Title

Insights from an AIMBE Workshop: Diversifying Paths to Academic Leadership

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Authors

Pruitt, Beth L
Chesler, Naomi C
Seltzer, Rena
et al.

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Abstract

The American Institute for Medical and Biological Engineering (AIMBE) hosted a virtual symposium titled "Diversifying Paths to Academic Leadership" on January 27 and 28, 2022. The symposium sought to educate the community on the opportunities for and impact of leadership by biomedical engineering faculty, to encourage and invite women faculty, especially women of color, to consider and prepare to pursue leadership roles, to educate faculty on the expectations and duties of these roles, and to highlight experiences and paths to leadership of women engineering leaders. Here we review the main outcomes of the symposium to provide perspective on (1) personal visioning and positioning for leadership, (2) negotiating for success in leadership positions, and (3) leadership strategies for success specific to women faculty and where applicable, faculty of color.

Keywords:

Diversity, Equity, and Inclusion; Academic Leadership; Professional Practice; Bioengineering Career Planning

Introduction

The American Institute for Medical and Biological Engineering (AIMBE) hosted a virtual symposium titled "Diversifying Paths to Academic Leadership" on January 27 and 28, 2022. The symposium sought to educate the academic biomedical engineering community on the opportunities for and impact of leadership by biomedical engineering faculty, to encourage and invite women biomedical engineering faculty to consider and prepare to pursue leadership roles, to educate faculty on the expectations and duties of these roles, and to highlight experiences and paths to leadership of women engineering leaders. The workshop emerged from discussions amongst the officers of AIMBE on the need to demystify the path to academic leadership and encourage its current and future members to take on these roles. The workshop was advertised directly to all AIMBE members; the Biomedical Engineering Council of Chairs were asked to advertise it to the faculty in their departments. The workshop was held over Zoom and attended by over 100 participants on day 1. From this, about 40 mid-career and senior women faculty were invited to participate in smaller working groups on day 2 to define personal goals and discuss professional advancement in moderated sessions.

The goals of the workshop included connecting and presenting topics relevant to women faculty to best prepare and present themselves as leadership candidates and to shed light on typical leadership search processes. The attrition of women in higher ranks of leadership has been reported and studied[1,2]. Root causes for this attrition are multi-factorial and largely institutional and systemic. This workshop was not intended to address the institutional and systemic issues, but to empower women who may be interested in becoming leaders to do so by providing informational mentoring regarding: day-to-day activities; the balance between research, education, training, and administrative responsibilities; and strategies for success in leadership roles. In combination with other strategies for institutional transformation, diversifying the academic leadership ranks will contribute to systemic change, especially since majority groups generally have few incentives to fix systems that perpetuate disparities in their favor. Thus, the workshop and this report focus on

strategies to help women navigate the path to academic leadership. The organizers and sponsors of the Symposium recognized a timely need to encourage and educate women faculty, especially women of color, to take on leadership roles in academia and influence the academic community more broadly.

The first day of the workshop, organizers invited all interested bioengineering faculty to attend and encouraged current department chairs and academic leaders to participate so that they could learn how to recognize, support, and develop leadership in women and to serve as allies and advocates. The second day, sessions focused on the professional development of women faculty and creating a supportive peer network. This report serves to communicate recommendations from this workshop and its presenters, while recognizing that additional efforts are needed to educate the broader community on how to develop more equitable and inclusive leadership search processes.

We focus on bioengineering, not just because we the authors are bioengineers, but because of the potential for emerging leaders from this diverse and interdisciplinary field of study to have impact in the higher ranks of academic leadership. In part, this diversity in bioengineering stems from undergraduate PEERs[3], especially women, having increased interest in interdisciplinary engineering and technology fields. Adding to the attraction of bioengineering is the opportunity to achieve clear social and medical impact, more so than traditional, siloed STEM fields.[4,5] The field of biomedical engineering is inherently interdisciplinary, intersecting with mathematics, engineering, biology, and medicine. Beyond diversity in discipline, the success of biomedical engineering depends on diversity in the workforce. Different perspectives and experiences, especially in leadership, enhance innovation, decision-making, and research quality.[6–12] Diverse teams also publish in higher impact journals and are cited more often.[13] Finally, diverse teams are more innovative and provide more inclusive design outcomes.[8,12] The undergraduate student base in bioengineering is by far the most diverse among the engineering sub-disciplines: both undergraduate enrollment and the fraction of degrees-granted in bioengineering and biomedical engineering are more than 40% female, 7% Hispanic, and 3.5% African American.[14]

Yet, this diversity does not persist in those advancing to doctoral degrees, faculty positions, and eventual academic leadership roles.[2,15,16] Those from underrepresented groups in engineering, including women, are less likely to receive awards, participate on boards, be invited to present at conferences, and consequently be promoted to leadership positions.[17–19] Attrition from academic science, technology, engineering, and medicine (STEM) careers grows at each passing stage (Figure 1).[20,15,21] Representation of women falls off dramatically by the full professor rank (Figure 2) and more women of color are left behind at each stage of the academic ladder.[22] This drop-off also occurs at the assistant and associate professor level for biomedical engineering (Figure 3); at these career stages, biases in teaching evaluations[23], citation rates[24] and peer review[25], as well as service load imbalances, [26–32] take a disproportionate toll on "token" faculty, i.e., those who are under-represented in their environment and accrue additional shadow jobs.[2,33,34] Although the representation of women among deans of engineering (Table 1) is similar to the proportion of deans of medicine (17%)[35], the number and percentage of women joining academic medical faculty ranks have increased substantially in a relatively short period—from 29% in 2001[36] to 39% in 2015[37]. By contrast, the representation of women among biomedical engineering faculty was only 24.6% in 2019.[22]

