WHITE PAPER

Women In STEM Workforce 2023 Index

Rising Above the Headwinds

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By Neveen Awad, Adriana Dahik, Jason Jager, Natalie Scibilia, Ian Coley, Dina Kobeissi, and Michelle Munguia

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Athena is on a **mission to advance 1 million women leading in STEM, by 2030.** This biennial report **illustrates the state of the US and San Diego STEM workforce, the work that lies ahead to close the gender gap, and the corporate intervention strategies necessary to reap the business rewards of gender diversity.**

Women's representation in the STEM workforce realized only minimal gains throughout the pandemic, as the pace of positive change was stymied, including the following:

- **Women comprise 25% of the US STEM workforce,** unchanged since Athena's 2020 Index
- Women represent **44% of life & physical science jobs, 26% of computer & mathematical science jobs, and 15% of engineering jobs**
- Women make up < 20% in the **executive & C-suite levels**
- Women's pay gap decreased to 15%

There are two major tipping points for women's career journeys that must be addressed in order to increase sustained representation:

- **Women are not sufficiently elevated to senior & executive levels.** Those at the mid-career level attribute four top roadblocks to advancement, including **1) lack of a clear upward mobility path, 2) inability to advance without business education backgrounds, 3) limited upskilling opportunities,** and **4) challenges leveraging their networks**. Key policy interventions and employee initiatives to combat these roadblocks involve the following:
    - Formal, consistent male allyship, sponsorship, and mentorship programs to advocate for and support women across their career progression
    - "Segment of one" career planning that considers women's skills & experiences in promotion decisions, beyond formal education
    - Participation in industry organizations and business leagues that offer women's leadership development and upskilling programs, male allyship, and peer-to-peer networking and career support
    - Continued flexible workplace policies providing women with greater opportunity to work and manage personal responsibilities, including providing family care
- **Women earn 38% of STEM bachelor's degrees,** yet only 40% of these graduates enter the STEM workforce. The lack of visibility and exploration into STEM jobs that align with the interests developed in college, coupled with inflexible work environments, is prompting an exodus to other industries. Nurturing this talent pipeline will require that companies offer STEM career programs, including campus events and inclusive internships, at a younger age.

Engaging in the DEI journey and advancing women is a business imperative that's driving innovation and unlocking market performance, while those clinging to the status quo experience excessive costs associated with failure to retain and recruit diverse talent. Business leaders and boardrooms are accountable for implementing data-driven workforce solutions that advance women in leadership and drive companies' competitiveness, shareholder value, risk management, and brand reputation. **Are you ready to modernize your workforce?**

Context & Objectives

Athena is a women's global advocacy organization that fast-tracks women in STEM through its leadership development, mentoring, and advocacy initiatives. By transforming more scientists and technologists into corporate leaders, the goal is to advance 1 million women leading in STEM by 2030.

As Athena marks its 25th anniversary, honoring the companies and women that continually push for the **exploration of new ways of thinking** with advocacy and evidence, we drive awareness of these inequities and **enrich women's leadership opportunities that ultimately produce greater innovation.**

Athena advocates for a more equitable state of the STEM workforce by identifying actionable steps to advance women. This year, Athena and its partners at Boston Consulting Group are capturing the state of women in the workforce, highlighting drivers of macro trends, and defining evidence-based best practices both to support more companies modernizing their workforce and for STEM women eager to accelerate their career progression.

Methodology

This index leverages both quantitative and qualitative data sources for analyses and validation.

Large data sets sourced from the American Community Survey, Integrated Public Use Microdata Series (IPUMS), Integrated Post-secondary Education Data System (IPEDS), National Science Foundation (NSF), and National Center for Science and Engineering Statistics were used to complete quantitative analyses.

In addition to public data, BCG conducted its own surveys to validate hypotheses developed from larger public data sets and primary interviews. BCG's proprietary Diversity and Inclusion Assessment for Leadership (DIAL) data was analyzed from 1,200+ respondents (789 men and 476 women) in the STEM workforce; an incremental survey garnered 274 responses (78 men and 196 women) to further validate perspectives shared in interviews and obtained in desk research.

Quantitative analyses were augmented with desk research, incorporating reports from professional societies and other women's organizations in the STEM industry, with Coqual, Hiedrick & Struggles, Gallup, Massachusetts Institute of Technology, the National Center for Science and Engineering Statistics, Pew Research Center, the Society for Human Resource Management, and Yale Scientific all synthesized for broad STEM trends.

These findings are further triangulated through interviews with women with STEM degrees both in and out of the STEM workforce, supplemented by interviews with DEI expert leadership. We conducted 30 interviews, approximately half with mid-career and half with senior women, and three focus groups to pressure test the headwinds, tailwinds, and best practices that are well-supported by quantitative analysis and the breadth of published literature.

Definitions

STEM stands for Science, Technology, Engineering, and Mathematics. It was popularized in the early 2000s and evolved from the National Science Foundations' original term "SMET." The classification of occupations or fields of study that fall into STEM has varied over the years, particularly when linked directly to government programs or funding sources focused specifically on STEM education or advancement.

This Index, however, focuses on STEM in a narrower sense, only including industries and disciplines that closely fit the acronym "STEM" and excludes healthcare. Specifically, they fit into the following three broad categories:

- **Computer and mathematical sciences,** including programming, hardware engineering, mathematics, statistics, and actuarial sciences
- **Engineering,** including aerospace, civil, mechanical, and electrical engineering
- **Life and physical sciences,** including biology, chemistry, neuroscience, and physics

Both a precise list of major fields of study aligned with the Classification of Instructional Programs taxonomy from the National Center for Education Statistics (NCES) and a list of STEM occupations aligned with the Standard Occupational Classification developed by the Bureau of Labor Statistics are available in the appendices. Our list of majors and occupations aligns with STEM classifications published by NSF and NCES. The latest NSF report on "The STEM Labor Force of Today," published in August 2021 using data from 2019, takes a broader look at the skilled technical workforce and science- and engineering-adjacent careers, including those not requiring a bachelor-level education.

Additionally, we define a few key phases in the **STEM career journey** referenced throughout this report as follows:

- After graduating from college, a STEM candidate can establish herself in the workforce by taking an **entry-level** position. Typical job titles at this stage are research associate, bench scientist, or junior engineer. Alternatively, she may pursue an **advanced degree** (Master's or Doctoral) and enter the workforce at the next stage.
- The next phase is **mid-career,** comprising more senior individual contributors and junior managers. Job titles at this stage include senior engineer and scientist for individual contributors and project manager and project scientist for the managerial track. Workers with a doctoral degree usually enter the workforce at this stage. This is also where we begin to see differentiation between technical and managerial roles and workers making the switch from the former to the latter for a variety of reasons.
- The third and fourth phases are **senior** and **executive/C-suite,** respectively, which are almost entirely managerial positions. Except in the largest organizations, there are very few senior technical roles (principal or distinguished engineer), and perhaps one or two technical roles in the C-suite (chief science officer or chief medical officer). Many workers in these roles may not even have a scientific background, instead bringing a more general managerial skill set to a STEM company.

