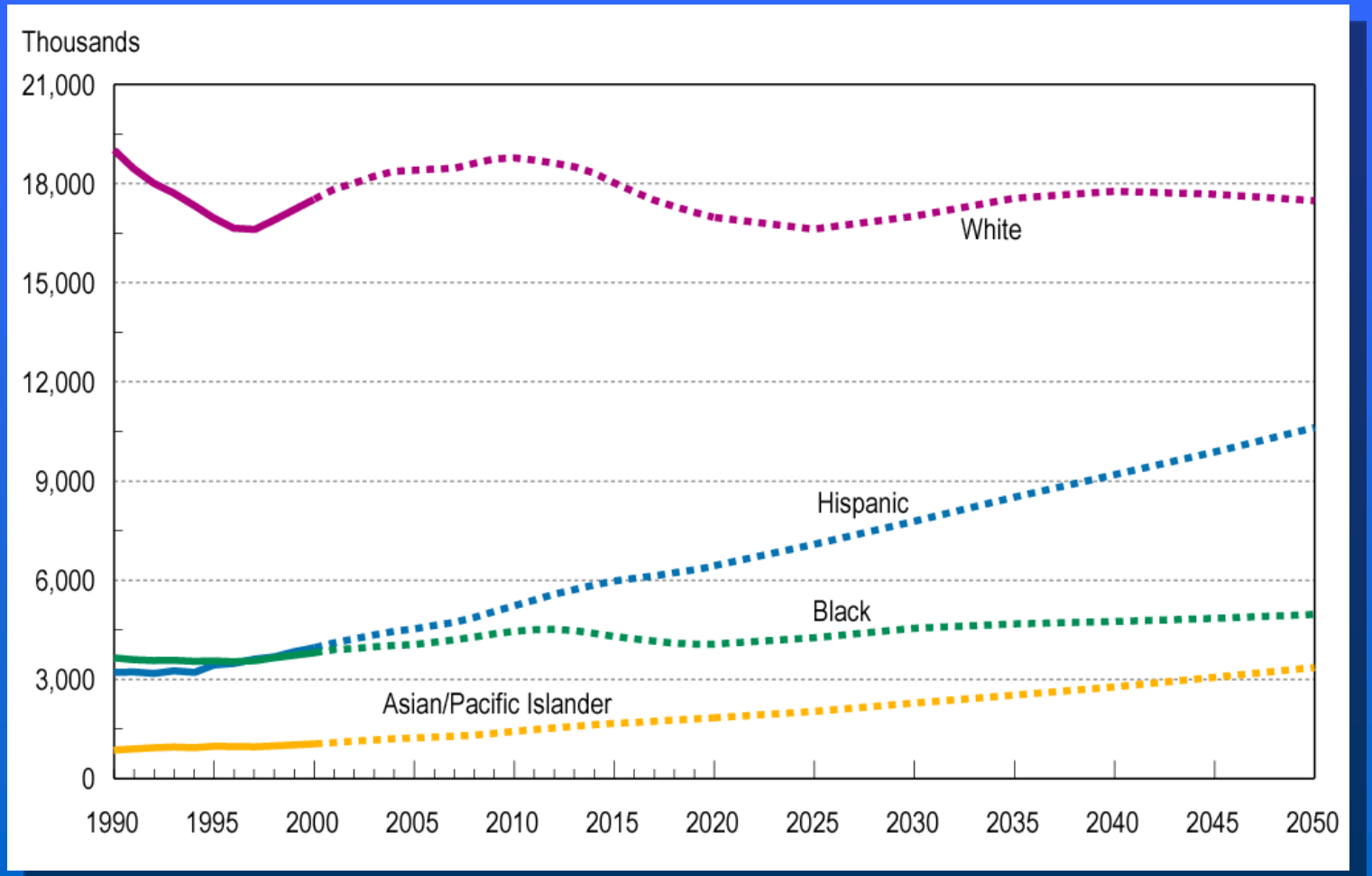
Diversity in Science and Engineering Careers

- Statistics/State of the Profession
- Creating and Finding a Supportive and Collegial Environment
- Finding a Mentor and Being a Mentor

What is the pool of students like?

