

# *Engaging Underrepresented Minorities (URMs) in STEM: Some Lessons Learned*



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Cirrus Academy-A STEAM Charter School System  
Mercer University



# Agenda

- Intro
- A Case Study
- Case for Diversity
  - A conversation starter
  - “The facts” regarding the US STEM Workforce
- Lessons Learned
- Positive Factors: Research-Based Evidence
- Diversity is in your Court
  - Mentoring Strategies
  - Cultivating Positive Communities via Concept Mapping
- Diversity and Professional Development Resources
- Questions
- ...



# *A Case Study*



- <http://video.foxnews.com/v/4762903470001/black-history-month-dr-ashanti-johnson/?#sp=show-clips>
- <http://beta.criticalmention.com/app/#clip/view/21188337?token=6f79f2a9-3695-4340-8fb5-58efe318a842>

# 2016 Fox News' *Fox and Friends* African American History Month Feature Story

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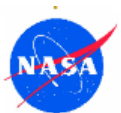
TTY: 711  
The Call  
Is FREE

*Why should we even be  
concerned about  
broadening participation  
and diversity?...*

*A Conversation Starter*

<https://www.youtube.com/watch?v=4yrg7vV4a5o>

Featuring Jane Elliot



# “Being Black” by Jane Elliot

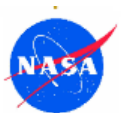


<https://www.youtube.com/watch?v=4yrg7vV4a5o>

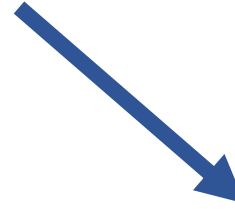
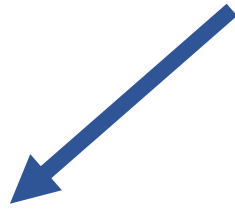
# *The Case for Diversity*



DIALOG III participants at the Bermuda Biological Station (1999)



# Need for Diversity



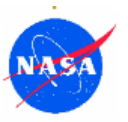
**Scientific Excellence & Ingenuity**

**Workforce Development**

"Diverse groups of problem solvers outperform groups of the best individual problem solvers."

Scott Page, 2007

The Difference: How the Power of Diversity Creates Better Groups, Firms, Schools, & Societies, Princeton University Press





# GENERALLY:

**Women**

Persons with Disabilities

**Native Americans**

Hispanics

**Alaska Natives**

Native Hawaiians

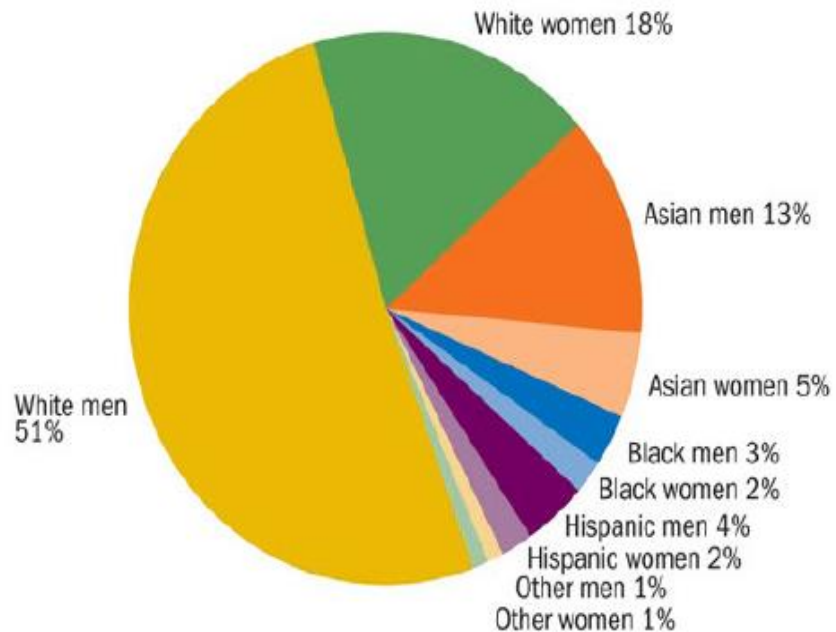
**other Pacific Islanders**

Blacks or African Americans



## Scientists and engineers working in science and engineering occupations: 2010

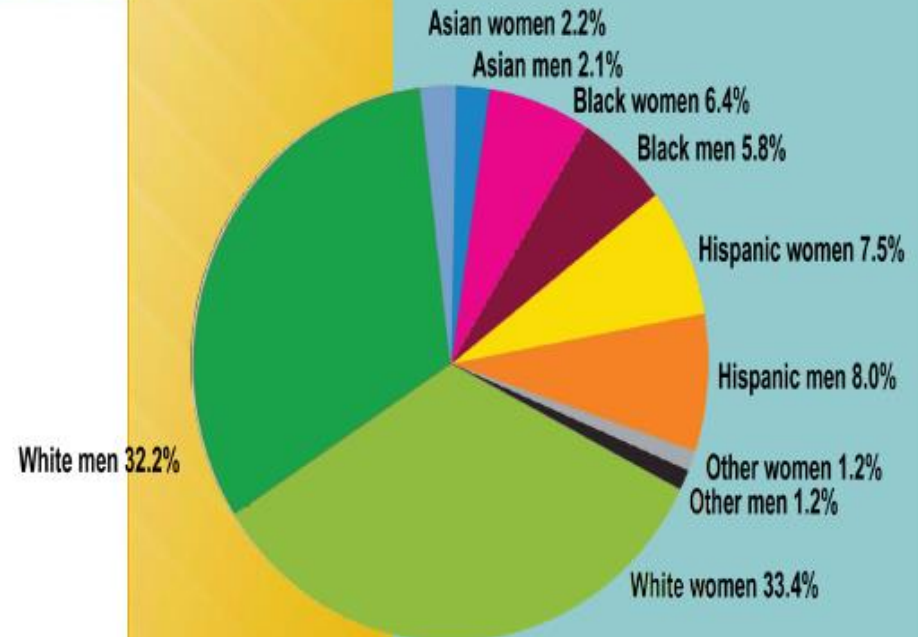
## Resident population of the United States: 2008



NOTE: Hispanic may be any race. Other includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and multiple race.