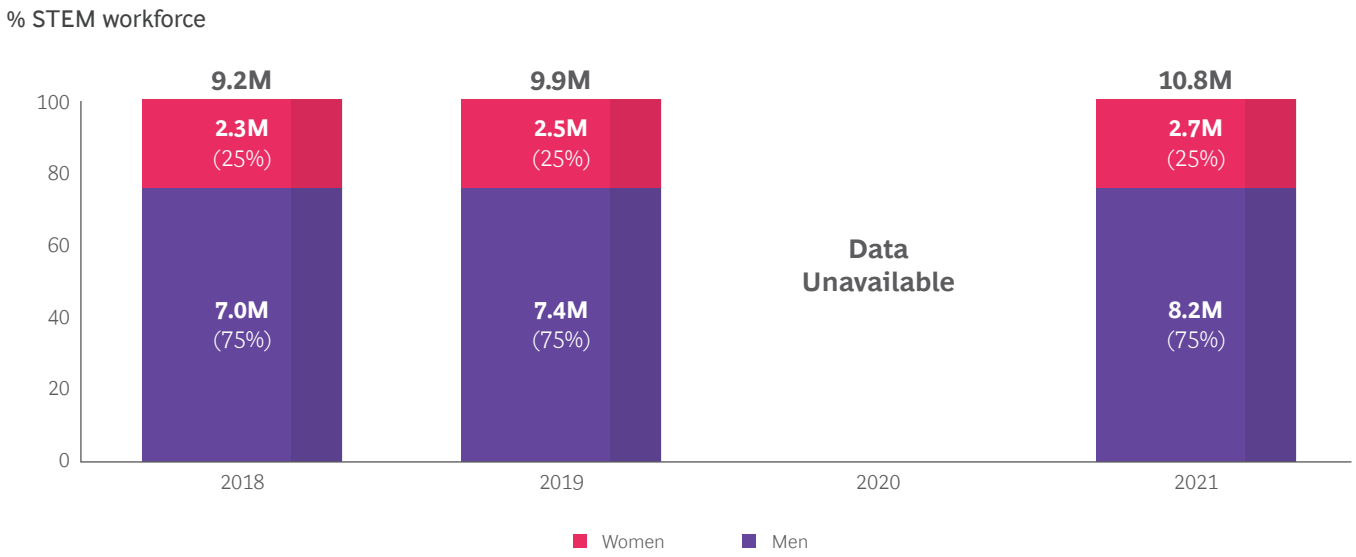
STEM Workforce Trends

It is widely known that women lag behind men in STEM studies and careers, with research showing women's representation significantly diminishing across their career journeys—a major miss by corporations that stand to benefit (financially and operationally) from diversity in leadership.

Women comprise 25% of the US STEM workforce, a figure unchanged year over year from 2018 through 2021.

However, women's representation varies widely across STEM sub-sectors. Women represented only 26% of employees in computers & math in 2021, the largest STEM sub-sector of total US STEM jobs; this is nearly unchanged since Athena's 2020 Index. Historically, low women's participation in computer and tech careers is attributed to lack of sufficient career awareness, inequitable hiring practices, and a persistent "bro" culture that questions women's competency, at best, and leads to harassment, at worst. One senior computer engineer interviewed shared, "I try to find ways to blend in while still being proud that I'm the only woman in the room." On a positive note, the attitude around women's participation in tech is starting to shift, with an increasing number of educational programs such as Girls Who Code and greater recruitment of male allies in the workplace. "It's so helpful when men call out other men," a mid-career hardware engineer noted.

Figure 1 - US STEM Workforce by Gender | 2018–2021



Sources: American Community Survey (2018, 2019, and 2021); BCG analysis.

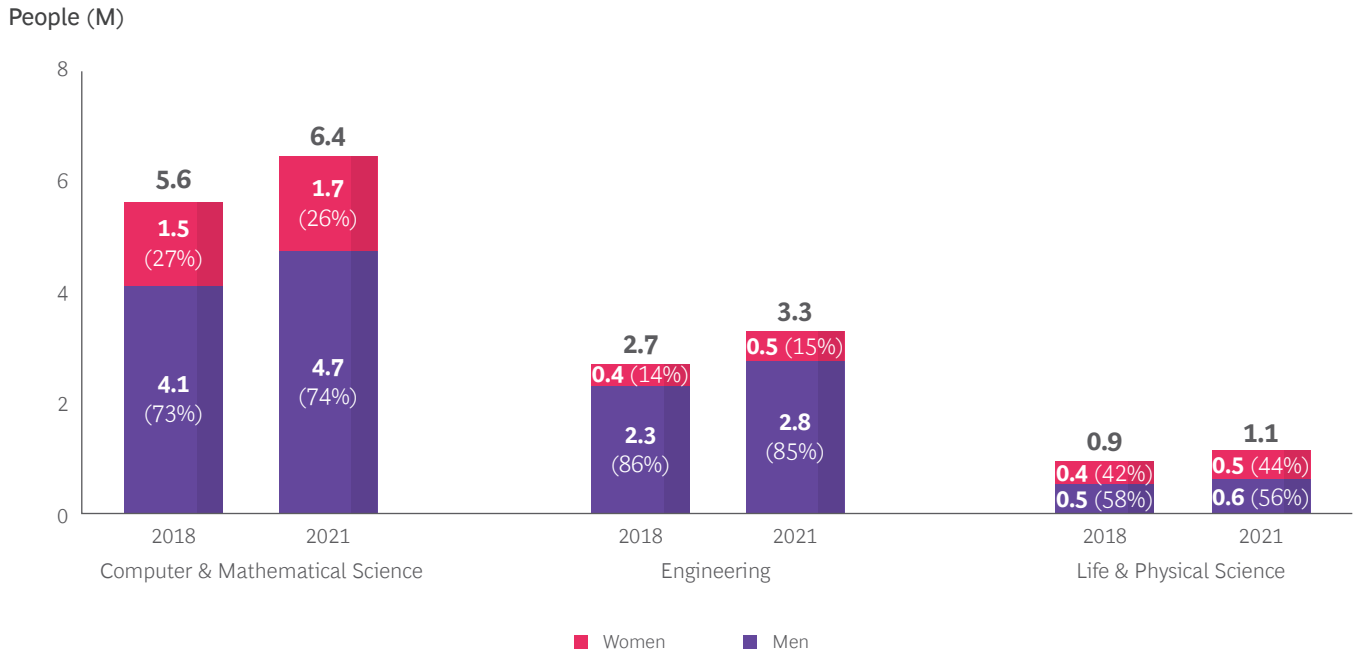
Note: STEM data excludes women and men working in post-secondary STEM teaching positions; data not available for 2020.

Unfortunately, women's representation in engineering remains consistently lower, at only 15% in 2021. Many women cite a lack of autonomy and creativity as a major driver not to enter or remain in the field, highlighted by one woman engineer graduate: "I thought engineering work would be tactical and hands-on. My internship wasn't, so I didn't pursue the field."

Growth of women's representation in life & physical sciences is tapering off since the massive increase over the 1990s and early 2000s, reaching 44% women in 2021—a 2 percentage point increase since the 2020 Index. Continued growth in this sector is likely given the common perception that careers in life & physical sciences have aspects of caretaking that are most associated with and approved of for women, along with a growing visibility of academic women in the life sciences. However, women also describe being drawn to the life & physical sciences due to its tangible impact on human lives, not from a caregiving perspective per se. "You can make a measurable change in benefiting humanity," said a PhD in Biochemistry, capturing a theme not as broadly reflected in interviews with computer scientists and engineers.

Across STEM sectors, the weighted median earnings gap slightly improved between 2018 and 2021 to a 15% difference between men and women. This gap is closely reflected in each sub-sector but in no way seems to explain the discrepancies regarding women representation.

