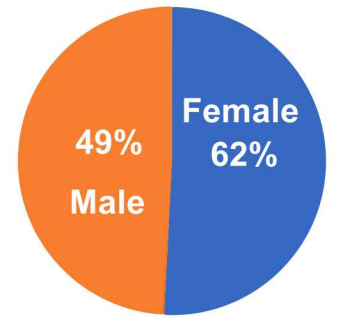
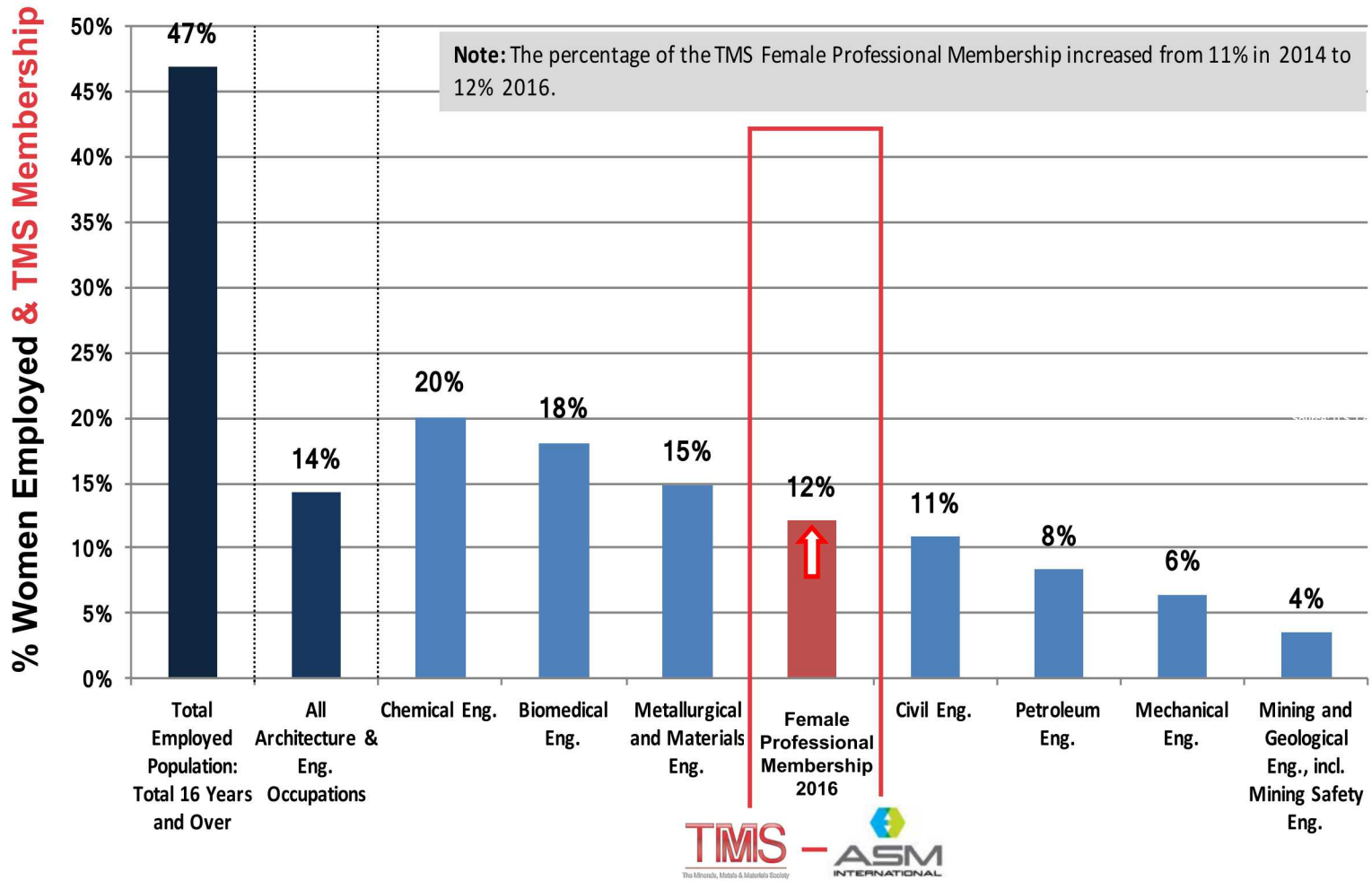


OBSERVATIONS, LEARNINGS AND OUTLOOKS FROM THE 3rd TMS SUMMIT ON **DIVERSITY** (DMMM3) IN THE MINERALS, METALS, AND MATERIALS PROFESSIONS

Jonathan Madison, Sandia National Laboratories (Chair)
Jennifer Andrew, University of Florida
Megan Brewster, Launch Forth, a division of Local Motors
Amy Clarke, Colorado School of Mines
Kristen Constant, Iowa State University
Oscar Dubón, University of California, Berkeley
Emily Kinser, 3M Corporate Research Laboratory
Matthew Korey, Purdue University
Natalie Larson, University of California, Santa Barbara
Xavier Ochoa, McEwen Mining Inc.
Michael Rawlings, AAAS Fellow at NSF
Rosa Maria Rojas, University of Arizona