Women, Minorities, and Persons with Disabilities in Science and Engineering | Arlington, VA | NSF 13-304 | February 2013

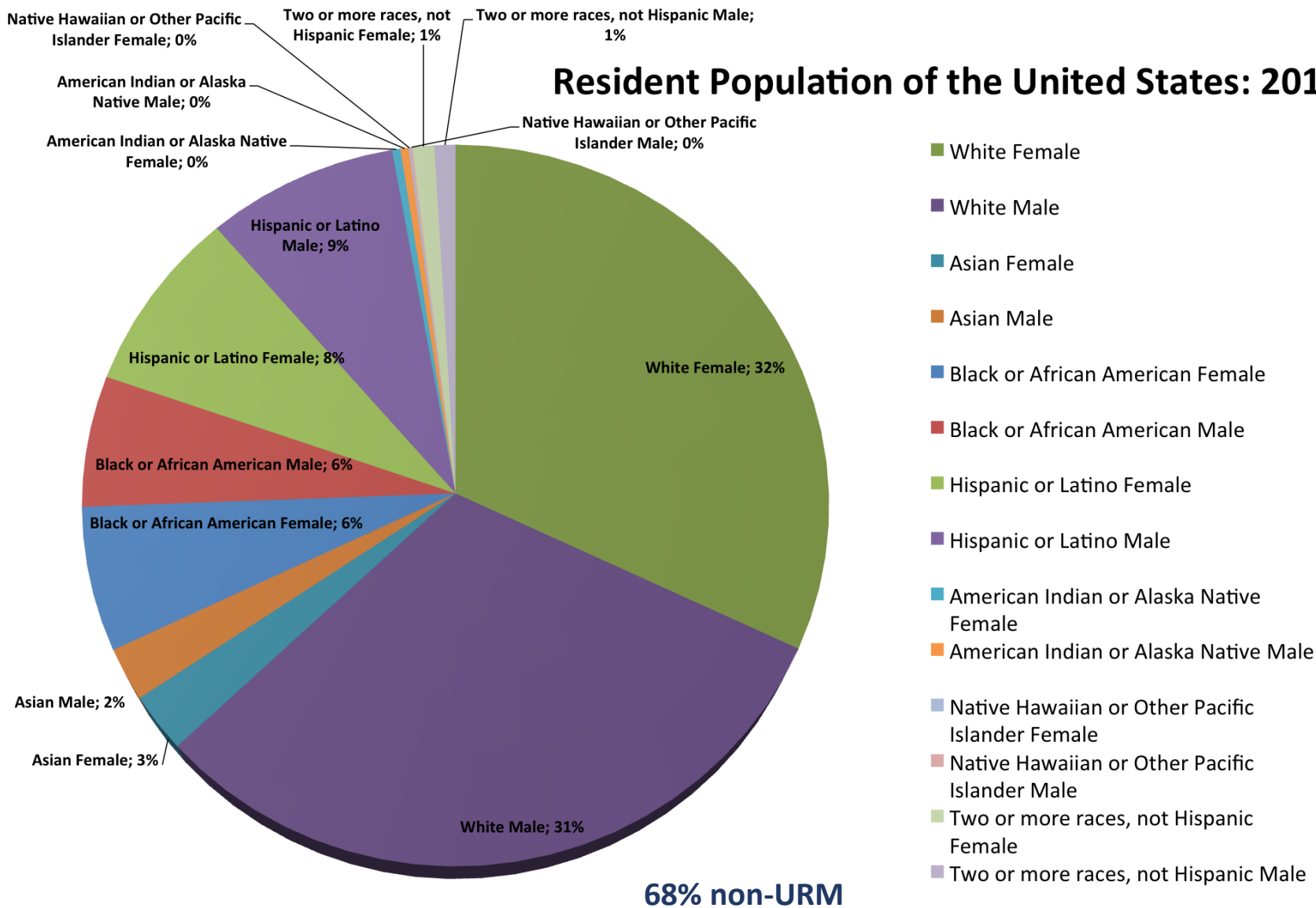
**87% non-URM**



**70% non-URM**

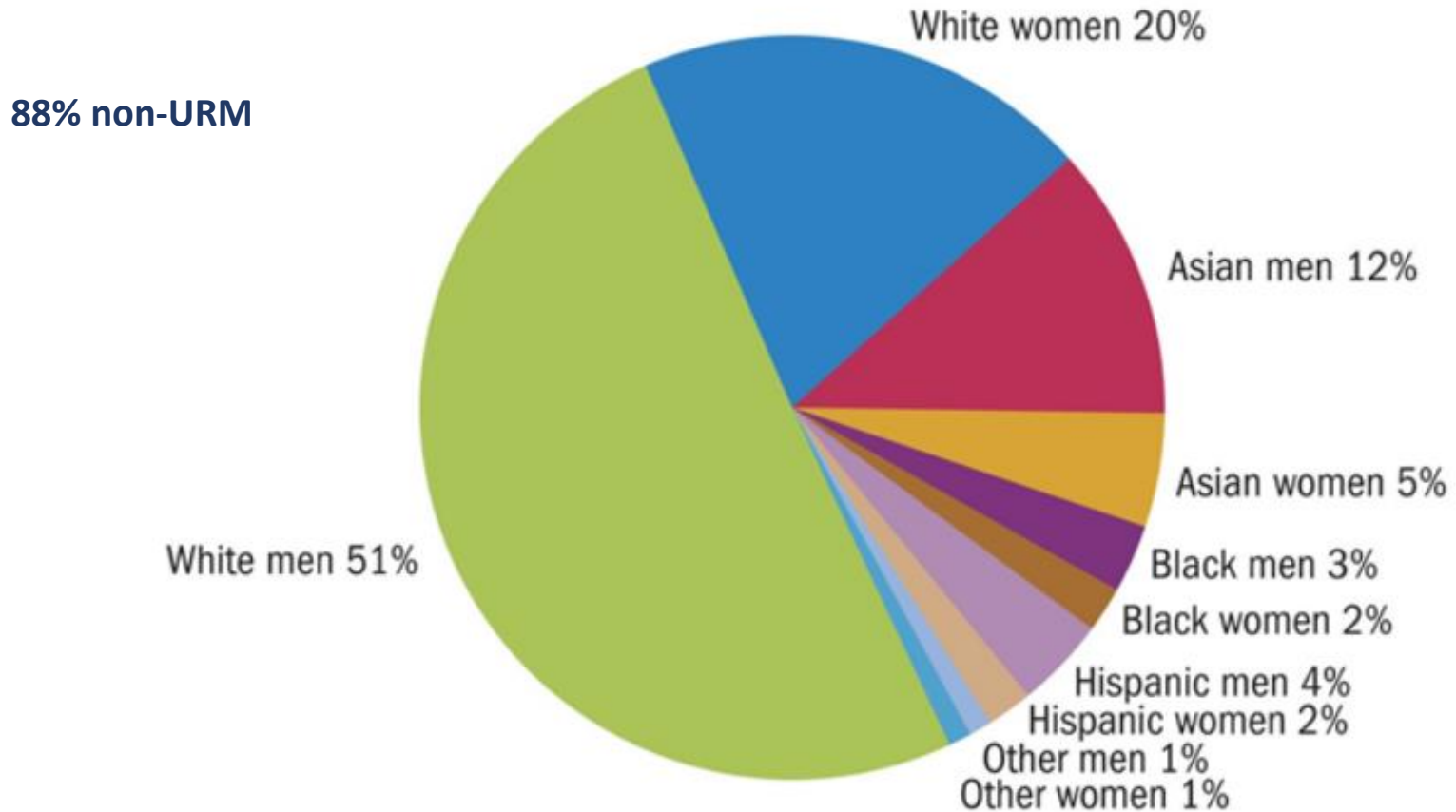


# Resident Population of the United States: 2012



# How is it going?