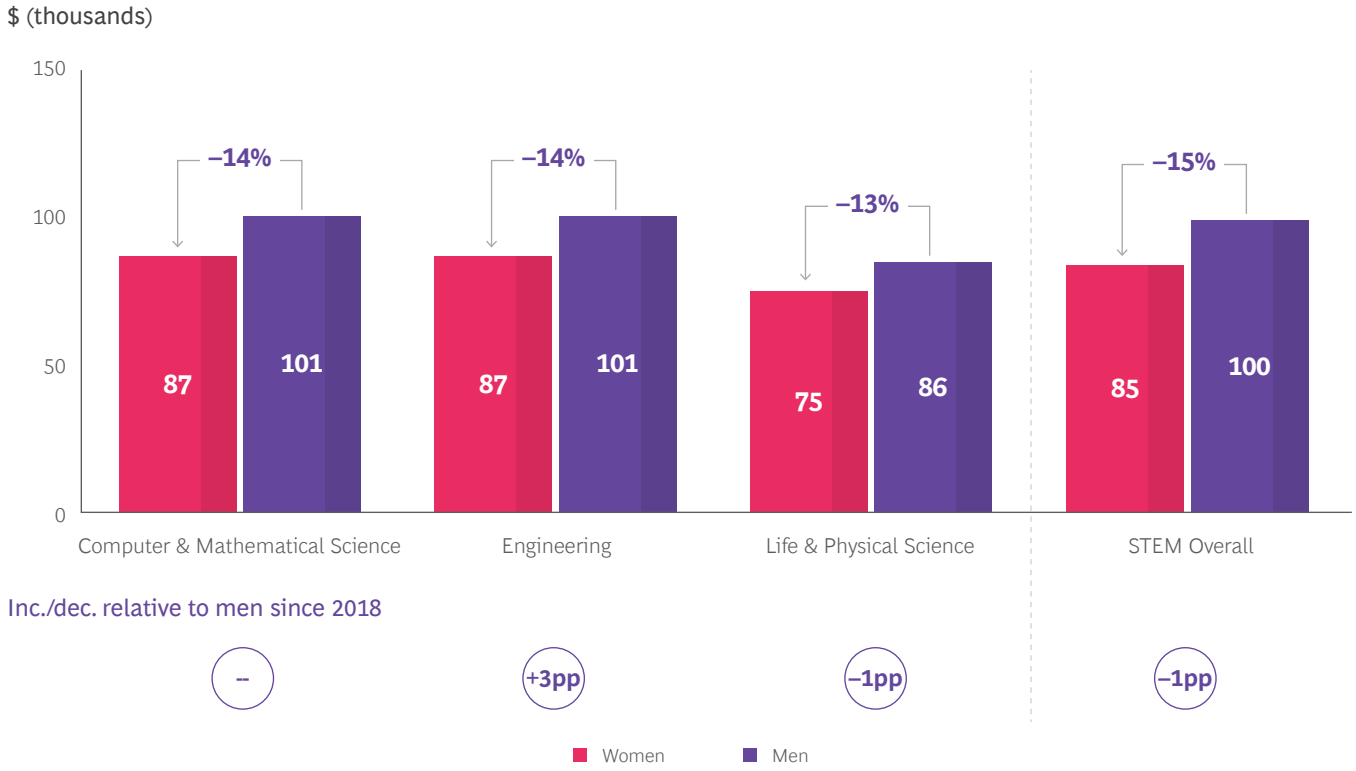
Figure 2 - US STEM Workforce by Gender | 2018–2021



Sources: American Community Survey (2018, 2019, and 2021); BCG analysis.

Note: STEM data excludes women and men working in post-secondary STEM teaching positions; data not available for 2020.

Figure 3 - US STEM Weighted Earnings by Gender | 2021



Sources: American Community Survey (2018, 2019, and 2021); BCG analysis.

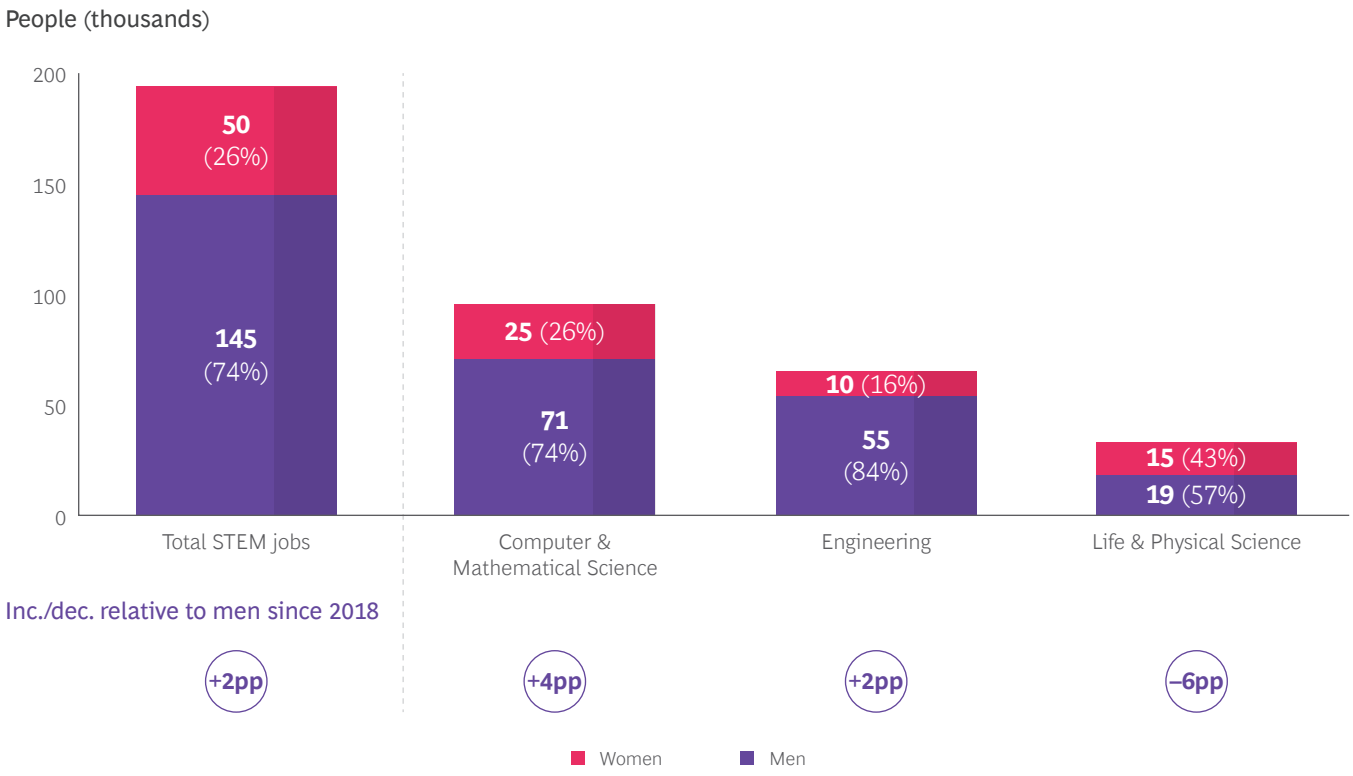
Note: In Census Bureau terminology, earnings are a subset of income. Specifically, earnings are wages or salary from a job income from being self-employed. Other kinds of income, not included in earnings, include social security payments, interest and dividends, income from property rental, places, public assistance, and child support. Median income weighted by occupation based on proportion of members of workforce in that occupation vs. total workforce.

1. Excludes ~0.7% of workforce with earnings of $250,000+ due to lack of accurate earnings data for that population.

Women's representation inside San Diego's global STEM hub is largely reflective of their representation nationally. Significant gains in women's representation in computers & math resulted in parity with that of the US overall. However, women's representation in life sciences decreased from 2018 to 2021 despite San Diego's global life sciences hub status and a stronger affinity for women in science. This decrease may be due to industry layoffs disproportionately impacting women across numerous San Diego-based companies where, women in technical roles tend to be newer hires and less senior, and subject to "last in, first out" headcount reduction practices. These factors led to nearly half of recent layoffs being women, while representing little more than a quarter of the workforce.

Further disaggregating representation of women across their career journey highlights that women's representation is more concentrated in early career stages, particularly in engineering and life & physical sciences, with a noticeable drop-off at the senior and executive levels.

Figure 4 - San Diego STEM Workforce by Sub-sector | 2021



Sources: American Community Survey (2018, 2019, and 2021); BCG analysis.