Overcoming the barriers women encounter in their pursuit of biomedical engineering leadership roles is an important step toward creating more inclusive leadership cultures. To overcome these barriers, we must first understand who chooses to pursue academic leadership and the paths they follow. Studies indicate that deans often matriculate from high-ranking institutions[38], suggesting a possible bias towards high-ranking "pedigree".[19,39] The dean selection process also tends to reward those who have already become a department head or chair one to two steps before becoming dean. Furthermore, the majority of deans are recruited from outside institutions, perhaps as a way to bring in higher-ranked individuals and those with new ideas. However, other factors come into play as well. For example, women and racially minoritized people tend to do more service within and outside their institution, although the relative weight of this service to promotion varies compared with other factors, such as publications and funding dollars. Excess service responsibilities can be barrier to women who wish to pursue academic leadership roles.[27,28]

In light of the current leadership trajectories,[35,40] how can we *empower* women, especially women of color, to pursue and secure leadership roles? Becoming an academic leader is a long process, and we need a toolkit of strategies to assist at each stage, from assessing one's leadership potential and style, to preparing application materials and negotiating successfully, to being an effective leader in the engineering academy. Ultimately, increasing the representation of women in leadership is an important part of transformative change in academia.[41] Achieving excellence in biomedical research is inseparable from achieving inclusivity, and notably, diversity at all levels enhances outcomes.

The benefits of faculty and team diversity were discussed recently during AIMBE's inaugural Equity and Anti-Racism Summit: A Roadmap to Transformation in BME In January 2021.The emergent discussion theme of #Diversity.Saves.Lives highlighted the imperative for the field of bioengineering to increase diversity in our research and training pipeline. For example, the earliest airbags were designed by and for the average white American male - lacking diverse voices in the design process, airbags were deadly to women and children.[42] This problem persists with self-driving cars that are more likely to kill pedestrians of color because the vision systems (designed by primarily white engineers) do not identify a person of color in the field of view.[43] Fitness trackers and soap dispensers that do not register dark skin have been similarly implicated as racist and lacked diverse representation in the design process.[44,45]

Ultimately, engineering leadership needs to allow for and value diverse participation from all stakeholders, including faculty, donors, and students, to build a supportive chain of mentorship, education, and research and to encourage students from diverse backgrounds and with diverse identifies to remain in STEM.[7,21] However, creating equitable and inclusive systems will require developing and advancing leaders committed to increasing diversity and dismantling biased systems that discourage or dismiss women scholars. For example, women leaders in STEM may be criticized or dismissed for traits like assertiveness that earn a male candidate praise.[46,47] The costs of systemic barriers that have prevented women from gaining entry to science, or encourage their exit, is well documented.[16] Moreover, an intersectional, bibliometric examination further revealed the negative consequences of these inequalities in the form of scientific knowledge not produced. [9] The intersectional (race or gender) characteristics of scientists and their research topics are strongly related, suggesting that diversity changes the scientific portfolio with

consequences not just for knowledge, but for career advancement.[9] Therefore, this symposium and resulting summary seeks to empower would-be leaders to understand the current system, with all of its limitations, and to take on leadership positions to effect change.

Positionality of the Authors

The authors of this paper include 10 women (three of color and seven white) and two men (one of color and one white). Of these twelve authors, eight are currently faculty in institutions of higher education and several have leadership positions at these institutions including department chair, center director, program director, dean, etc. We acknowledge that our own identities, positions, and experiences influenced the topics selected for the workshop and thus are reflected in this report.

Understanding Your Own Leadership Style: Dr. Maritza Salazar Campo

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Suggested Reading

- Every Other Thursday, Ellen Daniell[48]
- Zen and the Art of Happiness, Chris Prentiss[49]
- Feel the Fear and Do it Anyways, Susan J. Jeffers[50]
- Strengthfinders 2.0, Tom Rath[51]

Dr. Maritza Salazar Campo, Assistant Professor of Organization and Management, Paul Merage School of Business at University of California, Irvine, presented on developing a leadership style, honing a leadership vision, and communicating your vision to others. As summarized below, her presentation supported the workshop outcomes of providing perspective on personal visioning and positioning for leadership and leadership strategies for success specific to women.

She began by asking the question "What makes someone a leader in science?" Often, she suggested, it is based on scientific expertise – making contributions to a research field and having credibility. Despite having scientific know-how, however some leaders do not know how to manage a large budget or group of people. The demands on a leader to make actionable plans, motivate people, and create common goals may be mentally taxing and time consuming for those with no formal management training or experience.

Then she Dr. Campo asked "How can we get better at leading projects?" An important ingredient in influencing others is having a solid scientific vision. As important as having a solid scientific vision is communicating that vision in a way that motivates the team. According to a study of thousands of leadership assessments, women were perceived as being less able to recognize new opportunities and develop a new strategic direction than men.[52] Women leaders also struggle with not being perceived as strong in traits like tenacity and emotional intelligence, according to Campo.

