

Advocating for diversity from a personal and professional perspective

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Exploring and celebrating diversity in science.

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Diversity in STEM: What It Is and Why It Matters

By [Kenneth Gibbs, Jr.](#) | September 10, 2014 |  10

Innovations resulting from science, technology, engineering and mathematics (STEM) fields have positively touched nearly every aspect of human life. Scientific innovations do not arise *on their own*; each is brought forth through the hard work and ingenuity of scientists. Therefore, the quality of the scientific research enterprise, and its ability to meet the needs of, and positively impact the lives of individuals, communities, nations and the world is inextricably linked to the individual “STEMists” involved. In my 16 years in science (from high school intern to [postdoc](#) at the [National Institutes of Health](#)), I’ve never encountered a person who disagrees with these statements.

5 NUMBERS THAT EXPLAIN WHY STEM DIVERSITY MATTERS TO ALL OF US



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engaging science



MATHEMATICS

The Mathematics Pipeline and Student Diversity: An Uncommon Dialogue

By Roni Ellington on Mon, 04 May 2015

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To meet the growing demand for science, technology, engineering (STEM) professionals, we need to prepare a broader cadre of students prepared to enter these fields. This has in turn increased the focus on inclusion and diversity in the STEM pipeline. How can educational institutions help underrepresented minority students persist, matriculate, and succeed in STEM related disciplines? I will draw on my personal experience as well as the stories of other high achieving mathematics students in order to provide strategies that will help support all students successfully navigate the mathematics pipeline.

The Increasing Diversity of America's Youth

Children Lead the Way to a New Era

Kenneth M. Johnson, Andrew Schaefer, Daniel T. Lichter, and Luke T. Rogers

Children are in the vanguard of America's increasing racial and ethnic diversity. The majority of newborn babies today are among racial and ethnic minority populations, according to recent Census Bureau estimates. U.S. Census Bureau projections indicate that by 2043, non-Hispanic whites will cease to be a majority of the American population. For America's children and youth, the future is now.¹ American diversity is fueled by differing fertility rates among racial and ethnic groups, changes in the racial composition of women of childbearing age, and immigration. Here we document how unfolding demographic forces have placed today's children and youth at the forefront of America's new racial and ethnic diversity. America's rapidly changing racial and ethnic composition has important implications for intergroup relations, ethnic identities, and electoral politics.²

Much of the growing racial diversity is caused by unprecedented population increases of minority children, particularly Hispanic children. It is also due to a significant numerical decline in the number of non-Hispanic white children, which is less often appreciated. The Great Recession reduced fertility and domestic migration rates and slowed the flow of immigrants, yet the demographic forces fueling diversity are unrelenting. Diversity has unfolded unevenly in geographic space. More than 600 U.S. counties, or approximately

KEY FINDINGS



Powerful demographic forces place America's children in the vanguard of the nation's increasing racial and ethnic diversity.



Diversity is increasing among America's youth because there are more minority children and fewer non-Hispanic white children.



Minority births exceeded non-Hispanic white births for the first time in U.S. history in 2011 according to Census Bureau estimates.



The largest gains in child diversity between 2000 and 2012 were in suburban and smaller metropolitan areas. Yet, child diversity is geographically uneven, with minimal diversity in some areas of the country and significant diversity in other areas.

15%

Child diversity increased despite the negative effect of the Great Recession, which reduced births among women in their 20s by nearly 15 percent between 2007 and 2012.

95%

The growing child diversity is fueled by U.S. births. More than 95 percent of the children in each major minority group were born in the United States.

The beginning....



Where is Puerto Rico?



My mother...



“Lo mas importante que les puedo regalar es una buena educación, pues eso, nada ni nadie se los puede quitar”.

