No. 14-981

IN THE
Supreme Court of the United States

ABIGAIL NOEL FISHER,

Petitioner,

v.

UNIVERSITY OF TEXAS AT AUSTIN, *et al.*,

Respondents.

On Writ Of Certiorari
To The United States Court Of Appeals
For The Fifth Circuit

BRIEF OF DUPONT, IBM, INTEL, AND THE NATIONAL ACTION COUNCIL FOR MINORITIES IN ENGINEERING IN SUPPORT OF RESPONDENTS

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INTEREST OF *AMICI*[1]

Amici DuPont, IBM, and Intel are American corporations that operate at the cutting edge of numerous science, technology, engineering, and mathematics ("STEM") disciplines. Each of them has focused for many decades on research and development, and those efforts have resulted in countless innovations. Through products as diverse as personal computers and paint, microprocessors and mylar, flak jackets and floppy disks, and genetically modified seed and solid state drives, their innovations have altered our way of life and contributed significantly to our economic well-being.

Amicus National Action Council for Minorities in Engineering, Inc. ("NACME")—an organization that has worked alongside these and other businesses since 1974 to provide leadership and support for the national effort to increase the representation of minorities in the STEM fields—shares the concerns of the corporate *amici*.

Today, the corporate *amici* operate on a world stage. Through hundreds of facilities located on every continent, they pursue the next generation of innovations and market the products and services that are the fruits of prior efforts. All of those

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[1] The parties have consented to the filing of this brief, and their letters of consent are on file with the Clerk. No counsel for any party authored this brief in whole or in part, no such counsel or party made a monetary contribution to fund the preparation or submission of this brief, and no one other than the *amici curiae* and their counsel made any such monetary contribution.

endeavors have led *amici* to the common realization of three fundamental points, about which they have no doubt and on which basis each is making major strategic investments.

First, we live in a diverse world of widely varying perspectives and experience, and the greatest possible appreciation and understanding of those other perspectives is essential to businesses like theirs to compete effectively.

Second, and more fundamentally, there are simply not enough qualified professionals entering the technical fields in which these corporations work to meet the demands of an increasingly competitive world marketplace. Thus, it is essential, just to meet the growing demand for STEM talent, that we address, and soon, the profound underrepresentation of minorities and women in the STEM disciplines. There are many causes of this problem, including persistent stereotyping, an absence of role models, and a shortage of educational opportunities. All agree that the solution to this underutilization is as complex and many layered as its causes, and that the problem cannot be solved only by universities' use of affirmative action in admissions.

Third, at the same time, all *amici* agree that the gateway to advanced training in STEM fields—the point of admission to undergraduate and graduate programs—is a critical step, where consciousness of the underutilization problem and the urgent need to correct it, must be brought to bear. At the end of the day, employers can only hire people for advanced STEM positions who have been admitted to, and succeeded in pursuing, the essential educational prerequisites. Thus, any decision by this Court

which would foreclose university admissions officers from thinking about race (and gender), and the urgent need to correct our historic underutilization, would deal a serious blow to their businesses and their efforts to remedy this critical problem.

A. DuPont

E.I. du Pont de Nemours and Company ("DuPont") was founded in 1802 by Éleuthère Irénée du Pont, initially as a manufacturer of gunpowder. Over its more than two centuries of existence, it has evolved into a multifaceted company engaged in wide-ranging basic and applied research, which has led to numerous innovations and widely used products, including, among many others, Nylon, Corian, Teflon, Mylar, Kevlar, and Lycra. Throughout its existence, DuPont has been attentive to its duty to the nation. As well as other contributions, DuPont supplied a major portion of the gunpowder used by the Union army in the Civil War. It was a leading innovator in the development of body armor, beginning with the development of flak jackets for the Allies in World War II, and continuing with its invention of Kevlar in the 1960s.

Today, DuPont has approximately 150 research and development facilities around the world, employing more than 10,000 scientists and engineers. The increasingly international and cross-cultural nature of its operations throughout the twentieth century led it several decades ago to a deep conviction that its long-term business interests, as well as the public interest, demand a strong commitment to the pursuit of diversity. DuPont has thus expanded its education initiatives, which it began in 1918, to address STEM education at all

levels, from elementary school to post-doctoral education. These programs include the DuPont Challenge, Ag Ambassadors Academy, and the Young Professors Program, all of which are designed to improve science literacy. It has also adopted ambitious diversity goals for its own workforce through the hiring of diverse candidates and attention to retaining diverse employees. Among its efforts focused on retention are a training program on unconscious bias and advanced leadership development programs for women.

B. IBM

The International Business Machines Corporation has been a global innovator in technology since its founding in 1911, beginning with its creation of punch card tabulating machines that calculated census data, and including its development of the first programmable computers that fueled the U.S. landing on the Moon. IBM is still a leader in technology after 100 years because it continuously innovates. It developed a cognitive computer, called Watson, that beat the top competitors on the game show "Jeopardy," and IBM has maintained its record breaking position as number one in patents for twenty-two consecutive years. To continue that leadership, IBM has twelve research laboratories located around the world. Its employees have won five Nobel Prizes, among many other honors. Since its founding in the United States, IBM has expanded internationally. Today it has nearly 400,000 employees servicing more than 175 countries. Given the accelerating pace of technology, innovation is critical to the future success of IBM.