The question on the minds of many busy women executives is "How could I possibly have time for this?" in large part because women are asked more often and say no less often than their male colleagues to low prestige service.[28,31,53] Dr. Campo underscored the importance of setting aside some time to reflect on your past, attend to the present, prospect the future, and feel your passion. With better clarity about what one seeks to achieve in their career, it can be easier to prioritize and focus on the activities that yield the desired results. Such awareness can also help scholars avoid simply reacting to demands and requests without a rationale for their decisions and actions.

During this process, it is important to avoid what Dr. Campo referred to as "traps." For instance, rather than only having conversations with a small group of people with whom you always talk, expand your conversations to gain a broader perspective. Also, look up from current projects and look around to gather perspectives from individuals across diverse domains of expertise to develop future directions. Leadership requires setting aside time for joint problem discovery, establishing milestones to see your vision come to fruition, and getting buy-in on approaches to execute the plan and measure progress.

Leadership often involves challenging the status quo, Dr. Campo shared. There are reactive changes (i.e., closing a performance gap) and proactive changes (i.e., closing an opportunity gap). Pursuing the latter, taking advantage of new opportunities, Dr. Campo suggested, is what will set you ahead. To do so, you must seize the opportunity with purpose, which may involve experimenting and taking risks. Dr. Campo instructed listeners: As you generate small wins, celebrate them and learn from your experiences; strengthen your resilience as you continue to adapt and make progress; and consider whether you are seeking and accepting challenging opportunities that will enable you to test your leadership abilities.

She encouraged: as you build relationships with collaborators and agencies in pursuing your scholarly questions, you can build your network of peer leaders.[54] As you develop new work relationships, collaborations, and communities of practice[55], be authentic. In creating community, institute norms that ensure that everyone's voice matters. Two simple practices for doing so are to take detailed notes and amplify comments by women and faculty of color who often go unheard.[56]

Dr. Campo ended by urging faculty to balance the creative part of their research with administrative and execution tasks. She suggested purposefully brainstorming without considering implementation details and then focusing on implementation details at a separate time. Finally, she encouraged faculty: stay driven by the work that is meaningful to you.

> ### *Key takeaways:*
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> - Purposely set aside time to develop your vision.[26,31]
> - Use networks to help you think outside the box and achieve your vision.[54,57]
> - In creating community, make sure all voices are heard. [56]
> - Close opportunity gaps, not performance gaps, for greater impact.
> - Do not be afraid to take risks, try new things, and follow your passions. [10,58]

Positioning Oneself for Leadership: Joi Hayes-Scott, Dr. Julie Filizetti and Regan Gough

> ### *Suggested Reading*
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> - The Coach's Guide for Women Professors, Rena Seltzer[57]
> - Leadership, Doris Kearns Goodwin[10]

Joi Hayes-Scott, a consultant at Russell Reynolds Associates who conducts academic leadership searches, shared tips on how to sharpen your skills and be successful in obtaining an academic leadership position. Dr. Julie Filizetti and Regan Gough, who are partners in the candidate search firm Isaacson Miller, also shared their perspectives on this topic. These speakers supported the

workshop outcomes of providing perspective on strategies for women to position themselves for leadership and negotiate for success.

An important step of the job search is determining whether you are competitive for a particular opening.[59,60] Men are more likely than women to apply for leadership roles even if they do not meet all of the job qualifications.[53,60] Ms. Hayes-Scott advised that women should consider the job qualifications to determine their readiness level and to identify gaps in their skills.[53] To fill those gaps, look for experiences, even those outside of the institution, to develop skills. Once you feel you can meet most of the competency skills for a job listing, do not hesitate to apply. Ms. Hayes-Scott cautioned to not apply to every opening because it can indicate a lack of interest or commitment for a specific job opportunity. She also suggested probing what an organization is looking for in a particular role, as some organizations need an experienced leader to solve ongoing problems whereas others are on more solid footing and looking for new energy. Applying to the right roles for your readiness level and skill set is key for success.

When deciding whether to consider a job search in public versus private institutions, there are important similarities and differences to consider. Both types of institutions will involve tuition considerations, fundraising, and student recruitment. However, public institutions are typically more resource-constrained, and you may need to make tough decisions around money. The mission of each institution may differ as well. It is important to understand an institution's mission and be able to articulate why their mission is important to you.

In discussing how to prioritize and curate a CV before applying for a leadership role, Ms. Gough recommended having both an academic CV and an administrative CV that includes accomplishments and is tailored to the job. It is helpful to learn about the requirements for a position and include those in the CV, with relevant experience up front. Highlight leadership roles and provide a sense of scope and scale (e.g., number of people you have worked with or managed, involvement in budgetary management, organizational changes or impacts). Dr. Filizetti also recommended shaping your CV as a story about your academic career, including informal leadership experiences. Similarly, Ms. Hayes-Scott emphasized the importance of demonstrating impact. How have you moved the needle? For each bullet point on your CV, ask yourself "so what?" Provide metrics to demonstrate your impact. She echoed Ms. Gough's comment that you should highlight the administrative and leadership roles on your CV.