Then....elementary school and junior high school—Escuela Cacique Majagua

- 4th-6th grade math
teacher: Ms. Solonida Hernandez
- 7th-9th grade math
teacher: Ms. Idalia Figueroa



5	3			7			
6			1	9	5		
	9	8					6
8				6			3
4			8		3		1
7				2			6
	6					2	8
			4	1	9		5
				8		7	9



High School... Escuela Superior

Miguel Meléndez Muñoz

- Algebra II teacher:
Mr. Joselín Alonso
- Biology and
Chemistry teacher:
Mr. José Manuel
Erazo



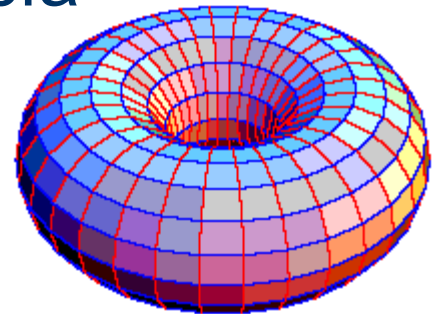
"Just a darn minute! — Yesterday
you said that X equals two!"

What had I seen and experienced?

- Good teaching involves
 - firm expectations
 - knowing your students
 - providing opportunities to extend and broaden knowledge
 - having excitement for the subject

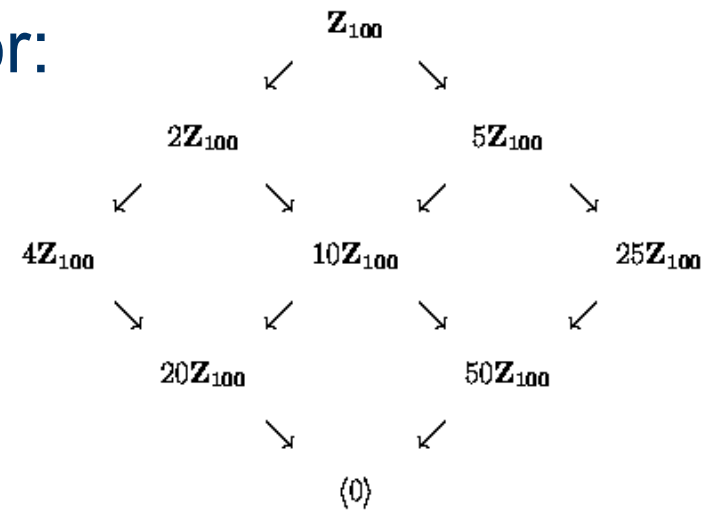
Universidad de Puerto Rico

- Advanced Calculus: Dr. Enrique Bayó
 - Challenging
 - Supportive
- Topology professor: Dr. Victor García
 - Organized
 - Thorough



Universidad de Puerto Rico

- Abstract Algebra professor:
Dr. Carol Knighten
 - Caring
 - Encouraging
 - Supportive
 - Challenging



As a student, why did I think that they were great teachers?

- Very excited about the subject!!!
- Respectful to all students
- They were professors who cared about their students, made them excited to learn and encouraged them to follow their dream
- They believed in their students capability to succeed
- Very high expectations!!!

*Then... leave home, graduate school:
Berkeley, Iowa*

❖ *University of California at Berkeley*

Master's degree in Mathematics

Subject I loved at Berkeley: Complex Analysis

Favorite Professor: Donald Sarason

❖ *University of Iowa*

Professor Frank Kosier-Abstract Algebra

1. In-depth study of topics
2. Students were his collaborators-"Kosier and friends".
3. Beautiful Science

Doctoral dissertation and receiving PhD degree!!

Combinatorics and
Finite Geometries:
semifield planes

Thesis advisor:
Professor Norman
Johnson-absolutely
loved the subject!!!!



UNIVERSITY OF IOWA
Commencement
May 6, 1989

Since graduation...

- ❖ Work on my research on finite non-associative algebras
- ❖ Professor at Texas Tech University
- ❖ Now, Professor at the University of Texas at Arlington
- ❖ Associate Dean for Academic Affairs in the College of Science
- ❖ Supervise doctoral students

Algebra-Geometry-Combinatorics-Design of Experiments: Finite Non-associative Algebras

- A (finite) semifield is a non-associative algebra consisting of a set S with two operations $+$ and \cdot , such that
 - $(S,+)$ is an abelian group,
 - multiplication is distributive on both the left and right,
 - there exists a multiplicative identity element, and
 - There are no zero divisors: $a \cdot b = 0$ implies $a = 0$ or $b = 0$.
- The order of a semifield is p^n for some prime number p and some positive integer n .
- The class I constructed and studied is the class of p -primitive semifields of order p^4 .
- I conducted an exhaustive computer search to obtain all the semifields of order $81=3^4$. These semifields of order 81 have 81^2+81+1 points and lines. I studied these structures and classified them.