## Scientists and engineers working in science and engineering occupations: 2013

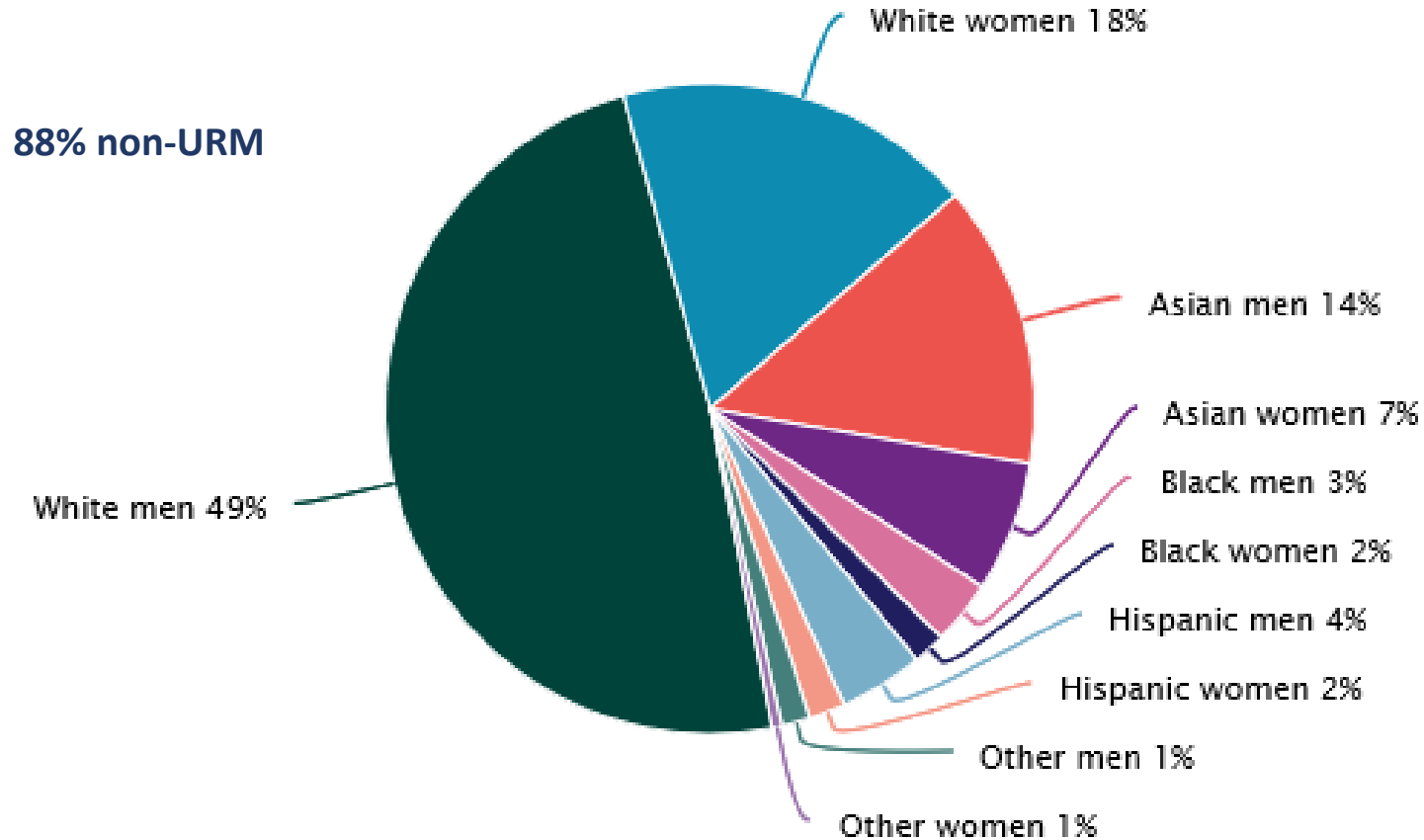


NCSES report: *Women, Minorities, and Persons with Disabilities in Science and Engineering*: <http://nsf.gov/statistics/>



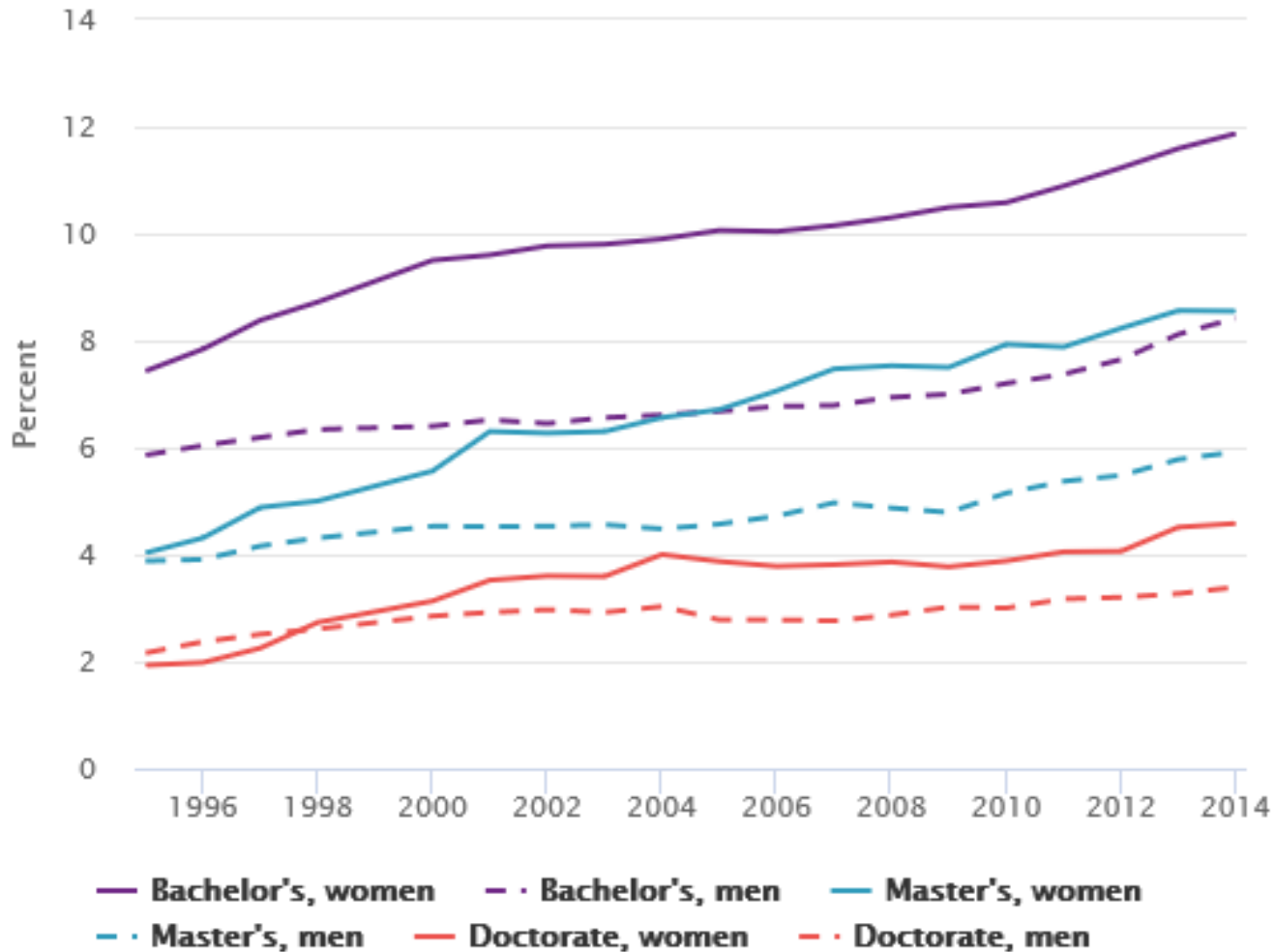
# How is it going?

