *See* Shannon Stirone, *Mission to Mars, The Engineers and Scientists Uncovering the Red Planet's Secrets*, ROLLING STONE (Mar. 1, 2019), http://www.rollingstone.com/culture/culture-news/nasa-insight-mission-mars-799914/ [http://perma.cc/96W2-7Q6J].

95 *Id.*

96 *Id.*

97 Telephone Interview with Christine Szalai, Systems Engineer, JPL (Nov. 9, 2019) (transcript on file with author).

98 *Id.*

99 *Id.*

100 *Id.*

101 *Id.*

and seemed to impress Szalai, less because she was a woman, and more because of the remarkable accomplishments and personal challenges she had overcome.[102] Gender did not appear to play a role, although it is unclear whether that is because there were simply very few women working as engineers as she was coming up in her profession.[103] As for the impact of role models in general, she shared, "Role models also are key, seeing women in top leadership positions at JPL. That kind of thing."[104]

Szalai believes that role models typically occur organically, in the natural course of working together, but recalled one positive experience:

> I did have someone specifically ask me to be their mentor. It's a woman engineer, amazing woman engineer at JPL and I thought, I was very—I was very humbled and honored to be asked that question. Which I had never actually been asked that straightforward before . . . that's been a real cool experience.[105]

The act of asking someone directly can have an empowering effect. Managers can motivate employees by paying attention to talents, creating stretch assignments, and shoulder tapping staff members for new roles.[106] Szalai confirmed the role of networking, noting that in her experience at JPL, advancement was much more about technical skills and knowledge than about gender.[107]

When Szalai was asked about barriers she experienced, she stated they were focused on the challenges of work-life balance and motherhood.[108] As a new mother, she returned to work when her leave was up to find that leaving a newborn was harder than she had anticipated.[109] Having "on-site day care where I could literally walk over there throughout the day or at lunch and just see my newborn" made it much easier for her to assimilate back into her work as an engineer and as a new parent.[110] She had time to concentrate on the job at hand.[111] With advances in remote collaboration technology, such as Google Drive, Slack, and iCloud, this is less of a barrier for women today.

Now in senior management at JPL, Szalai reports that she has found that, in addition to needing exceptional technical skills, communication is one of the key things she looks for when

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102 *Id.*
103 *Id.*
104 *Id.*
105 *Id.*
106 *Id.*
107 *Id.*
108 *Id.*
109 *Id.*
110 *Id.*
111 *Id.*

hiring Systems Engineers: "Management in a technical field is sort of interesting because sometimes the smartest person isn't necessarily the best manager. There's such a key aspect of the soft skills that are required for management. So, it's got to be a combination of both technical and soft skills."[112]

She believes that people who possess soft skills, such as the ability to read subtle cues, regardless of gender, make better communicators and, thus, better managers.[113] Szalai has found that women, despite the fact that they are often not very good at self-promotion, are frequently more aware of these subtle cues.[114] Nonetheless, Szalai recognizes that positive role models are key and seeing women in top management, in critical positions, or at the helm of an organization, is encouraging to young female engineers.[115]

In terms of the future, Szalai reports some phenomena she attributes to the next generation—an impatience that seems to have less to do with gender than it does with a growing confidence in their skills and their desire to work on a dream project.[116] "I think I've seen a more generational thing right now where newer employees are very impatient, want promotions very quickly . . . move on to other things; maybe work at JPL for one to two years and then move on to Space-X or something."[117] She added, "It just feels [like more] . . . movement I guess than what I was used to. It's like you find something you love, you're there for your entire career. So, I think that it's just something I've noticed recently."[118] She clarified that she did not believe it to be gender based and reflected that she thought it was encouraging.[119]

Industry standards in allowing for flexible work options and telecommuting enhances the work/life balance for engineers, regardless of gender, and will no doubt make STEM fields more attractive to young women.[120] She is, however, quick to note that in her experience, being seen as hard working and curious is often the result of onsite exposure.[121] Legislation mandating these types of options is sparse.

