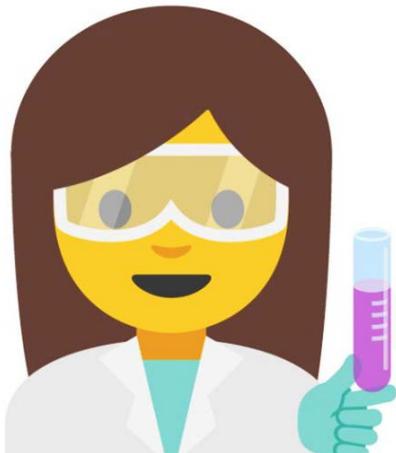


# What I've Learned About Best Practices for Diversity and Inclusion in STEM

Dr. Denneal Jamison-McClung

Director, UC Davis Biotechnology Program

#PlantBio2019



**UCDAVIS**

Biotechnology Program

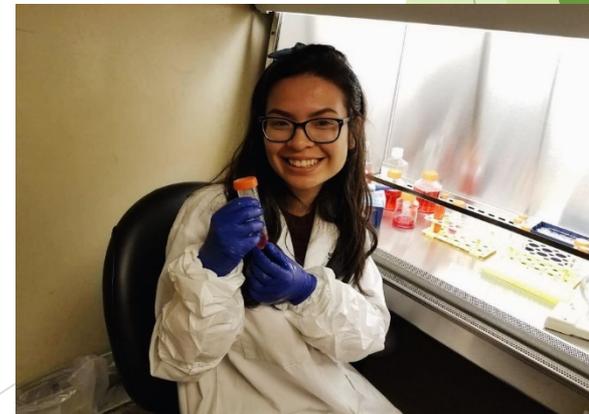
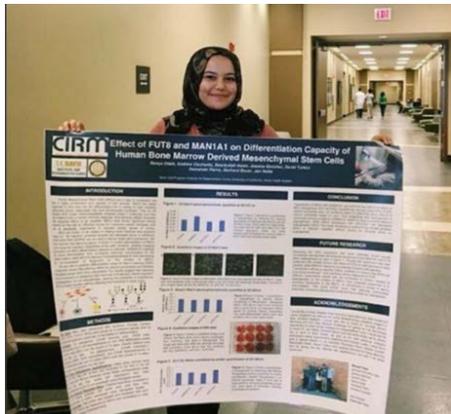
# My STEM Journey

- ▶ As a kid I enjoyed science - gardening, animals, dinosaurs, rocks and minerals, human organ systems
- ▶ As a teen, I fell in love with genetics
- ▶ As an undergrad, I figured out that I wasn't cut out for health sciences... a Yoder Lab internship in the Dept of Vegetable Crops and Weed Science set me on the path to grad school
  - ▶ 1995 UC Davis BS Biological Sciences, Minor in Women's Studies
- ▶ As a grad student in the Designated Emphasis in Biotechnology, TA'ing vs. a Celera AgGen internship pointed toward an academic career
  - ▶ 2003 UC Davis PhD in Genetics with DEB
- ▶ I started teaching as an adjunct faculty member at UC Davis and Sac State while ABD
- ▶ Post-PhD, I morphed into a program administrator, course developer/instructor and science communicator
- ▶ All along my journey, there have been #metoo moments and clear cases of gender bias - hence my life-long interest in making sure all people have a chance to engage in STEM.
- ▶ Thankfully, I continue to have a number of great mentors, sponsors and supportive social networks...



# Working Across the STEM Pipeline

- ▶ **K-14 Biotech Teachers and Students:** BioTech SYSTEM consortium and Teen Biotech Challenge website design competition (grades 9-12)
- ▶ **Undergrads:** Plant Bio and Honors Program teaching and REU program coordination
- ▶ **Graduate Students and Postdocs:** DEB graduate teaching and program coordination, service on Grad Council
- ▶ **Faculty:** UC Davis ADVANCE Management Team



# Enhancing Diversity and Inclusion in STEM - the Basics!

- ▶ Importance of mentors and sponsors at all career stages - “I can be it, if I can see it”
  - ▶ Facilitate professional networking and invite diverse experts/speakers to events
  - ▶ Be a sponsor/suggest junior colleagues for awards and opportunities
- ▶ Individuals need to develop a **sense of belonging**, a **science identity** and a **voice** in order to be successful in STEM
  - ▶ Pay attention to **intersectionality** (added impact of multiple underrepresented identities (gender, ethnicity, sexuality, etc.))
  - ▶ Make cultural norms explicit and evaluation processes transparent - people need to know “**what is expected of me?**”
  - ▶ Offer training and opportunities in **science communication** (traditional and non-traditional)
- ▶ All humans are innately tribal and exhibit **implicit biases** when evaluating others - raising awareness of potential biases towards other people is the starting point for individual and institutional change
- ▶ Institutions need to have climates, policies, and practices (**accurate data, pay equity, work-life balance**) that facilitate inclusion and broad awareness of all of the above - leadership and admin support is crucial

# NSF Demographic Data

<https://nces.nsf.gov/pubs/nsf19304/>

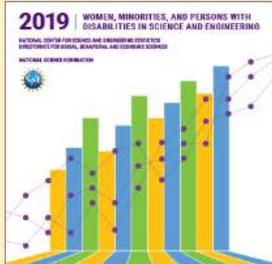


**NCSES**

Women, Minorities, and Persons with Disabilities in Science and Engineering

Digest Data Technical Notes Downloads Additional Resources How Do I? Contact Us Errata

## Women, Minorities, and Persons with Disabilities in Science and Engineering



Provides statistical information about the participation of these three groups in science and engineering education and employment. A form report, in the form of a digest, is issued every 2 years.

National Science Foundation | National Center for Science and Engineering Statistics (NCSES)  
Women, Minorities, and Persons with Disabilities in Science and Engineering | Alexandria, VA

## Demographic Trends

- Life sciences are roughly gender-balanced across all degree levels (BS, MS, PhD), math/stats is improving, but computer science, engineering and physical sciences are still very unbalanced (~20% women).
- Underrepresented groups are gaining slowly in STEM degree attainment, overall.
- Of unemployed/part-time STEM workers, women more often cite family obligations as the reason, men cite retirement.
- Of STEM degree holders, women are more likely than men to be working in “STEM-related” rather than “STEM” fields. Same trend for underrepresented groups.