EMPLOYMENT BY GENDER



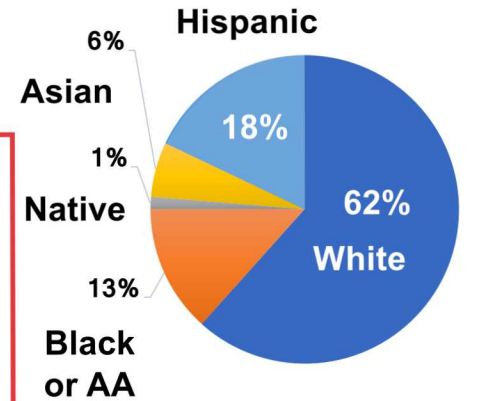
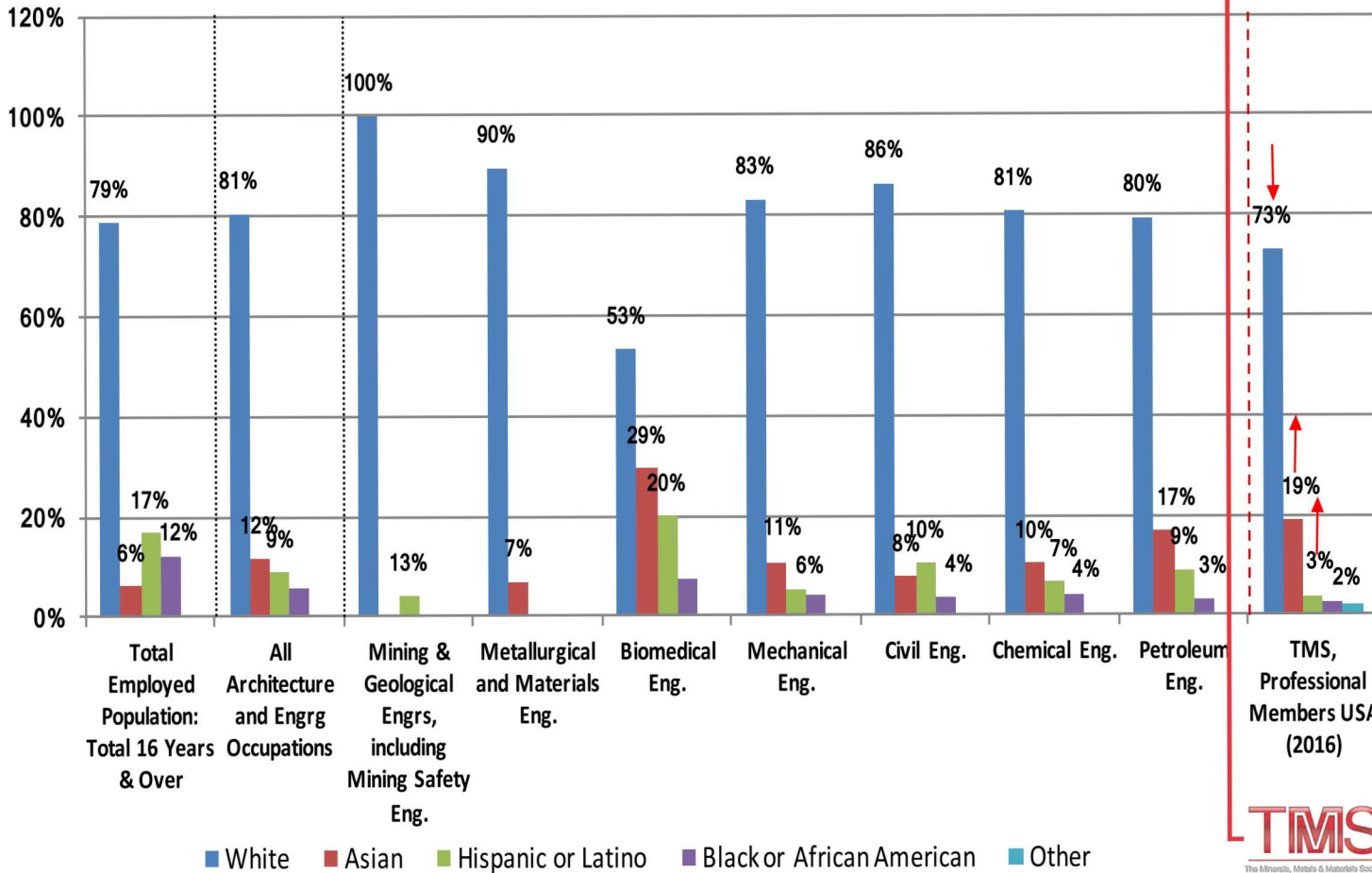
US Population by Gender

Source: U.S. Census Bureau, Quick Facts, 2016

At left:
Source(s): BLS. Employed and experienced unemployed person by detailed occupation, sex, race, and Hispanic or Latino ethnicity, Annual Average 2016; Current Population Survey, TMS Membership Statistics, 2016

EMPLOYMENT BY ETHNICITY

% Ethnicity Employed & TMS Membership



US Population by Ethnicity

Source: U.S. Census Bureau, Quick Facts, 2016

At left:
 Source(s): BLS. Employed and experienced unemployed person by detailed occupation, sex, race, and Hispanic or Latino ethnicity, Annual Average 2016; Current Population Survey, TMS Membership Statistics, 2016



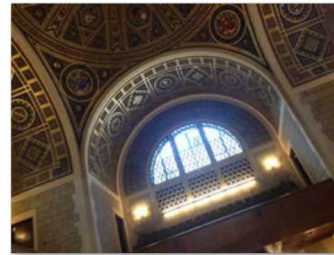
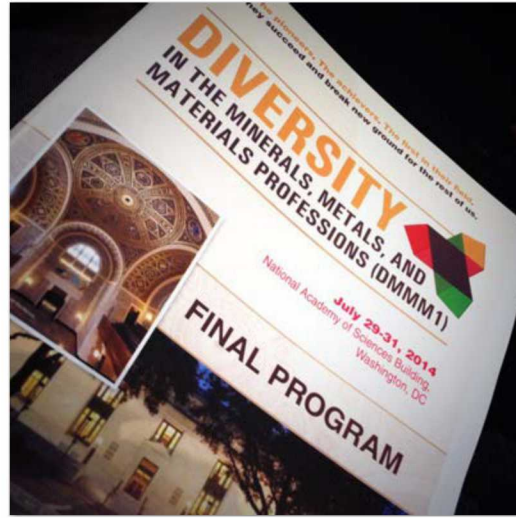
1st TMS SUMMIT ON DIVERSITY

National Academy of Sciences

Washington, DC

July 29-31st, 2014

The National Academies of
SCIENCES • ENGINEERING • MEDICINE



DIVERSITY IN THE MINERALS, METALS, AND MATERIALS PROFESSIONS (DMMM1)

July 29-31, 2014
National Academy of Sciences
Building, Washington, DC



1st TMS SUMMIT ON DIVERSITY OUTCOMES

National Academy of Sciences

Washington, DC

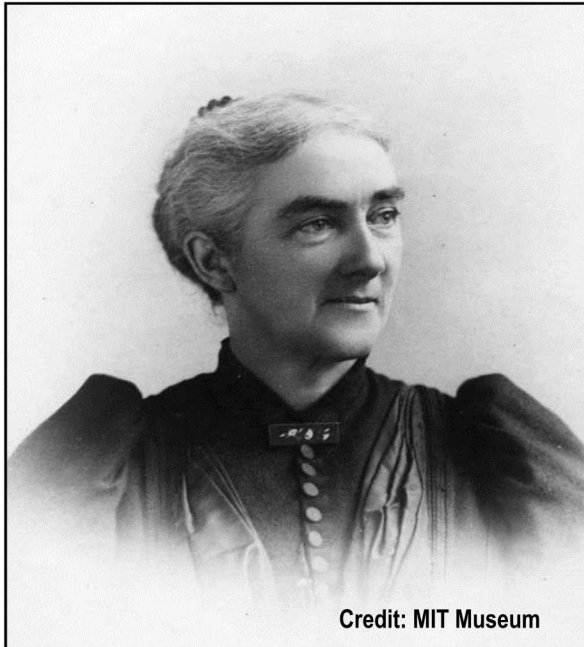
July 29-31st, 2014

The National Academies of
SCIENCES • ENGINEERING • MEDICINE



...recognizes an individual who...has helped or inspired others to overcome personal, professional, educational, cultural, or institutional adversity to pursue a career in minerals, metals, and/or materials.