Thus, employing the best technical talent—from all walks of life—is key to IBM's strategy.

To that end, IBM has a long-standing commitment to diversity.[2] And today, that commitment extends well beyond non-discrimination, to a range of activities that IBM pursues in order to enhance its ability to hire minorities and women, especially in the STEM professions where these groups are underrepresented. IBM has thus expended significant resources to promote diversity in STEM, both in the educational setting and within its own ranks. For example, over the past decade, IBM has hosted technology camps for minority and female students between the ages of eight and fourteen who have expressed an interest in the STEM fields. Also, in cooperation with state and federal agencies, IBM established a series of technology-focused high schools, known as "P-TECH" schools (the Pathways in Technology Early College High School), which provide an intensive technology focused curriculum, along with mentorship and internship opportunities, to prepare minority youth to pursue STEM careers.

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[2] In 1953, its then-President, Thomas Watson, Jr., sent a letter to all IBM employees, stating that IBM needed to hire the best people regardless of race, ethnic origin, or gender. IBM100, *Building an Equal Opportunity Workforce*, Overview, http://www-03.ibm.com/ibm/history/ibm100/us/en/icons/equal workforce/. In 1984, it added sexual orientation to its non-discrimination policy. IBM100, *Building an Equal Opportunity Workforce*, Transforming the World, http://www-03.ibm.com/ibm/history/ibm100/us/en/icons/equal workforce/ transform/.

In addition to its efforts targeted at growing the pipeline, IBM has also focused on promoting diversity in its own workforce. As an equal opportunity employer and federal contractor, it proactively recruits diverse candidates for STEM positions through programs like Project View, and encourages retention of diverse employees through approximately 270 affinity groups worldwide. These initiatives, along with others that IBM has pursued for many years, have "expanded minority markets dramatically" and led to "a virtuous circle of growth and progress." David A. Thomas, *Diversity as Strategy*, Harv. Bus. Rev. (Sept. 2004).

C. Intel

Intel Corporation was founded in 1968, by Robert Noyce and Gordon Moore, to pursue the development of integrated circuits, of which Noyce was a co-inventor. Over the ensuing years, it became the top manufacturer of microprocessors used in modern computers, as well as a leading force in the progressive miniaturization of such circuits, which resulted in constant improvement in computing speed and efficiency. Today its products include motherboards, chipsets, network interface controllers, flash memory, graphics chips, embedded processors, and solid state drives, among others. Not surprisingly, given the international market for its products, Intel now has numerous facilities in countries around the world, including Argentina, India, Ireland, Israel, Malaysia, Russia, and Vietnam.

Intel has long been committed to equal opportunity and non-discrimination. In recent years, however, the problem of underutilization of

minorities and women in the technology industry has become a matter of special concern at the top levels of the company. In January 2015, Intel announced a $300 million initiative to address that problem, for itself and for the technology industry in general. Concluding that its workplace and industry should reflect the full availability and talent pool of women and underrepresented minorities, Intel has undertaken a multifaceted effort designed to make it a more diverse company, grow the STEM pipeline, and expand diversity through suppliers and start ups.

To that end, Intel set a goal of full representation in its U.S. employee base by 2020 and expanded representation of minorities and women in leadership. Intel has committed to transparency in this process and will continue to share publicly its diversity data. As of this summer, Intel had exceeded its goal for 2015 by hiring 43.3% diverse employees for positions in the United States and increasing the representation of minorities and women in leadership roles. As part of its initiative, Intel also intends to drive collective investments in STEM education at the high school, community college, and higher education levels—such as through its pipeline programs with Georgia Tech and the Oakland Unified School District—and diversify both the industry supply chain as well as the venture landscape.

D. NACME

The National Action Council for Minorities in Engineering, Inc. was established in 1974 by a group of concerned business leaders to develop strategies for increasing the participation of underrepresented

minorities in STEM-based careers. NACME has not only provided leadership and support for the national effort to increase the representation of successful African Americans, Native Americans, and Latinos in these fields, but also serves as the nation's largest private source of scholarships for minorities in engineering. Since 1974, more than 23,000 students have received $124 million in NACME scholarships and other support to study in these technical disciplines. NACME Alumni have gone on to hold leadership positions in many fields, including industry, medicine, and education.

In addition to providing scholarships, NACME's work focuses on three primary areas. In conjunction with its Research and Policy Advisory Council, NACME conducts research and publishes reports analyzing educational trends in engineering enrollment, degree completion, and workforce participation of underrepresented minorities. It also advances policies and practices that support the development of a diverse corps of world-class technology professionals. Finally, it delivers a range of programs to students, educators, and practitioners—including professional development programs—to ensure that students receive the quality learning and work experiences they need to pursue a career in the STEM fields.