FIGURE 2-C  
Degrees awarded to women: Computer sciences, 1997, 2006, 2016

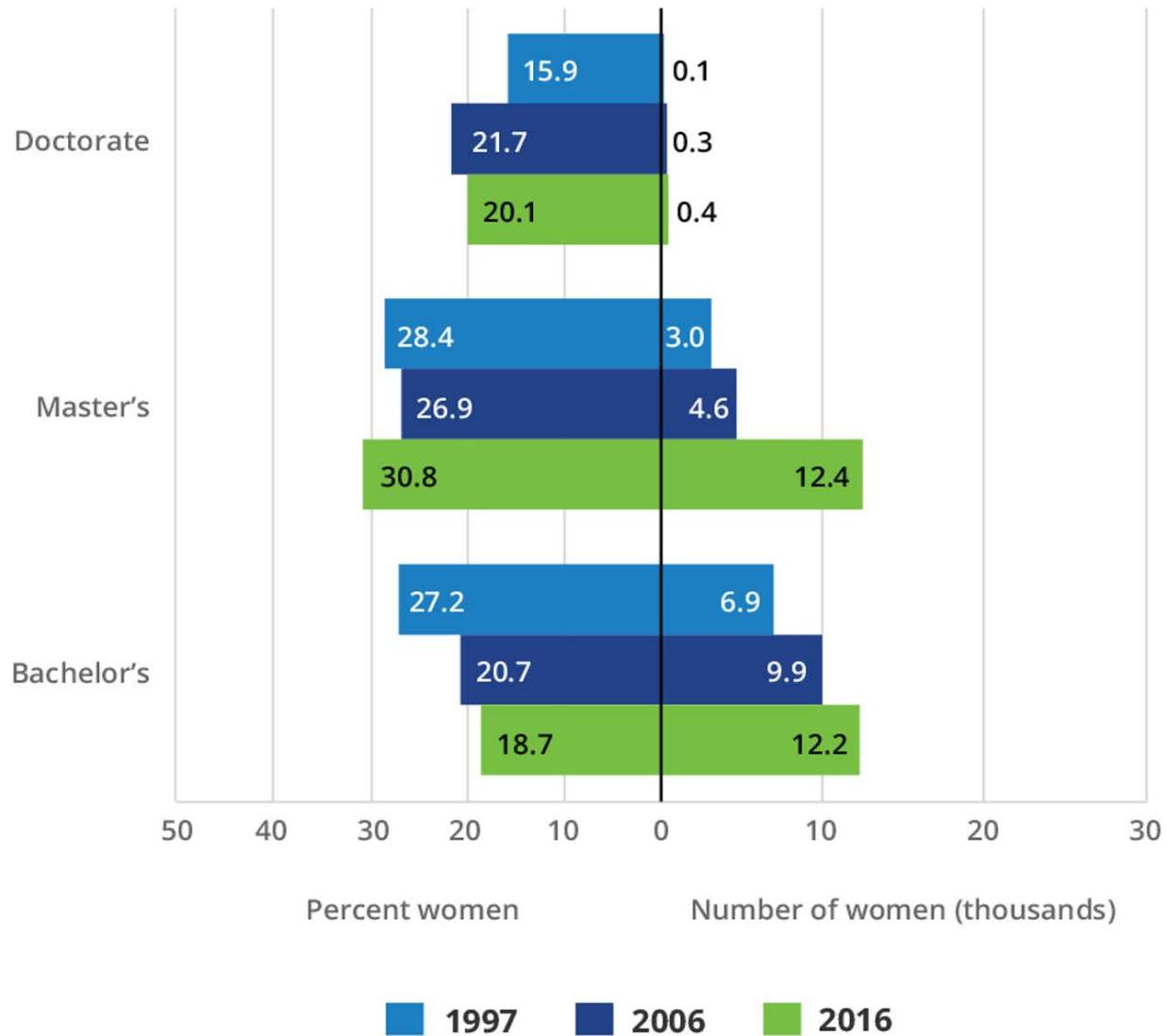
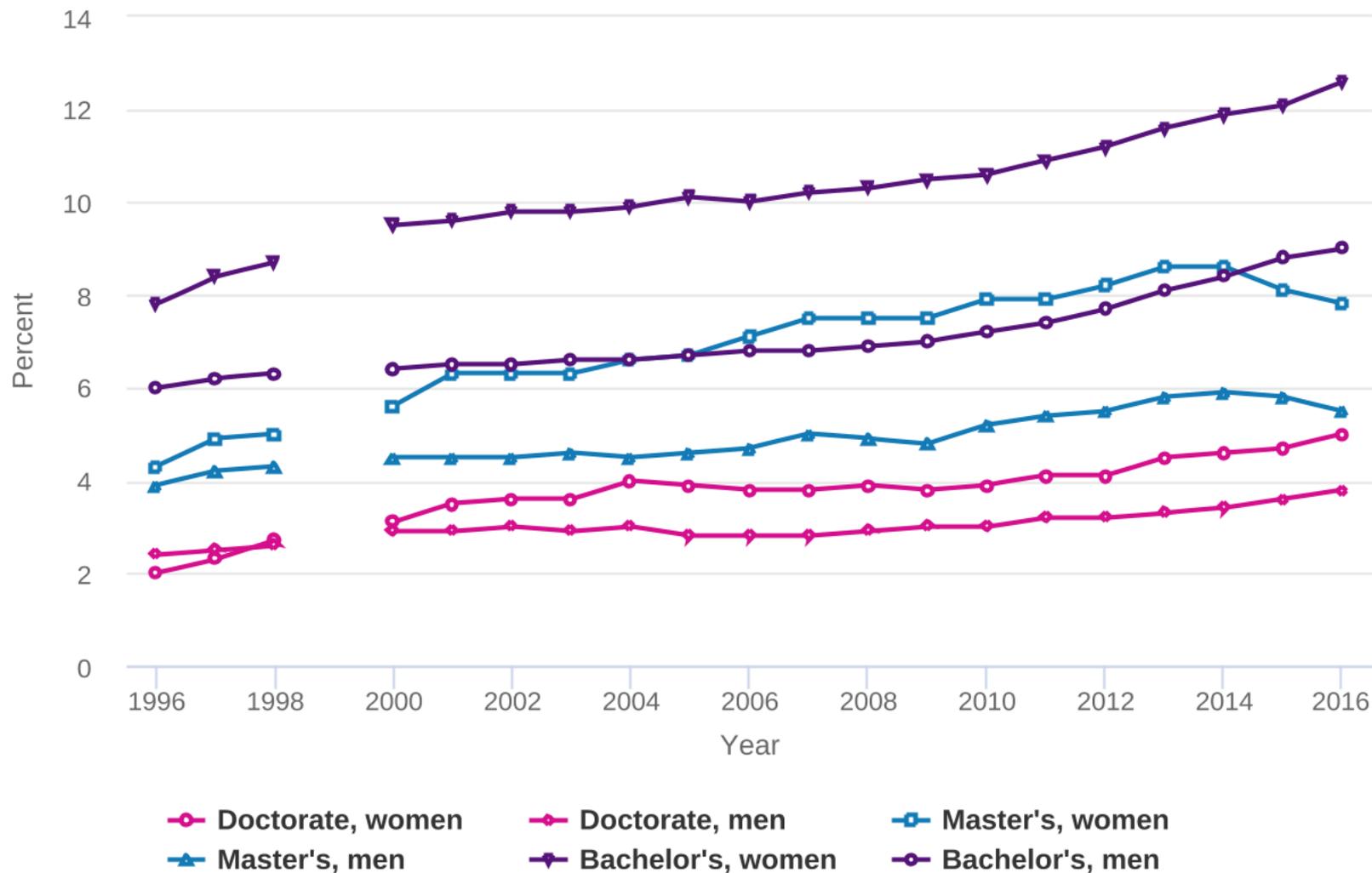


FIGURE 4-B

Science and engineering degrees earned by underrepresented minority women and men, as a percentage of all S&E degrees awarded of each degree, by degree type: 1996–2016



# NSF Summary Statements on 2016 STEM Degree Attainment

- ▶ “Of all science and engineering (S&E) degrees awarded in 2016, **women earned about half of bachelor’s degrees, 44% of master’s degrees, and 41% of doctorate degrees**, about the same as in 2006. However, the proportion of degrees awarded to women in S&E fields varies across and within broad fields of study. Women’s highest degree shares are in psychology and biosciences; the lowest, in computer sciences and engineering.”
- ▶ “**In 2016, underrepresented minority students received 22% of all S&E bachelor’s degrees and 9% of all S&E doctorate degrees.** Their share of master’s degrees has increased between 1996 and 2016, although there has been a slight decline over the past couple of years. It should be noted that the decline in the share of master's degrees was also seen among almost all racial and ethnic groups, as the number and share of temporary visa holders receiving a master's degree increased.”

# After the degree... employment opportunities

National Center for Science and Engineering Statistics | NSF 19-304

FIGURE 6-A

Employed scientists and engineers, by occupational group, sex, ethnicity, race, and disability status: 2017