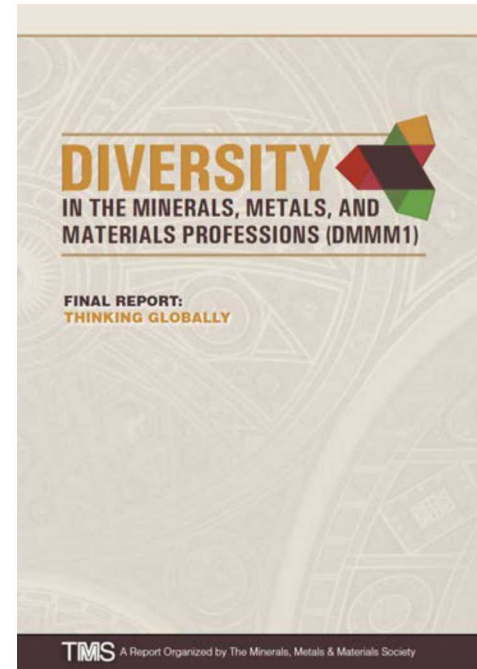
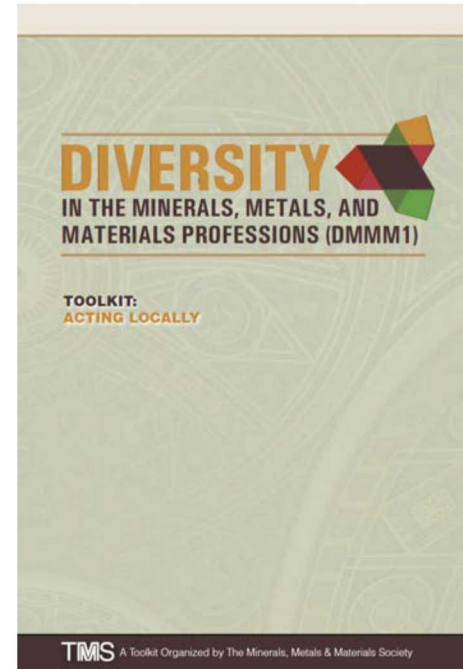
ABOUT THE SUMMIT HONOREE



Credit: MIT Museum

- 2014
Viola Acoff
- 2015
Julia Weertmaan
- 2016
Lynnette Madsen
- 2017
Lorna Gibson
- 2018
Bevlee Watford

Ellen Swallow Richards

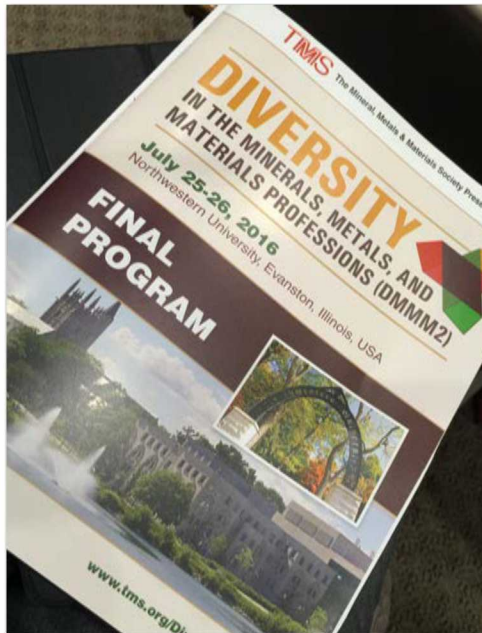


2nd TMS SUMMIT ON DIVERSITY

Northwestern University

Evanston, IL

July 25-26th, 2016



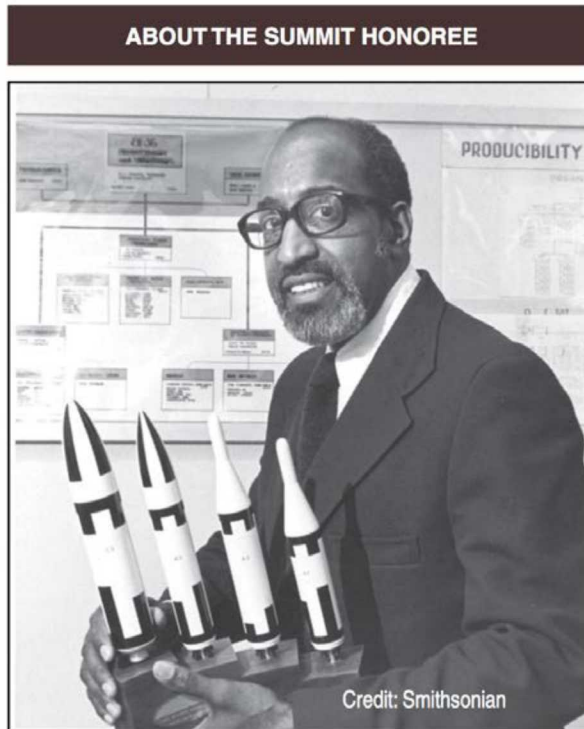
2nd TMS SUMMIT ON DIVERSITY OUTCOMES

Northwestern University
Evanston, IL
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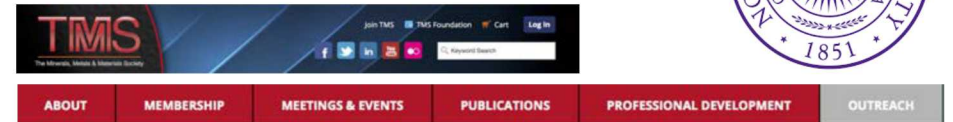
... recognizes an individual who has personally overcome personal, professional, educational, cultural, or institutional adversity to pursue a career in minerals, metals, and/or materials.

2016
Carolyn Hansson
2017
Lawrence Crosby
2018
Shadia Ikhmayies



Frank Crossley

Credit: Smithsonian



Diversity and Inclusion at TMS

A more diverse and inclusive workplace benefits everyone—individual scientists and engineers, entire organizations, and the materials science and engineering profession as a whole. That's why TMS has made it a priority to create opportunities for learning and sharing knowledge and experiences in advancing diversity in impactful ways, while providing information and resources that can be applied in the workplace or everyday life. Whether you wish to connect with others addressing the same issues you are, access free online resources or find inspiration to continue the work, TMS can help.

TMS Diversity Statement

The Minerals, Metals & Materials Society (TMS) is committed to advancing diversity in the minerals, metals, and materials professions, and to promoting an inclusive professional culture that welcomes and engages all who seek to contribute to the field. TMS recognizes that a diverse minerals, metals, and materials workforce is critical to ensuring that all viewpoints, perspectives, and talents are brought to bear in addressing complex science and engineering challenges. To build and nurture this diverse professional community, TMS welcomes and actively engages the participation of underrepresented groups in all of its initiatives and endeavors.

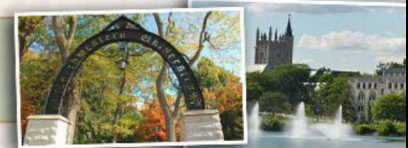
Diversity and Inclusion Toolkit and Report

TMS offers the following free resources related to diversity and inclusion in the minerals, metals, and materials professions:

- [TMS Diversity and Inclusion Toolkit](#)
This regularly updated toolkit contains a variety of useful resources related to diversity and inclusion issues.

DIVERSITY
IN THE MINERALS, METALS, AND
MATERIALS PROFESSIONS (DMMM2)

July 25-26, 2016 | Northwestern University, Evanston, IL



3rd TMS SUMMIT ON DIVERSITY

University of California
Santa Barbara, CA
July 23-24th, 2018



DIVERSITY (DMM3)
IN THE MINERALS, METALS, AND MATERIALS PROFESSIONS



3rd TMS SUMMIT ON DIVERSITY OUTCOMES

University of California
Santa Barbara, CA
July 23-24th, 2018



(20) Personal
Commitments

Government Labs
Mining Industry
Manufacturing
Academia

- **Re-evaluate for implicit bias** in job postings
- **Advocate for unconscious bias training** for interview panels
- **Provide programming for intersectionally-identified persons** at home institution
- **Drive corporate diversity policies** toward real-life success models & practice



TMS Diversity and Inclusion Toolkit

The insights and recommendations gained from the First TMS Summit on Creating and Sustaining Diversity in the Minerals, Metals, and Materials Professions (DMMM1), July 29-31, 2014, serve as the foundation for this resource. Since publishing the initial toolkit from DMMM1, TMS has expanded this resource to become an interactive clearinghouse of tools addressing diversity and inclusion issues in the workplace and professional community.