## Scientists and engineers working in science and engineering occupations: 2015

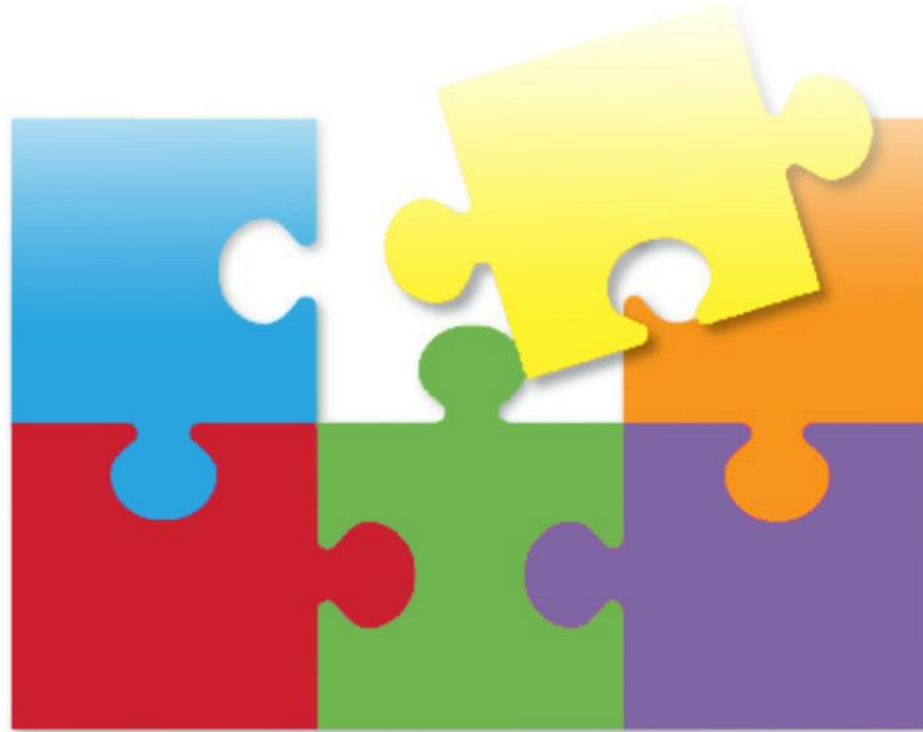


# How is it going?

## Degrees earned by URM, 1995-2014



**It is a complex issue...**



**It's not usually just about one missing piece**



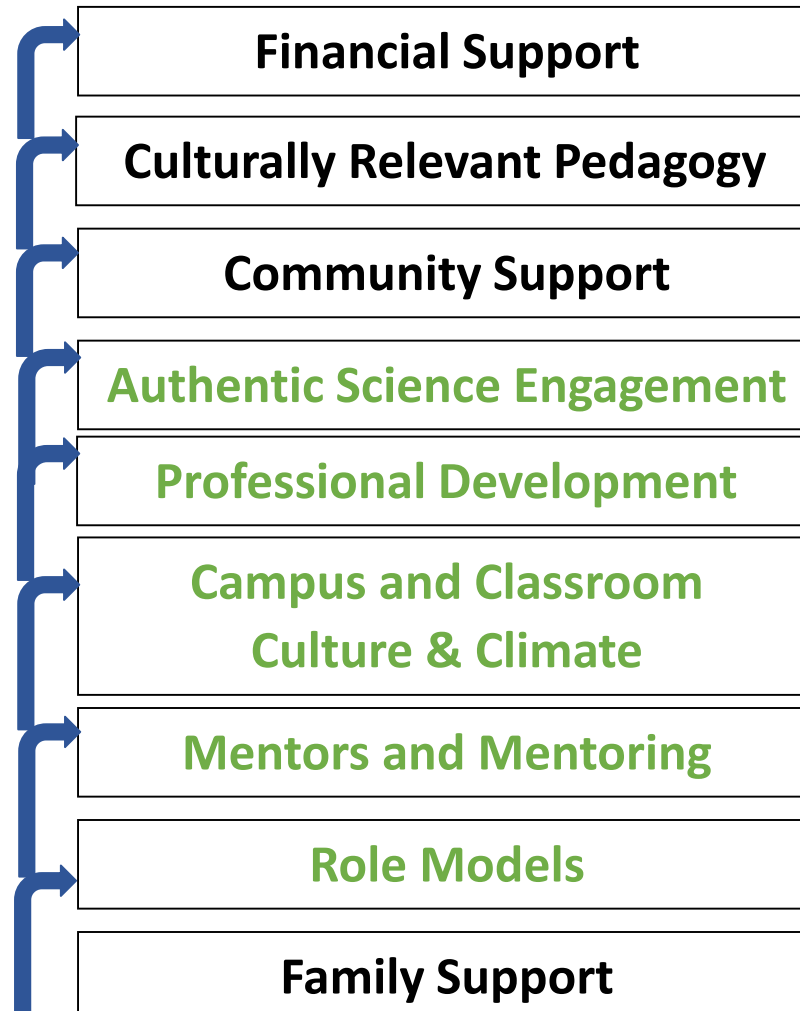
# What we have learned

- **Timing and coordination** is important at various scales: from academic calendar to academic and professional transitions.
- There is still an **unmet need for resources** that synthesize best practices.
- **Access to resources is a big obstacle** for both students and faculty, and is therefore a big opportunity for impact.
- **Partnerships** enable scaling out of project impacts and outreach.
- There is no one best strategy: multiple and complex challenges to STEM participation require a suite of **integrated strategies**.





# Positive Factors: A Multi-layered Approach



# Role Models

“a person whose behavior, example, or success is or can be emulated by others”



# Mentors and Mentoring

*“An intentional relationship or partnership, focused on the needs of the mentee that encourages individuals to develop to their fullest potential.”*

- One-to-one
- Faculty-to-student
- Peer-to-peer
- Group
- E-mentoring
- A shorter-term mentoring match at a conference
- Long term



# Authentic Science Engagement

*Relies on student-based, project driven, discovery-based and often independent course work or research that provides a direct way for students to experience the feeling of authentic discovery, innovation, and individual ownership, creating engagement that is inspiring, and motivating, and interesting.*

“Discovery-based: the possibility of true discovery & exploring the unknown. Independent research and individual ownership. Inspiring and motivating.”