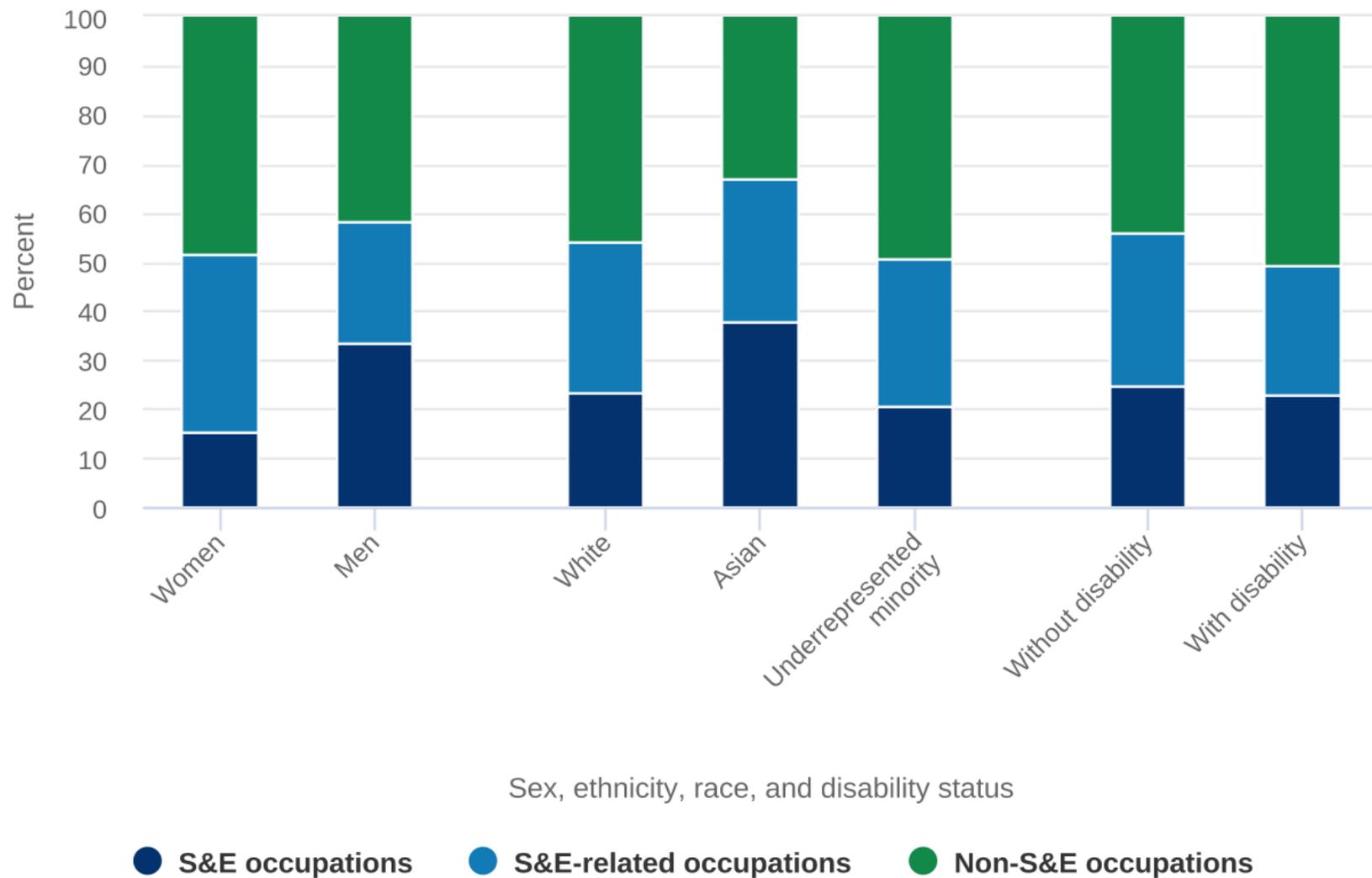
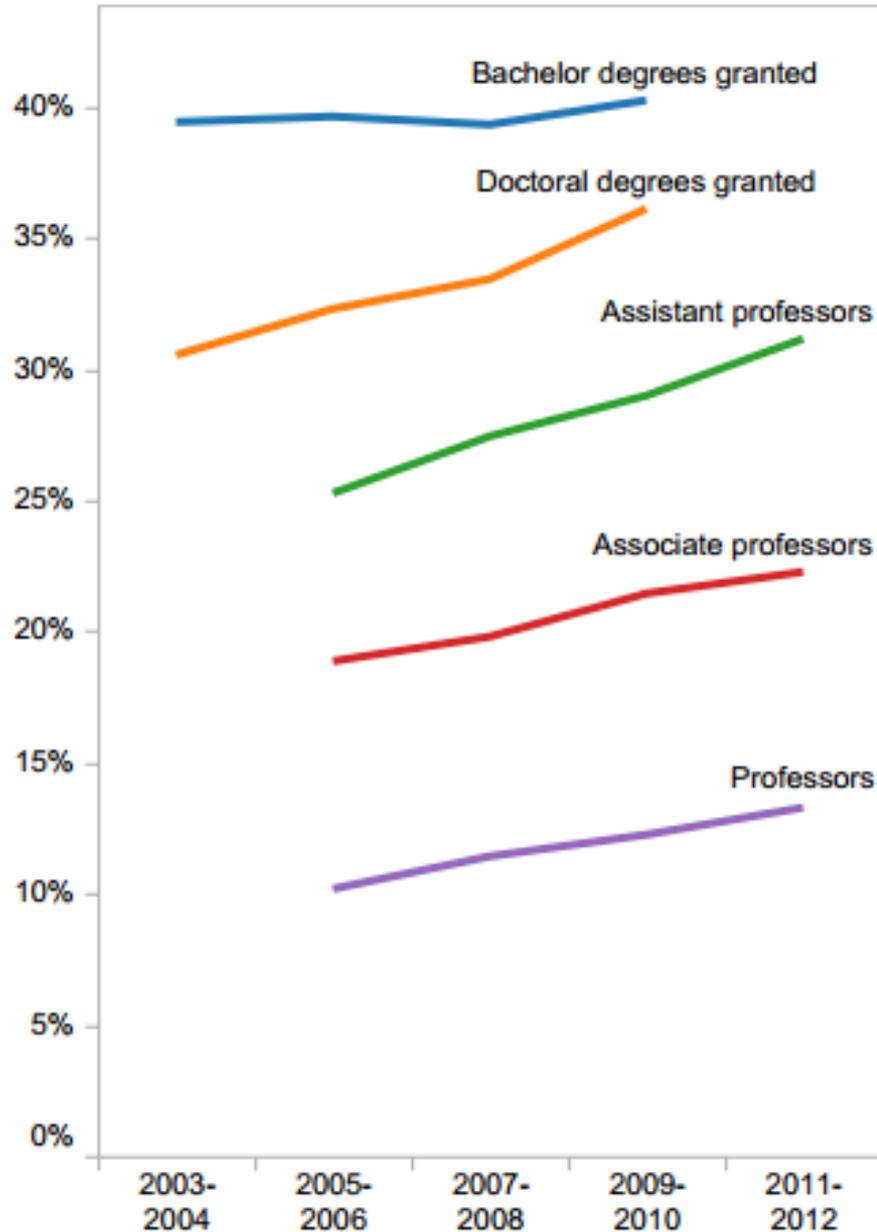


Figure 19. Change in proportion of women in STEM fields by academic population



## “Women in the Academic Pipeline for Science, Technology, Engineering and Math”

Association of American Universities Data Exchange (AAUDE) - April 2013

- ▶ Doctoral degree pool growing
- ▶ # of women in tenure track faculty positions growing more slowly in STEM fields
- ▶ # of women assistant profs growing faster than associate and full professors
- ▶ <http://aaude.org/system/files/documents/public/reports/report-2013-pipeline.pdf>

# Elite male faculty in the life sciences employ fewer women

JM Sheltzer and JC Smith (June, 2014) PNAS v. 111 no. 28, pp 10107-10112.

- Found high-achieving male faculty members train significantly fewer (-10-40%) women grad students and post-docs, relative to high-achieving female faculty members (NAS member, awards, HHMI funded researcher, etc...)
  - Cause may be faculty member conscious or unconscious bias or self-selecting behavior by the women grad student and postdocs
  - Effect – fewer women are trained in highly competitive labs = leaky pipeline at doctoral training -> academia phase
- “Our dataset also included 24 Nobel Laureates in Medicine/Physiology or Chemistry. **Male PIs who had won a Nobel Prize ( $n = 22$ ) ran laboratories that had, on average, 24% female postdocs and 36% female graduate students, which represents a 39% and 27% deficit, respectively, relative to the pool of trainees (Fig. S1).** The paucity of female Nobel Laureates prevented a meaningful comparison using this criterion, although we note that both female Nobel Laureates in our sample ran laboratories in which female trainees outnumbered male trainees at the time of our survey.”