Figure 5 - Women Representation Across STEM Journey by Sub-sector

Women lag behind men throughout STEM career journey across most sub sectors, particularly at the senior and executive levels

	% of Workforce	Bachelor's	Entry-level	Mid-career	Senior	Exec./C-suite
Overall STEM	**25%**	**38%**	**35–40%**	**N/A[1]**	**20–30%**	**10–20%**
Computer & Mathematical Science	**26%**	**26%**	**20–30%**	**25–30%**	**20–30%**	**15–25%**
Engineering	**15%**	**23%**	**20–25%**	**20–25%**	**10–20%**	**5–10%**
Life & Physical Science	**44%**	**60%**	**40–60%**	**40–50%**	**25–30%**	**25–35%**

Sources: BIO & Coqual Measuring Diversity Report (2022); Hiedrick & Struggles Board Monitor US (2023); Integrated Postsecondary Education Data System Digest (2021); MIT Women in Mathematics National Survey (2019); National Center for Science & Engineering Statistics Report (2021); Pew Research Center Report (2018); Society of Women Engineers Research (2022); Yale Scientific "By the Numbers: Women in STEM" (2020); BCG research.

[1]Reports do not distinguish clearly between entry-level and mid-career in the overall STEM workforce.

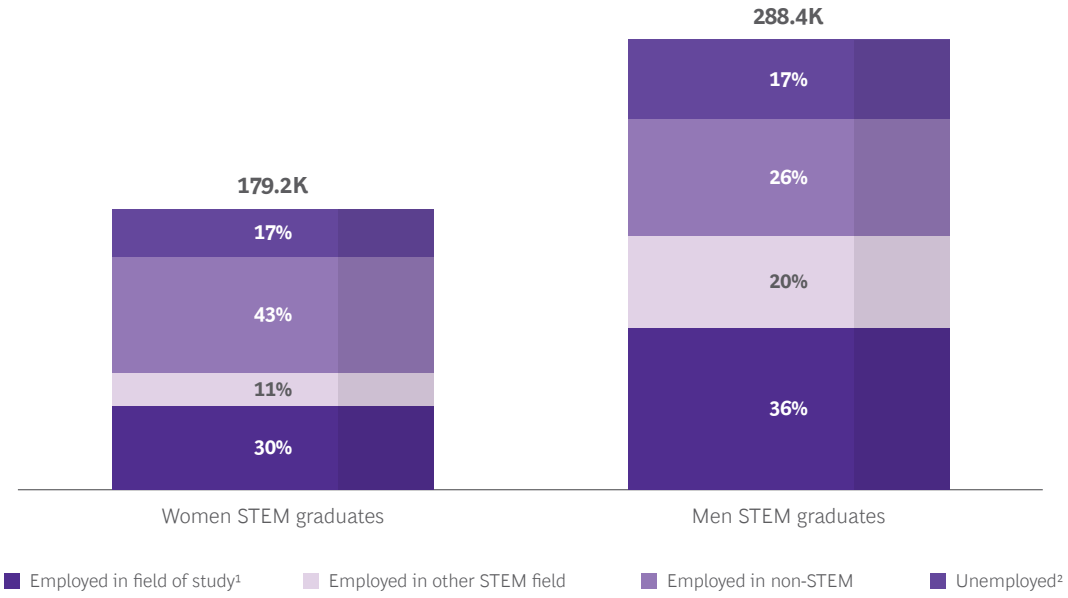
Trend Drivers & Success Factors

There are two critical drop-off points for STEM women that are targeted for improvement.

#1: Low rate of women graduating with STEM degrees and entering the STEM workforce. Despite women earning 58% of bachelors' degrees in the US in the 2019–2020 academic year, only 38% of STEM bachelors' degrees were earned by women. Of those women, only 40% entered jobs in STEM sectors by February 2021, compared with 55% of men who earned STEM degrees and entered STEM jobs in the same period.

Of the surveyed women who did not enter STEM jobs after earning STEM degrees, 70% said poor work-life balance or inflexibility in working accommodations were important in their decision not to enter STEM careers and nearly 80% reported lack of available jobs of interest or difficulty getting hired as major factors. "I think it comes down to access," said an administrator at the University of California, San Diego, "giving women access to the breadth of career options increases their interest in entering the field."

Figure 6 - STEM Degree (2019) to Workforce (2021) Pipeline, Women vs. Men



Sources: Integrated Postsecondary Education Data System (2019-20), National Survey of College Graduates (2021).

Note: Total STEM graduates is derived from IPEDS, whereas job ratios come from NSCG. NSCG survey methodology causes overweight of recent college graduates in STEM by about 20% relative to all recent college graduates, but this should not affect the accuracy of the degree to workforce pipeline within the STEM degree population.

[1]Includes managers, technicians, and related occupations but not STEM teachers or healthcare workers.

[2]Includes graduates both pursuing and not pursuing higher education.

To increase representation of STEM women, it's evident that the career funnel must expand—the pipeline of women STEM graduates must grow, and a greater percentage need to enter STEM careers. Three key mechanisms may stimulate growth, which are the following:

- **Develop and promote engagement with Industry associations and company-sponsored programs that introduce women to STEM fields and careers at a younger age.** Many of these programs already exist, such as Girls who Code, YOU Belong in STEM, a US Department of Education initiative that enhances STEM education for all students, and other local programs.[1] Athena now offers memberships to female university students pursuing STEM degrees, providing access to future employers, helping them to identify as a professional woman in STEM, and informing their STEM educational curriculum.

- **Offer formal and inclusive internship opportunities to foster continued interest and increase women entrants into the STEM workforce.** One interviewee reported not seeing a single woman in the first weeks of her internship, which itself lacked interesting problems to solve. Company leaders may combat negative internship experiences that turn away women from STEM jobs by hiring diverse groups of interns and ensuring proper exposure to senior (women) leaders and visibility into the breadth of roles and work scope available at a company.

- **On-campus interactions with STEM companies to provide visibility into available jobs and career paths.** Career fairs, industry insight panels, and speaking engagements at club events are effective ways to nurture student interest in specific career paths and companies. Building formal relationships with universities also offers companies a strong talent pool for recruiting early-career scientists.

#2: Women leaving STEM mid-career before entering senior and executive roles. Women in this phase cited numerous challenges for progression to senior and executive roles or reasons for leaving STEM altogether, including the following:

- **Lack of clear career mobility.** Particularly for women pursuing technical roles, there is often not a well-defined track or timeline to advance to senior levels or sufficient focus on proactive career planning. Participants in our Women in STEM survey cited this as one of the most challenging aspects of advancement—one that often drives women to leave their company in pursuit of career progression or at least opportunities to expand knowledge and better satisfy intellectual curiosity. One woman said, "You have to choose between technical and management ladders. If you want to move up, it's usually into management."

- **Gated advancement without business background or executive skills.** Women consistently reported that they're expected to gain skills in non-technical and business-oriented functions to advance their careers, with many encouraged to pursue an MBA or other upskilling opportunities. However, many early-career employees also expressed appreciation for leaders who "spoke the same language" and had sufficient understanding of the technical landscape that informed decision-making, indicating that the combination of business and technical skills can be favored in leaders of STEM-oriented companies.

- **Limited upskilling opportunities for business- and leadership-focused skills.** Despite being expected to grow their skills, women in interviews and focus groups repeatedly commented on the difficulty of getting exposure to and practice at roles in business development, strategy, and other similar functions without a background in business. There is a mentality at many companies that training scientists to do something other than science encourages them to leave. The women able to try different functional roles and gain expertise noted that their efforts were often not accounted for in promotions or role-transition decisions.

1. "U.S. Department of Education Launches New Initiative to Enhance STEM Education for All Students," *US Department of Education*, 2022.

- **Minimal use of critical networks.** Nearly all women in the focus groups highlighted the importance of networking and voicing their aspirations to the right people within their organization and professional ecosystem. "More so than your competence," one senior woman in biopharma added, "if someone knows you and promotes you, then you'll have a seat at the table." Most called this out as a factor they learned through the Athena on Boards Series (a board-ready program for senior career women) and recurring personal experiences, highlighting that women may not be proactively leveraging their networks to the fullest extent in order to advance their careers early on.