# Professional Development

- Institutional Leadership
- Engaged Faculty
- Bridging to the Next Level
- Continuous Evaluation
- Workshops
- Networking
- Coaching
- Participation in Professional Society Meetings



*Campus-based programs include: LSAMP Bridge to the Doctorate, Alfred P. Sloan, Alliance for the Advancement to the Professoriate (AGEP), GK-12 Fellowship Programs and S-STEM*



# Campus & Classroom Culture and Climate

“very specific, minimal changes  
can make a difference”





# Diversity is in your court

- Mentoring Resources and Best Practices
- Cultivating a Positive Campus Community:  
Articulating Your Story and Concept Mapping





# Mentoring: Active Listening- an essential mentoring skill

- “Hearing” vs “Listening”
- Evaluate and then react

Some of benefits of active listening:

- Encourages the speaker
- Promotes trust and respect
- Enables listener to gain information
- Improves relationships
- Makes resolution of problems more likely
- Gains cooperation
- Promotes better understanding of people



# Suggestions for Improving Active Listening Skills

1. Make Eye Contact
2. Exhibit Affirmative Nods and Appropriate Facial Expressions
3. Avoid Distracting Actions or Gestures
4. Ask Good Questions
5. Listen for Both Fact and Feelings
6. Paraphrase
7. Avoid Interrupting the Speaker
- 8. Do Not Talk Too Much**

Taken from: <http://pcaddick.com/page8.html>



# Mentoring & Professional Development: A Collaborative Experience

- Establish Relationship/ Determine Expectations
  - “Handlin’ your Business”
- Determine Next Steps
  - Self Assessment, Skills Assessment, Career Exploration, Personality Testing
  - Consultation with Intra-Campus development centers and programs
  - Suggested Readings
- Complete an Individual Development Plan
  - Goal Setting and Career Mapping
  - Preparing for Future Opportunities along the Pathway: Letters of Recommendation, Personal Statements, etc.



# Assist Students in Marketing for Success

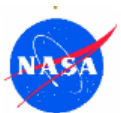
## -Introvert/Extrovert

- Either way, it's necessary to be seen as a team player
- Scientifically talented
- Approachable and interested in work on group projects

## -Connect/network with broad groups

## -Develop “elevator” presentation

## -Maximize interactions for purpose of expanding networks and identifying future opportunities



# Encourage Students to Complete a Self-Assessment (an example presentation)

## How many of you...

- Have participated in a research experience at your home institution?
- Have participated in a research experience away from home institution?
- Have taken or planned to take math classes up through Calculus III?
- Have taken a GRE prep course?
- Have planned to take a GRE prep course?
- Have co-authored a research publication?
- ...

These are not **random questions**; they are points that make up the profiles of **competitive applicants** for REU's, internships, B.S. and graduate school degree programs and jobs.



# Promoting Positive STEM Communities: Telling your Story using Concept Mapping with Positive Factors



Success



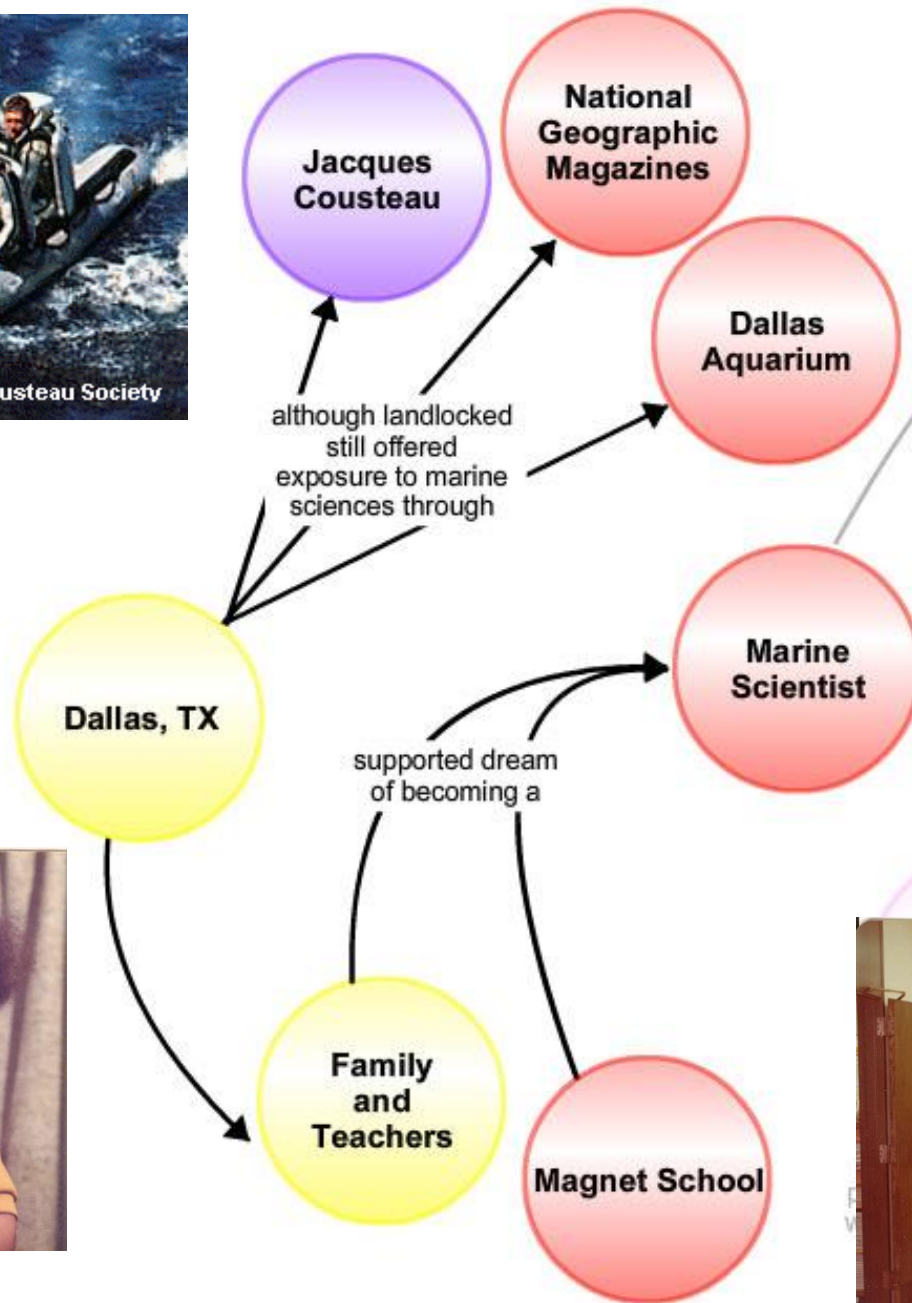
# Articulating your Story using Concept Mapping:

- **Constructing** your academic and career pathway.
- **Identifying** positive factors along your pathways