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112 *Id.*
113 *Id.*
114 *Id.*
115 *Id.*
116 *Id.*
117 *Id.*
118 *Id.*
119 *Id.*
120 *Id.*
121 *Id.*

B. A Conversation with Cora Carmody

Cora Carmody is a powerful force for the advancement of women in STEM, or as she terms it, "STEAM," with the incorporation of "Arts" into the acronym.[122] From an early age, she noticed that women were underrepresented in her increasingly advanced math classes and even did a project on girls in math while still in high school.[123] Carmody found few female role models or mentors as she progressed in her career and into her role as CIO.[124]

Carmody stated that, for her, everything changed because she took calculus in college, instead of in high school.[125] She was extraordinarily proficient in mathematics and was invited to attend college during her senior year of high school.[126] She explained, "I had the opportunity to leave high school a year early and go to school in Manhattan for a year. The New School for Social Research. They had a freshman year program."[127] This program was only one year long and the students went on to finish up their degrees elsewhere.[128] Carmody went on to attend Johns Hopkins, in part because they offered her a chance to play lacrosse and field hockey, but for her the most important reason "was that they had a combined bachelors and masters in mathematics, which I thought was pretty efficient."[129] So, earning her first masters at twenty, she attributes her successful career in technology to the decision to take calculus.[130]

While serving on the women's advisory board for George Mason University in Fairfax, Carmody took note of gender differences in acquiring math and technology skills.[131] She believes in encouraging girls, particularly through the organization she founded, Technology Goddesses, which she now runs in a partnership with Girl Scouts U.S.A.[132] She believes that early exposure through programs like Technology Goddesses will grow the number of women who will be in a position to advance in STEM careers.[133] When asked why she thought there were

122 Telephone Interview with Cora Carmody, CIO, Carmody Technology (Nov. 11, 2019) (transcript on file with author).

123 *Id.*

124 *Id.*

125 *Id.*

126 *Id.*

127 *Id.*

128 *Id.*

129 *Id.*

130 *Id.*

131 *Id.*

132 *Id.*

133 *Id.*

fewer women in STEM, she was quick to point to age.[134] "You've really got to start young. If you don't, if you haven't snagged a girl or a boy's interest in math and technology by third grade it gets increasingly harder."[135] She observed that parents and teachers should start integrating technology at an early age, regardless of their child's gender.[136] When she first started Technology Goddesses, she targeted seventh through eleventh grade, but noticed that the seventh graders caught on much more quickly than their older counterparts.[137] She also noticed that girls were more likely to drop out of math than boys, even if they earned the same grades.[138] "A difference between girls and boys—and this is still true, is that . . . if a girl gets a 'C' in calculus in high school she goes, 'That's it, I can't study engineering. I can't [] major in math.' Whereas a guy will go, 'Yes! I passed!'"[139]

Regarding S.B. 826,[140] although Carmody believes the bill as a means to increase women on boards of directors will help to diversify leadership, she is skeptical of mandating quotas over talent in the long term.[141] She is a believer in the Rooney Rule.[142] The Rooney Rule is an NFL strategy originally espoused by the late former Pittsburgh Steelers owner Dan Rooney, which advocates the benefits of diversity by requiring minorities to be included in the interview process.[143]

She believes that inclusion in the interview process will help secure diversity and gender parity by endorsing a process in which applicants of minority status (including gender) are considered for positions.[144] In the immediate future, she is hopeful that the number of women serving on boards will increase due to S.B. 826.[145] For the long term, she is hedging her bets by providing technology and leadership opportunities to girls as young as six through Technology Goddesses so that bills such as S.B. 826 will be unnecessary.[146] It is in this role, as the

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134 *Id.*
135 *Id.*
136 *Id.*
137 *Id.*
138 *Id.*
139 *Id.*
140 S.B. 826, 2017–2018 Leg., Reg. Sess. (Cal. 2018).
141 *See* Carmody, *supra* note 122.
142 *Id.*
143 *See NFL expands Rooney Rule requirements to strengthen diversity*, NAT'L FOOTBALL LEAGUE (Dec. 12, 2018, 5:20 PM), http://www.nfl.com/news/story/0ap3000000999110/article/nfl-expands-rooney-rule-requirements-to-strengthen-diversity [http://perma.cc/5FJY-Y7FA].
144 Carmody, *supra* note 122.
145 *Id.*
146 *Id.*

founder and director of Technology Goddesses, that the very accomplished Carmody seems to have found her calling: providing a platform for young minds, in particular, young female minds, to grow and thrive.