Semifields of order p^4

- ◆ **Conjecture (Cordero):** *There are exactly*

$$1 + (p - 2) + \left(\frac{p + 1}{2}\right)^2$$

non isomorphic semifields of order p^4 for each prime number $p > 2$.

- ◆ Cardinali, Trombetti, and Polverino (2006)
Abstract: “A classification of semifields of order q^4 is given. For q prime, this proves the conjecture stated by Cordero in (10).”



What I have learn about the power of teachers

- ❖ As teachers we need to help our students see themselves as **empowered learners** of mathematics **who belong** in the mathematics community and **who develop a positive identity** as a mathematics learner and scholar.
- ❖ The key is to create learning environments that foster this identity for all students, specifically for underrepresented groups.

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The Increasing Diversity of America's Youth Children Lead the Way to a New Era

- ❖ In 2012 ~ 37% of the U.S. population was a racial or ethnic minority.

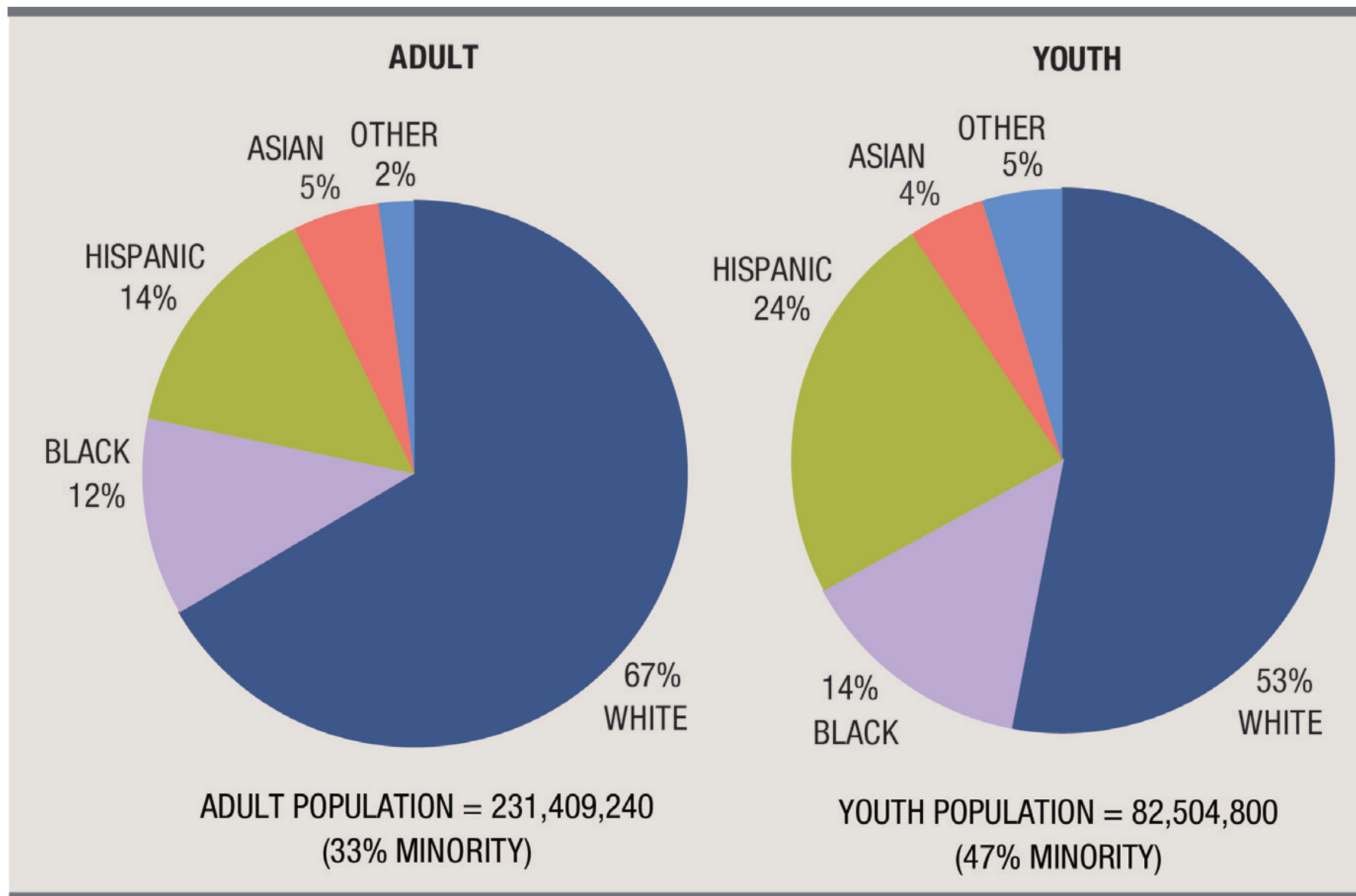
For those younger than 20 years old...