...My Story

*Objective: identify common positive factors that support STEM career pathways.*









received a full scholarship to

**Texas A&M Galveston**

joined a



while here was mentored by

while attending

marine biologist

**Texas Instruments Internship**

**Alpha Kappa Alpha Sorority**



**Willie Crayton  
Director of Multicultural Services**

turned to support from

Da Un

**Pastors James & Wanda Turner**

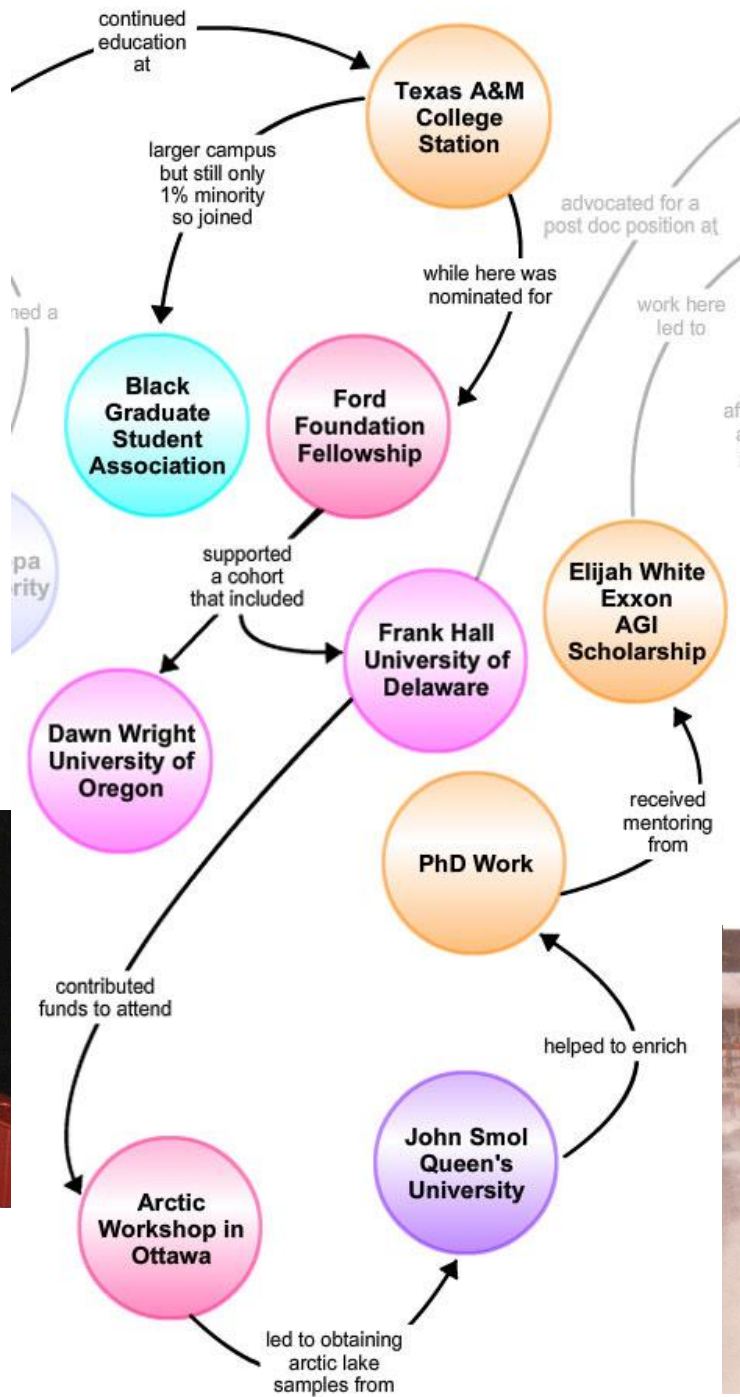


despite fear of public speaking, was encouraged to run for

**Student Government**

co fund







as A&M college student

while here was nominated for

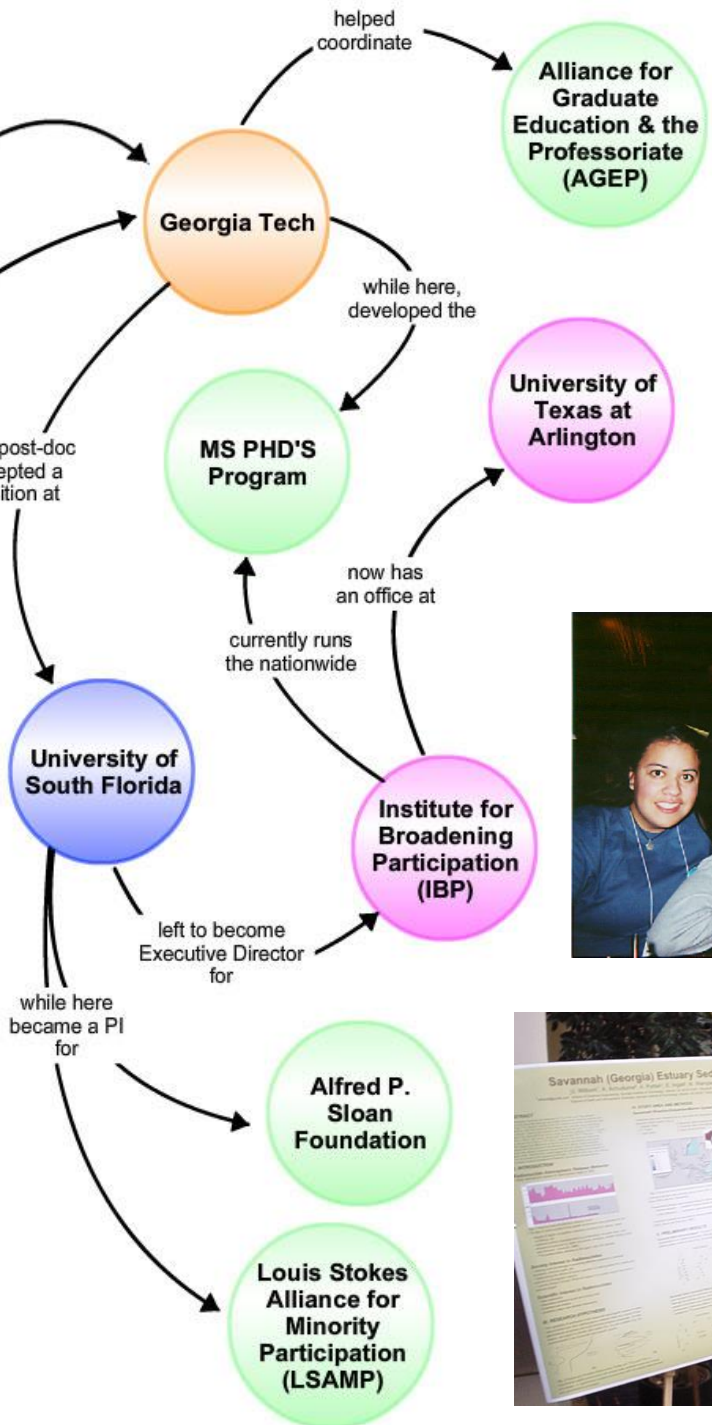
Frank Hall University of Delaware

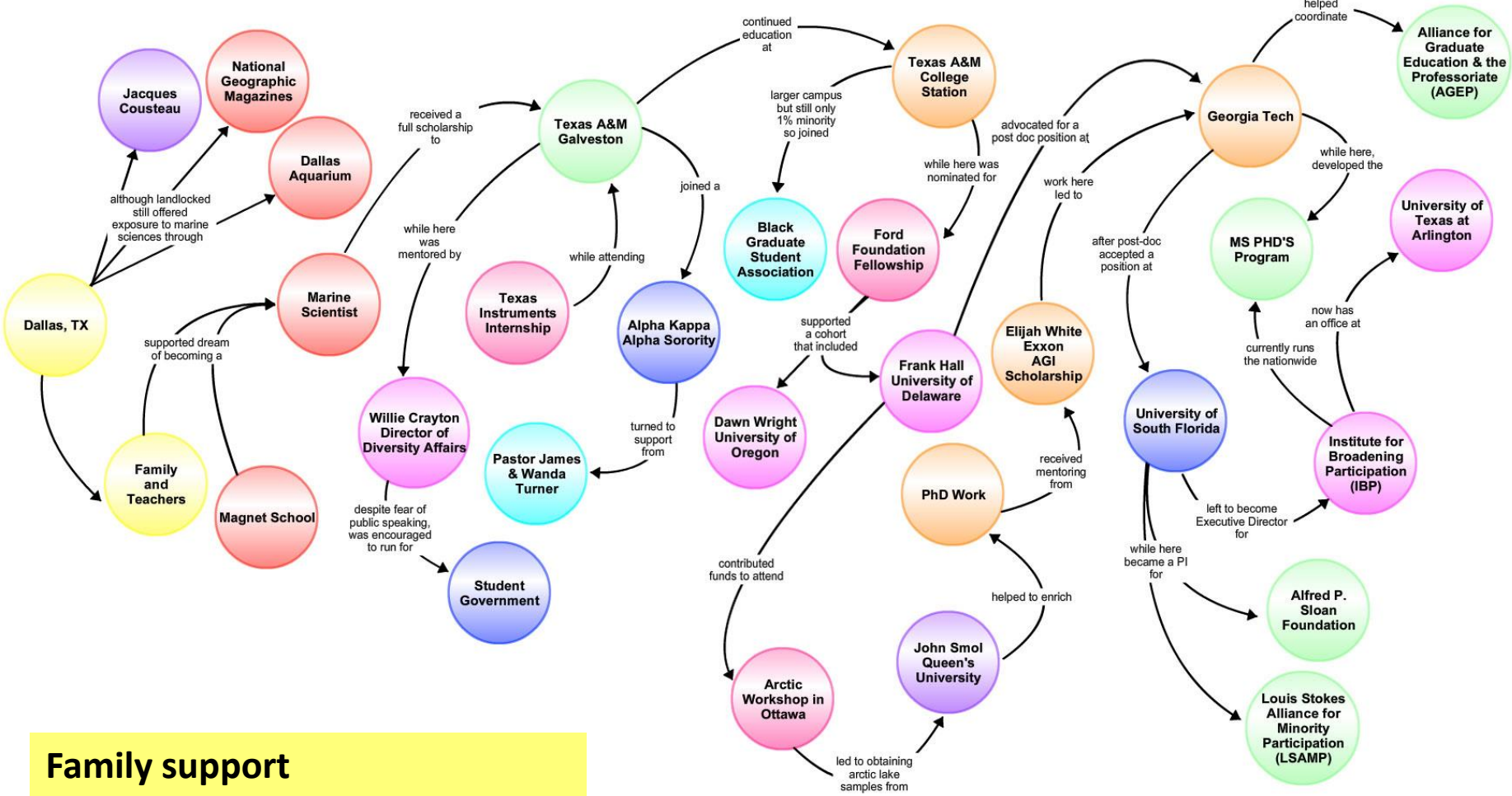
Elijah White Exxon AGI Scholarship

received mentoring



ining ke rom





**Family support**

**Early exposure to STEM in K-12**

**Resiliency**

**Community of support**

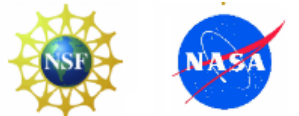
**Professional development**

**Role models**

**Campus & classroom culture**

**Mentors & mentoring**

**Authentic science engagement**



# AMERICAN Scientist

PERSPECTIVE

## How to Recruit and Retain Underrepresented Minorities

**From kindergarten through fulltime positions, what works to engage aspiring minority researchers in studying ocean science?**

Ashanti Johnson, Melanie Harrison Okoro

*Editor's Note: Ashanti Johnson not only studies aquatic environments but also is committed to mentoring young underrepresented minorities pursuing careers in science, technology, engineering, or mathematics (STEM). More than 10 years ago, she began a mentorship program for such students. Melanie Okoro is a former graduate mentee, now her coauthor and colleague, and is an environmental scientist at the National Oceanic and Atmosphere Administration (NOAA). Their story of mentorship and collaboration starts before they met, when Johnson was a child.*

I became interested in science in the 1970s, when African Americans and U.S. Hispanics comprised only 5 percent of the STEM workforce: As a third grader growing up in Oak Cliff, which at the time was a predominately African American community in Dallas, Texas, I was given a class assignment as part of my school's talented and gifted program to identify a career that I wanted to pursue and then to conduct independent research on it. Some kids weren't sure what they wanted to do, but for me, that was easy: I wanted to be the "next" Jacques Cousteau. I watched the TV icon and oceanographer on PBS almost every Saturday. He worked with people of various nationalities, who spoke with different accents, as they explored exotic underwater locations. Inspired by his program, each year from third through twelfth grade, I conducted a new independent project related to the ocean.