The following resources are available at no charge, and no log in is required to view them. Simply choose a category to locate the tools that best meet your needs or search for topics by keyword.

Resources are divided into the following categories:

- [TMS Diversity Summit Presentations](#)
Watch videos and download files of selected presentations from TMS Diversity summits.
- [Advancement and Assessment Resources](#)
Access valuable resources that can assist in training and measuring progress on diversity and inclusion programs.
- [Reference Materials](#)
Learn practical ways to increase awareness and practice diversity and inclusion in your organization.
- [Skill-Building Resources](#)
Find training sites and programs suggested by, or reflective of those indicated by, speakers and participants from the TMS Diversity Summits.
- [Community Partners and Resources](#)
Access electronic forums for discussion of diversity and inclusion issues.



SNAPSHOT OF PARTICIPATION

DIVERSITY (DMMM3)

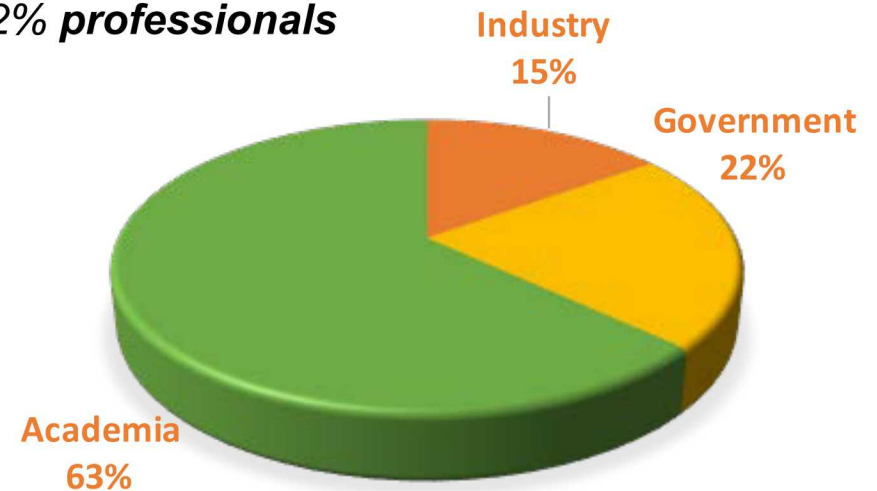
IN THE MINERALS, METALS, AND MATERIALS PROFESSIONS

Speakers (45)

- 38% **Academia (STEM)**
- 16% **Government**
- 29% **Industry**
- 7% **Academia (Non-STEM)**
- 6% **Professional Facilitation & Consulting**
- 4% **Professional Societies***

Total registrants (97)

- 18% **students**
- 82% **professionals**



* Professional societies represented: ASME & NAMEPA



2 DAY FOCI



DAY 1

OVERVIEW

OPENING / WELCOME
PLENARY
KEYNOTE 1
KEYNOTE 2
KEYNOTE 3
TMS 2018 DIVERSITY AWARDS

LUNCH

PROFESSIONAL LEVEL FOCUSED

PROFESSIONAL DEVELOPMENT	EARLY CAREER & STUDENTS	EXECUTIVE LEADERSHIP
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NETWORKING RECEPTION

DAY 2

DEMOGRAPHICS FOCUSED

PROFESSIONAL DEVELOPMENT - STRATEGIC COMMUNICATION	PROFESSIONAL DEVELOPMENT - LGBTQ+	
RACE & ETHNICITY	LGBTQ+	MEANS & MEASURES

LUNCH

SPHERE OF INFLUENCE FOCUSED

GRASSROOTS	INTERNAL SUPPORTS	INSTITUTIONAL CULTURE
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THEORY

AM

PRACTICE

PM



OPENING PLENARY



Erin A. Cech, Ph.D.
Assistant Professor



STEM Inclusion Study



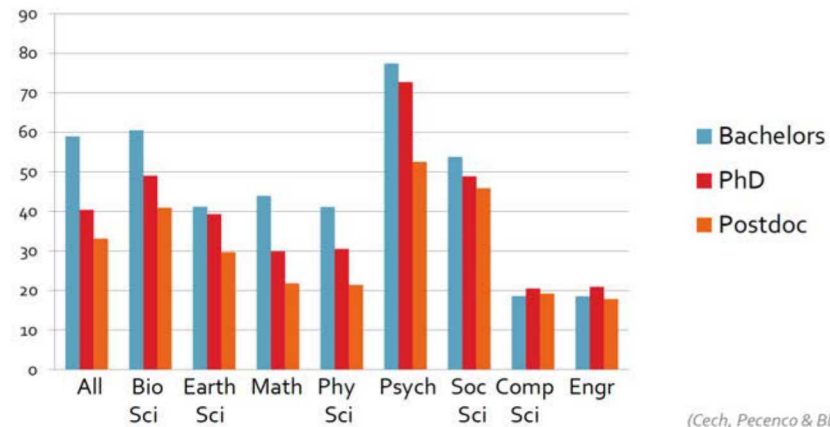
PRINCIPAL INVESTIGATORS: ERIN A. CECH, University of Michigan & TOM WAIDZUNAS, Temple University



This material is based upon work supported by the National Science Foundation under Grant No. EEC-1539140, HRD 1535385 & HRD 1535360. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Gender Diversity in STEM

Percent Women Among People with BS Degrees, PhDs and Postdocs in Science and Technology Fields (U.S.)



(Cech, Pecenco & Blair-Loy 2013)



OPENING PLENARY



Erin A. Cech, Ph.D.
Assistant Professor



STEM Inclusion Study



PRINCIPAL INVESTIGATORS: ERIN A. CECH, University of Michigan & TOM WAIDZUNAS, Temple University

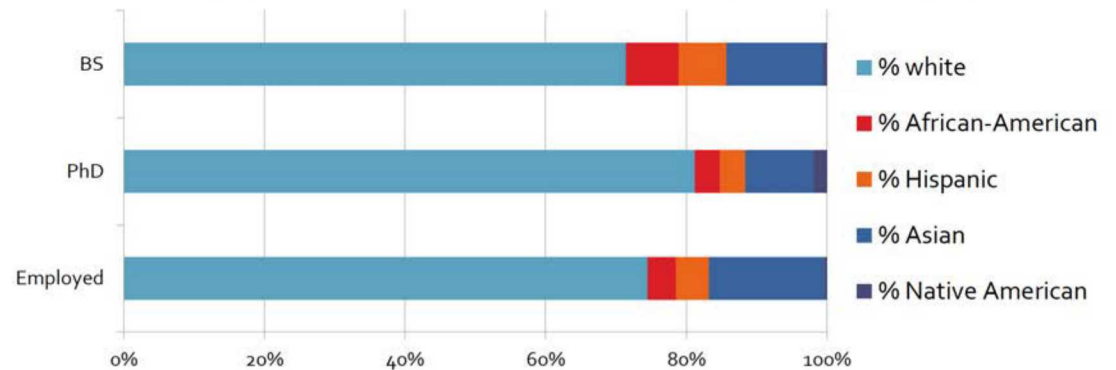


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Gender Diversity in STEM

Racial/Ethnic Diversity in STEM

Percent Minority Groups among U.S. S&E Bachelor's and PhD Earners in 2008, and those employed in S&E Jobs in 2006¹ (Excluding SocSci and Psych)