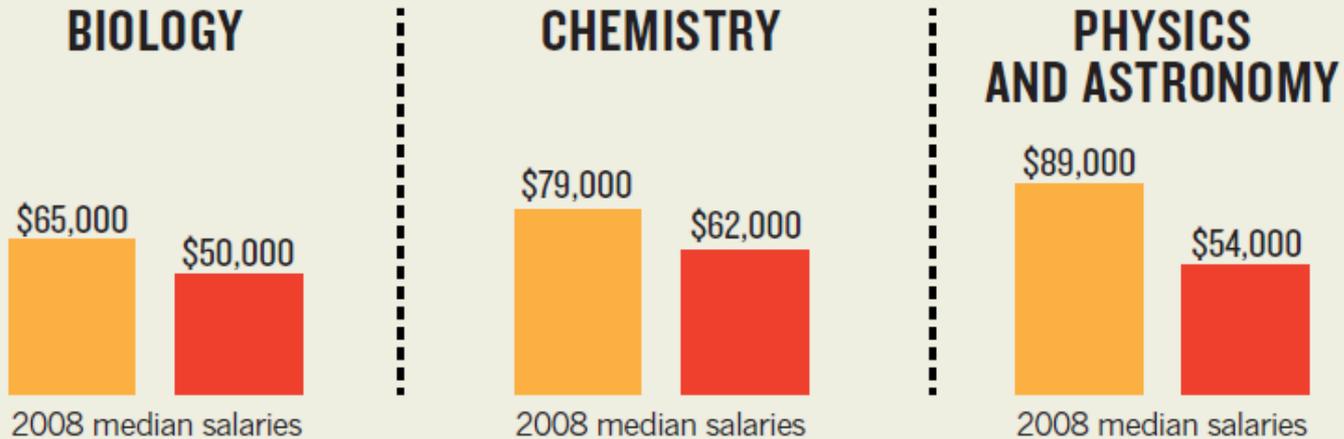
[http://www.slate.com/articles/double\\_x/doublex/2014/06/women\\_in\\_science\\_a\\_new\\_study\\_on\\_how\\_male\\_professors\\_discriminate\\_against.html](http://www.slate.com/articles/double_x/doublex/2014/06/women_in_science_a_new_study_on_how_male_professors_discriminate_against.html)

# Mind the Gap – Nature, March 2013 Special Edition

SOURCE: NSF/SESTAT

## THE SALARY GAP

Female scientists in the United States earn much less than men, on average, with the difference varying strongly by field.

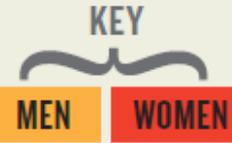


**18%** AVERAGE PAY GAP  
ALL POSITIONS

# Mind the Gap – Nature, March 2013 Special Edition

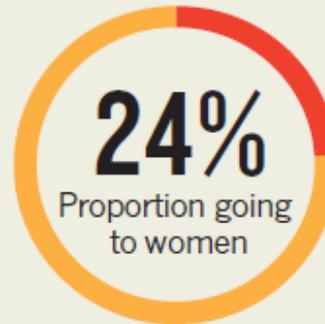
## THE FUNDING GAP

Women are earning an increasing share of research grants from the US National Institutes of Health (NIH) but the average size of their awards has consistently lagged behind what men receive.



**2002**

NUMBER OF NIH RESEARCH GRANTS



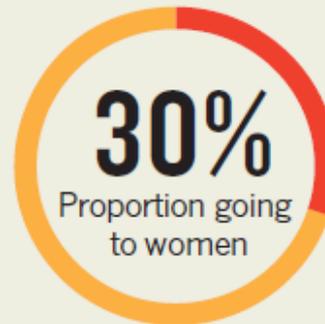
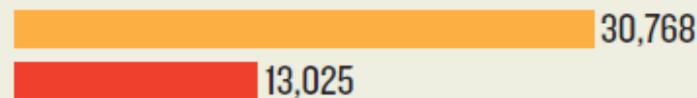
**2002**

AVERAGE SIZE OF GRANT



**2012**

NUMBER OF NIH RESEARCH GRANTS



**2012**

AVERAGE SIZE OF GRANT



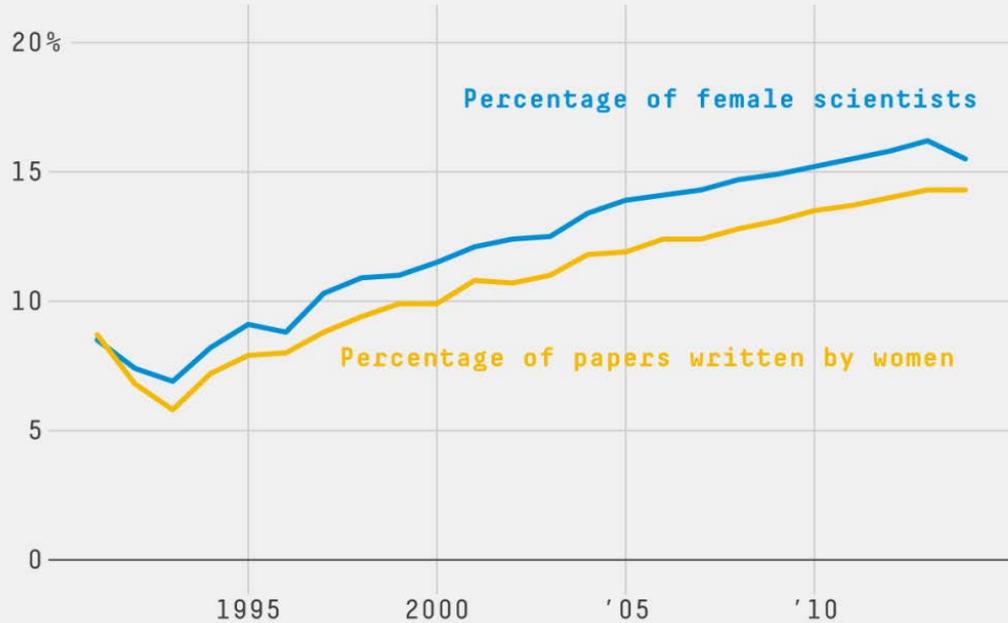
THE QUALITY GAP

# In Science, It Matters that Women Come Last

by Emma Pierson Aug 5, 2014

## Female Scientists And Authorships Since 1991

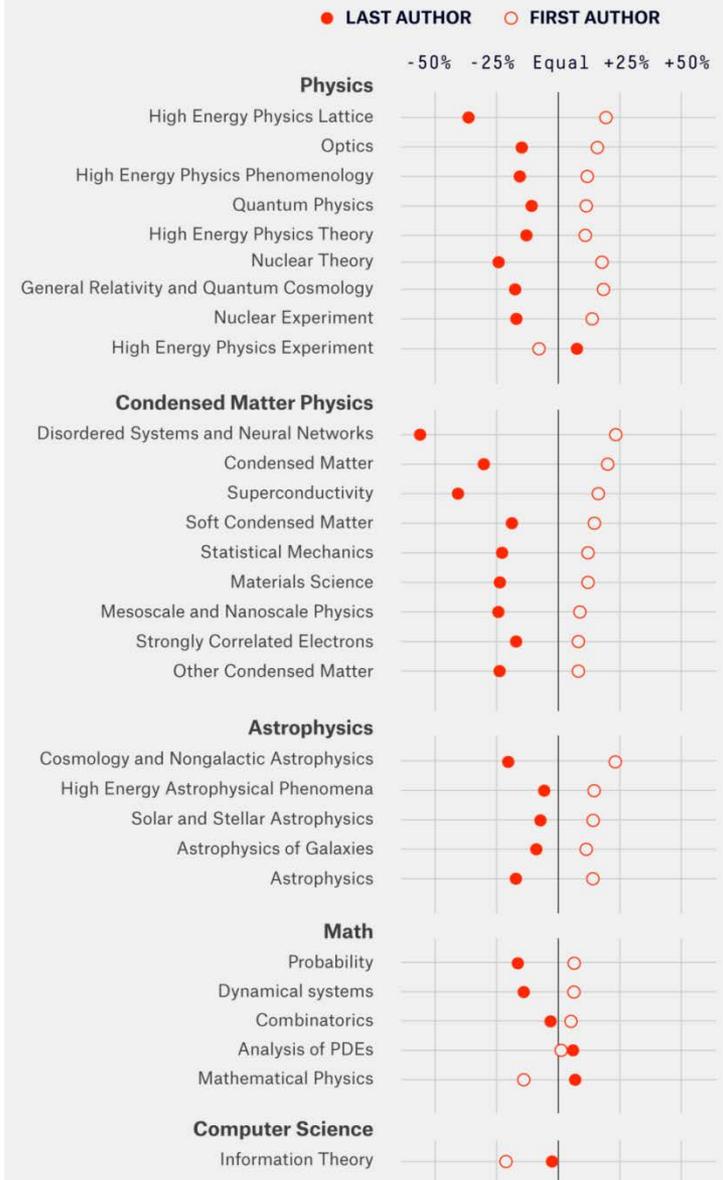
Female representation in the arXiv data set



Women were 13% less likely to be last author (PI) in this analysis of arXiv data.