Noteworthy is that computer & mathematical science has more consistent representation across career steps, which may be enabled by the following:

- A "start-up" culture prevalent in tech companies that allows for women's mobility across different roles, skills, and working models

- Compensation models that incentivize women to remain at companies longer through stock options and equity vesting

- The desire of women in tech to stick it out as role models and help kick-start a flywheel process of recruiting more women

To retain and advance women in STEM beyond the entry-level and mid-career stages, several tactical drivers of success are defined based on best-in-class companies driving DEI, STEM hub cities with strong programs for women, and input from women leaders in STEM. Implementing these success drivers will be the "unlock" to transforming the workforce to be more diverse and productive, including the following:

- **Full engagement and commitment of senior leadership, especially male senior leadership, to promote an inclusive environment.** While senior women consistently expressed their willingness to champion women in their organization, this "diversity tax" can also negatively affect their careers if it is not tied to enterprise-level goals and priorities. In particular, men in leadership must be expected to do just as much as women to promote women within their organization, including sponsorship, mentorship, and other opportunities for engagement. Men tend to overestimate both progress and personal involvement in DEI efforts, so tying promotion and compensation to institutional goals is essential to prevent male participation from becoming "checking a box."

- **Sponsorship and mentorship that provide women consistent support for career mobility and advancement opportunities.** Senior women in the focus groups repeatedly emphasized the significance of sponsors or mentors looking out for their career interests, including identification of upskilling opportunities, collaborative thinking around strategic career moves, and facilitation of roles, leader introductions, and stretch opportunities not otherwise accessible. Leaders should be tasked with actively, openly, and consistently supporting high-potential women across organizations.

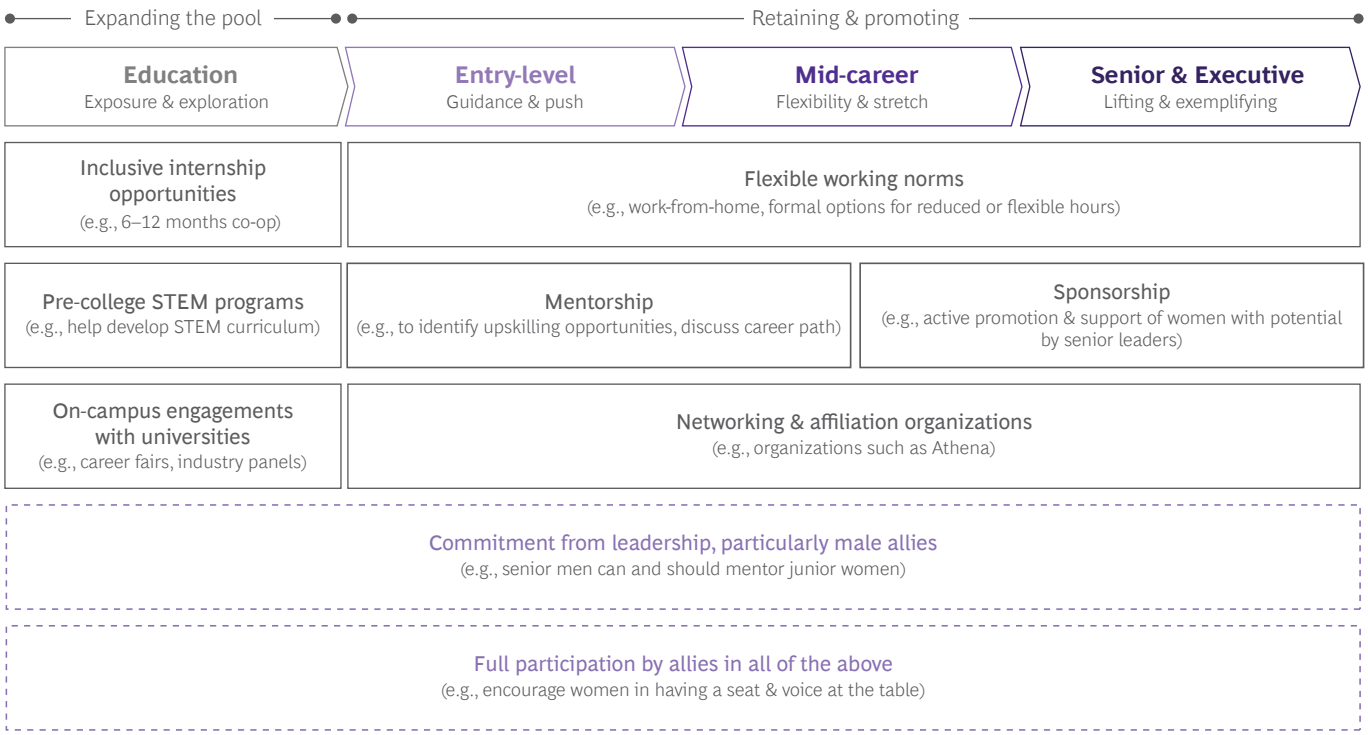
- **"Segment of one" career advancement approaches that enable women's skills and experiences—both formal and informal—for consideration in job promotions.** Given the demand for business skills in senior positions, companies can support women's growth aspirations by offering upskilling opportunities ranging from rotational programs, dedicated recurring time for learning other functions, learning and development programs (internal or outsourced), and business school/master's degree sponsorship. Additionally, corporate leaders can take a segment of one approach to determine which experiences a leader may need or already have that prepare them for advancement and then craft a plan to enable continued success.

- **Industry/affinity associations that offer women peer-to-peer mentorship, upskilling programs, and professional networks they can leverage directly for career advancement.** Women making shifts to often more corporate leadership roles are seeking affiliation with other women pursuing similar paths in order to learn from one another and expand their professional networks. Silicon Valley, Boston, and Atlanta are US STEM hubs with strong representation of women and feature affinity groups such as Society of Women Engineers, Institute of Electrical & Electronics Engineers, Women in Engineering Affiliation Group, and Women in Bio. Athena is a women's global STEM organization offering similar leadership training, mentoring, and advocacy initiatives aimed at closing the gender gap. Companies may support participation in these industry organizations through corporate sponsorship or individual membership; corporate partners can deepen their efforts to meet the needs of target populations by accessing custom leadership development content and accelerating women's career journeys.

- **Working norms that provide women with greater flexibility as they consider advancing their careers while caring for families.** Work/life balance and flexibility are increasingly important to the workforce at large—which were only exacerbated during the COVID-driven shift to the remote workplace. For women in STEM, work-from-home or hybrid working, formal or informal options for reduced or flexible hours (such as 60% or 80% capacity options or flex away from a 9 to 5 schedule), and thoughtful interim support during maternity leave are all essential policies in retaining women at the mid-career and senior levels, particularly for those building families.

Figure 7 - Best Practices to Address Career Headwinds Facing Women in STEM

Several impactful practices essential to address the headwinds women in STEM face across career stages



Looking Ahead

As women's representation in the STEM workforce continues to stagnate since Athena's 2020 Index publication, what might the macro trends look like in the coming years?

It is likely that the headwinds described in this report will continue, and impending trends may compound these challenges further, including the following:

- Looming recession and associated layoffs disproportionately impacting more junior roles, in which women are more concentrated
- Artificial intelligence replacing existing roles, especially those where women make up a majority
- Potential expansion of political and legislative efforts to reverse diversity policies (currently focused on racial diversity) in corporate hiring, university enrollment, and military recruitment

However, persistent tailwinds may help turn the narrative, including the following:

- Business rewards of ESG and DEI initiatives and commitments from global companies to enhance diversity in teams and leaders to drive market edge and foster innovation
    - Note that media attention around ESG blowback is having only a limited impact on policies, with just 2% of surveyed companies citing blowback as a roadblock to initiatives[2]
    - New job opportunities unlocked as the (male dominant) workforce continues to age and retirees need to be back-filled, and incremental new roles emerge, such as data scientists and green engineering
- Continuance of hybrid and flexible work models increasing opportunities for caregivers to maintain their careers
- Focus on STEM education and flow-through effects to future women in the STEM workforce

The initiatives defined in this report must be aided by not only macro tailwinds but also factors within companies, including the following:

- Company culture that embraces diversity, growth opportunities, and experimentation to try different initiatives until improvements are realized
- Managers/leaders investing in advancing women as a top-down strategic business commitment
- Concrete metrics that track corporate improvement and are factored into leadership evaluations

2. "Sustainability in the Spotlight: Has ESG lost momentum in the boardroom?" *SpencerStuart*, 2023.