(Cech, Pecenco & Blair-Loy 2013)



OPENING PLENARY



Erin A. Cech, Ph.D.
Assistant Professor



STEM Inclusion Study



PRINCIPAL INVESTIGATORS: ERIN A. CECH, University of Michigan & TOM WAIDZUNAS, Temple University



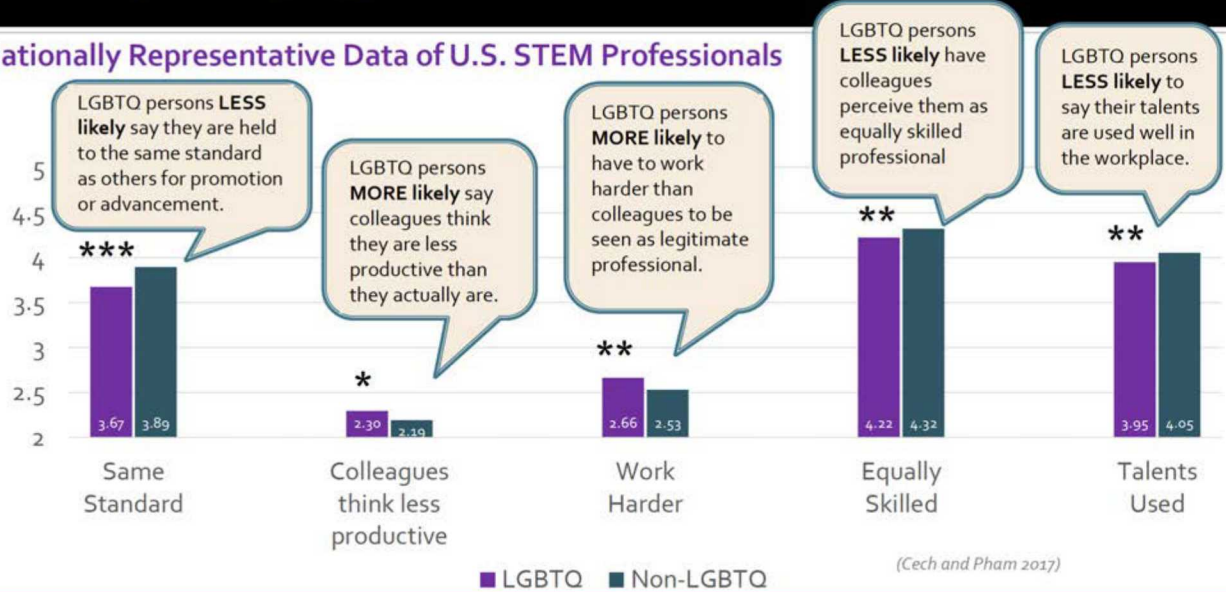
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Gender Diversity in STEM

Racial/Ethnic Diversity in STEM

Inequality by LGBTQ Status

Nationally Representative Data of U.S. STEM Professionals



OPENING PLENARY



Erin A. Cech, Ph.D.
Assistant Professor



Gender Diversity in STEM

Racial/Ethnic Diversity in STEM

Inequality by LGBTQ Status

STEM
Inclusion
Study



PRINCIPAL INVESTIGATORS: ERIN A. CECH, University of Michigan & TOM WAIDZUNAS, Temple University



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4 - FOLD FUNDAMENTAL PREMISE

1. No longer primarily a “bad apples” problem, but a cultural one
2. Subtle beliefs and cultural practices matter
3. Cultural status quos don’t necessarily change over time by themselves
4. Small disadvantages accumulate over time



OPENING PLENARY



Erin A. Cech, Ph.D.
Assistant Professor



Professional Cultures of STEM

Schemas of Scientific Excellence

Depoliticization

Meritocratic Ideology

STEM
Inclusion Study



PRINCIPAL INVESTIGATORS: ERIN A. CECH, University of Michigan & TOM WAIDZUNAS, Temple University



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Characteristics & skills assumed to be markers of professional competence

- The cultural yardsticks we utilize to measure “excellence”
- Influence hiring, promotion & funding decisions
- Not necessarily the characteristics actually required for success
- They can be gendered, racialized and heteronormative

The belief that STEM is a “pure” space that can and should be stripped of political and cultural concerns

- But what to study, how we define problems and what to fund are cultural & political decisions

The belief that success is solely the result of individual talent, training and motivation

- This frames inequalities in STEM as the fault of women and under-represented population, not the social system



OPENING PLENARY



Erin A. Cech, Ph.D.
Assistant Professor



STEM Inclusion Study



PRINCIPAL INVESTIGATORS: ERIN A. CECH, University of Michigan & TOM WAIDZUNAS, Temple University



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Professional Cultures of STEM

Schemas of
Scientific
Excellence

Depoliticization

Meritocratic
Ideology

Solution(s) :

- Its not about “fixing” women and under-represented populations to be more like white men
- Be wary of discussions on “fit”

Solution(s) :

- Legitimize topics of diversity and equality in the context of STEM

Solution(s) :

- First & most important step – explain there may be a problem beyond the scope of the individual and his/her level of effort and productivity



KEYNOTES



Keith Bowman, Ph.D.
**Dean, College of
Engineering & IT**



Cohorts, Community & Commencement



Oscar Dubon, Ph.D.
**Vice Chancellor Equity & Inclusion
and Faculty Scientist**



Diversity, Inclusion & Culture : Turning Intentions into Actions



Mr. Xavier Ochoa
Chief Operating Officer



A FEW THOUGHTS ON DIVERSITY & INCLUSION



KEYNOTES



Keith Bowman, Ph.D.
 Dean, College of
 Engineering & IT



ASEE Data MSE Programs Five Year Total 2013-2017

School	African American Male	African American Female	Total African American	All
Alabama at Birmingham	6	11	17	95
Georgia Tech	7	9	16	311
Clemson	10	4	14	269
Michigan	6	5	11	292
Alabama	6	4	10	67
Florida	6	3	9	186
MIT	4	4	8	192
Purdue	5	3	8	232
North Texas	4	2	6	68
Ohio State	4	2	6	406
Stanford	5	1	6	57
Virginia Tech	4	2	6	247

49 Programs averaged one or fewer AA degrees per year
10 Programs had zero AA degrees in a given year



KEYNOTES



Keith Bowman, Ph.D.
 Dean, College of
 Engineering & IT



ASEE Data MSE Programs Five Year Total 2013-2017

School	African American Fraction	State Fraction African American
Alabama at Birmingham	18.1%	26.4%
Alabama	15.4%	26.4%
Columbia	11.1%	15.2%
Stanford	10.7%	6.7%
Pittsburgh	9.3%	10.8%
North Texas	9.2%	11.9%
Tennessee-Knoxville	6.1%	16.8%
Georgia Tech	5.8%	31.4%
Cincinnati	5.3%	12.0%
Clemson	5.2%	28.5%
Florida	4.9%	15.9%
Michigan	4.6%	14.2%
Wisconsin	4.5%	6.1%



KEYNOTES



Keith Bowman, Ph.D.
Dean, College of
Engineering & IT

UMBC
AN HONOR UNIVERSITY IN MARYLAND



MEYERHOFF SCHOLARS PROGRAM

<https://meyerhoff.umbc.edu>

- In existence since 1993
- Over 1100 students as of October 2017:
- Produced:
 - **273** Ph.D.s
 - **76** MD-Ph.D.s
 - **1** DDS / Ph.D.
 - **1** DVM / Ph.D.
 - **107** MDs
- **300+** alumni currently enrolled in grad. & professional degree programs
- **260** students enrolled in '17-'18 academic year
- **63%** Afr-Amer., **15%** Caucasian, **11%** Asian, **10%** Hispanic, **1%** Native Amer.