- ❖ In 1990 ~ 32 % of the population younger than age 20 was a minority.
- ❖ By 2000 ↑39%.

What was the percentage in 2012?

- a) 40% b) 42% c) 47%

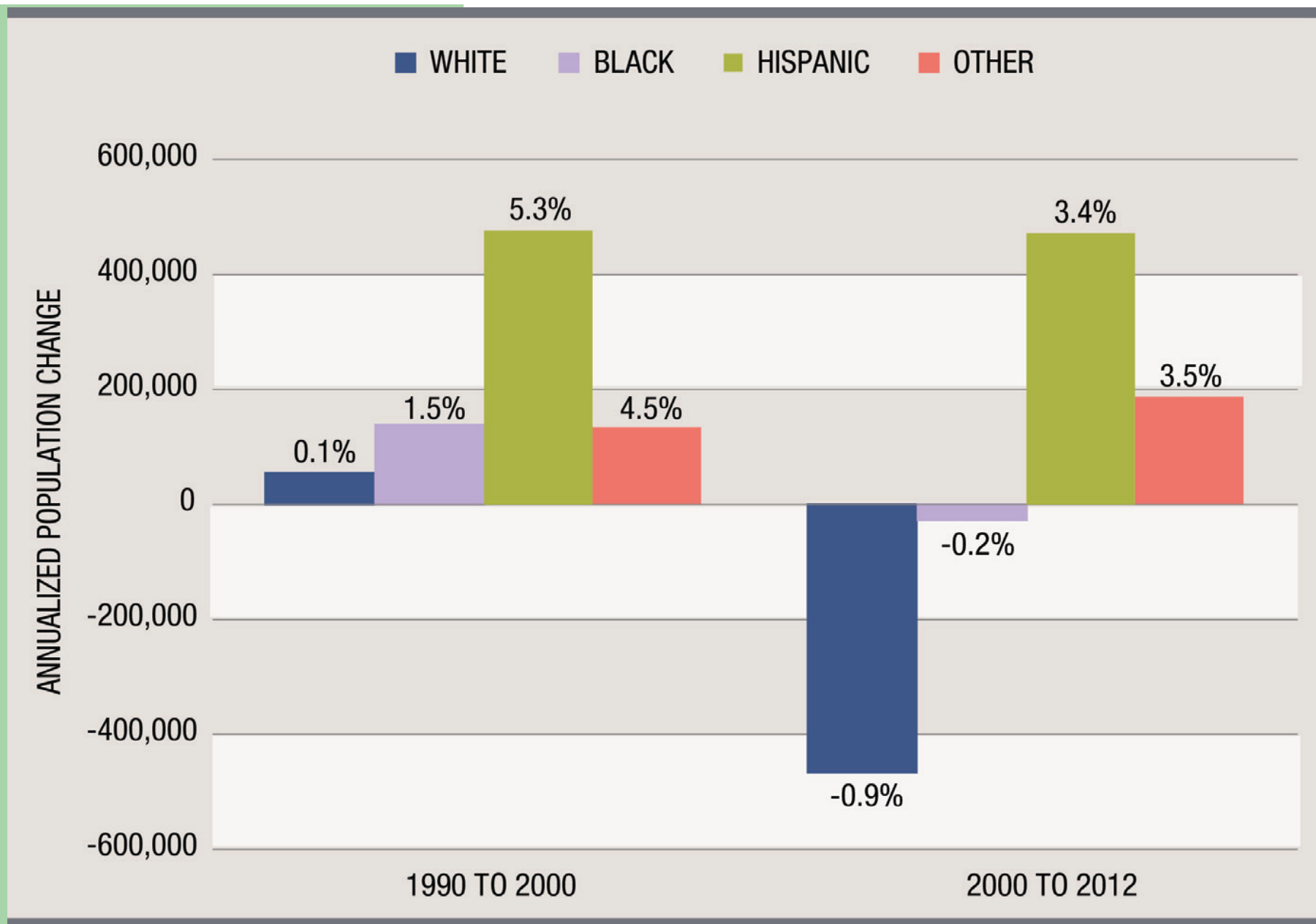
By July of 2012, 47% of the 82.5 million people under age 20 in America were from minority populations