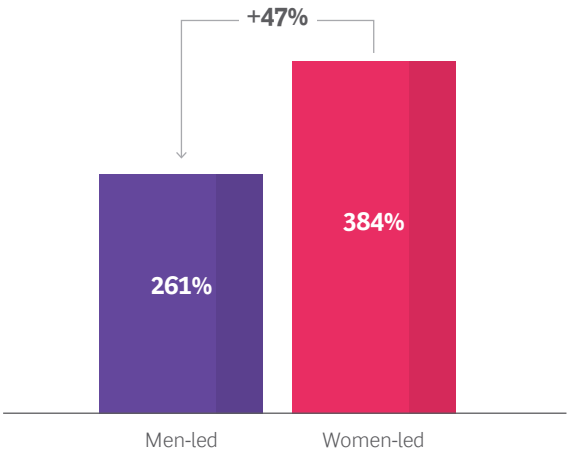
Conclusion & Call to Action

Irrespective of the direction of macro trends, advancing 1 million women leading in STEM by 2030 requires action by companies, organizations, leaders, and women in the field. Accelerating DEI maturity and supporting women is a business imperative, as public companies led by women outperform other companies on the S&P 500 by 50%.[3] And not retaining women comes at a huge cost: up to 250% of leaders' salaries.[4]

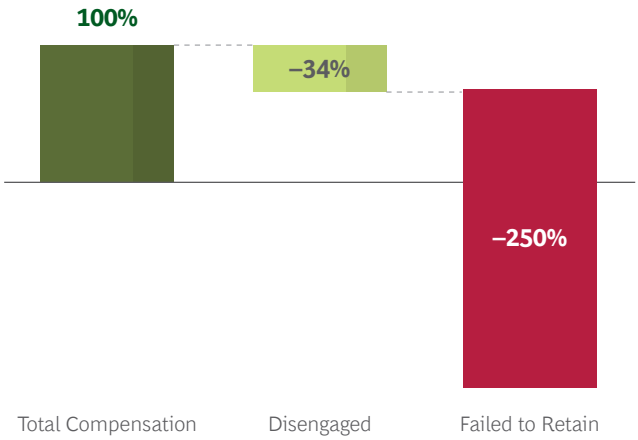
Transforming across DEI dimensions is not a one-time adjustment but rather a sustained commitment to setting a vision for your company, taking focused actions that create long-term value and generate business opportunities to transform the workforce in ways that reflect the values of your company, customers, and shareholders.

Figure 8 - Greater Equity in the STEM Workforce is a Proven Business Case

S&P 500 **companies headed by women have had nearly 1.5x the returns** of those headed by men over the past decade (2012–2022)



A disengaged employee can cost a company 34% of her compensation in lost productivity, and up to 250% of compensation to replace her if the company fails to retain her



Sources: Gallup "State of the Global Workforce 2022," Society of Human Resource Management, BCG analysis.

Note: Leadership determined by CEOs in 2022, not over entire-year period.

3. Schneider, Jeremy. "Are female CEOs better than male CEOs?" *Personal Finance Club*, 2023.
4. "Calculating the cost of employee attrition and disengagement," *LinkedIn Interactive Workbook*.

References

"Advancing Science for Life 2022 Performance Report." *Boston Scientific*, 2022.

Alexander, Brittany and Stokes, Trinitee. "Through an Exchange Initiative, Women Are #HiddenNoMore in STEM." *US Department of State,* 2022.

"Alumni Data Report." *Girls Who Code*, 2019

"Bachelor's, master's, and doctor's degrees conferred by postsecondary institutions, by sex of student and field of study." *National Center for Data Statistics*, 2016–2020.

Bishop, Todd. "Research finds women are 65% more likely than men to lose jobs in ongoing wave of tech layoffs." *Geekwire*, 2023.

"Board Monitor: US." *Hiedrick & Struggles*, 2023.

"Calculating the cost 100 of employee attrition and disengagement." *LinkedIn Interactive Workbook.*

Castleberry, Candi. "An update from Amazon VP Candi Castleberry on our diversity, equity, and inclusion work." *Amazon*, 2023.

Castleberry, Candi. "An update on our diversity, equity, and inclusion work at Amazon." *Amazon*, 2022.

"Chapters across the world collaborate to ameliorate." *Women in STEM*.

Ceron, Ella. "Hybrid Work Is Getting a Little Better for Women." *Bloomberg,* 2023.

"Collaborating to Advance Women in STEM." *Women Deliver,* 2019.

"Detailed Occupation for the Civilian Employed Female Population 16 years and over." *American Community Survey,* 2018–2021.

"Detailed Occupation for the Civilian Employed Male Population 16 years and over." *American Community Survey,* 2018–2021.

"Detailed Occupation by median earnings for the full time, year-round civilian employed female population 16 years and over." *American Community Survey,* 2018–2021.

"Detailed Occupation by median earnings for the full time, year-round civilian employed male population 16 years and over." *American Community Survey,* 2018–2021.

"Diversity and STEM: Women, Minorities, and Persons with Disabilities Report." National Center for Science and Engineering Statistics (NCSES), *National Science Foundation*, 2023.

"Douglas WiSE Program." *Rutgers*.

Dubina, Kevin. “How Women and Aging Affect Trends in Labor Force Growth.” *US Bureau of Labor Statistics,* 2020.

“Empowering the women leaders of tomorrow.” *Oracle*.

“Fact Sheet: The American Jobs Plan Will Support Women’s Employment.” *The White House,* 2021.

Fry, Rick, et al. “STEM Jobs See Uneven Progress in Increasing Gender, Racial, and Ethnic Diversity.” *Pew Research Center,* 2021.

Funk, Cary and Parker, Kim. “Women and Men in STEM Often at Odds over Workplace Equity.” *Pew Research Center,* 2018.

Golod, Amy. “Partnerships, Volunteerism, Philanthropy: Companies with STEM Talent Support Education.” *US News,* 2015.

Grau, Erin. “Flexible work is feminist–and women won’t return to a system that hasn’t served them well to spare the feelings of powerful men.” *Fortune,* 2023.

“Grow with us.” *Oracle*.

Hall, Rachel. “Hybrid working may hold back women’s careers, say managers.” *The Guardian,* 2022.

Illes, Judy and Ono, Santa. “Global collaborations are changing conditions for women in STEM.” *The Conversation,* 2019.

Jahan, Nusrat, et al. “Academic Recruitment, Hiring, and Attrition during 2018-2019.” Mathematical and Statistical Science Annual Survey, *American Mathematical Society,* 2022.

Johnson, Paula, et al. “Strategies for Increasing Girls’ Participation in STEM.” *Intercultural Development Research Association,* 2019.

Kalev, Alexandra. “How ‘Neutral’ Layoffs Disproportionately Affect Women and Minorities.” *Harvard Business Review,* 2016.

Lindzon, Jared. “How recent tech layoffs can disproportionately affect women and people of color.” *Fast Company,* 2023.

Martin, Kaitlynn. “Women in Data Science: Why They’re Critical to the Data Science Workforce.” *University of Wisconsin,* 2021.

“Measuring Diversity in the Biotech Industry.” *Bio & Coqual,* 2022.

Meck, Tanya. “Navigating The Current Backlash Against ESG.” *Forbes,* 2023.

Milgrom-Elcott, Talia. “4 Trends Shaping #STEM Education.“ *Forbes,* 2023.

Narasimman, Preethiga. “Demand For Data Science: Jobs, Data Scientists Future.” *Knowledge Hut*, 2023.

“National Mathematic Survey.” *MIT Women in Mathematics (WIM)*, 2019.