An important part of the job application may be a statement on diversity, equity, and inclusion (DEI). Candidates should give broad thought to DEI, including the role of DEI in hiring and mentoring, promotion and tenure, pay equity, and workload distribution. A strong DEI statement describes one's values and philosophy about DEI, in addition to specific efforts and impacts. It is important to provide concrete examples of how you have enacted your commitment to DEI. You can demonstrate your commitment through taking courses, doing service within your unit or institution around DEI, or having an influence through your mentoring or work. If you are new to this commitment, then be sincere about that. You can also discuss how you help people feel included and welcome. Another useful tip is to look at what the institution is doing with DEI and try to adopt some of their approaches.

The cover letter should not repeat the CV but should state why you are right for the job and highlight a few items from your CV that demonstrate your fit. Share why you are interested in the organization and why the position excites you. Do not be afraid to tell your story and your accomplishments, but also be sure to emphasize that you are a team player.[57,59,60]

Search committees are looking for both scholarly and administrative credentials. When a search firm is involved, they are more aggressive in trying to identify and reach the right person for the job. Firms may reach out to 200-300 people for one position. Some may not be actively looking for a new position. For a dean position at a large institution, likely candidates are deans from smaller institutions, associate deans, and department chairs. Candidates will likely be pulled from both urban and rural locations to form a diverse pool. As a candidate, be sure to network and look for opportunities to ensure that you are on the radar of search firms. Dean search committees seek candidates who have experience in handling the responsibilities necessary for a dean, including building external relationships, fundraising, and evaluating faculty. Fundraising can be the hardest qualification to gain experience in because it is often centralized. Look for opportunities to learn how to fundraise, even if those opportunities come from outside your institution, for example, by fundraising on a board or with a non-profit organization. Some institutions may hold fundraising workshops or may have a fundraising professional that could mentor you.

Ms. Hayes-Scott noted that women are often labeled in terms of their leadership style based on assumptions and biases. Thus, during a job search, women should be clear about their leadership style and articulate the way they lead. It is also important to establish a professional development support team that will ultimately provide positive references on your behalf. The goal is to be able to show all sides of how you work in a professional capacity. This support team may include a colleague who can speak to your work ethic and style, an individual whom you are supervising and who can speak to your management style, and a person to whom you report or previously reported who can share some of your areas of strength and growth. Before asking for a reference, you can ask these individuals for feedback to gauge how they might respond to various questions about you.

If you are invited for an interview, do your research on compensation and salary. Look at what people in this position are earning at other institutions. If you work with a recruiter, they can also help you determine what your pay should be and what the institution might be looking for in a leader. Additionally, Ms. Gough recommended being proactive about addressing any breaks in your career progression to avoid skepticism from the search committee. Rena Seltzer of Leader Academic explained that most women tend to self-promote less than their male counterparts, sometimes because they find it uncomfortable and sometimes out of concern that if they tout their successes, they will be perceived negatively.[61] A useful reframe for those who feel awkward talking about their successes is to think about it as championing the work or the accomplishments of the team you led. If you're worried about incurring backlash, you might share examples of how you led by empowering others and engage your audience through storytelling rather than simply sharing the outcome.

Finally, it is important to do your homework to understand the institution to which you are applying. Although you can only glean so much from an institution's website, you can read between the lines to help you prepare. If you know someone there, talk to them about the institution. Ask about

potential resources, support structures, and opportunities that might facilitate success. Moreover, if a search firm is involved, the search firm's goal is to find a long-term match. Therefore, these firms welcome transparency and can often provide advice on your CV, cover letter, and interview, to help you put your best foot forward. If you are not offered the position, you can reach out to your contact at the firm for feedback.

Key takeaways:

- Applying to the right roles for your readiness level and skillset is key for success.
- Be clear about your leadership style.
- Gain experience in leadership activities such as mentoring, fundraising, and people management.
- Establish a professional development support team that can speak to how you work in a professional capacity from all perspectives.
- Demonstrate your impact on your application and CV through metrics.
- Tailor your interview, CV, and cover letter to the institution.
- Learn about the institution to which you are applying and show how your experience will translate to success in your desired role
- In an interview, share your successes in a positive way that champions the work you've done and tells an engaging story.

Negotiation Strategies: Dr. Rena Seltzer

Suggested Reading

- Ask for It, Linda Babcock and Sarah Laschever[59]
- Never Split the Difference, Chris Voss and Tahl Raz[62]
- Getting to Yes, Fisher and Ury[63]
- Getting Past No, Ury[64]

Rena Seltzer, MSW, is the Founder and Principal Coach of *Leader Academic* and author of "The Coach's Guide for Women Professors: Who Want a Successful Career and a Well-Balanced Life." She focused her presentation on the second goal of the workshop: providing perspective on negotiating for success in leadership positions.