## How Much More Likely Is A Female Scientist To Be First Or Last Author?

In fields with at least 10,000 papers in the arXiv data set

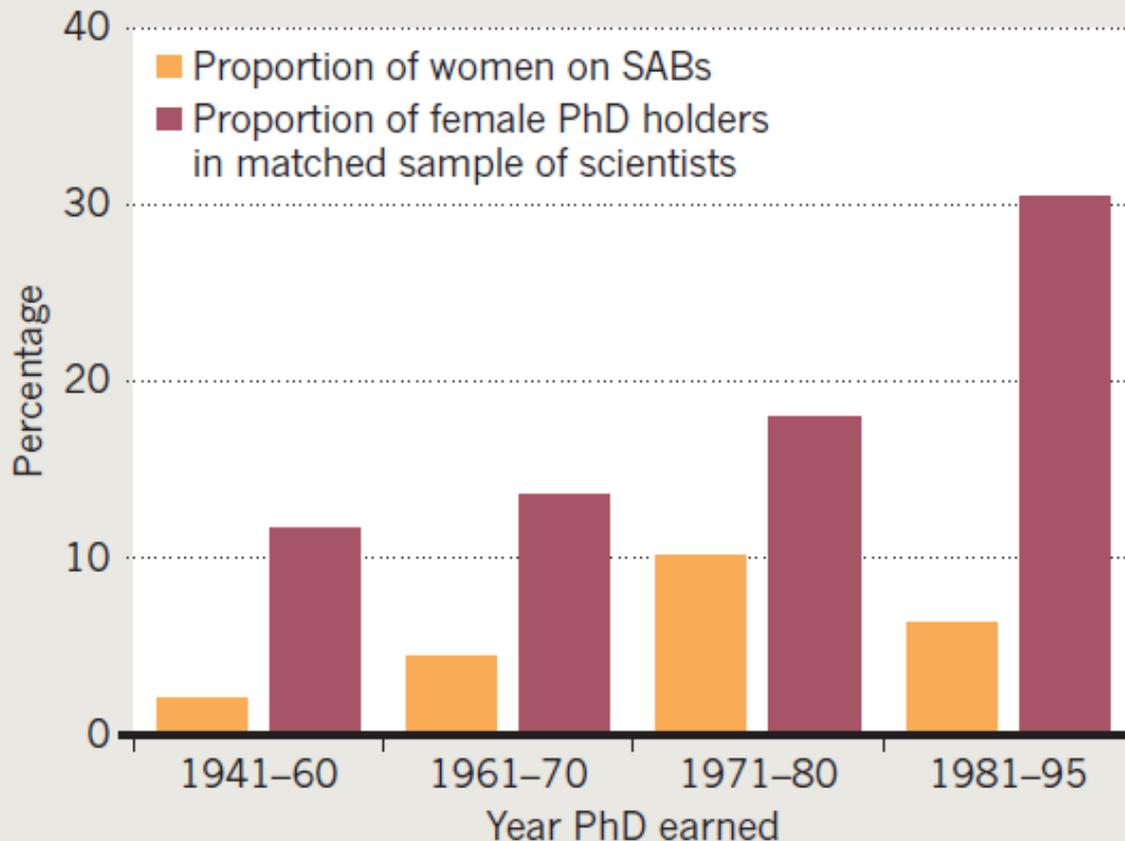


# “Barred from the Boardroom”

## Nature v. 495, n. 7 - March 2013

### INEQUALITY ON BOARD

The proportion of women on biotech scientific advisory boards (SABs) lags behind the proportion of eligible female candidates.



Women PhD's in science and engineering make up:

- ~25% of tenured academics
- ~25% of industry R&D scientists
- But only ~7% of industry board members

# On-going Challenges...

- Though progress has been made in # of STEM degrees awarded since the 1970's, gender-based and ethnicity-based inequities in science and engineering are real, measurable and persistent for a number of career-related indicators:
  - Lack of mentoring by high-achieving/awarded PIs
  - Recruitment and persistence in tenure track faculty positions
    - Disparities in start-up packages, need for “equal pay for equal work”
    - Disparities in teaching and service loads
    - Disparities in federal grant funding
  - Fewer publication authorships (“last author” = PI)
  - Lack of participation on industry boards/entrepreneurship



Dr. Denneal Jamison-McClung  
Director, UC Davis Biotech Program  
UC Davis ADVANCE Management Team  
*(ex officio since July 2018)*

## Institutional Transformation to Build and Sustain a Diverse Community of Innovative STEM Scholars



<http://ucd-advance.ucdavis.edu/>

# UC Davis ADVANCE is funded by the National Science Foundation (HRD-1209235)

## Mission

Institutional transformation to increase recruitment, retention and advancement of female STEM ladder rank faculty, **with an emphasis on Hispanic Women/Latinas**, to develop a more innovative STEM workforce that reflects the populations it serves.



- A \$3.7 million NSF ADVANCE Institutional Transformation (IT) cooperative agreement
- Led by **Chancellor Emerita Linda Katehi (PI)**, Prof. Karen McDonald (CoPI and Faculty Director), Prof. Ray Rodriguez (CoPI), Vice-Provost Maureen Stanton (CoPI) and Vice-Chancellor Adela de la Torre (CoPI) -> ***NSF looks for strong campus support***



- Pilot programs to enhance the recruitment, promotion and retention of women faculty in STEM with best practices institutionalized for all faculty
- NSF Award# HRD-1209235 funded from September 15, 2012 – August 31, 2017(2 years of no-cost extension – final end date of August 31, 2019).

# UC Davis ADVANCE Project Goals



1. Build a vibrant, welcoming and diverse STEM research community through establishment of the “Center for Advancing Multicultural Perspectives on Science”

*CAMPOS\*, Mentorship & Networking Initiative\**



2. Establish an institution-wide, inclusive climate in STEM departments/colleges in which diversity is valued  
*Inclusive Campus Climate Initiative – STEAD Implicit Bias Training Policies & Practices Review Initiative*



3. Promote equitable career advancement, achievement, and recognition among all STEM faculty

*Policies & Practices Review Initiative, Mentorship & Networking Initiative\**



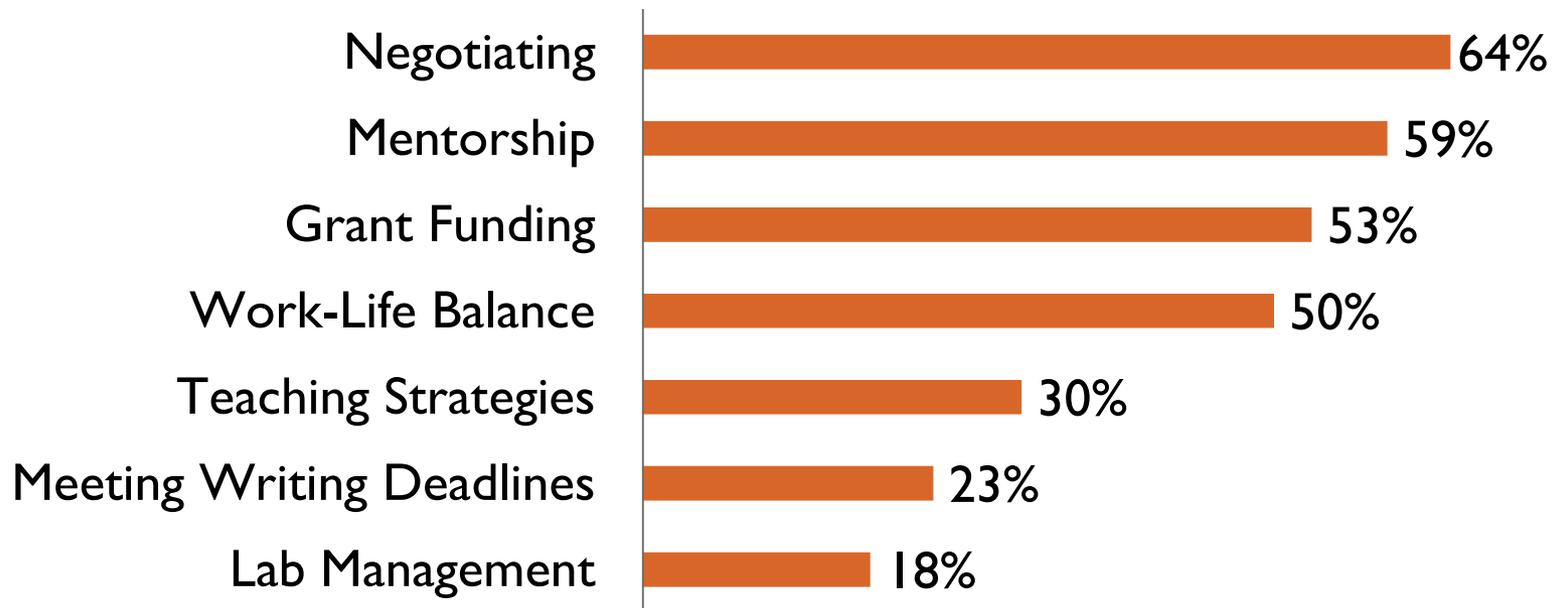
4. Understand barriers and catalysts for Latinas in STEM