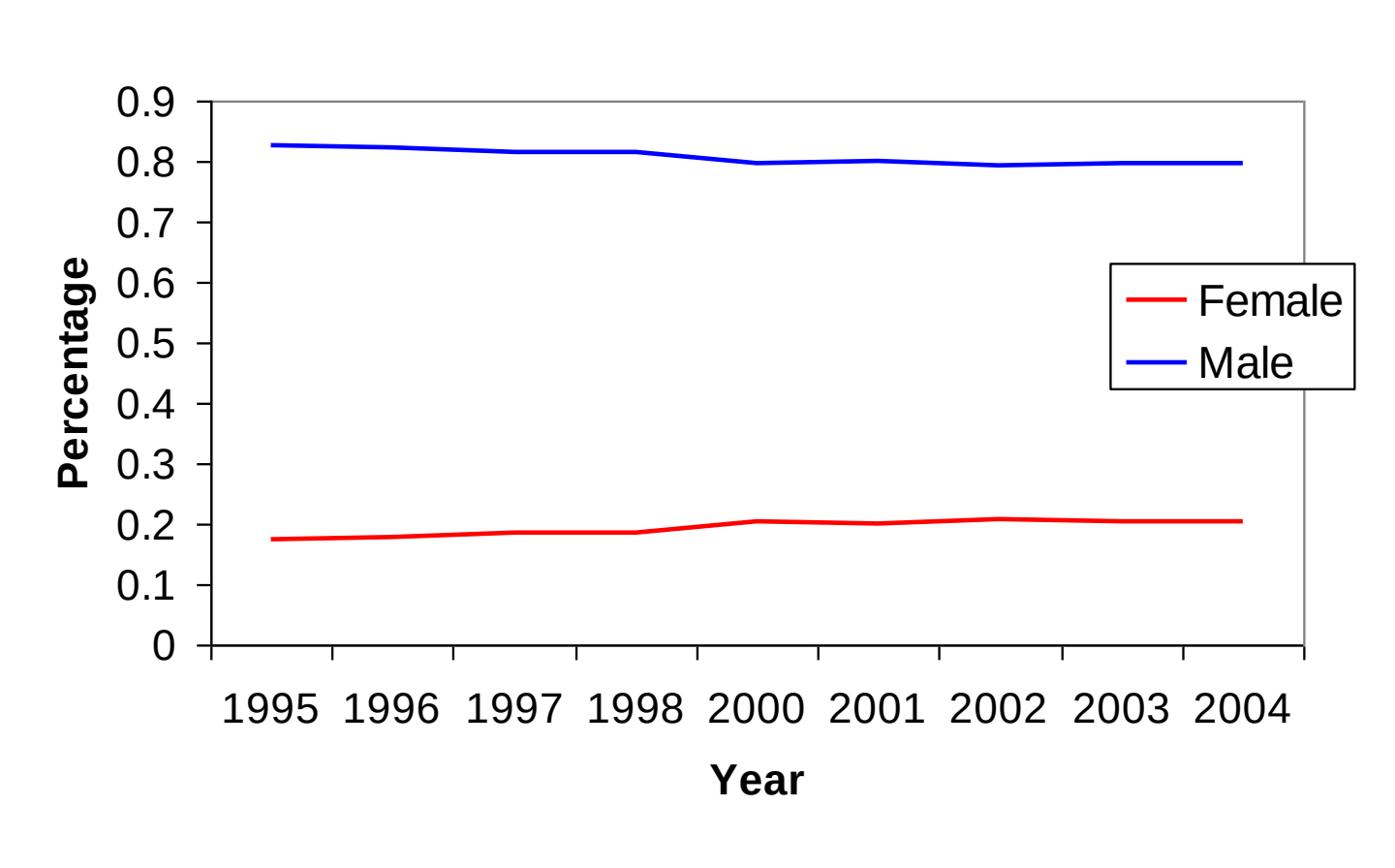
U.S. population 18–24 years old, by race/ethnicity: July 1990–99 and projections to 2050



SOURCE: *Women, Minorities and Persons With Disabilities in Science and Engineering-2004*

Who is getting the degrees?