Ms. Seltzer began by asking the group "Have you ever heard the saying, 'you don't get what you deserve, you get what you negotiate'? But what if you don't have experience negotiating? Or you're worried that people like you aren't respected in negotiations?" Ms. Seltzer shared that the

toolbox for successful negotiation is not "one-size-fits-all." She emphasized that in a negotiation, there are two mutually complementary goals: first to claim value such as resources, flexibility, and influence; and second to strengthen the relationship with your negotiating partner. The optimal approach to meet these goals can vary and can depend on one's race and gender.[65,66] For instance, one study found that adopting a dominant leadership style in a negotiation is viewed more negatively among White women or Black men compared to White men or Black women.[67] Until we as a community eliminate these biases in our institutions and systems, Ms. Seltzer asserted, information about the impact of these biases can empower individuals to deal with stereotype threats.[60]

One positive strategy for negotiation is to focus not on *what* the parties want (positions) but on *why* they want it (interests).[57,59,60] Consider the value proposition of the other person – what matters to them or their organization. In this way, you can find creative solutions where both parties get what they care most about. An important tool during negotiation is having objective data, such as comparable salaries available online for public institutions. For private institutions, you can seek information from colleagues on salary ranges for comparable positions. Since men often earn more than women, be sure to include men in your inquiries, Ms. Seltzer reminded.

Negotiation can be stressful for everyone, and especially so for women.[60] Some tips for managing this stress include doing your homework, knowing your fallback position if no agreement is reached, and role-playing and practicing ways to respond to roadblocks. Another strategy is to reframe your anxiety, viewing it as giving you an extra edge in your negotiation. The literature shows that simply believing that anxiety is beneficial for negotiation performance can improve your outcomes.[68] Another useful strategy is to focus on the communal benefits of your requests.[57,59,60] Rather than asking for something for yourself, frame your suggestion as a request for your team or to meet the interests of the organization.

And of course, negotiation isn't just about salary. For high level leadership positions, consider asking for administrative staff, a research scientist or postdoctoral fellow to maintain research productivity, a pause or sabbatical after the role ends before being evaluated on research productivity, an agreement on what the salary will be after returning to a faculty position, faculty lines for those who come with you, moving expenses for your postdoctoral fellows and graduate students, grants or loans for housing, travel or discretionary funds, tuition for your children's education, a position for your spouse, and funding for an executive coach or leadership training.

Key takeaways:

- In a negotiation, the goal is to simultaneously claim value and strengthen the relationship with the negotiating partner.
- Focus on interests rather than positions.
- Gather objective data to support your "asks" during a negotiation.
- Reframe your anxiety around negotiation by reminding yourself that it will help you to stay vigilant and thus improve your performance.

- Frame the negotiation positively and highlight the communal benefits of your requests.
- Consider what to ask for during a negotiation to support success both during the leadership role and after it ends.

Strategies for Successful Leadership. Dr. Andrew Alleyne, Dr. Tejal Desai, Dr. Jennifer West

Suggested Reading

- Fierce Conversations, Susan Scott[69]
- Black, Brown and Bruised, Ebony O. McGee[7]
- First, Break All the Rules, Buckingham and Coffman[70]
- An Inclusive Academy: Achieving Diversity and Excellence, Stewart and Valian[65]

Dr. Andrew Alleyne, who started his role as dean at the College of Science and Engineering at the University of Minnesota in January 2022, Dr. Tejal Desai, who started her role as dean in September 2022 at the Brown School of Engineering, and Dr. Jennifer West, who became dean at the School of Engineering and Applied Science at the University of Virginia in July 2021 shared their personal motivations for pursuing academic leadership and perspectives on strategies for success especially for women and faculty of color.

A common thread among the speakers was that they each sought to play a role in building something and solving problems. Their motivations were often altruistic, based on a desire to impact their community, advocate for institutional changes, or optimize systems and programs. Over the arcs of their careers, each took on leadership roles within or outside their departments before considering a Dean position. As they shared, being exposed to organizational challenges helped them to recognize their desire to not only do science but also contribute to institutional change.

Specific advice that all three leaders agreed upon included the following. For those considering whether a leadership role is right for them, leading a research program as a junior faculty can be an important opportunity to develop and hone a leadership style. Beyond the laboratory, there are many ways to gain leadership experience, such as by chairing a committee or a graduate program. These experiences can provide exposure to organizational challenges; reflecting on how satisfying these challenges are can help one gauge whether leading an institution would be fulfilling. Once one decides to pursue leadership, it is important to focus on one's own priorities and values and turn down opportunities that are not well aligned. Developing a strong sense of self can help one identify which roles will capitalize on one's strengths and address one's weaknesses. Executive coaching or academic leadership programs can aid in achieving this self-reflection by providing time and space to evaluate one's strengths and weaknesses. To evaluate a potential leadership opportunity, one should critically assess whether potential employers are invested in one's success and aligned with one's vision. Although all three panelists emphasized that you do not need to accept every offer that you receive.

Individual panelists gave additional advice. Dr. West stressed that you must be willing to deviate from your path to take advantage of unexpected opportunities that arise. Dr. Desai stressed the importance of building relationships with those who report to you as well as those to whom you report. Striking the right balance, she suggested, will make it possible to advance local goals while

ensuring that these goals fit with the global priorities of the institution. She recommended establishing a support network of those who can help you accomplish your goals and those whom you can trust for guidance to facilitate success. As a woman leader, Dr. Desai added that another challenge is ensuring you are heard without being perceived as aggressive. Other panelists echoed that as a racially minoritized person and/or woman, it can take time to navigate leadership positions in a predominantly white and male institution. To make sure that your voice is heard and that you have a seat at the table, you will sometimes have to advocate for yourself. Other times, allies with whom you have cultivated relationships can advocate for you, whether or not you are not in the room. Dr. Alleyne described being a person of color as a single variable in a multivariable optimization problem. He emphasized that leaders will be successful if they focus on the goals they are trying to accomplish, revisit these goals periodically, and ensure that they are making progress toward them.