*Social Sciences Research Initiative*

5. Develop a regional employment network and services to enhance recruitment and retention of dual-career faculty

*Capital Resource Network*

# MNI Found that UC Davis Faculty Women Want Information On:



- UC Davis ADVANCE surveyed 117 women faculty who attended a networking reception in February 2014
- 71% responded to the post-event survey
- Of these, 80% of respondents “likely” or “very likely” to attend future events
- Negotiation, mentorship, grant writing and work-life balance topped the list of career topics

# MNI LAUNCH Pilot Program for New Faculty

- LAUNCH pilots by our **Mentorship & Networking Initiative** under the leadership of **JoAnne Engebrecht** and **Carol Erickson** with key contributions by committee members, esp. **Magali Billen** (convened 12+ LAUNCHs in MPS!)
- Modeled after similar successful programs at Case Western Reserve University and University of Michigan
  - Guidance by Beth Mitchneck (U Michigan) and Diana Bilimoria (Case Western)
  - Adapted to UC Davis by Kim Shauman
- Key characteristics:
  - A faculty **Convener** leads the LAUNCH committee (monitors meeting logistics and follow up)
  - New faculty **Mentee** works with Convener to tailor mentorship focus
  - **Dept Chair** brings knowledge of key resources and expectations for tenure
  - Multiple senior faculty **Mentors** provide different perspectives & strategies (internal/external, cross-disciplinary)

# LAUNCH Example Questions – Things a new faculty hire may or may not know to ask...

---

- **TEACHING**

- What is the process for making teaching assignments, and what factors are used to decide what I am teaching?

- **RESEARCH**

- Should I continue to collaborate with my doctoral or postdoc advisor? Should I collaborate with this person who is a giant in the field? If I collaborate, how will my work be viewed when I come up for tenure?
- How many proposals should a junior faculty member in this department submit every year?

- **SERVICE**

- What if I say “yes” to something and now realize it is way too much for me to do?
- Should I consider service outside the university (e.g. professional societies)? How is that viewed at tenure time?

# Issues Regarding Lab Management:

## Lab and Equipment

- What lab am I assigned? What should I do if this isn't going to be sufficient/suitable?
- Why isn't the lab ready yet? What is the process for getting labs renovated?
- Who is the facilities person and can they help? Is there anything that can be done to speed things up?

## Personnel and Mentoring

- How should I counsel a student that just failed the qualifying exam?
- What qualities should I look for in a postdoc?
- Who might I contact to get good postdoc applications? Should I advertise and, if so, how and where?
- When hiring a postdoc, are there departmental norms in terms of salary, office space, length of term, etc.?

## LAUNCH Mentees Say...

---

“The LAUNCH committee gave me a unique opportunity to connect at the time I needed it the most. I really appreciated the fact that the committee involved professors from my department as well as from other departments. I always received **advice from different points of view**, which I found particularly invaluable. I remain in touch with most members, and they have become my long-term mentors.

Assistant Prof. Cindy Rubio Gonzalez  
(Computer Science)

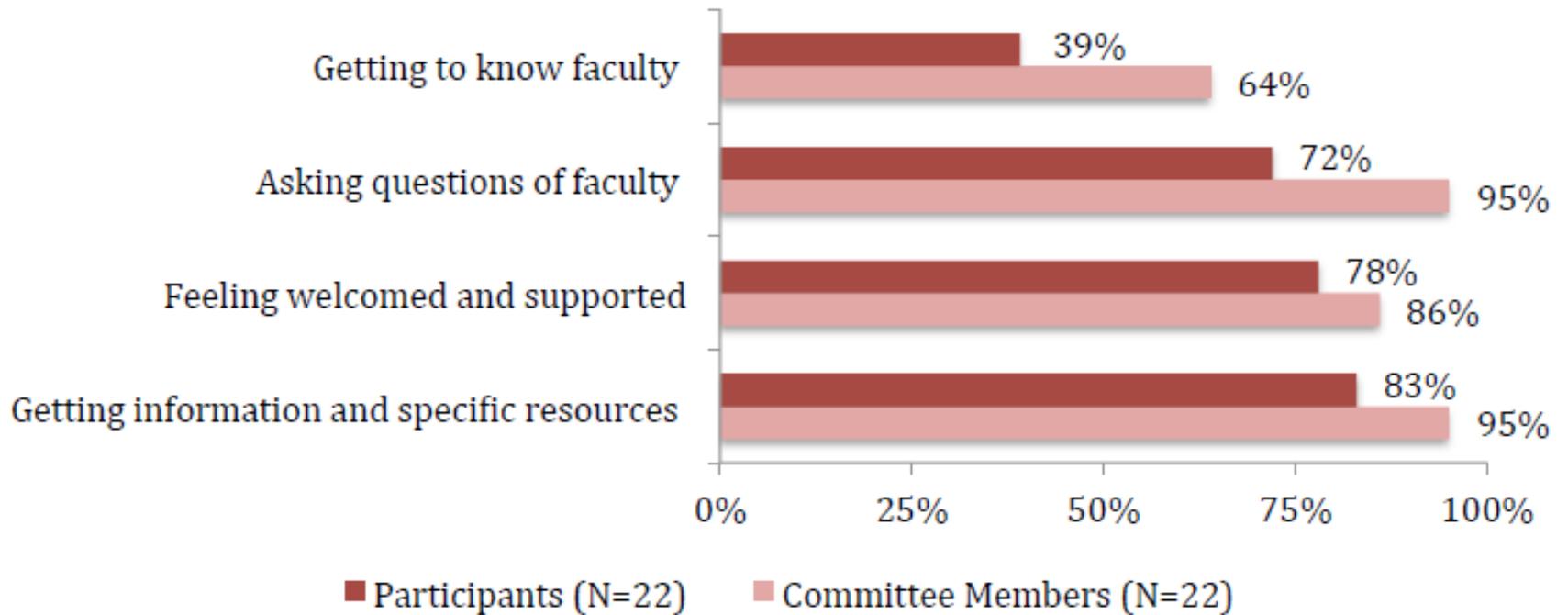


## LAUNCH Mentors Say...

---

- “The LAUNCH committee for \_\_\_\_\_ is composed of a highly sophisticated group of faculty members that provides a **unique level of mentoring support that cannot be met by any departmental support group**. It is my firm belief this committee has provided support unparalleled by any other committee....” – Prof. Kent Pinkerton
- “I particularly liked the committee that I served for all new assistant professors in the department of \_\_\_\_\_. I think initially the LAUNCH was targeted for \_\_\_\_\_, but her chair \_\_\_\_\_ suggested that **all new assistant professors in the department (Asst. Prof. X, Asst. Prof. Y, and Asst. Prof. Z) be invited to participate**. I thought this was a great idea and much more inclusive.” – Prof. Elva Diaz
- “I’ve been on several Launch Committees. They're an incredible resource for the new faculty. **But also, I've learned a lot, and it makes a connection with a new person**. Launch Committees are fantastic.”

**Figure 7. Most Successful Aspects of the Launch Committee**



# LAUNCH Pilots...the Consensus

- **Both mentees and mentors find the experience valuable (peer-to-peer mentoring occurs between senior faculty, as well)**
  - Important to formally recognize service of mentors
  - Mentees voicing enthusiasm for future service as mentors
- **Committee composition should be balanced between mentors with broad institutional knowledge and specific research/topical expertise**
  - External perspectives can be very helpful
- **Ideally, all new UC Davis faculty will be offered a formal, committee-based mentoring experience, like LAUNCH**
  - Encourage culture change and adoption of new practice
  - Potential need for monitoring and accountability
  - Need to identify creative ways to sustain and scale

# New Faculty Network

- ▶ Grassroots organization started by Prof. Magali Billen (Earth & Planetary Sciences)
  - ▶ Participants are “newish” faculty (~5-10 years on campus) interested in networking and informal peer-to-peer mentoring
  - ▶ Monthly mixers at local eateries
  - ▶ Social activities announced via listserv
  - ▶ Fall welcome hosts ~50-80 new faculty at a local restaurant



Encourage new faculty to join the SYMPA listserv  
“ucdnfn@ucdavis.edu”

- email list was maintained by UC Davis ADVANCE, now VPAA
- VPAA invites new faculty to join each fall