National Science and Technology Council. “Best Practices for Diversity and Inclusion in STEM Education and Research.” *Executive Office of the President of the United States*, 2021.

“National Survey of College Graduates, NSF 23-306.” *National Center for Science and Engineering Statistics (NCSES)*, 2021.

“Retention in the Engineering Workforce.” *Society of Women Engineers (SWE)*, 2022.

Ruggles, Steven et al. “IPUMS USA: Version 13.0 [dataset].” *IPUMS*, 2023.

Sapsford, Jathon. ”Republican Attorneys General Warn Top U.S. Businesses Over ‘Discrimination.’“ *The Wall Street Journal*, 2023.

Schneider, Jeremy. ”Are female CEOs better than male CEOs?” *Personal Finance Club*, 2023.

Schuler, Julie. “Support Girls in high School STEM Programs and Classes for Students.” *Your Teen*, 2022.

Stohlmeyer Russell, Michelle and Moskowitz Lepler, Lori. “How we closed the gap between men’s and women’s retention rates.” *Harvard Business Review*, 2017.

“Sustainability in the Spotlight: Has ESG lost momentum in the boardroom?” *SpencerStuart*, 2023.

Tsipursky, Gleb. “Women’s Day: The Vital Importance Of Allowing Women To Have A Flexible Hybrid Schedule.” *Forbes*, 2023.

“U.S. Department of Education Launches New Initiative to Enhance STEM Education for All Students.” *US Department of Education*, 2022.

Wallace, Alicia. “Nearly 80% of women’s jobs could be disrupted, automated by AI.” *CNN Business*, 2023.

Washington, Ella. “The Five Stages of DEI Maturity.” *Harvard Business Review*, 2022.

Weinberg, Bruce and Blaua, David. ”Why the US science and engineering workforce is aging rapidly.” *National Library of Medicine*, 2017.

Williams, Cassidy. “Bridging the gender gap in STEM with remote work.” *Remote*, 2022.

With People. “Why do mass layoffs tend to impact women and members of other equity-deserving groups disproportionately?” *LinkedIn*, 2023.

"Women in Tech: How to Attract and Retain Female Employees." *STEM Women*, 2022.

Wood, Sarah. "How Schools are Improving STEM Education for Girls, Students of Color." *US News*, 2022.

"2021 Global Inclusion and Diversity Report." *Bristol Myers Squibb*, 2022.

Appendix 1: STEM Majors by Field

Computer & Mathematical Science Majors

accounting and computer science

actuarial science

analysis and functional analysis

applied mathematics

applied statistics

artificial intelligence

cloud computing

computational and applied mathematics

computational mathematics

computational science

computer and information sciences

computer and information systems security/auditing/information assurance

computer engineering technology/technician

computer engineering

computer game programming

computer graphics

computer hardware technology/technician

computer programming, vendor/product certification

computer programming/programmer

computer science

computer software engineering

computer software technology/technician

computer support specialist

computer systems analysis/analyst

computer systems networking and telecommunications

computer technology/computer systems technology

data analytics

data entry/microcomputer applications

data modeling/warehousing and database administration

data processing and data processing technology/technician

data science

economics and computer science

financial mathematics

human-centered technology design

informatics

information science/studies

information technology

information technology project management

linguistics and computer science

management information systems

management science

mathematical biology

mathematical economics

mathematical statistics and probability

mathematics and computer science

mathematics and statistics

mathematics economics

mathematics statistics and probability

mathematics

modeling, virtual environments and simulation

network and system administration/administrator

science/technology management

statistics

system, networking, and LAN/WAN management/manager

web page, digital/multimedia and information resources design

web/multimedia management and webmaster

Engineering Majors

aeronautical/aerospace engineering technology/technician

aerospace, aeronautical and astronautical/space engineering

agricultural engineering

applied engineering

applied engineering technologies/technicians

architectural engineering

automation engineer technology/technician

automotive engineering technology/technician

biochemical engineering

bioengineering and biomedical engineering

biological/biosystems engineering

biomedical technology/technician

CAD/CADD drafting and/or design technology/technician

ceramic sciences and engineering

chemical and biomolecular engineering

chemical engineering

civil drafting and civil engineering CAD/CADD

civil engineering technology/technician

civil engineering

computer hardware engineering

construction engineering

construction engineering technology/technician

drafting and design technologies/technicians

electrical and computer engineering

electrical and electronics engineering

electrical/electronic/communications eng. technology/technician

electromechanical engineering

electromechanical technology/electromechanical eng. technology

electromechanical/instrumentation and maintenance technol./tech.

energy systems engineering

energy systems technology/technician

engineering chemistry

engineering design

engineering mechanics

engineering physics/applied physics

engineering science

engineering technology

engineering

engineering/industrial management

environmental engineering technology/environmental technology

environmental/environmental health engineering

forest engineering

geological/geophysical engineering

geotechnical and geoenvironmental engineering

hazardous materials management and waste technology/technician

heating, ventilation, air conditioning and refrigeration engineering technology/technician