ARGUMENT

Today, American businesses compete on the world stage, in which both the necessity for cooperation across cultural and ethnic lines and unrelenting competition are everyday realities. This is especially true in STEM businesses like those of the corporate *amici*, where rapid change driven by remarkable innovations is increasingly the product of international collaboration, and growth depends upon successful marketing to people of widely varying backgrounds. Based on practical experience operating in this setting, *amici* share convictions about which they have no doubt and on which basis each is making major strategic investments. One of these is the recognition that, even though the underrepresentation of minorities and women in the STEM fields is a complex problem requiring multifaceted solutions, affirmative action admissions to undergraduate and graduate university programs is an indispensable tool.

I. It Is Vitally Important To The Nation's Competitiveness And Future Prosperity That We Address The Substantial Underrepresentation Of Minorities And Women In STEM Fields.

We live in a diverse world of widely varying perspectives and experience, and the greatest possible appreciation and understanding of those other perspectives is essential if businesses like *amici*'s are to compete effectively. The general premise that diversity of a student body enhances the educational experience for everyone, which this Court has acknowledged as an interest of constitutional dimensions, *Grutter v. Bolinger*, 539

U.S. 306, 324-25 (2003) (citing *Regents of University of California v. Bakke*, 438 U.S. 265, 314-15 (1978) (Powell, J.)), is mirrored in the business reality. *Amici* must be able to approach and deal with customers, collaborators, and competitors of all backgrounds, wherever they reside, with reasonable understanding and respect of their diverse perspectives. Indeed, the benefits of diversity that were recognized in *Grutter* are equally present in work in the STEM fields, given the increasingly international and collaborative nature of virtually all advanced research.

As a result of their experiences running successful business enterprises, *amici* have long been committed to achieving the greatest level of diversity at all levels of their workforces because of the many ways that diversity improves competitiveness. *Amici* have found that diverse STEM teams create "better innovations and outcomes" than homogenous teams, and thus recognize that a diverse workforce is essential to succeeding in the competitive global marketplace. Virginia Rometty, IBM, *Diversity & Inclusion*, http://www-03.ibm.com/employment/us/diverse/downloads/ibm_diversity_brochure.pdf; *see also* DuPont News, *Promoting Diversity & Inclusion* (Feb. 11, 2013) (explaining that diversity is necessary to make DuPont "a stronger competitor and leading innovator across all our businesses").

These experiences, which *amici* all share, are borne out by the empirical data showing that "diverse groups typically outperform an individual of extraordinary ability or even homogenous groups of the best and brightest." Thomas J. Epenshade & Alexandria Walton Radford, *No Longer Separate, Not*

Yet Equal 406 (2009). As the National Academies have found, diversity strengthens innovation by "increasing the number of perspectives and the range of knowledge brought to bear" on an issue. Nat'l Acads., *Expanding Underrepresented Minority Participation* 19 (2011).

The benefits of diversity in the STEM fields are magnified by the increasingly collaborative nature of those disciplines.[3] Thus, *amici* firmly believe that "[a]s technology and markets continue to evolve, building and growing a workforce that is fully representative of the customers we serve and communities in which we operate is paramount to our success." Intel, *Intel Diversity in Technology Mid Year Report* 5 (Aug. 12, 2015). Research confirms that increasing diversity in the STEM fields is a business imperative because the "ability to respond to national needs and remain globally competitive" requires "the capabilities and ingenuity of

[3] Of the last ten Nobel Prizes awarded in Physics, all ten were given to collaborative teams, and five of the ten were awarded to diverse teams with members from different countries. *See* All Nobel Prizes in Physics, http://www.nobelprize.org/nobel_prizes/physics/laureates/. Similarly, of the last ten Nobel Prizes awarded in Chemistry, seven were given to collaborative teams, six of which were diverse and included members from different countries. *See* All Nobel Prizes in Chemistry, http://www.nobelprize.org/nobel_prizes/chemistry/laureates/. Moreover, academic scholarship depends upon international collaboration. In 2012, fully one quarter of all science and engineering scholarly articles were internationally co-authored, an increase of nine percent from 1997. *See* Nat'l Sci. Bd., *Science and Engineering Indicators* Table 5-40 (2014).

individuals of diverse backgrounds." Nat'l Sci. Bd., *Revisiting the STEM Workforce* 22 (Feb. 4, 2015).

In addition to these well-known benefits of diversity, in recent years, *amici* have been confronted with an even more fundamental concern—a serious shortage of STEM talent—demanding that they achieve greater representation of minorities and women in their workforce.

A. In Many STEM Fields, There Are Not Enough Qualified Professionals Graduating Each Year To Meet The Needs Of Our Economy.

Efforts to utilize the talents of a more diverse workforce are driven by an even more fundamental concern. There are simply not enough qualified professionals entering the technical fields in which *amici* work to meet the demands of an increasingly competitive world marketplace. *Amici* face real challenges finding the people they need, with appropriate training and experience, for the growing number of STEM jobs. Thus it is essential, just to meet the growing demand for STEM talent, to address, and soon, the profound and persistent underrepresentation of minorities and women in these disciplines.