All panelists agreed that being a racially minoritized and/or woman leader can involve challenges, but being in such a role also presents an opportunity to combat disparities. They emphasized that changing the culture can take time, yet leaders can set the tone and vision for an institution to align interests around core goals of diversity, equity, inclusion, and belonging.

> **Key takeaways:**
>
> - Key motivations of becoming an academic leader include the desire to participate in building something and solving problems.
> - A strong sense of self can help you to identify roles that capitalize on your strengths and shore up your weaknesses.
> - Success in leadership requires building relationships at all levels and developing a strong network of allies.
> - As a minority leader, it is important to ensure that your voice is heard.
> - Leaders have the opportunity to facilitate institutional changes to reduce disparities.

Opportunities for Leadership Beyond Academic Administration: Dr. Susan Margulies

Dr. Susan Margulies, former Chair of the Department of Biomedical Engineering at Georgia Institute of Technology and Emory School of Medicine, was recently appointed Assistant Director of the NSF leading the Directorate of Engineering. She shared her personal journey and factors that helped and hindered her along the way.

Dr. Margulies shared that being a woman has influenced her career trajectory, both in terms of her decision-making and the boundaries she has set along the way. She had to consider the timing of having children, integrate faculty work and family life, and negotiate with those in her life. Early in her career, her decisions were guided by supporting her husband's career, raising a family, and advancing her own career. She had to learn to be creative about how to meet these varied and sometimes conflicting expectations and recognize opportunities in unexpected situations. In each

career move, she felt that a key individual helped raise her awareness regarding how her *previous accomplishments were critical experiences that would lead to success in the new position.*

Dr. Margulies emphasized that leaders are developed, not born. Leadership is something to work on continuously, at all career phases. For her, communication has been a primary focus for developing and improving. She has learned to be specific, quantitative, and concise when she asks questions and always summarizes at the end of an answer. She has also learned skills related to strategic planning, fundraising, shared governance, finance, people management, and leading and managing through transitions. She has learned to focus on her strengths rather than weaknesses and has looked for opportunities to use those strengths. She also developed her leadership skills by observing role models and mentors, reading books, and participating in leadership coaching or workshops.

Women, especially women of color, are often asked to help with various tasks, including serving on committees or boards.[71,72] It is worth joining a committee or taking on a task if it provides the opportunity to learn something or grow your network. Even so, Dr. Margulies cautioned to cycle off and find a replacement when your learning phase is ending. Advice given to Dr. Margulies early on by a mentor was to say, "Yes, yes, no, yes." Yes, what you are asking me to do is something I care about; yes, I'd be great; no, I can't serve right now; but yes, please ask me again in the future. Say yes to things that interest you and say no to things that do not align with your interests.

As you consider leadership, a key recommendation is to keep a document that lists your experiences and what you accomplished in each role. This list should include examples of non-positional leadership, which is when someone acts as a leader (and is recognized as one) without the designation or title of leader. Those accomplishments are quite valuable. A leadership document can be useful when looking into new leadership opportunities to help demonstrate that your experiences will be appropriate for the role you want.

It is important to understand your strengths and values. When you know your values, you can assess an unexpected opportunity arise by asking yourself, "Does this opportunity align with my values?" It is important to ask questions and be open to a serendipitous opportunity to learn and grow.

Dr. Margulies articulated that it is important to maintain your research while taking on a leadership role. For her, she found that once she took a leadership position it was helpful to have her lab transition to more senior-level researchers (i.e., more postdocs and fewer graduate and undergraduate students). At the time of her comments (first quarter 2022), she spends one day per week focused on research and continues to hold lab meetings, do experiments, discuss data, read/write manuscripts, and pursue grants. She also described her activities in her role as Assistant Director of the NSF leading the Directorate of Engineering. A typical day focuses on identifying direction for future engineering research and educational initiatives, and consists of inter- and intra-agency collaborative meetings, and prioritizing resources, evaluating trends and areas of impact to set strategic goals. Within the Directorate, she advocates for divisions and programs, as well as cross Directorate and cross-agency initiatives. Outside the agency, she engages with stakeholders in academic, industry and government, and increases national visibility of engineering research and education.