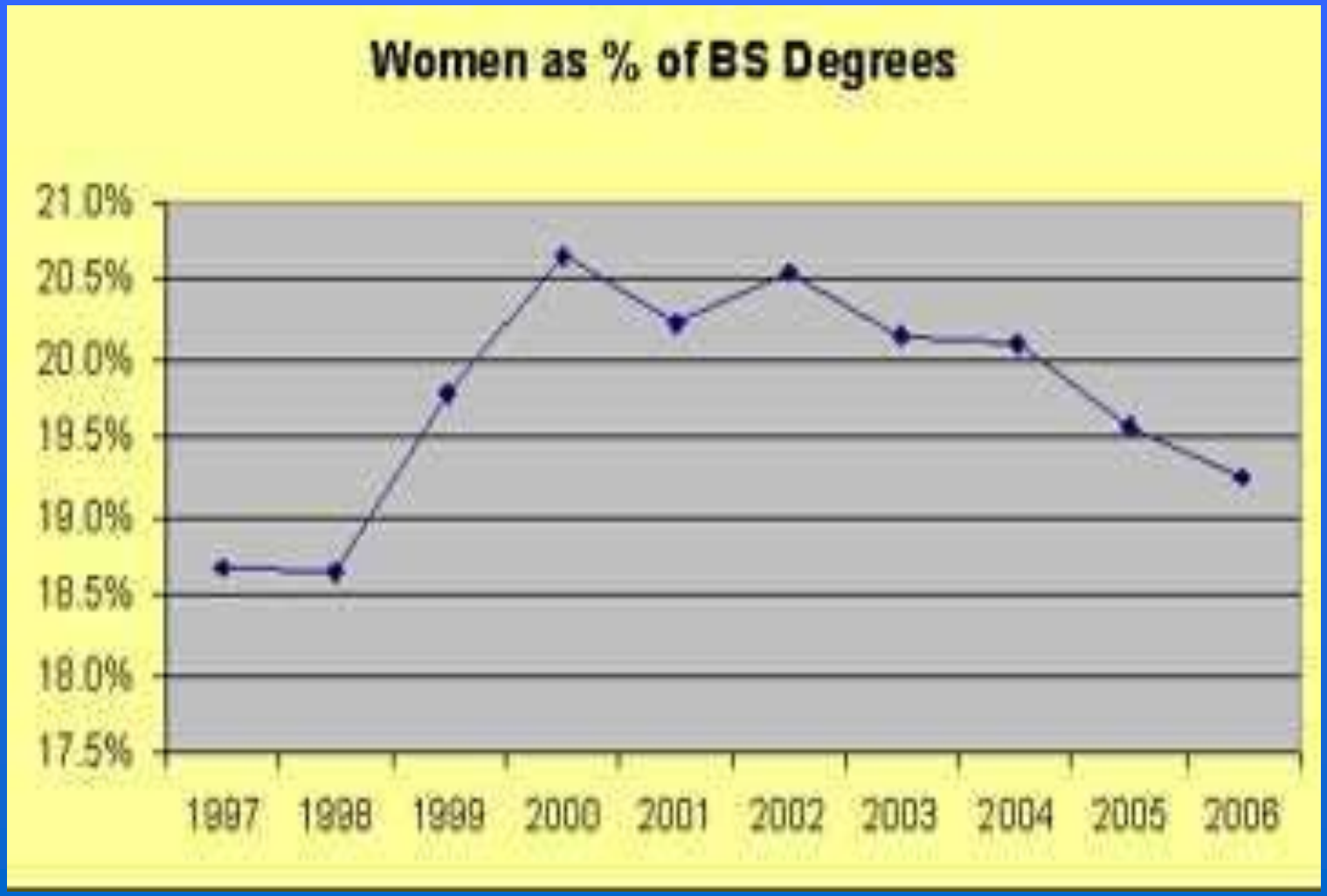
Percentage of BS engineering degrees awarded, by gender: 1995–2004



Latest data for BS Chemical Engineering degrees slightly higher (36% women)