# Best Practices for Mentoring

- ▶ Facilitate mentor-mentee matching with provided guidelines for interaction/topics (e.g. LAUNCH question list)
- ▶ Mentees should have multiple mentors and helped to build a strong professional network
- ▶ Provide mentees with training on the “culture of X discipline”, science communication and soft skills (e.g. workshops, courses, online modules, resource lists)
- ▶ Encourage peer-to-peer mentoring and mentoring down the STEM pipeline
- ▶ Provide help in identifying sponsors and career-building awards/opportunities, both internal and external to the university

# Center for the Advancement of Multicultural Perspectives on Science (CAMPOS)



## Award Period Mission

- To support discovery of knowledge by promoting women in science, starting with Latina STEM scholars and expanding to all underrepresented groups in STEM, through building an inclusive environment that is:
  - Diversity-driven
  - Mentorship-grounded
  - Career-success focused



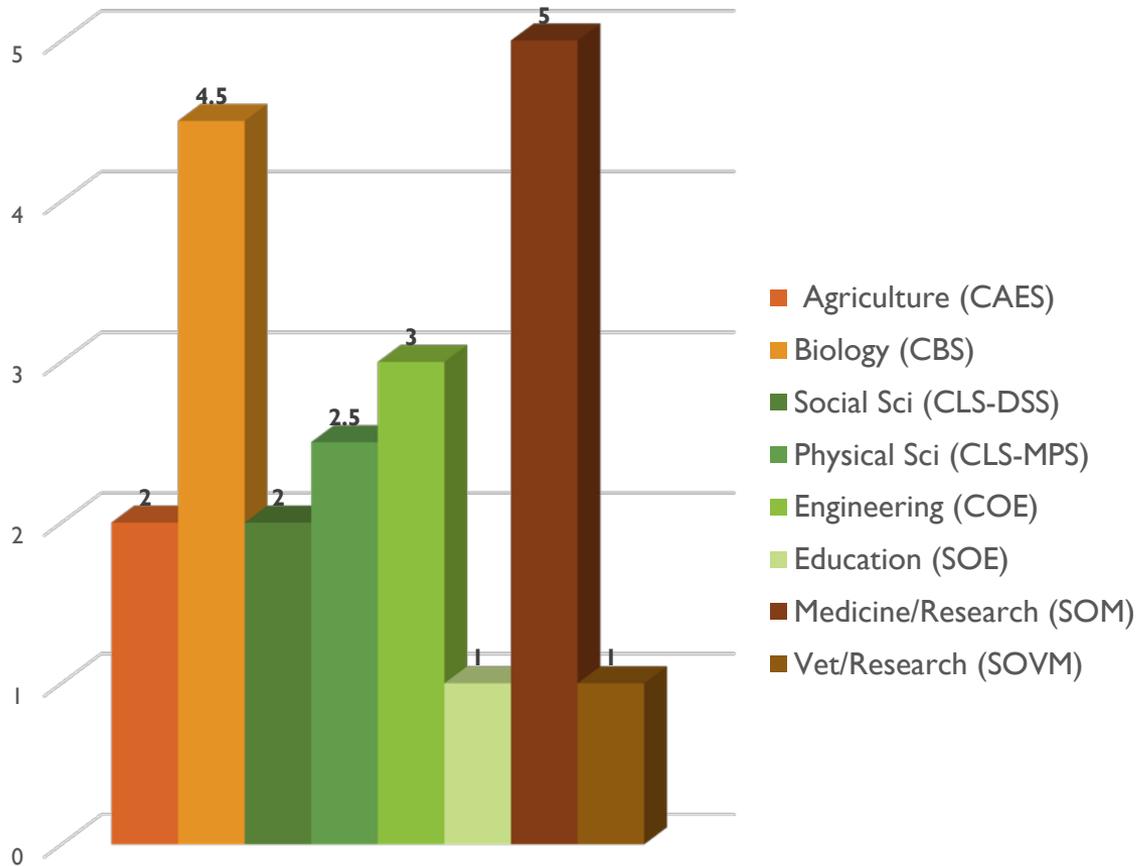
## Specific Goals

- Accelerate Latina STEM faculty recruitment over the award period (2012-2017) by adding 16 FTEs
- Develop the **CAMPOS Faculty Scholar award program**
  - Salary offsets to hiring deans: (\$85K per year for 5 years)
  - For CAMPOS faculty awardees:
    - Professional and leadership development
    - LAUNCH mentoring & NCFDD Faculty Success Program enrollment
    - \$6K to fund a summer graduate student researcher

# 2014 – 2017 CAMPOS Faculty Scholar Award Criteria

- Award process abides by California State Law and Proposition 209 (may not use gender or ethnicity as eligibility criteria)
- Nominees must be tenure track STEM faculty candidates from the current recruitment cycle
- **Awardees must demonstrate professional expertise (teaching, research, service) in serving California's diverse student populations and/or communities**
  - More than 50% of California K-12 students are Hispanic/Latinx
  - ~25% of UC Davis undergraduates are Hispanic/Latinx
- **“Check box” criteria (choose one or more) on the award nomination form filled out by department and search committee chairs:**
  - *Integrates understanding of Hispanics/Latinxs, African Americans, or other historically URM populations into their research*
  - *Is committed to research that engages underserved communities, especially Hispanics/Latinxs and African Americans, groups that are significantly underrepresented in STEM*
  - *Is engaged in service with historically underrepresented minority (URM) populations in higher education*
  - *Understands and tries to reduce barriers for women in science*
  - *Has demonstrated experience or potential for teaching and mentoring undergraduate Hispanics/ Latinxs, African Americans, or other students from historically underrepresented groups*
  - *Extends knowledge of how to achieve scholarly success despite challenges as a Hispanic/Latinx, African American or other URM*
  - *Is an effective cross-cultural communicator or shows potential for cross-cultural collaboration*
  - *Has research interests that contribute to STEM pipeline diversity and equal opportunity in higher education*
  - *Is a President's Postdoctoral Fellowship Recipient*

# CAMPOS Faculty Scholars are a Diverse Group



**CAMPOS Faculty Scholars in STEM Academic Units**

21 CAMPOS Faculty Scholar Awards Made (2014-2017) during Award Period; 7 additional awards during the extension (2017-2019)

Award Period Demographics:

- **14 Latinas/Hispanic Women**
- 2 Latinas/Hispanic Men
- 2 African Diaspora Women
- 2 Caucasian Women
- 1 Native American Woman

In 2019-2020, the first cohort will “rotate off” of the salary incentive, freeing several award slots.

UC Davis is committed to program continuation for the foreseeable future at a steady-state of ~25 active awards (various fund sources) and expanding the effort across non-STEM units.

Administration is occurring via partnership of VPAA and ODEI (<https://diversity.ucdavis.edu/campos>).

# UC Davis CAMPOS Faculty Scholars Build Professional Networks, Collaborate & Communicate Their Science

Cafecitos – gathering campus constituents to discuss issues of diversity & inclusion!



# The CAMPOS Faculty Scholars say...

“I think [research collaboration] is greatly facilitated by the CAMPOS bringing us all together as faculty of color. There is no imposter syndrome, no fear of judgement, no trying to one-up each other. It creates a safe place for us to talk, think and create what’s next.

I initially underestimated the potential that CAMPOS has for catalyzing this type of **research collaboration**, but clearly it is there and the leadership and staff had that vision and it is coming to be realized. Thank you!”