> **Key takeaways:**
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> - Read about, improve, and practice leadership skills.
> - Create a leadership document that lists your accomplishments in leadership.
> - Focus your time on things that energize you and be open to unexpected opportunities.
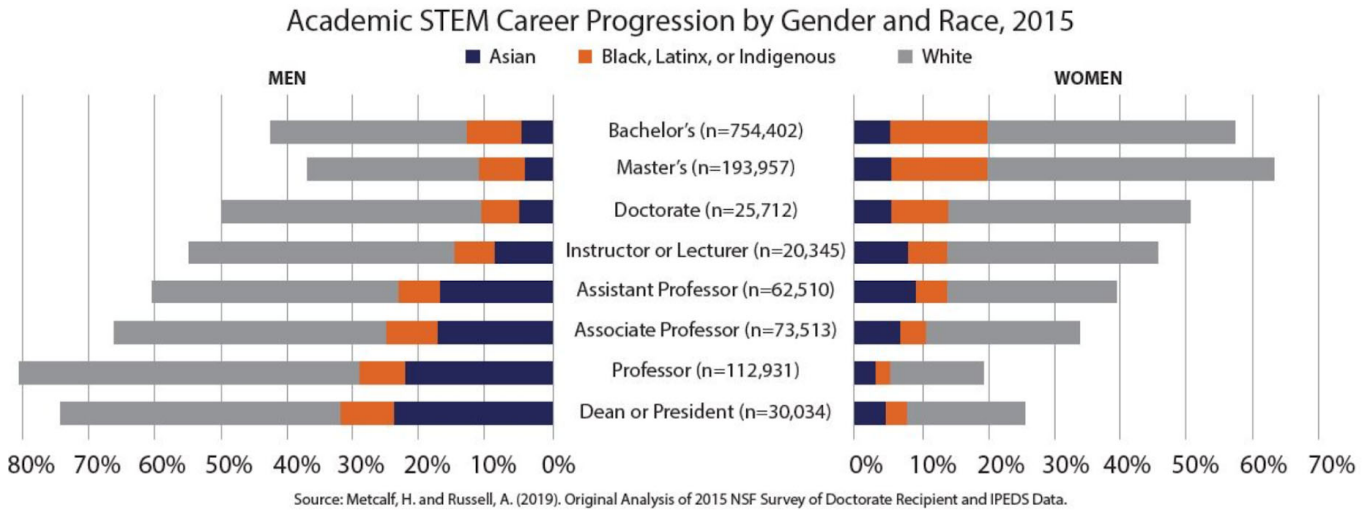
Conclusions and Outlook

In summary, the main outcomes of the symposium were to provide perspective on (1) personal visioning and positioning for leadership, (2) negotiating for success in leadership positions, and (3) leadership strategies for success specific to women faculty and where applicable, faculty of color. Important tips included developing a sense of self, establishing a strong network of allies, gaining experience in leadership activities, focusing on things that energize you, and being open to unexpected opportunities. For the leadership position search process, recommendations included applying to roles that are well matched to your strengths and weaknesses, demonstrating how your skills and experiences will translate to your desired role, and framing negotiations positively. The future is bright for women and faculty of color in bioengineering who wish to gain leadership positions. While it is the responsibility of engineering deans and university presidents to open doors to increase equity and diversity in positions of leadership, it is incumbent upon the individual to chart their strategic path to secure these opportunities.

The authors also wish to acknowledge and emphasize the importance of institutional change to support women leaders, and the need to advance women thought leaders to positions where they can drive change. Below we list additional resources for those who are in a position to enact (or lobby for) such systemic changes.

> **Suggested Reading**
>
> - On Becoming an Anti-Racist University. Principles and recommendations for universities from Black Engineering faculty, July 15, 2020[73]
> - The Hallway Ask [72]
> - Undoing the Can of Worms[72]
> - Faculty Workloads and Rewards Project, University of Maryland[74]
> - Long III, L. L. (2021). Toward an Anti-Racist Engineering Classroom for 2020 and Beyond: A Starter Kit[75]
> - Excluded[76]

Figures

Academic STEM Career Progression by Gender and Race, 2015

Legend: Asian | Black, Latinx, or Indigenous | White

MEN / WOMEN

Bachelor's (n=754,402)
Master's (n=193,957)
Doctorate (n=25,712)
Instructor or Lecturer (n=20,345)
Assistant Professor (n=62,510)
Associate Professor (n=73,513)
Professor (n=112,931)
Dean or President (n=30,034)

Men axis: 80% 70% 60% 50% 40% 30% 20% 10% 0%
Women axis: 0% 10% 20% 30% 40% 50% 60% 70%

Source: Metcalf, H. and Russell, A. (2019). Original Analysis of 2015 NSF Survey of Doctorate Recipient and IPEDS Data.