*Meyerhoff Scholars are **5.3X** more likely to have graduated from or be currently attending a STEM Ph.D. or M.D./Ph.D. program than those students who were invited to join the program but declined & attended another university.*



KEYNOTES



CHANCELLOR CAROL T. CHRIST First Female Chancellor in UC Berkeley's 150 year history

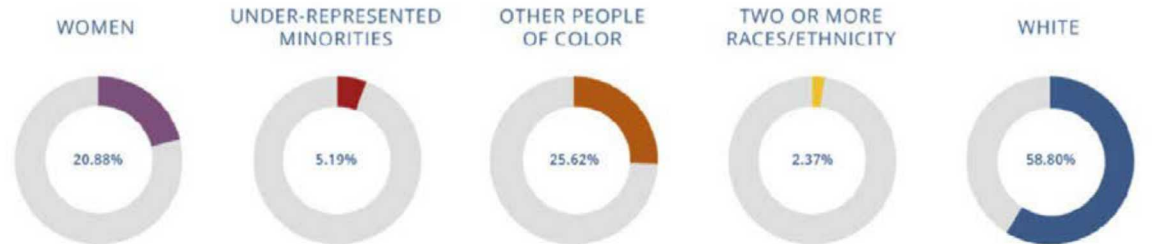
- Pioneering work in disabled students movement
- Leader in anti-Apartheid & Free speech movements
- Site of several protest movements beyond campus issues
- David Blackwell, 1st African-American member of NAS
- 22 Nobel Prizes
- Establishment of the first DOE lab (LBNL)



Oscar Dubon, Ph.D.
*Vice Chancellor Equity & Inclusion
and Faculty Scientist*



TECHNICAL RESEARCH STAFF



KEYNOTES



CHANCELLOR CAROL T. CHRIST First Female Chancellor in UC Berkeley's 150 year history

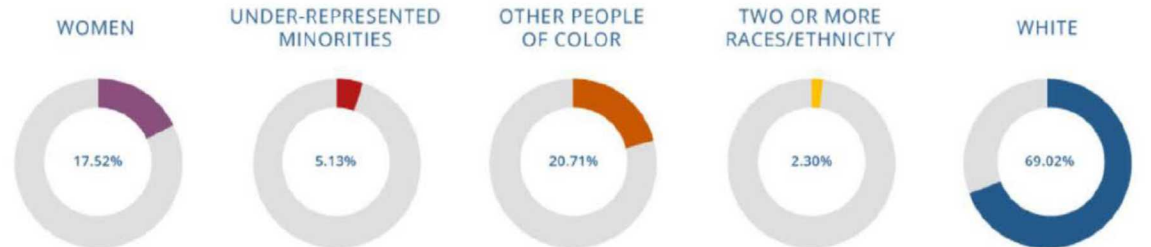
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Oscar Dubon, Ph.D.
*Vice Chancellor Equity & Inclusion
and Faculty Scientist*



RESEARCH/TECHNICAL MANAGEMENT



KEYNOTES



CHANCELLOR CAROL T. CHRIST First Female Chancellor in UC Berkeley's 150 year history

- Pioneering work in disabled students movement
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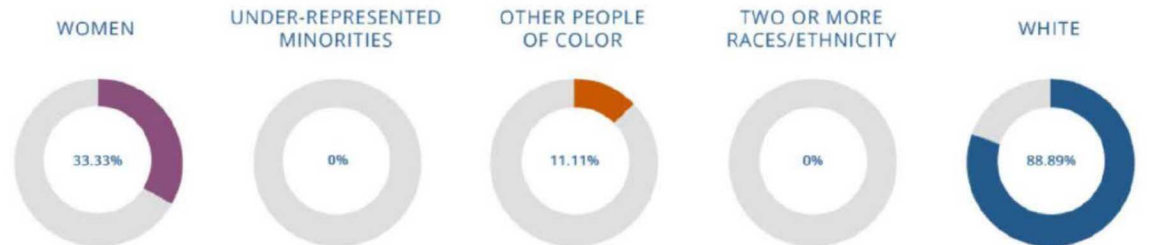


Oscar Dubon, Ph.D.
**Vice Chancellor Equity & Inclusion
and Faculty Scientist**



LAB SENIOR LEADERSHIP

- An organization should reflect it's population in all facets
- Change structures, policies & practice (*not just the people*)
- We must rethink rewards for diversity, equity & inclusion
- Having "agency" to address concerns is never to be underestimated



KEYNOTES



THE ROAD TO DIVERSITY & INCLUSION IS A TWO-WAY STREET

Companies & Institutions have a responsibility to endeavor to maintain a fair and equitable environment for all employees/students/members, etc.

Individuals have a responsibility to contribute to the positive development & growth of the company or institution by :

1. Helping to provide solutions not only call out wrongs.
2. Work to become a part of the whole and not merely exist as an isolated subset within the whole.
3. Realize institutional changes won't happen overnight but can and will change with dedication, effort and evidence of a business advantage due to said change.



Mr. Xavier Ochoa
Chief Operating Officer



BREAKOUT SESSIONS & PANELS

TOP TAKEAWAYS I

PROFESSIONAL LEVEL FOCUS

- As a student or young professional, you can't let being an agent of change eclipse your day job – and valuable mentors will remind you of this.
- “It's not enough to seek/receive mentoring, we also must be involved in mentoring/developing others” – *E. Kinser*
- Sponsorship & mentorship are both important - but they are not the same
- To bring about change at the level of leadership, its not enough to dialogue among underrepresented populations. Current power-holders must be at the table to be educated, to become informed and to buy-in.

EARLY CAREER & STUDENTS



Chris Borg
Citrine



Saemi Poelma
Clorox



Amy Wat
UC Berkeley

ESTABLISHED WORKFORCE



Emily Kinser
3M



Simona Murph
SRNL



Rosa M. Rojas
U of Arizona

EXECUTIVE LEADERSHIP



Resa Furey
Stantec



Amanda Reid
Caterpillar



Joe Carella
U of Arizona



BREAKOUT SESSIONS & PANELS

TOP TAKEAWAYS II

PROFESSIONAL DEVELOPMENT

- **Everyone** has unconscious bias, and that's ok. They are the mental shortcuts that help us survive – but it's also ok to learn that some of these mental shortcuts are wrong. That's where the growth occurs. – *Talia Fox*
- It's not enough to have a goal of inclusivity, we must create a **pathway** to achieving it. – *Sharoni Denise Little*
- Workplaces should foster 3 key elements to help close the gap between intentions and outcomes:



PROFESSIONAL DEVELOPMENT



Tali Fox
KUSI Global, Inc



PROFESSIONAL DEVELOPMENT



Sharoni Denise Little
The Strategist Company,
LLC



BREAKOUT SESSIONS & PANELS

TOP TAKEAWAYS III

DEMOGRAPHICS FOCUS

- Race may be a social construct. However, the results of generations of racial segregation, disenfranchisement, educational inequality, judicial malfeasance mental harassment and medical mistreatment are not – and the effects are still here.
- ‘Honor and acknowledge courageousness’ - Keith Bowman
- Successful assessment of D&I efforts do not always have to rely on counting dollars & quotas. Assessing ability to thrive can be far more valuable than a head count
- NSF’s National Center for Science and Engineering Statistics (NCSES)*

RACE & ETHNICITY



LGBTQ+



MEANS & MEASURES



Ann Gabriel
Elsevier



A. Clayton-Pederson
Emeritus Consulting



Lynn Milan
NCSES, NSF



Jessie DeAro
NSF



BREAKOUT SESSIONS & PANELS

YOP TAKEAWAYS IV

SPHERE OF INFLUENCE



- No matter the context, there is no substitute for genuine leadership when attempting to challenge the status quo
- ‘Two things change people the most; education & humanization’ – R. Beal
- *At times there may be no roadmap for the change you seek and that’s ok – discovery is always preceded by the unknown.*



OBSERVATIONS, LEARNINGS & OUTLOOKS

- We should all strive to create & contribute to environments where individuals can bring their **WHOLE, AUTHENTIC** selves to work with them
- The biggest challenge in dealing with unconscious bias is the added work associated with learning something new. – *T. Fox ... this means effort, correction, failure and repeated attempts* – (all aspects of the learning process) – should be expected parts of unraveling our own unconscious biases
- Regardless of institution, if we are serious about diversity and inclusion, measuring where we are and where we are going is non-negotiable. Assessment models are available and benchmark datasets for comparison are increasing in breadth & scope regularly.
 - *Sexual Harassment of Women: Climate, Culture & Consequences in Academic Sciences, Engineering, and Medicine*, National Academies of Science, Engineering and Medicine, 2017
 - *Women, Minorities, and Persons with Disabilities in Science and Engineering*, National Science Foundation, 2017
 - *National Center for Science & Engineering Statistics*, www.nsf.gov/statistics
 - Corporate Equality Index, Human Rights Campaign, 2018



SPONSORING ORGANIZATIONS



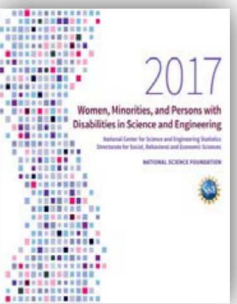
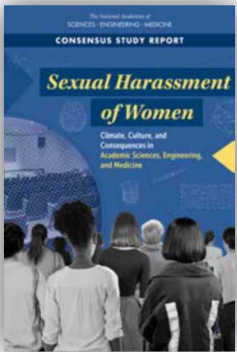
Sponsors



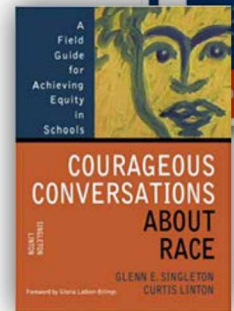
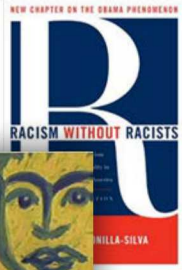
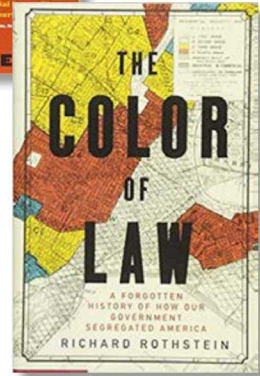
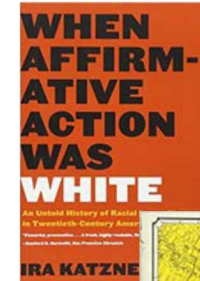
Materials Engineering



RESOURCES



- <https://www.tms.org/diversity>
- *Sexual Harassment of Women: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine*, NASEM, 2017
- G. Singleton and C. Linton, *Courageous Conversations About Race*, 2005
- L. Hong and S. E. Page, *Groups of diverse problem solvers can outperform groups of high-ability problem solvers*, PNAS, 2004
- *Women, Minorities, and Persons with Disabilities in Science and Engineering*, National Science Foundation, 2017
- K.W. Phillips, *How Diversity Makes us Smarter*, Scientific American, 2014
- R. Rothstein, *The Color of Law: A Forgotten History of How Our Government Segregated America*, 2017
- I. Katznelson, *When Affirmative Action was White*, 2005
- E. Bonilla-Silva, *Racism without Racists*, 2006
- National Center for Science and Engineering Statistics, www.nsf.gov/statistics





Backup Slides



NEXT STEPS

- **Summit highlights will be shared as part of an upcoming JOM article this fall and disseminated at other TMS events**
- **Take ideas and concepts back to work and teach them to others**
- **Solidify your personal commitment**



OTHER THOUGHTS

- Be wary about discussions of “fit”
- Will take work to legitimize topics of diversity and equality
- What is professional culture?
 - Schemas of Scientific Excellence
 - Depoliticization
 - Meritocratic Ideology
- Build bridges (trust) with impacted communities
- “What does it mean if our top-ranked programs are also our least diverse?” – Keith Bowman
- “Care” is critical component of the diversity and inclusion conversation



PERSONAL COMMITMENTS

How will you help advance diversity & inclusion
after DMMM3?



I will advocate for unconscious bias training in interviewing and candidate screening at my place of employment
--Jonathan Madison

I will promote diverse speaker lineups and panels at events and conferences as an organizer and as a participant
--Megan Brewster



I will drive alignment of company diversity policy into real world practices underpinning a culture of inclusion that leverages the contribution of all its members
--Xavier Ochoa

I will volunteer in or create an educational outreach event
--Natalie Larsen

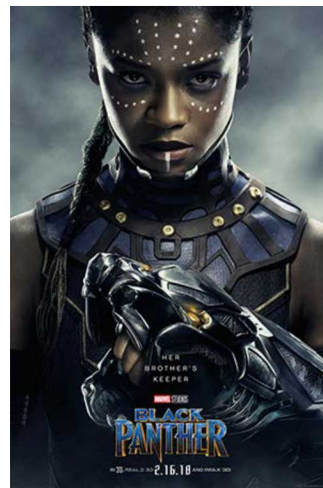


I will help provide programming to intersectionally identified people at my home institution.
--Matthew Korey

I will advocate for purposeful inclusion of diverse perspectives and feedback in future strategic planning workshops and events
--Michael Rawlings



WAKANDA'S MOST CONTROVERSIAL & POLITICAL FEATURE ?



WAKANDA'S MOST CONTROVERSIAL & POLITICAL FEATURE ?