It is telling that Carmody encourages volunteers at the annual camp to bring their young sons to attend as well—not necessarily as independent "campers," but as a bona fide unit all the same.[147] Though this may seem counterintuitive, Carmody sees this inclusion as natural.[148] The young men who participate are led by the next generation of aids, mostly female, who run the labs. She is showing them what leadership looks like, too. They serve as a catalyst to ending gender disparity.

It is worth mentioning that the burgeoning acceptance of "smart," "nerd," and "geek" in today's pop culture helps. In fact, both of our interviewees acknowledged this.[149] In response to a question about stereotypes of working in STEM, Szalai responded with a laugh and said:

> [T]he first one that comes to mind, is that you're a nerd and frankly I don't mind that stereotype, and I think it was just really cool when we were featured in *Rolling Stone* and those types of things. Maybe that's becoming less and less a stereotype with astronauts. But that's the first one that comes to mind. And I don't care if someone calls me a nerd. I'm actually proud of it.[150]

Likewise, Carmody, replied to the question with a chuckle:

> We're geeks, I mean we're nerds. However, the big difference between now and when I was in high school—[i]t's kind of cool to be a nerd. Now we've got Silicon Valley. And we've got billionaires formed out of nerds. So yeah, there are stereotypes, and they're stereotypes for a reason. We're geeky. I'm proud to be a geek.[151]

With Technology Goddesses, Carmody helps young girls explore their "geek," their inner "nerd."[152] More than that, Carmody allows the girls to see that they can embrace science and technology in a multitude of industries.[153] She takes the girls on "field trips" to some expected destinations like Google offices and Microsoft campuses, but more than that, she shows them that careers in technology exist everywhere.[154] She has taken them to Sony Studios to see how films are edited, to sound rooms

147 *Id.*
148 *Id.*
149 *See* Szalai, *supra* note 97; *see also* Carmody, *supra* note 122.
150 Szalai, *supra* note 97.
151 Carmody, *supra* note 122.
152 *Id.*
153 *Id.*
154 *Id.*

to watch how movie soundtracks are engineered, and lighting sets to see how scenes are shot.[155] She has taken them to the "Kids Choice Awards" with backstage passes to see how an awards show is produced.[156] She shows them that technology exists everywhere, and does so with a glee and enthusiasm that is contagious to be around. She makes herself accessible so there are no excuses.[157]

She also runs an informal group that started when her own daughter was in elementary and middle school, which she calls "Cupcakes and Coefficients."[158] It consists of tutoring sessions in which Carmody creates innovative cupcakes at her home, while her daughter and her daughter's friends come and get help with mathematical concepts.[159] An avid seamstress and quilter, she was interested in the technology behind fonts and explored sewing machines and their computer programs.[160] She expanded this with Technology Goddesses and showed them how to "bling" their camp t-shirts each year.[161] She explained the science behind the adhesive used to attach them. She brought a 3D printer in to teach them not just how to use it, but also to show them how it worked.[162] She teaches them how to connect circuit boards, and as they progress, how to become teachers and leaders. She allows the few boys at camp to stay and volunteer as they grow old enough not to have to follow their moms to camp, because as much as Carmody continues to support girls in technology, she understands innately that the future demands gender neutrality.[163]