GRAPH 1

Figure 1. An analysis of the demographics by career stage, gender and race of leadership positions in all STEM fields reveals attrition of diversity in academic leadership positions. Women, and those from underrepresented groups in STEM, are not persisting to leadership positions at the same rates as men. *Source: Skinner, R. A. Paths to the Deanship in American Academic Engineering: A Snapshot of Who, Where, and How. (2018).*[35]
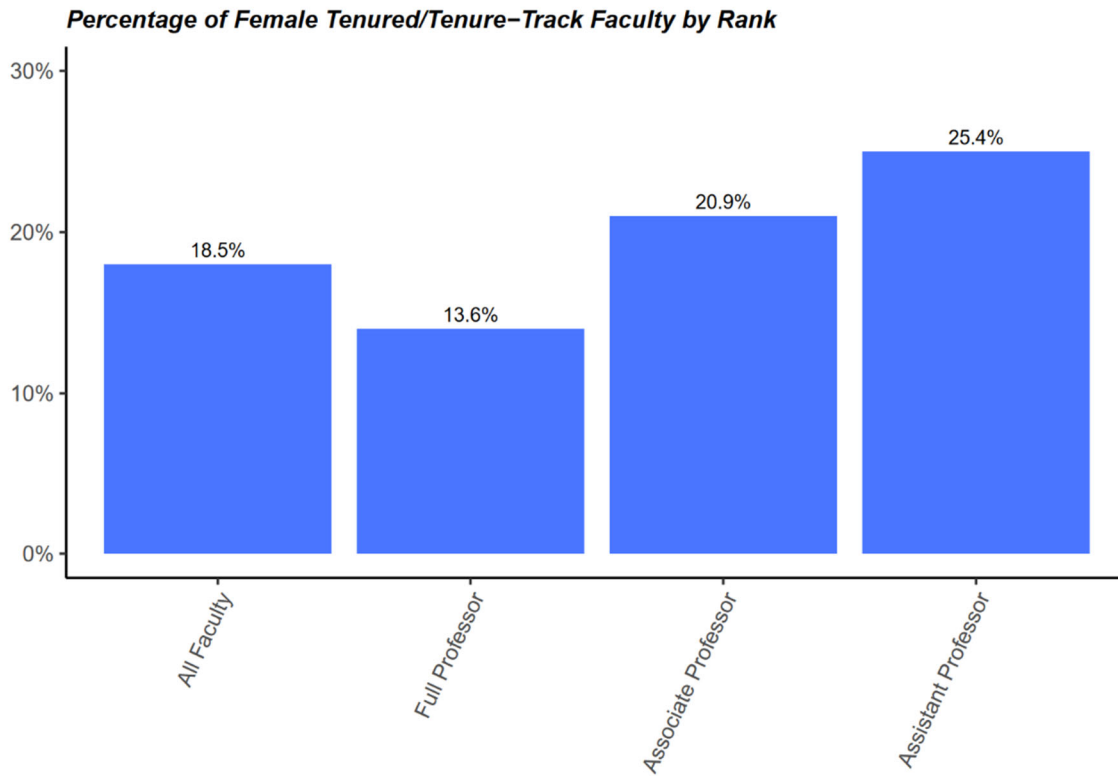
Percentage of Female Tenured/Tenure−Track Faculty by Rank

Figure 2. Percentage of Female Tenured/Tenure-Track Faculty by Rank. Women's representation falls off dramatically at full professor rank. *Source*: *American Society for Engineering Education. 2021. Profile of Engineering & Engineering Technology, 2020. Washington, DC*[22]
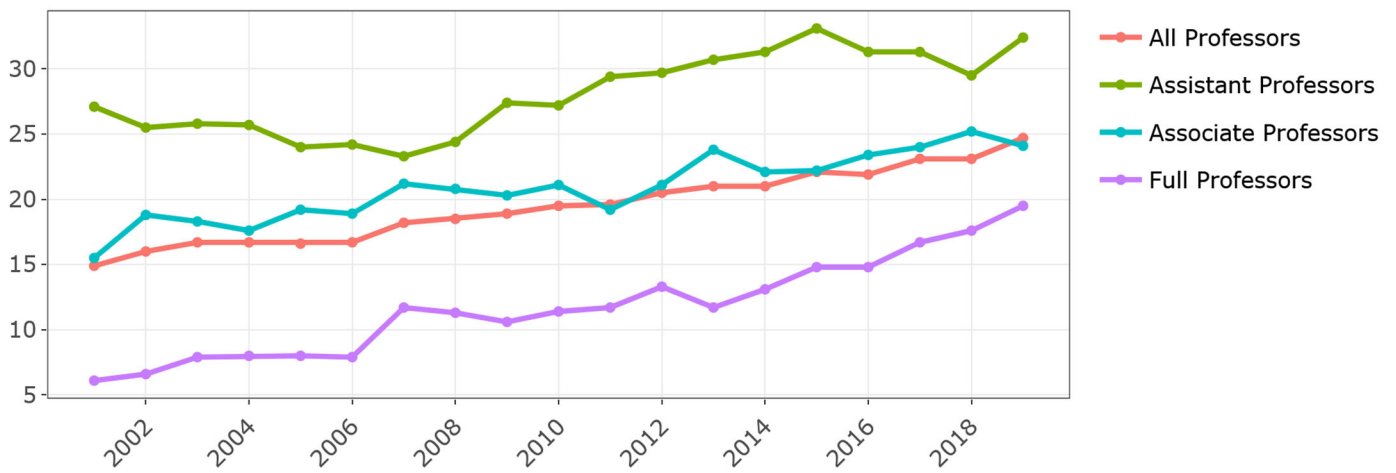
Figure 3. Percentage of Female Tenured/Tenure-Track Biomedical Engineering Faculty by Rank. Women's representation at the junior and mid-career ranks appear to have plateaued in the last decade. *Source*: *American Society for Engineering Education. 2021. Profile of Engineering & Engineering Technology, 2020. Washington, DC*[22]

TABLE 1 Demographics of 186 US deans/interim deans of engineering

Gender	Percent	Number
Female	18%	33
Male	82%	153
Race/ethnicity		
African American	7%	14
Asian American	16%	29
Caribbean	0.5%	1
Latino/Hispanic/Chicano	2%	4
White	74%	137
Unable to determine	0.5%	1
Foreign-born/-educated		
Yes	29%	54
No	65%	121
Unable to determine	6%	11

Table 1. Focusing on the demographics of engineering deans reveals low representation of under-represented faculty as of 2018. African American faculty (mostly men) are rising to dean at rates higher than that in the overall engineering faculty pool (2%), while Hispanic and Asian faculty become dean at lower rates than that of the pool (3.7% and 29.1%, respectively). [22]

Table Source: Skinner, R. A. Paths to the Deanship in American Academic Engineering: A Snapshot of Who, Where, and How. (2018).

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