At home, my parents supplied me with *National Geographic* magazines, took me to the Dallas Aquarium at Fair Park, and purchased individual volumes of *Funk and Wagnalls Encyclopedia* at the neighborhood grocery store to support my fascination with the sea and science. At school, my teachers, strong African American women, encouraged me to pursue my dreams, even though none of them had any experience related to oceanography or could point me to a single person of color who could serve as my role model. My family and teachers instilled in me the belief that if I applied myself I could achieve my career goal. They also taught me that it was important to be successful so that I could give back to the community and help others achieve.

These lessons served me well throughout my education, from public school through my doctoral studies at Texas A&M University in College Station. Despite any challenge, I was determined to persevere. My success represented success for my family and community. I felt that each career achievement would put me in a better position to reach out and help others.

When I stepped onto the research vessel *Gyre* to collect sediment samples from the Gulf of Mexico during my



enlarge image

agement within my community and arduous journey of learning how to d

al programming, along with mentor minority students aspire to STEM major they have lower completion rates, acc



## Recent Publications

STEM

# HIGH SCHOOL & UNDERGRADUATE RESEARCH EXPERIENCES

CRUCIAL COMPONENTS OF STEM STUDENT PATHWAYS

By Ashanti Johnson, Liv Detrick and David Siegfried

Internships, research experiences and science exposure programs are pivotal to student success in science, technology, engineering and mathematics (STEM). Many high school students first affirm their career interests in STEM and many college students discover their passion for research, hone their disciplinary interests, and identify their future graduate program advisor through participation in a research experience. Undergraduate research experiences—typically occurring during the summer months—give students insight into graduate

administrators; therefore, it is important to understand how to support promising students from all backgrounds in obtaining a summer research internship, starting in their high-school years and continuing through their undergraduate careers.