The U.S. Congress Joint Economic Committee has confirmed that "the U.S. is failing to produce an ample supply of workers to meet the growing needs" of STEM employers. U.S. Congress J. Econ. Comm., *STEM Education Preparing for the Jobs of the Future* 3 (Apr. 2012). For example, the Department of Defense is having difficulty filling numerous open positions for "systems engineers and other STEM

workers," cybersecurity professionals, as well as mechanical engineers, systems engineers, and aerospace engineers. Bureau Lab. Stats., *STEM Crisis or STEM Surplus? Yes and Yes*, Monthly Lab. Rev. (May 2015); *see also* Nat'l Acads., *Rising Above the Gathering Storm* 170 (2005) (noting that the "trends in enrollments and degrees" in STEM fields "are cause for concern").

This critical talent shortage threatens to grow more severe over time, as the role of STEM disciplines continues to expand. Indeed, "[e]conomic projections point to a need for approximately 1 million more STEM professionals than the U.S. will produce at the current rate over the next decade." President's Council of Advisors on Sci. & Tech., *Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics* 1 (Feb. 2012). "To meet this goal, the United States will need to increase the number of students who receive undergraduate STEM degrees by about 34% over annual rates." *Id.*

The shortage of qualified STEM professionals is a matter of national concern for several reasons. Advancements in the STEM fields have long been a primary driver of America's economic growth. *Revisiting the STEM Workforce*, *supra*, at 5. In fact, the National Academies have concluded that technological innovation alone has led to "half or more" of the growth in the nation's Gross Domestic Product in recent decades. *See* Nat'l Acads., *Rising Above the Gathering Storm, Revisited* 18 (2010). This is not surprising, given that the United States has traditionally been at the forefront of innovation,

producing "the world's top research scientists and engineers," which, in turn, has led "to breakthrough advances in science and technology." *STEM Education: Preparing for the Jobs of the Future*, *supra*, at 1.[4]

Moreover, the rapidly increasing size of STEM industries will continue to contribute to the country's well-being as these industries become a more dominant sector of our economy over time. As of 2012, more than seven million people were employed in core STEM occupations,[5] and another eight million people were employed in healthcare STEM occupations, together accounting for more than twelve percent of the U.S. workforce. *Id.* at 57.[6]

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[4] *See also Science and Engineering Indicators*, *supra*, at 5-35 (showing that United States leads world in publication of science and engineering scholarly articles); *Rising Above the Gathering Storm, Revisited*, *supra*, at 35 (stating that the United States is home to a disproportionate share of the world's innovators).

[5] Core STEM fields are generally defined to include engineering, life science, physical science, information technology, and mathematics, but do not include healthcare occupations. U.S. Gov't Accountability Office, GAO-14-374, *Science, Technology, Engineering, and Mathematics Education* 5 (May 2014).

[6] These statistics do not fully reflect the need for STEM talent in the workforce because "core competencies obtained by STEM graduates are increasingly in demand by non-STEM employers." *STEM Education: Preparing for the Jobs of the Future*, *supra*, at 4. This phenomenon has "led to a growing number of STEM graduates working in non-STEM fields—while STEM employers continue to cite a shortage of qualified workers." *Id.* Specifically, as of 2010, ten million workers were employed in an occupation that requires bachelor's level

From this baseline, the STEM sector is anticipated to expand at a faster rate than non-STEM fields at least through 2020. *STEM Education Preparing for the Jobs of the Future*, *supra*, at 2.

Finally, a well-qualified STEM workforce helps to safeguard national security—an area heavily dependent upon innovation in STEM disciplines. *See, e.g.*, Jonathan Rothwell, *The Hidden STEM Economy* 12, Brookings Inst. (June 2013) (explaining that fully forty percent of national security occupations require high levels of knowledge in at least one STEM field). For this reason, "harnessing the best science and engineering" talent is necessary "to help counter terrorism and other national security threats." *Rising Above the Gathering Storm*, *supra*, at 25-26, 104.

For these many reasons, then, related to but far transcending the business success of entities like *amici*, it is vitally important that the country maintain its long-held leadership position by producing more "'STEM innovators'—those individuals who have developed the expertise to become leading STEM professionals and perhaps the creators of significant breakthroughs or advances in scientific and technological understanding." Nat'l Sci. Bd., NSB-10-33, *Preparing the Next Generation of STEM Innovators* 9 (2010).

(continued…)

expertise in science or engineering but is not considered a STEM occupation. *Revisiting the STEM Workforce*, *supra*, at 6.

B. The Shortage Of Trained Professionals In The STEM Fields Is Substantially Related To The Fact That A Majority Of The Population—Minorities And Women—Are Profoundly Underrepresented In These Fields.

The shortage of available STEM professionals is correlated with the underutilization of minorities and women. Greater diversity in the workplace is essential to "expand the talent pool." Thomas, *supra*, at 1-2 (analyzing IBM's diversity initiatives).