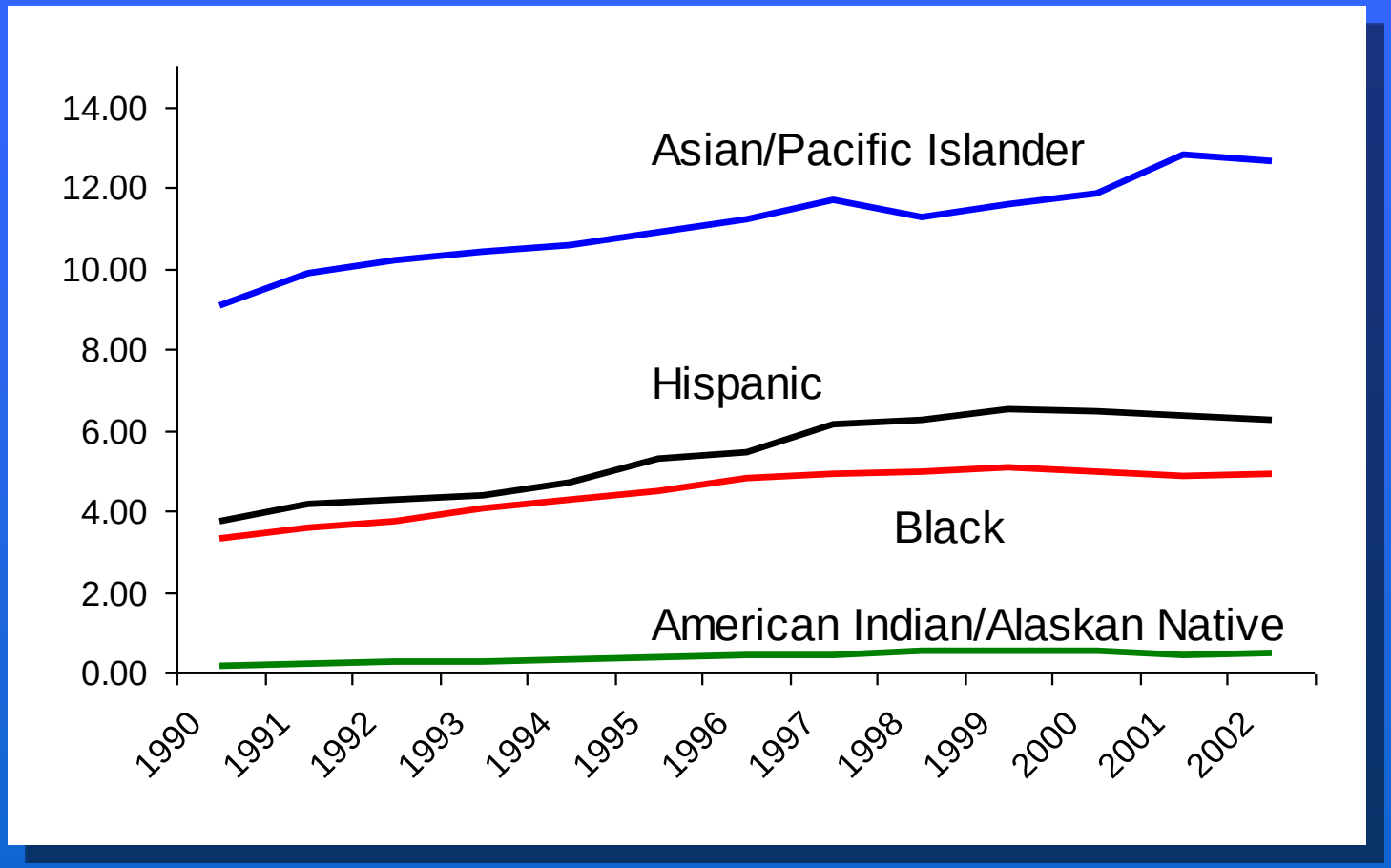
SOURCE: National Science Foundation, Division of Science Resources Statistics, special tabulations of U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey, 1995–2004.