Barriers to women in male-dominated industries still exist, yet because STEM careers typically take good care of their technical talent, with good pay and generous maternity and family leave, Carmody acknowledged that she and others often are able to afford high-quality childcare. Szalai, as a single parent, benefitted from having access to on-site childcare.[164] Both Szalai and Carmody agree that having a passion and a natural curiosity, regardless of gender, is what they look for in an applicant.[165] Neither Szalai nor Carmody see gender, in and of itself, as the ultimate factor in hiring; however, both recognize

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155 *Id.*
156 *Id.*
157 *Id.*
158 *Id.*
159 *Id.*
160 *Id.*
161 *Id.*
162 *Id.*
163 *Id.*
164 Szalai, *supra* note 97.
165 *See id.*; *see also* Carmody, *supra* note 122.

the benefit of diversification to the success of a team.[166] Both Szalai and Carmody have seen an increase in females in STEM careers and believe that gender parity, in fact, diversification of all types, lends itself to a stronger team. Providing the right to vote through the Nineteenth Amendment enabled women to advocate for the right to a gender-neutral education which, in turn, has allowed women to make inroads in male-dominated fields such as STEM.

V. INTERSECTING INTERVIEWEE EXPERIENCES, STEM RESEARCH, AND LEGISLATION

The interviews of Szalai and Carmody revealed some common threads when comparing the legislation and STEM research to their personal and professional experiences. Neither interviewee was witness to the enactment of most laws mentioned in this Article; however, they recognized that they have benefited from the efforts of those that advocated for change throughout the past 100 years of legislation.[167] As a result of increased access to education and equal employment through the implementation of these laws, these women, in particular, have become leaders in STEM and work to inspire young women to consider the same career path.

As mentioned previously, encouragement at a young age can play a significant role in whether more women will enter STEM fields:

> [W]hen teachers and parents tell girls that their intelligence can expand with experience and learning, girls do better on math tests and are more likely to say they want to continue to study math in the future. That is, believing in the potential for intellectual growth, in and of itself, improves outcomes. This is true for all students, but it is particularly helpful for girls in mathematics, where negative stereotypes persist about their abilities. By creating a "growth mindset" environment, teachers and parents can encourage girls' achievement and interest in math and science.[168]

Research on societal beliefs about girls and their perceived competence in science and math illustrates the importance of capturing the interest of girls at an early age.[169]

> Most people associate science and math fields with "male" and humanities and arts fields with "female," according to research examined in this report. Implicit bias is common, even among

166 *See* Szalai, *supra* note 97; *see also* Carmody, *supra* note 122.
167 *See* Szalai, *supra* note 97; *see also* Carmody, *supra* note 122.
168 CATHERINE HILL ET AL., *supra* note 3, at xiv.
169 *Id.*

> individuals who actively reject these stereotypes. This bias not only affects individuals' attitudes toward others but may also influence girls' and women's likelihood of cultivating their own interest in math and science.[170]

It highlights how other factors, such as implicit bias, can actually alter girls' test performances.[171] When eliminating bias, gender differences disappear:

> Research profiled in this report shows that negative stereotypes about girls' abilities in math can indeed measurably lower girls' test performance. Researchers also believe that stereotypes can lower girls' aspirations for science and engineering careers over time. When test administrators tell students that girls and boys are equally capable in math, however, the difference in performance essentially disappears, illustrating that changes in the learning environment can improve girls' achievement in math.[172]

Increasing awareness of the power of implicit bias can change the attraction of girls to the STEM subjects and lead to an increase in women entering STEM fields.[173]

Szalai and Carmody did not have negative mindsets or associations with STEM because, as youths, they discovered that they were interested in STEM, enjoyed STEM activities, and felt encouraged to succeed.[174] Overall, they have had a positive mindset about the possibilities of working in STEM and were shoulder tapped to take on leadership positions when they demonstrated their skills at work.[175] They grew more confident to take on new roles and work in STEM over time as they developed their abilities.[176] The experiences of both Szalai and Carmody demonstrate how powerful eliminating these inhibiting forces can be. Szalai expressed how she was encouraged in her youth by her father and her exposure to the space program.[177] She shared, "[O]f course, having a dad that worked at NASA also very much I think got me headed in that direction."[178] Szalai's experience illustrates how early STEM exposure and educational opportunities can influence a career in STEM. Szalai also had the encouragement of her family and role models to pursue her dreams.[179] Capturing her interest before she was affected by societal beliefs or implicit bias seemingly inoculated her against them.