### Equipping High School Students for STEM Success

Research experiences, internships and exposure programs help students succeed and persist in the STEM fields, both during their high school years and beyond, as they transition into college. These paid or voluntary opportunities engage students in authentic STEM experiences and research topics relevant to their communities, two

in an internship and/or research program during high school can strengthen students' applications to college and to undergraduate research programs, particularly when they can acquire letters of recommendation from mentors and directors of the high school level programs they attended. The PathwaysToScience.org website (<http://www.pathwaystoscience.org/K12.aspx>) contains resources for high-school students—including a search link for nationally recognized programs—and many local and regional programs can be found through state education department websites and through the Change the Equation website (<http://changetheequation.org/stemworks>). High school students applying to college

GRADUATE EDUCATION IN THE OCEAN SCIENCES

## Strategies for Increasing Diversity in the Ocean Science Workforce Through Mentoring

By Ashanti Johnson, Melanie J. Huggans, David Siegfried, and LaTanya Braxton

**ABSTRACT.** Establishing and maintaining a diverse US workforce that fully engages all populations represents a tremendous opportunity not only for furthering ocean science-related enterprises but also for cultivating future global ocean science leaders who collaborate effectively to make discoveries, achieve solutions, and develop technologies. A growing body of evidence suggests that a more diverse professional US workforce that better reflects the nation's demographics can be achieved through numerous strategies aimed at effectively recruiting, supporting through graduation, and facilitating the increased participation of underrepresented minorities in Earth, atmospheric, and ocean sciences (and other related) graduate degree programs. To provide background and context for understanding the diversity challenge, we first describe expectations for the future US population and compare these projections to information about today's demographic realities and the situation for the geosciences (including the ocean sciences) in particular. Descriptions of several specific implementations provide examples of successful strategies and reflect the research-based positive factors shown to foster increased engagement of underrepresented minorities.

### INTRODUCTION

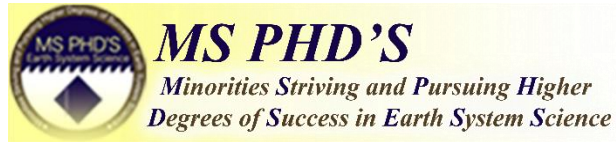
Why does increasing diversity in the ocean science workforce really matter? Research shows that diverse teams of problem sol-

(STEM) fields, including ocean sciences, is essential for maximizing and fostering progressive innovation that is critical to scientific discovery and addressing

Americans, Hispanics, Native Hawaiians, and other Pacific Islanders are referred to as URM). This broad-based and concerted approach that includes industry partners, academic and civic institutions, and individual change agents can facilitate the retention and production of URM ocean science graduate degree recipients by facilitating focused strategies across the entire professional and educational STEM system. Specifically, a number of positive factors have been demonstrated to foster increased URM engagement throughout the STEM educational pathway. These factors include, but are not limited to: (1) early exposure to STEM fields during K-12 years (Fries-Britt et al., 2010; Fullilove and Treisman, 1990; Oakes, 1990); (2) culturally relevant pedagogy and science relevancy (Ladson-Billings, 1995; Nelson, Barber, and Etrian

# MS PHD'S Professional Development and Mentoring Institute

*URM Student Programs (K-12, undergraduate and graduate students)*



## STEM Human Resource Development, Inc.

*Diversity and inclusion workshops, training sessions, on-going support, etc.  
(faculty, researchers, administrators in academia, government and industry)*



**STEM HRD**  
Incorporated





**MS PHD'S**

*Minorities Striving and Pursuing Higher  
Degrees of Success in Earth System Science*



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**Thank you!**

**MS PHD'S Professional Development and Mentoring Institute**  
*(a 501(c)3 non-profit organization), CEO/Executive Director*

**STEM Human Resource Development (HRD) Inc., President/CEO**

**Cirrus Academy-A STEAM Charter School System**  
*(a 501(c)3 non-profit organization), CEO/Superintendent*

**Mercer University, Associate Professor**

**[Dr.AshantiJohnson@gmail.com](mailto:Dr.AshantiJohnson@gmail.com)**

**<http://video.foxnews.com/v/4762903470001/black-history-month-dr-ashanti-johnson/?#sp=show-clips>**

**Talking Points to Encourage  
Students to Complete a Self-  
Assessment**  
*(an example presentation)*





# Handlin' Your Business

a necessary conversation

How many of you...

- Are from outside of the state of (Insert your state here)?
- Are from outside of the US?
- Are 1<sup>st</sup> generation students?
- Are/were in organizations on campus?
- Hold/held leadership positions on campus?
- Are/were in honor societies?



# How many of you...

- Are in STEM discipline organizations?
- Know what minority focused professional conferences are key for your discipline?
- Know what non minority-focused professional conferences are key for your discipline?
- Would like to conduct research and present your results at a professional society meeting?
- Have presented or will present your research at a professional society meeting?



# How many of you...

- Have participated in a research experience at your home institution?
- Have participated in a research experience away from home institution?
- Have taken or planned to take math classes up through Calculus III?
- Have taken a GRE prep course?
- Have planned to take a GRE prep course?
- Have co-authored a research publication?



# How many of you...

- Have identified 3 possible universities that you would like to attend?
- Have identified at least 2 possible graduate schools that you would like to attend after receiving a B.S. degree?
- Have developed a networking strategy to connect with potential research advisors or opportunities?
- Who has a 5-year plan/ goal?
- Who has a 10-year plan/goal?



# How many of you...

- Who has a 20-year plan/ goal?
- Who knows what is meant by digital identity?
- Who has purposefully kept their digital identity professional and would be comfortable with a potential employer carefully reviewing it?
- Who is on track with their 5-year plan/goal?
- What are your immediate next steps to reaching your goals?



# How many of you...

- What barriers have you identified to reaching your immediate next steps?
- What would you like to accomplish through this meeting?
- What would you like to accomplish in this semester?
- What steps have you taken or identified you need to take to illuminate those barriers?
- Who is willing to admit that they could do a better job handling their business?



# Handlin' Your Business

These are not **random questions**; they are points that make up the profiles of **competitive applicants** for REU's, internships, B.S. and graduate school degree programs and jobs.

How do I know this?

I will tell you how by giving you some information about my background and experiences.

(Insert **YOUR** story and concept map here)



# Student Session Closing thoughts:

## Remember:

- \* Your job is not to be eliminated because you have not handled your business
- \* Your job is to make anyone you represent be represented well
- \* Your job is to stay connected to your passions, and do what it takes to make it happen and let no one or anything keep you from your goals
  - Your job is to run your race...and complete it!!!

And while you are running your race look around and behind you to see others who are running their race. Encourage them. Support them. Help them. Lift them up as you climb!

At the end of your race you should be able to look at what you have accomplished in fulfilling your own goals, and see who you have helped along the way and what good you have done to leave an inheritance for future generations and be able to say “I have handled my business!”





# Change Agents: Recruitment and Retention



# Academic Mentoring and Professional Development Opportunities (Important Elements of Successful Recruitment and Retention Strategies)

Participation in professional organizations



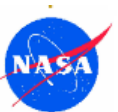
Department-specific activities

Intra-campus collaborations

Industry and government

Campus diversity initiatives

Training opportunities



# STEM Human Resource Development, Inc. Infrastructure for Broadening Participation in STEM (IBP-STEM)

**“To increase the diversity of the STEM workforce by helping students navigate their pathways to success in STEM.”**



*Students and m*

*opment program*