As the empirical data demonstrates, minorities and women obtain core STEM degrees and participate in the STEM workforce at disproportionately lower rates than their overall representation in the population. This "persistent STEM participation and achievement gap[]" prevents the United States from "fufill[ing] the demand for STEM workers," *STEM Education Preparing for the Jobs of the Future*, *supra*, at 5, and is cause for "concern, even alarm," *Expanding Underrepresented Minority Participation*, *supra*, at 36. Although women compose about fifty percent of the U.S. population, they receive only thirty-two percent of core STEM degrees, U.S. Gov't Accountability Office, GAO-14-374, *Science, Technology, Engineering, and Mathematics Education* 53 (2014), and constitute only twenty-eight percent of those currently working in science and engineering occupations, Nat'l Sci. Bd., *Science and Engineering Indicators* 3-43 (2014).

Minorities are also profoundly underrepresented in the STEM fields. Hispanics compose about sixteen percent of the U.S. population, and African Americans compose about thirteen percent. Nat'l

Sci. Found., *Women, Minorities, and Persons with Disabilities in Science and Engineering* 2 (2015). Hispanics receive, however, only ten percent of core STEM degrees, and African Americans receive only eight percent. *Science, Technology, Engineering, and Mathematics Education*, *supra*, at 55. This underutilization is magnified greatly in the STEM workforce, where Hispanics compose only about five percent and African Americans compose about four and a half percent of those employed in science and engineering occupations. *Science and Engineering Indicators*, *supra*, at 3-22. Thus, "the proportion of underrepresented minorities in S&E [workforce] would need to *triple* to match their share of the overall U.S. population." *Expanding Underrepresented Minority Participation*, *supra*, at 36.

In light of the fact that Hispanics and African Americans are "the most rapidly growing segment of the population," businesses like *amici* will face a substantial "demographic challenge" if the underrepresentation is not remedied. *Id.* at 1. Specifically, projections show that by 2030 racial minorities will compose the majority of the college-age population. *See Science and Engineering Indicators*, *supra*, at Table 2-15. These projections for the college-age population are consistent with overall demographic trends that show the current majority group (non-Hispanic white) is projected to fall to less than half of the population by 2044. *See* U.S. Dep't of Commerce, *Projections of the Size & Composition of the U.S. Population: 2014 to 2060* 1 (Mar. 2015).

The National Academies therefore have concluded that the country's ability to maintain "[a]

strong and robust science and engineering workforce" depends on "greater participation of underrepresented minorities in that STEM workforce." *Expanding Underrepresented Minority Participation*, *supra*, at 143. Indeed, the U.S. Congress Joint Economic Committee reached the same conclusion and asserted that America's "continued economic prosperity" depends on "the proactive identification and development of talented young men and women from all demographics with all types of STEM-related abilities who have the potential to become our next generation of STEM innovators." *Preparing the Next Generation of STEM Innovators*, *supra*, at 9. The shifting demographics show that the country's ability to fill the growing number of available STEM positions will decline unless and until minorities and women fill the void.

II. The Underutilization Of Minorities And Women In STEM Fields Is A Complex Problem That Demands A Full Court Press To Address Its Causes At All Levels.

There are many complex reasons for the underutilization of minorities and women in the STEM fields. They include an absence of role models, persistent stereotypes that these groups lack competence in STEM fields, and a shortage of educational opportunities, especially in technical fields at public schools with inadequate resources. Governmental bodies and American businesses are all actively engaged in addressing these issues in a variety of ways, and such efforts at every level are essential. All agree that the underutilization of minorities and women in STEM professions cannot be solved simply by affirmative action admissions

processes at the college and graduate school levels. At the same time, as discussed in Part III, *infra*, affirmative action admissions remain a critical part of addressing and resolving the underrepresentation of minorities and women.

The path to achieving an undergraduate or graduate degree in a STEM discipline, and thus attaining the qualifications for many STEM careers, is a rigorous and cumulative process that begins no later than primary school. Minorities and women may face various impediments that differ in character and degree from those confronting all students pursuing a STEM career, which contribute to the underrepresentation of minorities and women in these fields. Remedying the growing underrepresentation problem thus requires implementation of multifaceted solutions that address the causes of the problem at each stage of the STEM development pipeline—from establishing early and equal access to STEM educational opportunities, to implementing hiring and retention programs in the workforce. *See, e.g.*, *Expanding Underrepresented Minority Participation*, *supra*, at 7 (explaining that the "potential for losing students along all segments of the pathway from preschool through graduate school necessitates a comprehensive approach that focuses on all segments of the pathway, all stakeholders, and the potential of all programs").