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170 *Id.* at xvi.
171 *Id.*
172 *Id.* at xiv–xv.
173 *Id.*
174 *See* Szalai, *supra* note 97; *see also* Carmody, *supra* note 122.
175 *See* Szalai, *supra* note 97; *see also* Carmody, *supra* note 122.
176 *See* Szalai, *supra* note 97; *see also* Carmody, *supra* note 122.
177 Szalai, *supra* note 97.
178 *Id.*
179 *Id.*

Carmody too experienced the impact of her extraordinary skills in mathematics as a youth.[180] Her invitation to attend college when she would have still been in high school shifted her interest.[181]

> It was pretty much by accident. In high school I was good at math, but I loved history. And if I had stayed in high school, I would have gotten around to calculus in twelfth grade, but I got the opportunity to go to college a year early and took calculus there and then that changed everything.[182]

Once bitten by the technology bug, she pressed on, fueled by her interest and encouraged by her success.[183] Indeed, Carmody's foray into technology happened by accident as well, as she was hired by PRC Litton to be a programmer because of her advanced degree in mathematics—not because of her interest in computer programming.[184] "I started being a programmer without having ever touched a computer and took to it like a fish to water. I taught myself Assembler because they didn't send anybody to classes anymore because the people who took it got better jobs elsewhere."[185] Nobody got in the way of her confidence in her ability, which was strengthened in her youth and fueled by competence and passion.[186]

The role of mentors can have a profound effect on women and their achievement in STEM fields.[187] As illustrated by both Szalai and Carmody, in addition to a positive mindset about the possibilities of working in STEM from an early age, they benefited from recognition from others.[188] Both were encouraged to shoulder new roles and responsibilities they had not contemplated for themselves.[189] In Szalai's case, encouragement from her colleagues prompted her to apply for a position she might not have considered. "I probably lacked some self-confidence and thought you know I wasn't qualified for the supervisor position. But there were certain people who I respected very highly that said absolutely you are qualified, and you can do it. And that's why I applied."[190] Carmody too, experienced this. She explained,

> [I]n one of my performance reviews at space station my manager said: Hey look, you've got to learn how to say no to some of it. And then a couple of months later, I had this opportunity to lead this quality

180 *See* Carmody, *supra* note 122.
181 *Id.*
182 *Id.*
183 *Id.*
184 *Id.*
185 *Id.*
186 *Id.*
187 *See* Szalai, *supra* note 97; *see also* Carmody, *supra* note 122.
188 *See* Szalai, *supra* note 97; *see also* Carmody, *supra* note 122.
189 *See* Szalai, *supra* note 97; *see also* Carmody, *supra* note 122.
190 Szalai, *supra* note 97.

> improvement team and I said no two or three times. Finally, I said okay I will get the program started, but you've got to do it on your own. And he pulled me aside and said: Now is not the time to say no.[191]

This shoulder tapping to take on leadership positions when they demonstrated their skills at work helped propel them to their current status.[192] They grew more confident to take on new roles and work, and in turn, developed their abilities and increased their visibility.[193]

Despite the paucity of women in her field, Szalai credits her achievements not with the protections of Title IX, but with the accolades she received for her academic achievements, positive encouragement from her father, and the female mentor and role model she had at her first job with NASA Ames, who encouraged her to think outside the box.[194] Szalai was often the only woman in some of her engineering classes at UCLA, bearing the burden of trailblazing simply because she was good at what she did and was passionate about space exploration.[195] Recounting an interaction with a professor during college, Szalai recalls him commenting that she must have been reading a *Good Housekeeping* magazine over the weekend.[196] Rather than take offense at the sexist nature of the remark, she simply thought he was being rude.[197] It was not until later when he apologized that she realized it was related to her gender.[198] Even then, Szalai did not consider her sex to be a barrier, she simply thought she had to work hard just like everyone else.[199]