ADULT AND YOUTH POPULATION BY RACE/HISPANIC ORIGIN, 2012

A few other interesting numbers...

- ✓ Minorities represented 48 percent of the population under age 5 in 2012.
- ✓ Between 2000 and 2012, the number of minority young people grew by 7.7 million (25%).
- ✓ The Hispanic youth population accounted for 5.8 million, or approximately 75% of the increase in the U.S. minority population under age 20.
- ✓ The number of young whites increased by only 54,000 (1 percent) during the 1990s.
- ✓ Since 2000, the number of young non-Hispanic whites has declined by 5.7 million (-11.5%).
- ✓ The proportion of young people who are non-Hispanic white declined from 61 to 53 percent between 2000 and 2012.



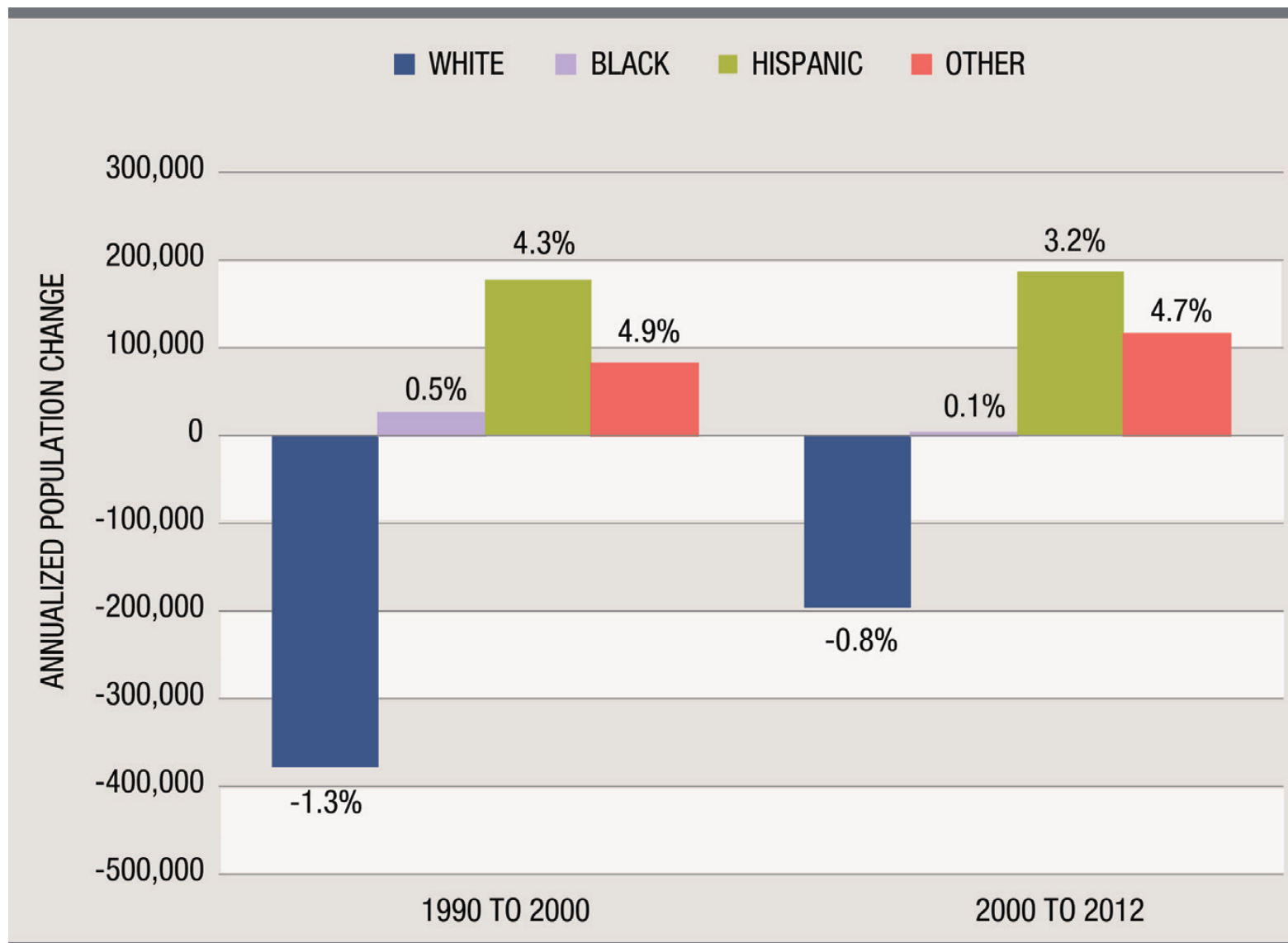
ANNUALIZED POPULATION CHANGE FOR THOSE UNDER AGE 20 BY RACE/HISPANIC ORIGIN, FROM 1990 TO 2000 AND FROM 2000 TO 2012

Minority Births Increase, White Births Diminish

- ⌘ In **1990**, non-Hispanic whites accounted for nearly two-thirds of all births. Blacks accounted for the second largest number of births (17%), followed by Hispanics (15%).
- ⌘ By **2012**, U.S. births decreased by 5% compared with 1990, but Hispanic births had **risen** by more than 50%. Births to non-Hispanic whites and blacks **diminished** during the same period.
- ⌘ In 2011 minority births exceeded non-Hispanic white births for the first time in U.S. history according to Census Bureau estimates.

Women of childbearing years (ages 20-39)

Non-Hispanic white	Hispanic
1990s declined by nearly 4 million (-12.8%)	Grew by 2.8 million (25%)
From 2000-2012 declined by another 2.4 million	Grew by 3.8 million (25%)
Total by 2012: 6.2 million fewer than in 1990	6.6 million more than in 1990
Proportion of women in their childbearing years decreased from 73% to 57% between 1990 and 2012	