The National of Sciences has observed that women are underrepresented in the STEM fields primarily for reasons related to bias and stereotyping, including the implicit bias that men outperform women in STEM disciplines, as well as

social expectations, lack of role models, and a perceived lack of inclusion. Nat'l Acad. Scis., *Beyond Bias and Barriers, Fulfilling the Potential of Women in Academic Science and Engineering* 63-66 (2007); *see also Preparing the Next Generation of STEM Innovators*, *supra*, at 9.[7]

The causes of minority underrepresentation include some of those dissuading women from entering the STEM fields, such as the absence of role models and persistent stereotypes regarding lack of competence. But minorities also often face a lack of preparation in primary and secondary education, as well as economic disadvantage. *Expanding Underrepresented Minority Participation*, *supra*, at 5. For minority women, the causes of underrepresentation are cumulative, such that they "face even more barriers to success," *Beyond Bias and Barriers, Fulfilling the Potential of Women in Academic Science and Engineering* 4—a phenomenon that scholars have coined the "double bind," Maria Ong, et al., *Inside the Double Bind*, 81 Harv. Educ. Rev. 172, 175 (2011).

Of these factors impacting minorities, perhaps the most critical is that minority students often lack access to high quality primary and secondary

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[7] Although women demonstrate the same aptitude and preparation as men for STEM careers during high school, these social factors "influence both women and men's perceptions and evaluations of competence and performance," and lead to women choosing STEM majors, graduate degrees, and careers at a much lower rate than men. *Beyond Bias and Barriers, Fulfilling the Potential of Women in Academic Science and Engineering*, *supra*, at 215.

schools. Specifically, minorities are more likely to attend secondary schools that do not offer key prerequisite courses for college-level STEM study,[8] gifted and talented programs, or Advanced Placement courses. *See, e.g.*, *Preparing the Next Generation of STEM Innovators*, *supra*, at 13. This disparity is significant not only because the STEM fields require a significant measure of pre-college preparation, but also because without these resources and opportunities, as the National Science Board has recognized, the "most talented and determined . . . minority students . . . are never identified or given an equal opportunity to realize their enormous potential." *Id*.

To address this problem, government agencies, private foundations, and STEM industry leaders, among others, have invested significant time and resources "to remedy the skills deficits" that pervade primary and secondary education. Kaye Husbands Fealing & Samuel L. Myers, Jr., *Pathways v. Pipelines to Broadening Participation in the STEM Workforce*, S. Econ. Ass'n Meeting, at 1 (Jan. 13, 2012). Federal government agencies alone have implemented at least thirty K-12 STEM education programs that prepare students for postsecondary

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[8] As the U.S. Department of Education recently reported, a "quarter of high schools with the highest percentage of black and Latino students do not offer Algebra II," and a "third of these schools do not offer chemistry." U.S. Dep't of Educ. Office for Civil Rights, *Civil Rights Data Collection* 1 (Mar. 2014); *see also* Bus. Higher Educ. Forum, *Creating the Workforce of the Future* 1 (Aug. 2011) ("Nearly a quarter of African American students are interested in STEM but not proficient in math.").

education in a STEM discipline. *Science, Technology, Engineering, and Mathematics Education*, *supra*, at 32-33.[9]

Amici and other private entities have also long facilitated efforts to provide underrepresented minorities, and women and girls, early and equal access to STEM education, such as The DuPont Challenge for students and IBM's technology camps.[10] IBM, in cooperation with state and federal agencies, has also established a series of technology-focused high schools, known as "P-TECH" schools (the Pathways in Technology Early College High School), which provide an intensive technology focused curriculum, along with mentorship and internship opportunities, to prepare minority youth to pursue STEM careers.

Other key causes of this growing underrepresentation are the absence of minority and women STEM role models and persistent

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[9] These programs provide a wide variety of services to achieve these benefits, such as "classroom instruction; curriculum development; outreach to general student interest in STEM fields; short-term experiential learning activities; and teacher professional development or retention activities." *Id.* at 33.

[10] DuPont and IBM have spearheaded education initiatives that address science literacy beginning as early as elementary school. NACME has also recently expanded its efforts to increase the pipeline of underrepresented students in STEM by partnering with the National Academy Foundation and Project Lead the Way to create Academies of Engineering, which are small schools-within-schools that focus high school students on STEM careers.

stereotyping. The National Academy of Sciences has observed that in high school and college settings, these STEM students are often "academically and socially isolated," which "can result in a lack of a support structure and reinforcement that scientific careers are not for them." *Expanding Underrepresented Minority Participation*, *supra*, at 134.[11] And, for those minority students who are from economically disadvantaged backgrounds, college presents "new, often intimidating situations," and these students are often "without the same level of information or even access to information that students from advantaged situations take for granted." *Expanding Underrepresented Minority Participation*, *supra*, at 134.[12]

To remedy the absence of social support and better integrate minorities and women in the study of STEM disciplines, educators have recommended "addressing institutional climate issues" and "building supportive peer networks." Mitchell

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[11] *See also* Shelley J. Correll, *Gender and the Career Choice Process: The Role of Biased Self-Assessments*, 106 Am. J. Soc. 1691, 1698 (2001) (an absence of strong role models and "widely shared cultural beliefs about gender and task competence" bias how women judge their own STEM ability).