Carmody recalled a similar incident during the time she was working on the Space Station as a Systems Engineer at PRC Litton.[200] The Chief Systems Engineer on the contract remarked, as they were leaving a meeting, that she had been the only woman with seventeen men and asked her, "How did that feel?"[201] She answered, "I didn't notice," but what she left unsaid was, "So why did you?"[202] Her response was not based on a belief that she was different because she was a woman in a male-dominated industry, rather, incredulity that her gender

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191 Carmody, *supra* note 122.
192 *See* Szalai, *supra* note 97; *see also* Carmody, *supra* note 122.
193 *See* Szalai, *supra* note 97; *see also* Carmody, *supra* note 122.
194 *See* Szalai, *supra* note 97.
195 *Id.*
196 *Id.*
197 *Id.*
198 *Id.*
199 *Id.*
200 *See* Carmody, *supra* note 122.
201 *Id.*
202 *Id.*

should make a difference to anyone.[203] She had utter confidence in her own skills and value and seemed baffled that one might attribute that to her gender.[204]

Overcoming bias in the workplace has a dual benefit: not only does the increased diversity increase ideas and innovation, it also encourages females to stay in the field longer.[205] Keeping females in the field longer increases the number of positive female role models, who in turn increase acceptance.[206] As noted in one study:

> [C]olleges and universities can attract more female science and engineering faculty if they improve departmental culture to promote the integration of female faculty. Research described in this report provides evidence that women are less satisfied with the academic workplace and more likely to leave it earlier in their careers than their male counterparts are. College and university administrators can recruit and retain more women by implementing mentoring programs and effective work-life policies for all faculty members.[207]

Only in the past twenty to thirty years have new technologies, such as computers, search engines, social media, and iPhones, drawn increased attention to employment opportunities in STEM. The previous stereotype of "nerds" is diminishing.[208]

In the next few decades, it is hoped that the United States may begin to see more women working in STEM as they graduate school and earn the necessary experience as a result of these youth programs.[209] It took Szalai about fifteen years to obtain her manager position,[210] and it took Carmody about sixteen years to become CIO.[211] The time to mature or choose to take a leadership position varies based on each person's individual path. What is clear is that it may take a few decades before someone develops the necessary skills and experience to reach the level of management Carmody reached. It is only a matter of time before the influence of twenty-first century technologies produce more women in positions of leadership within STEM. The equation is fairly simple: the higher percentage of women who choose STEM in youth, the higher the production of women leaders in STEM decades later.

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203 *Id.*

204 *Id.*

205 CATHERINE HILL ET AL., *supra* note 3, at xv.

206 *Id.*

207 *Id.*

208 Szalai, *supra* note 97.

209 GENERATION STEM: WHAT GIRLS SAY ABOUT SCIENCE, TECHNOLOGY, ENGINEERING, AND MATH, GIRL SCOUT RESEARCH INSTITUTE 2, 4, 34 (2012), http://www.girlscouts.org/join/educators/generation_stem_full_report.pdf [http://perma.cc/5HA9-F4Z9].

210 Szalai, *supra* note 97.

211 Carmody, *supra* note 122.

On a positive note, these interviews and research reveal that if someone has the personal drive and ambition, they can succeed in STEM. The objective of mentors and professionals in STEM are to support youth programs that encourage and inspire both genders to consider a future profession in STEM. Gender parity in youth programs will hopefully lead to gender parity in the STEM professions, thus, creating diversity of ideas, which may increase economic growth.