ANNUALIZED POPULATION CHANGE OF WOMEN AGED 20–39, FROM 1990 TO 2000 AND FROM 2000 TO 2012

STEM workforce numbers



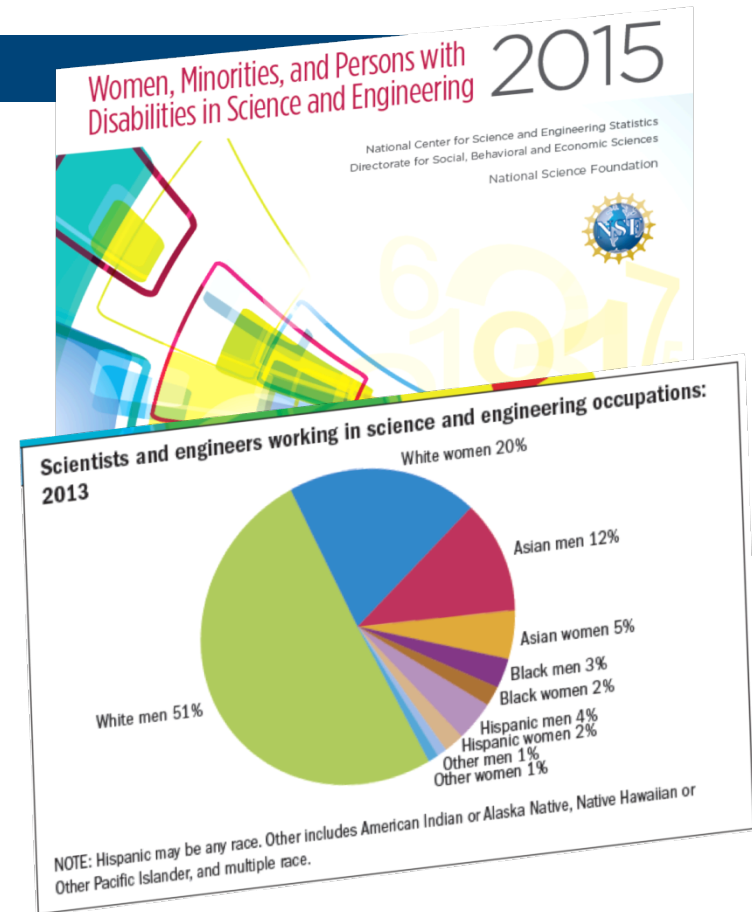
8,650,000

Estimated size of the STEM workforce in the U.S. by 2018
(Bureau of Labor Statistics)

What is the percentage of working professionals **currently** in science and engineering jobs in the U.S. who are non-Hispanic white or Asian males?

a) 35% b) 48% c) 84%

Correct answer: c) 84%



In conclusion...

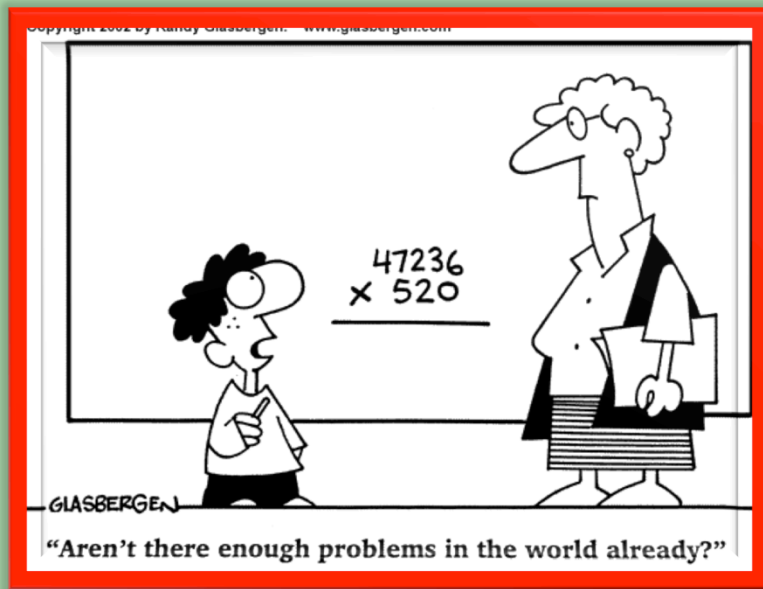
- *Enthusiastic, firm, caring, knowledgeable and passionate mentors/teachers are best equipped to succeed at conveying the beauty and power of mathematics/STEM through their teaching and mentoring.*
- *The U.S. is becoming a majority-minority society—with children leading the way.*
- *The growing demand for STEM professionals dictates that we prepare a larger and broader group of individuals to work in these fields—we must design programs that attract, retain and graduate this new, diverse population.*

One last thought...

“We need to give each other the space to grow, to be ourselves, to exercise our diversity. We need to give each other space so that we may all give and receive such beautiful things as ideas, openness, dignity, joy, healing, and inclusion.”

Max De Pree

Thank you!



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