[12] Moreover, scholarship has shown that there is a persistent bias against minority students in the academic setting. Minority students are less likely than non-minority students to complete a science major in part due to the "negative racial experiences" that they experience during their first year of study. Mitchell Chang, et al., *Considering the Impact of Racial Stigmas and Science Identity*, 82 J. Higher Educ. 563, 566 (2011).

Chang, et al., *Considering the Impact of Racial Stigmas and Science Identity*, 82 J. Higher Educ. 563, 588 (2011).[13] "Fostering contact with faculty outside of the classroom," particularly minority and women faculty, can also "decrease isolation," as does "building a critical mass" of minority and women student peers. *Expanding Underrepresented Minority Participation*, *supra*, at 134.[14]

NACME has therefore worked to build a critical mass of minority students in the STEM disciplines. Along with its corporate and individual donors, it has provided scholarship funding for more than 23,000 minority STEM students attending universities that have demonstrated a commitment to minority student success.

The corporate *amici*, too, have made efforts to diversify their workforces which, in turn, has created more positive role models of STEM professionals for

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[13] These include instituting programs that provide spaces for underrepresented minorities and women to "(1) belong to a supportive community of scholars who look[] like them; (2) reject negative stereotypes; (3) validate their identities as emergent scientists; (4) learn how to address microaggressions (subtle offenses) from faculty and peers; and (5) grow their subcommunity by serving as role models, mentors, and teachers." Ong, *supra*, at 184.

[14] *See also* Liliana M. Garces, *Understanding the Impact of Affirmative Action Bans in Different Graduate Fields of Study*, 50 Am. Educ. Res. J. 251, 276 (2013) ("faculty play a critical role in influencing the decisions of [minority] students to attend graduate school, choose a particular program, and pursue a STEM career"); Mark E. Enberg & Gregory C. Wolniak, *College Student Pathways to the STEM Disciplines*, 115 Teachers Coll. Record 1, 23 (2013) (similar).

minority and female youth to emulate. IBM proactively recruits minority and women candidates for STEM occupations, and also encourages the development of underrepresented groups through company-wide affinity groups based on gender, ethnicity, and other personal attributes. DuPont and Intel have both outlined specific diversity goals for hiring among all company divisions in the United States. DuPont aims for its workforce to be forty percent female and twenty-five percent minority. Intel's goal for 2015, which will change year-to-year, is to make forty percent diverse hires, defined to include women, and African American, Hispanic, or Native American individuals.[15]

III. Affirmative Action In Admissions To Undergraduate And Graduate STEM Programs Is And Remains An Essential Step In Any Serious Effort To Address Minority Underrepresentation In The STEM Fields.

Notwithstanding the many complex causes of the substantial underrepresentation of minorities and women in the STEM fields, it remains true that the final and essential qualifying step for an individual to attain many STEM positions is receiving an undergraduate or graduate degree in a STEM field. As discussed above, *amici*'s diversity initiatives

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[15] Additionally, Intel committed $300 million to form the Intel Diversity in Technology Fund, with the goal to accelerate hiring and retention programs, and provide seed funding for a wide variety of programs aimed at developing STEM pipelines, increasing spending with diverse suppliers, and growing diversity in venture capital investments.

address primarily the underrepresentation of minorities and women through pre-college STEM preparation and post-graduate recruitment programs. *Amici* remain dependent, however, on universities to provide candidates with the educational prerequisites essential to practice STEM disciplines. Unlike other fields where skills can be learned on the job, the vast majority of STEM occupations require a degree in a STEM field. *See* U.S. Dep't of Commerce, ESA Issue Brief 05-11, *Education Supports Racial and Ethnic Equality in STEM* 4 (Sept. 2011) (finding only fourteen percent of STEM workforce had less than a bachelor's degree). Thus, university admissions serve as the gateway to practice in many STEM occupations.

Focusing on the issue before the Court—race-based affirmative action—*amici* believe that affirmative action in undergraduate and graduate admissions decisions is an essential step to educating qualified minority students at the highest levels and, in turn, addressing their profound underrepresentation in the STEM fields. This position is supported by the consensus view that banning affirmative action would dramatically reduce the number of minority students at competitive universities.[16] A recent, comprehensive

[16] For our purposes, the term "competitive universities" refers to those schools where substantial numbers of applicants are rejected. These schools generally employ some form of affirmative action in admissions decisions. This group has been roughly characterized as including the top fifty four-year institutions. *See* Ben Backes, *Do Affirmative Action Bans Lower Minority College Enrollment & Attainment?*, 47 J. Hum. Resources 435, 438 (2012).

study on the effect of affirmative action bans in six states—Texas, California, Washington, Florida, Georgia, and Michigan—found "there were large drops in the African American and Hispanic share of students enrolling and graduating from" competitive institutions in those states. *Id.* at 450. [17] Specifically, following the affirmative action bans, African American enrollment dropped twenty-nine percent and Hispanic enrollment dropped twenty percent. *Id.* at 447.