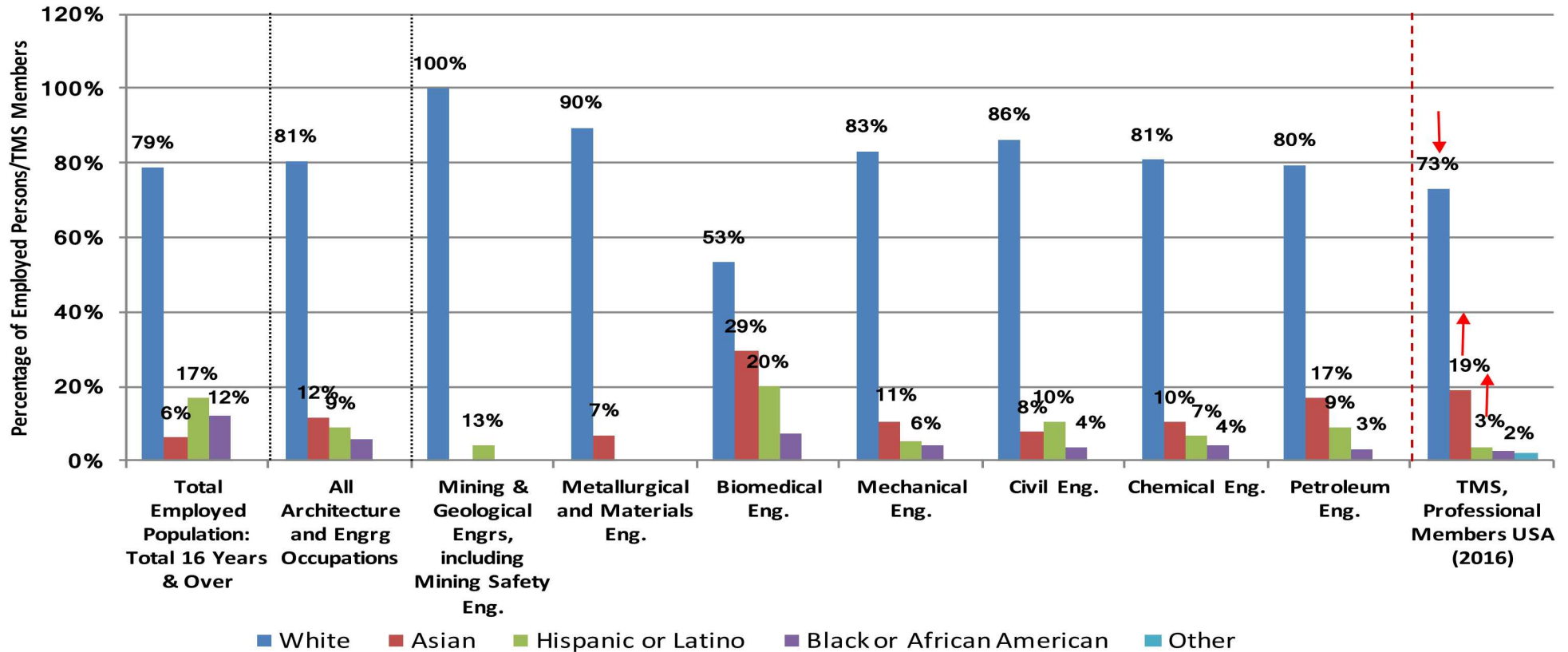


**“My entire existence is political”
– Roberta Beal**

We often like to avoid what is political and controversial. However, one lesson we can learn from Black Panther -- while treating things that are both both political & controversial as invisible may be easier, these same things we want to keep unseen, may literally hold the potential to revolutionize the world for the better.



Employed Persons in Metallurgical and Materials and Other Engineering Disciplines by Ethnicity

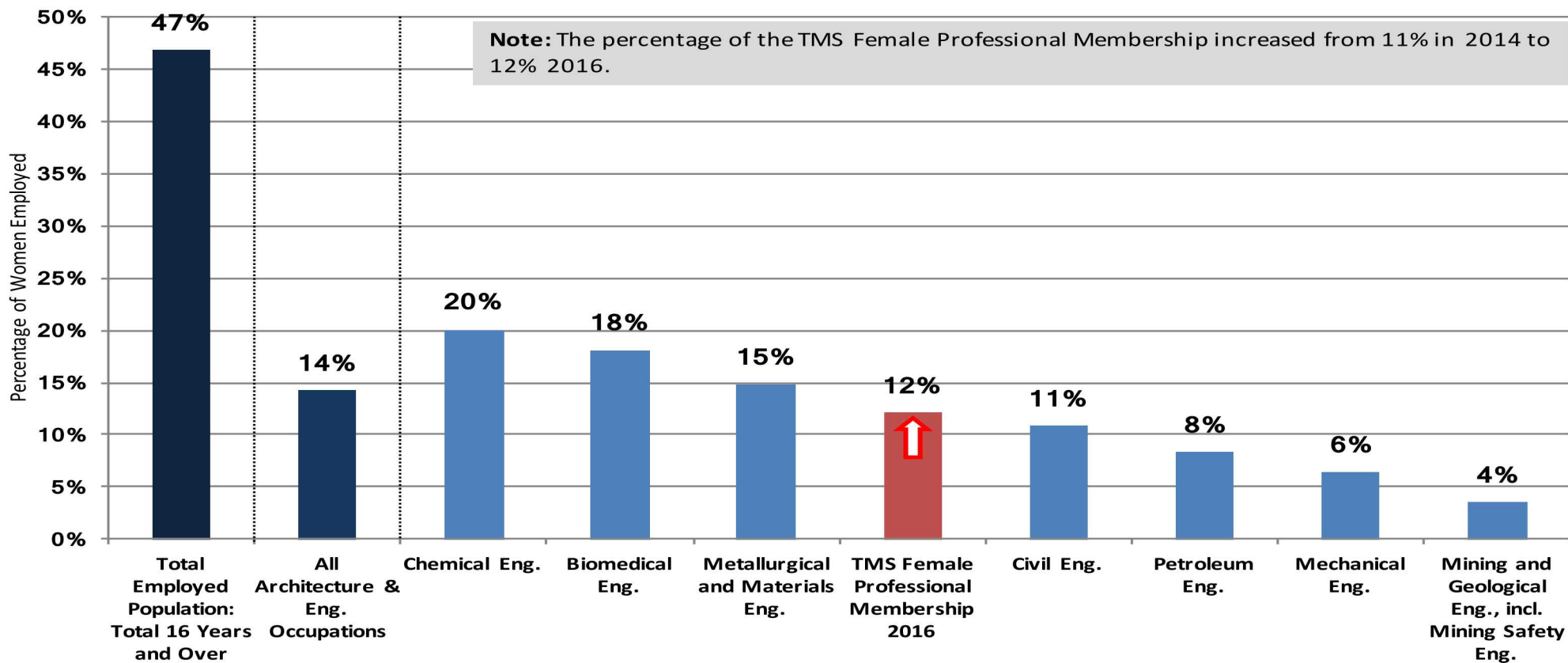


Source: BLS Table 1. Employed and experienced unemployed person by detailed occupation, sex, race, and Hispanic or Latino ethnicity, Annual Average 2016, Current Population Survey; TMS Membership Statistics, 2016

Note:

- The percentage of "White" TMS Professional Members (USA) decreased from 81% in 2017 to 73% in 2016. An increase can be noted in the "Asian" membership from 13% in 2014 to 19% in 2016. The percentage of "Hispanic/Latino" TMS Professional Members increased from 2% to 3% in 2016. The percentage of "Black or African/American" and the "Other" category remained the same.
 - Totals may not add up to 100% per category. Statistics based on the CPS are subject to both sampling and nonsampling error. **The estimates shown in this**

Employed Women in Materials Science and Engineering and Other Engineering Disciplines



Source: BLS Table 1. Employed and experienced unemployed person by detailed occupation, sex, race, and Hispanic or Latino ethnicity, Annual Average 2016, Current Population Survey; TMS Membership Statistics, 2016