As for the future of women in STEM careers, both Szalai and Carmody are remarkably gender neutral.[212] They value the achievements, qualifications, and temperament of potential team members over gender distinctions.[213] Nonetheless, both Szalai and Carmody take the effort and commitment to promote women in their field: Szalai, by participating in women's groups through JPL, and Carmody, by bringing awareness and skills to the next generation by introducing them to STEM through youth programs.[214] Many youths are unaware that, with the rise of new technologies in Silicon Valley and globally, there are a variety of non-traditional employment opportunities in STEM.[215] Through these efforts, awareness, and the influence of new technology, both interviewees are confident that there will be more gender parity in STEM fields in the future.[216]

VI. CONCLUSION

The efforts of litigation and the ratification of the Nineteenth Amendment, along with progressive laws that came after it, have opened opportunities for women to pursue careers.[217] The pursuit should now focus on maintaining these freedoms and creating opportunities for youth to equally experiment and become confident in STEM. In regard to maintaining the equal rights that have been obtained, much can be learned from the strategies and methods used to establish them.

Girls are growing up in a different time—a time of advanced technology, new innovations, increased methods of communication,

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212 *See* Szalai, *supra* note 97; *see also* Carmody, *supra* note 122.

213 *See* Szalai, *supra* note 97; *see also* Carmody, *supra* note 122.

214 *See* Szalai, *supra* note 97; *see also* Carmody, *supra* note 122.

215 *Panel: Women in STEM and Non-Traditional Occupations Careers—Barriers and Successful Strategies*, EDCHOICE (Nov. 10, 2018), http://appam.confex.com/appam/2018/webprogram/Session10912.html [http://perma.cc/H3NG-UJZQ].

216 *See* Szalai, *supra* note 97; *see also* Carmody, *supra* note 122.

217 Heidi Williamson, *Women's Equality Day: Celebrating the 19th Amendment's Impact on Reproductive Health and Rights*, CENTER FOR AM. PROGRESS (Aug. 26, 2013, 4:41 PM), http://www.americanprogress.org/issues/women/news/2013/08/26/72988/womens-equality-day-celebrating-the-19th-amendments-impact-on-reproductive-health-and-rights/ [http://perma.cc/BYU7-P46T].

and equal access to education.[218] This could influence more girls to take a path toward STEM. However, it is a path of choice. This year more women own their own businesses than ever before.[219] Likewise, it may only be a matter of time before more women choose STEM occupations and decide to serve as executives in companies.

There is an increased cultural acceptance by parents, mentors, teachers, and managers to encourage young women to consider careers in STEM, to follow their passions in these fields, and to accept leadership positions in STEM-related careers.[220] Non-profit organizations, such as Technology Goddesses in Southern California, hope to increase the number of women in STEM-related fields through interactive youth programs that inform girls of the opportunities to pursue careers in STEM-related fields.[221] Encouraging activities and promoting possibilities in our youth has been shown to increase positive associations with scientific pursuits.[222] New legislation, such as S.B. 826, and NASA's mission to have the first woman on the moon, will likely increase the number of women who are role models in STEM. In turn, women in highly esteemed positions are role models and demonstrate possible achievements in STEM to the next generation. Although it may take a few decades to see the results, the efforts being undertaken today will likely serve as a catalyst for increasing gender parity in STEM fields in the near future.

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218 GENERATION STEM: WHAT GIRLS SAY ABOUT SCIENCE, TECHNOLOGY, ENGINEERING, AND MATH, *supra* note 209.

219 AMERICAN EXPRESS, THE 2019 STATE OF WOMEN-OWNED BUSINESSES REPORT 3 (2019), http://about.americanexpress.com/sites/americanexpress.newshq.businesswire.com/files/doc_library/file/2019-state-of-women-owned-businesses-report.pdf [http://perma.cc/EEU9-9BP5].

220 CATHERINE HILL ET AL., *supra* note 3, at xiv–xvi.

221 *See* Carmody, *supra* note 122.

222 Rep. Marcia L. Fudge, *Early Exposure to STEM Education Benefits Children, Economy*, HILL (Apr. 12, 2013, 5:00 PM), http://thehill.com/blogs/congress-blog/education/293569-early-exposure-to-stem-education-benefits-children-economy [http://perma.cc/JM9R-YE2M].