Numerous other studies on the effect of affirmative action bans on admission to competitive schools have reached similar results. *See, e.g.*, Epenshade, *supra*, at 10, 345 (considering data representative of the top fifty universities as ranked by U.S. News and concluding that "[u]nderrepresented minority students currently account for more than 16 percent of admitted students, but this overall share would decline to less than 10 percent with the loss of affirmative action," with the African American share declining by half and the Hispanic share declining by twenty-five percent); Peter Hinrichs, *The Effects of Affirmative Action Bans on College Enrollment, Educational Attainment, and the Demographic Composition of Universities*, 94 Rev. Econ. & Stats. 712, 717 (2012) (analyzing data from the top fifty universities as

[17] Backes analyzed the effects of affirmative action bans at those schools where the average mean standardized test score was in the top decile of scores. *Id.* at 438. He observed that the same decrease in minority enrollment occurred when analyzing data from the top fifty public universities as ranked by U.S. News. *Id.* at 438 n.8.

ranked by U.S. News and concluding that "changes in representation caused by affirmative action bans are very large in relative terms," specifically African American enrollment would drop thirty percent and Hispanic enrollment would drop twenty-eight percent).

In the absence of affirmative action, qualified minorities that otherwise would have attended competitive institutions lose out on a host of advantages that attendance confers, including a higher likelihood of graduating, a higher likelihood of earning a professional or doctoral degree, and, on average, "greater career success as measured by annual income." *Expanding Underrepresented Minority Participation*, *supra*, at 95. *See also* Epenshade, *supra*, at 237 (finding numerous benefits from attending a competitive university); Daria Witt, *et al.*, *Compelling Interest: Examining the Evidence on Racial Dynamics in Colleges and Universities* 8 (2003) (attending a competitive "undergraduate institution dramatically increases minority students' chances of both graduating and being accepted into a graduate or professional school").

Any curtailment of affirmative action admissions would also critically imperil *amici*'s ability to achieve diversity among its top researchers and management, because a ban would have a particularly severe impact on the number of minorities admitted to STEM graduate programs. Specifically, after affirmative action was banned in Texas, California, Florida, and Washington, "the greatest declines in the proportions of enrolled graduate students who are students of color took place in the fields of engineering (26%) [and] natural

sciences (19%)." Liliana M. Garces, *Understanding the Impact of Affirmative Action Bans in Different Graduate Fields of Study,* 50 Am. Educ. Res. J. 251, 25 (2013). And, there was a similar drop in the number of minorities enrolled in medical school after affirmative action was banned in California: the number of African Americans enrolled dropped thirty-eight percent and the number of Hispanics enrolled dropped twenty-nine percent. G. Orfield & E. Miller (eds.), *Chilling Admissions: The Affirmative Action Crisis* 41 (1998).[18]

A decline in the number of minorities with advanced STEM degrees would have a devastating impact on *amici*'s ability to diversify their workforce because there would be fewer minority candidates for high level research and development positions. This is problematic because, as it stands now, *amici* are unable to recruit minorities with advanced degrees in representative numbers—there are simply too few minorities obtaining these degrees. *See, e.g.*, Nat'l Sci. Found. & Nat'l Ctr. for Sci. & Eng'g Stats., *Science and Engineering Degrees, by Race/Ethnicity of Recipients: 2002-12*, NSF 15-321, Table 3 (May 2015) (finding in 2012, Hispanics composed less than four percent and African Americans less than three

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[18] Importantly, the full consequences of eliminating affirmative action on the number of minorities with advanced STEM degrees are likely even more severe than this data reflects. This is so because those minorities admitted to STEM programs in the absence of affirmative action are less likely to "persist through their program" as a result of increased racial isolation. Garces, *supra*, at 26.

percent of those earning doctoral degrees in science and engineering).

And, critically, a decline in the number of minorities with STEM graduate degrees would set back *amici*'s long-term efforts to address the underrepresentation problem because there would be fewer minority role models in positions of leadership in industry and on STEM faculty. Minority role models play an essential role in influencing students to pursue and persist in STEM occupations, and also in challenging persistent stereotypes that minorities lack competence in STEM fields. *See, e.g.*, *Expanding Underrepresented Minority Representation*, *supra*, at 47, 156. *See also* Garces, *supra*, at 26 (concluding that minority "faculty play a critical role in influencing the decisions of students to attend graduate school, choose a particular program, and pursue a STEM career"). Further, the need for minority STEM role models is increasing as the number of minority youth grows. Reduction or elimination of affirmative action would thus dramatically reduce the number of minority role models going forward and undercut *amici*'s efforts to encourage minority youth to pursue STEM occupations.

For these reasons, affirmative action at competitive universities is a necessary part of the solution to remedying the profound underrepresentation of minorities in the STEM disciplines. Industry leaders are dependent on universities to provide the specialized training necessary to succeed in the STEM workforce. And minority graduates from competitive universities, particularly those that have received advanced

degrees, are in the best position to become leaders in the STEM fields and serve as role models to minority youth.

CONCLUSION

For the reasons stated in Respondent's brief, and in this and other amicus briefs, the decision of the Fifth Circuit should be affirmed.

Respectfully submitted,

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