- *Asst. Prof. Sam Diaz-Munoz on the experience of a CAMPOS Leadership Institute visit to the California State Capitol.*

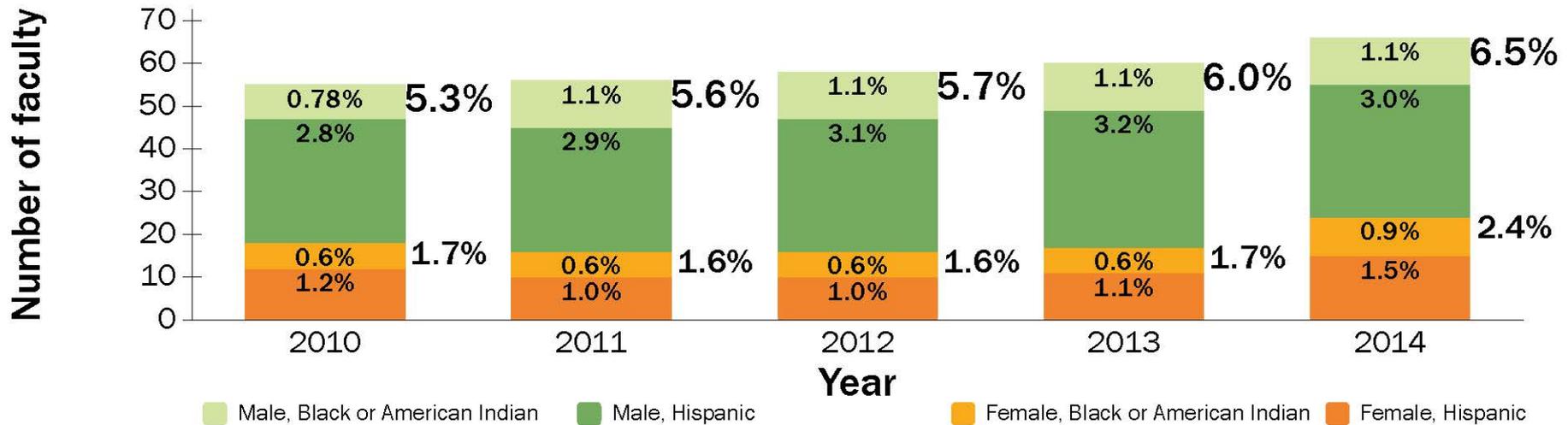
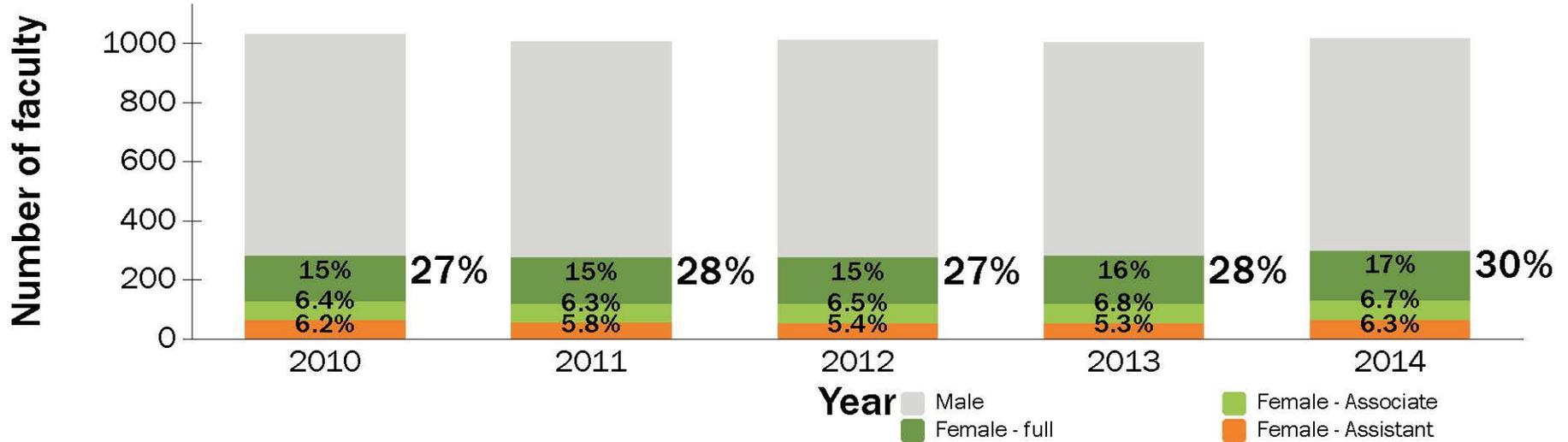


- “...the greatest impact that I believe CAMPOS has is with our K-12, undergraduate and graduate students. For them, **we represent an existence proof, an example of what is possible.**” - *Asst. Prof. Alexis Patterson (School of Education) at a CAMPOS Welcome event.*

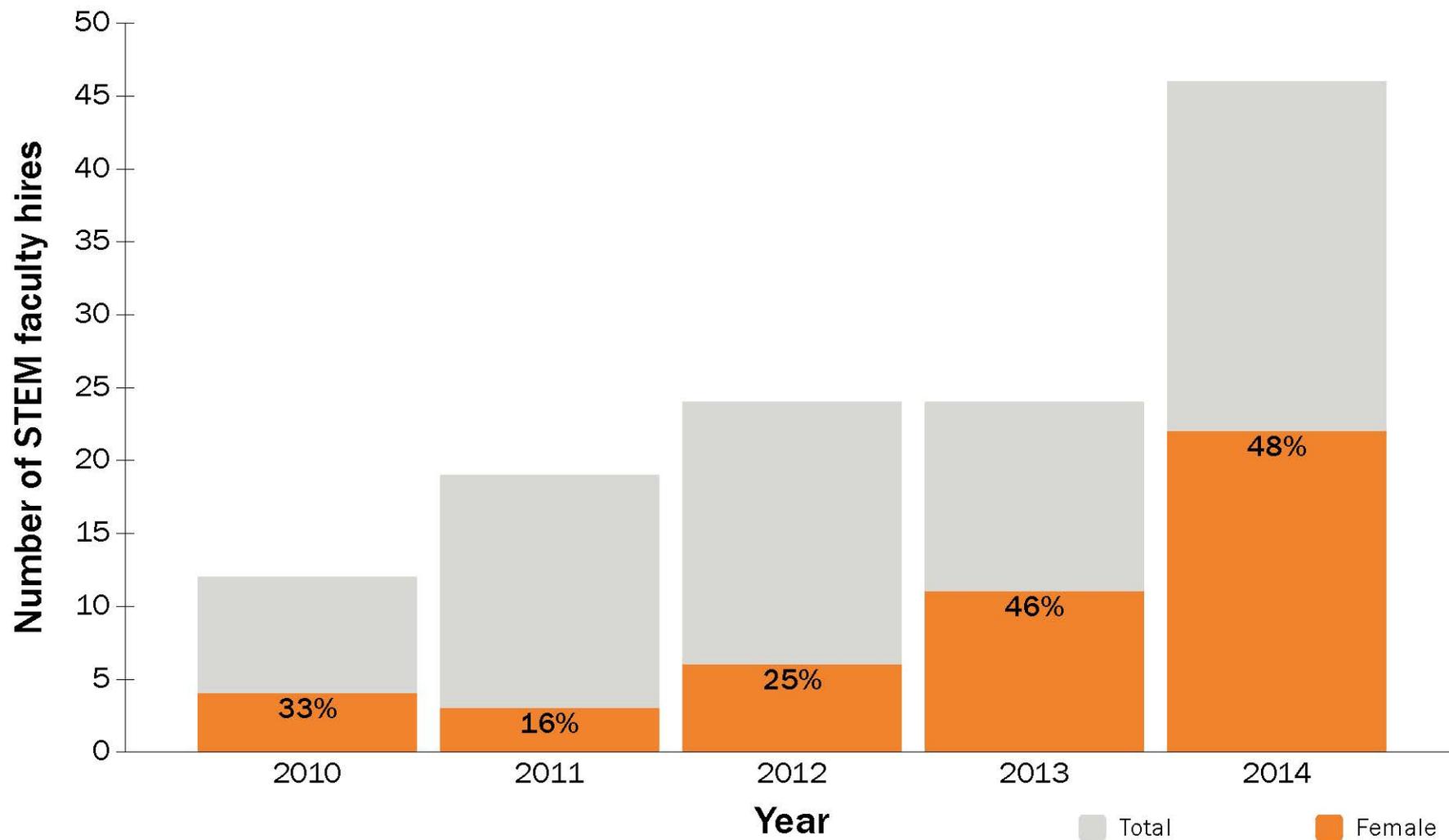


May 26, 2017 – Several CAMPOS and ADVANCE team members met with a group of 4-H students (ages ~9-20) from the Central Valley of California.

# STEM Faculty Diversity at UC Davis at the beginning of ADVANCE



## STEM Faculty Hiring at UC Davis trending at ~50% Women



# UC Davis Receives Bronze SEA Change Award

## New AAAS Program Recognizes UC Davis for Advancing Diversity

By Julia Ann Easley on February 13, 2019 In University



*A professor and students look at experiment results during a biodesign class. (Gregory Urquilaga/UC Davis)*

# Members of the ADVANCE team have also helped with/advised on:

---

- Developing and implementing implicit bias training for faculty serving on search committees
- Adding a diversity statement requirement to new faculty job applications
- Structuring the new Office of Diversity, Equity and Inclusion and recruiting the new Vice Chancellor, Prof. Renatta Hull and Associate VC, Prof. Raquel Aldana
- UC Davis receiving the Hispanic Serving Institution (HSI) designation
- Many other internal and external STEM inclusion projects and grant proposals...