hydraulics and fluid power technology/technician

industrial engineering

industrial production technologies/technicians

industrial safety technology/technician

industrial technology/technician

instrumentation technology/technician

laser and optical engineering

laser and optical technology/technician

manufacturing engineering

manufacturing engineering technology/technician

marine engineering technology/technician

materials engineering

mechanical drafting and mechanical drafting CAD/CADD

mechanical engineering

mechanical engineering related technologies/technicians, other

mechanical engineering/mechanical technology/technician

mechatronics, robotics, and automation engineering

mechatronics, robotics, and automation engineering technology/technician

metallurgical engineering

mining and mineral engineering

mining technology/technician

nanotechnology

naval architecture and marine engineering

nuclear engineering

nuclear engineering technology/technician

occupational safety and health technology/technician

ocean engineering

operations research

packaging science

paper science and engineering

petroleum engineering

petroleum technology/technician

plastics and polymer engineering technology/technician

polymer/plastics engineering

power plant technology/technician

pre-engineering

quality control technology/technician

robotics technology/technician

solar energy technology/technician

structural engineering

surveying engineering

systems engineering

telecommunications engineering

telecommunications technology/technician

textile sciences and engineering

transportation and highway engineering

water quality/wastewater treatment management/recyclingtechnology/technician

water resources engineering

welding engineering technology/technician

Life & Physical Science Majors

acoustics

aerospace physiology and medicine

agronomy and crop science

analytical chemistry

anatomy

animal behavior and ethology

animal genetics

animal physiology

aquatic biology/limnology

astronomy

astrophysics

atmospheric chemistry and climatology

atmospheric physics and dynamics

atmospheric sciences and meteorology

atomic/molecular physics

behavioral sciences

biochemistry

biochemistry and molecular biology

bioinformatics

biological and physical sciences

biology/biological sciences

biology/biotechnology technology/technician

biomechanics

biomedical sciences

biometry/biometrics

biophysics

biopsychology

biostatistics

biotechnology

botany/plant biology

brewing science

cardiovascular science

cell biology and anatomy

cell physiology

cell/cellular and molecular biology

cell/cellular biology and histology

chemical physics

chemical technology/technician

chemistry

cognitive science, general

computational biology

condensed matter and materials physics

conservation biology

developmental biology and embryology

earth systems science

ecology

ecology and evolutionary biology

elementary particle physics

endocrinology

entomology

environmental biology

environmental chemistry

environmental geosciences

environmental science

environmental toxicology

epidemiology

evolutionary biology

exercise physiology and kinesiology

food science

food technology and processing

forensic chemistry

forest sciences and biology

genetics

genome sciences/genomics

geochemistry

geochemistry and petrology

geography and environmental studies

geology/earth science

geophysics and seismology

horticultural science

human biology

human/medical genetics

hydrology and water resources science

immunology

infectious disease and global health

inorganic chemistry

marine biology and biological oceanography

marine sciences

materials chemistry

materials science

medical microbiology and bacteriology

meteorology

microbiological sciences and immunology, other

microbiology and immunology

microbiology

molecular biochemistry

molecular biology

molecular biophysics

molecular genetics

molecular medicine

molecular pharmacology

molecular physiology

molecular toxicology

natural sciences

neurobiology and anatomy

neurobiology and behavior

neuropharmacology

neuroscience

nuclear physics

nuclear/nuclear power technology/technician

oceanography, chemical and physical

oncology and cancer biology

optics/optical sciences

organic chemistry

paleontology

parasitology

pathology/experimental pathology

pharmacology

pharmacology and toxicology

physical chemistry

physical sciences

physics and astronomy

physics

physiology

planetary astronomy and science

plant genetics

plant molecular biology

plant pathology/phytopathology

plant physiology

plant sciences

polymer chemistry

population biology

radiation biology/radiobiology

range science and management

reproductive biology

science technologies/technicians

soil chemistry and physics

soil science and agronomy

structural biology

systematic biology/biological systematics

theoretical and mathematical physics

theoretical chemistry

topology and foundations

toxicology

virology

vision science/physiological optics

wildlife biology

wildlife, fish, and wildlands science and management

zoology/animal biology

Appendix 2: STEM Occupations by Field

Computer & Mathematical Science Occupations

computer and information systems managers

computer and information research scientists

computer systems analysts

information security analysts

computer programmers

software developers

software quality assurance analysts and testers

web developers

web and digital interface designers

computer support specialists

database administrators and architects

network and computer systems administrators

computer network architects

computer occupations, all other

actuaries

mathematicians

operations research analysts

statisticians

other mathematical science occupations

Engineering Occupations

architectural and engineering managers

aerospace engineers

agricultural engineers

bioengineers and biomedical engineers

chemical engineers

civil engineers

computer hardware engineers

electrical and electronics engineers

environmental engineers

industrial engineers, including health and safety

marine engineers and naval architects

materials engineers

mechanical engineers

mining and geological engineers, including mining safety engineers

nuclear engineers

petroleum engineers

engineers, all other

electrical and electronic engineering technologists and technicians

other engineering technologists and technicians, except drafters

sales engineers

Life & Physical Science Occupations

natural sciences managers

agricultural and food scientists

biological scientists

conservation scientists and foresters

medical scientists

life scientists, all other

astronomers and physicists

atmospheric and space scientists

chemists and materials scientists

environmental scientists and specialists, including health

geoscientists and hydrologists, except geographers

physical scientists, all other

agricultural and food science technicians

biological technicians

chemical technicians

environmental science and geoscience technicians

nuclear technicians

About the Authors

Neveen Awad is a core member of the Technology Advantage practice and leadership team at Boston Consulting Group. She leads the Women in Technology initiative in North America and is an active sponsor of the firm's Women@BCG and Women in Digital initiatives. Neveen is also the office leader for BCG's Detroit office.

Adriana Dahik is an expert in the Technology, Media, and Telecommunications practice area at Boston Consulting Group. She specializes in driving transformation, including people & organizational change, for her clients.

Jason Jager leads Boston Consulting Group's San Diego office and is a core member of the Medical Technology practice area. He is a strong ally of women leaders at BCG and deeply engaged in the relationship with Athena.

Natalie Scibilia is a member of Boston Consulting Group's San Diego office and leads the relationship with Athena. She also leads the local Women@BCG network.

Ian Coley, Ph.D is a member of Boston Consulting Group's San Diego office. He is engaged with Athena and actively drives allyship in the San Diego office. He also leads the local Pride@BCG network.

For Further Contact

Please reach out to the Athena leadership team if you would like to discuss this report: holly@athenastemwomen.org.

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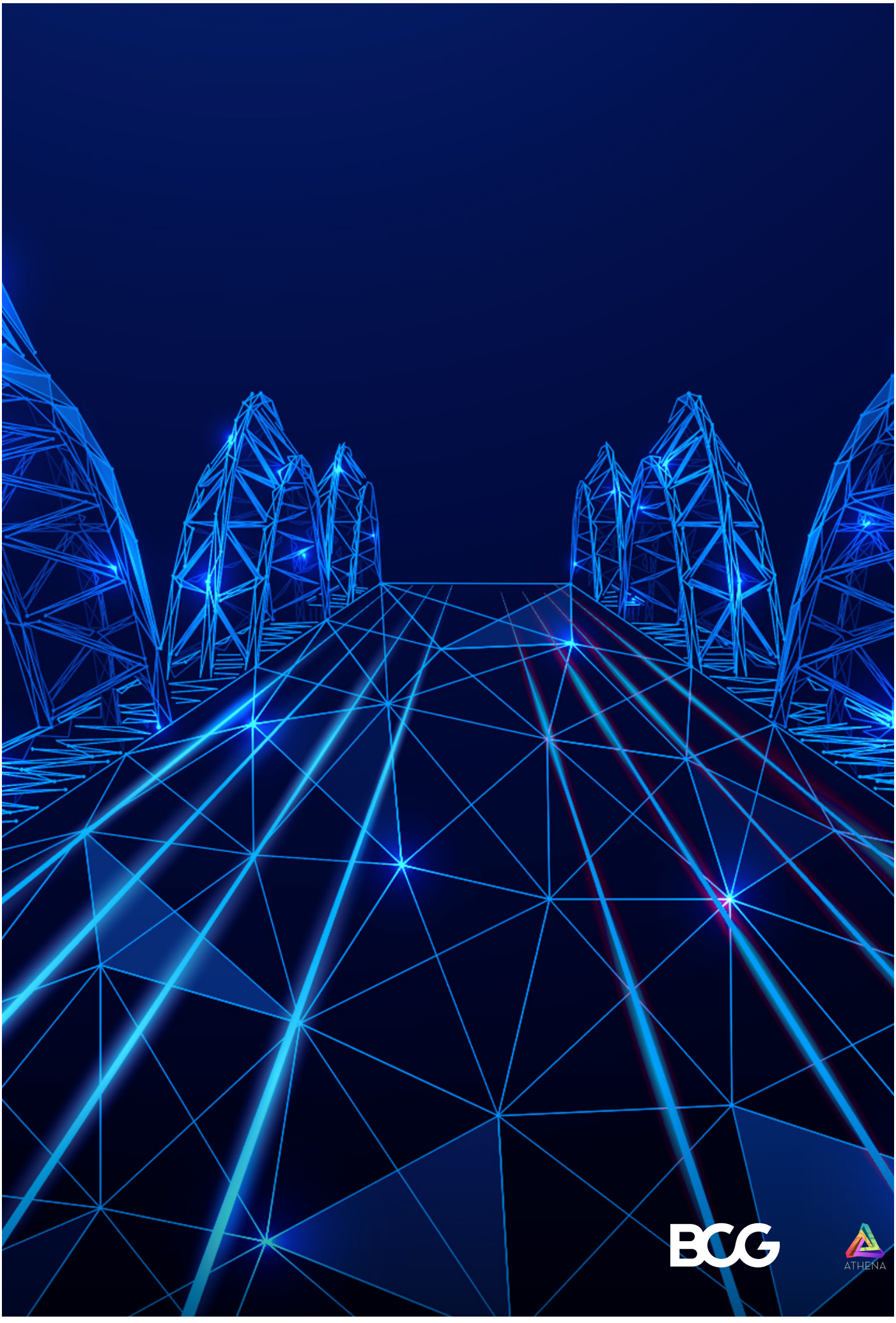
Athena

Athena is a global women's advocacy organization that fast-tracks women in STEM through leadership development, mentoring, and advocacy initiatives. By transforming scientists and technologists into corporate leaders, the goal is to widen the bridge to advance 1 million women in STEM by 2030. Its 25-year history of advancing women in a global STEM hub marks Athena as a premier women's empowerment advocate. Founded in 1998, Athena members feature executives, aspiring leaders, entrepreneurs, and academia from all sectors of life sciences, technology, engineering, mathematics, healthcare, and defense, as well as the associated service providers.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