More Recent Trends:
Gender of BS Engineering Degree Recipients



SOURCE: Engineering & Technology Degrees, 2006 survey undertaken by the Engineering Workforce Commission

Percentage of BS engineering degrees awarded, by race/ethnicity: 1990–2002

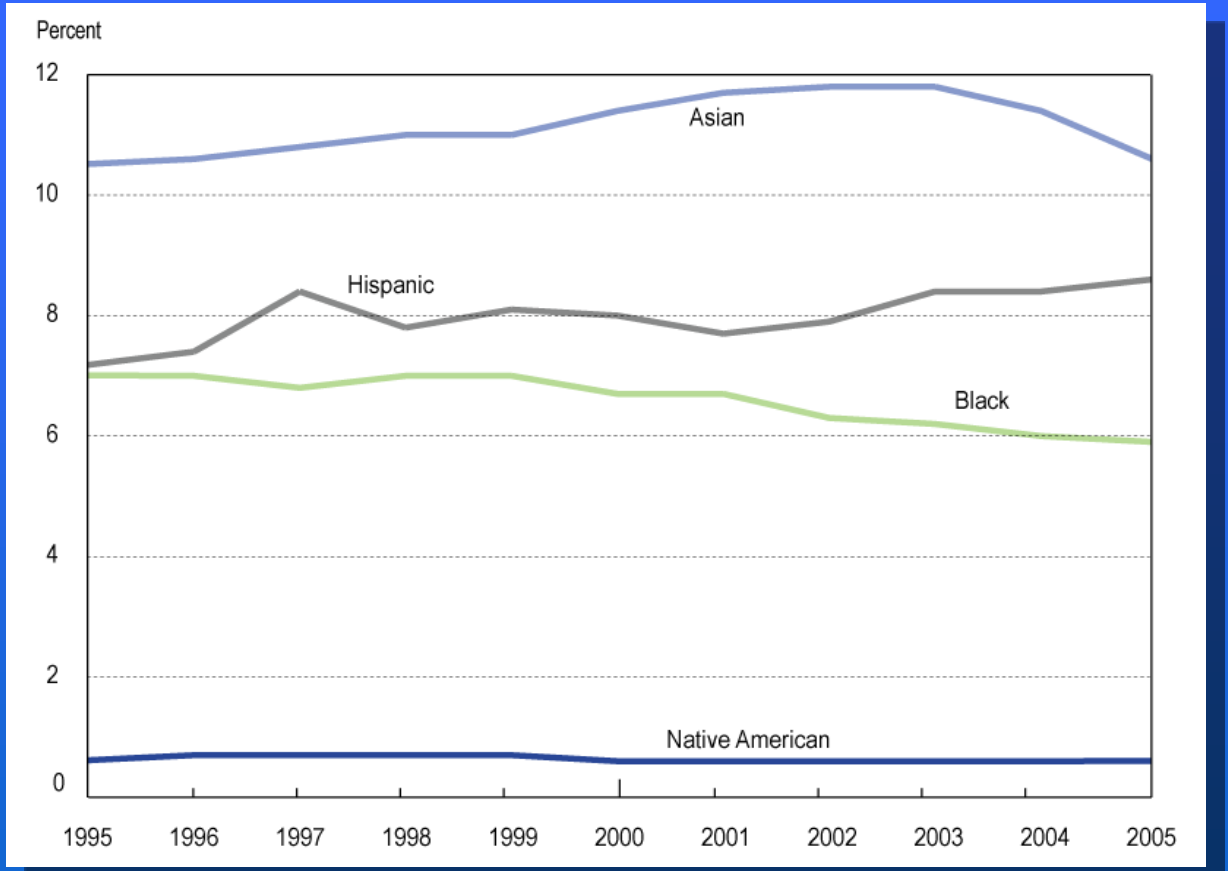


African-Americans constitute 12% of the U.S. population but only 5% of BS engineers

Hispanics constitute 10% of the U.S. population and 6.5% of BS engineers

SOURCE: *Women, Minorities and Persons With Disabilities in Science and Engineering-2004*

More Recent Trends: Undergraduate engineering students, by race/ethnicity: 1995–2005

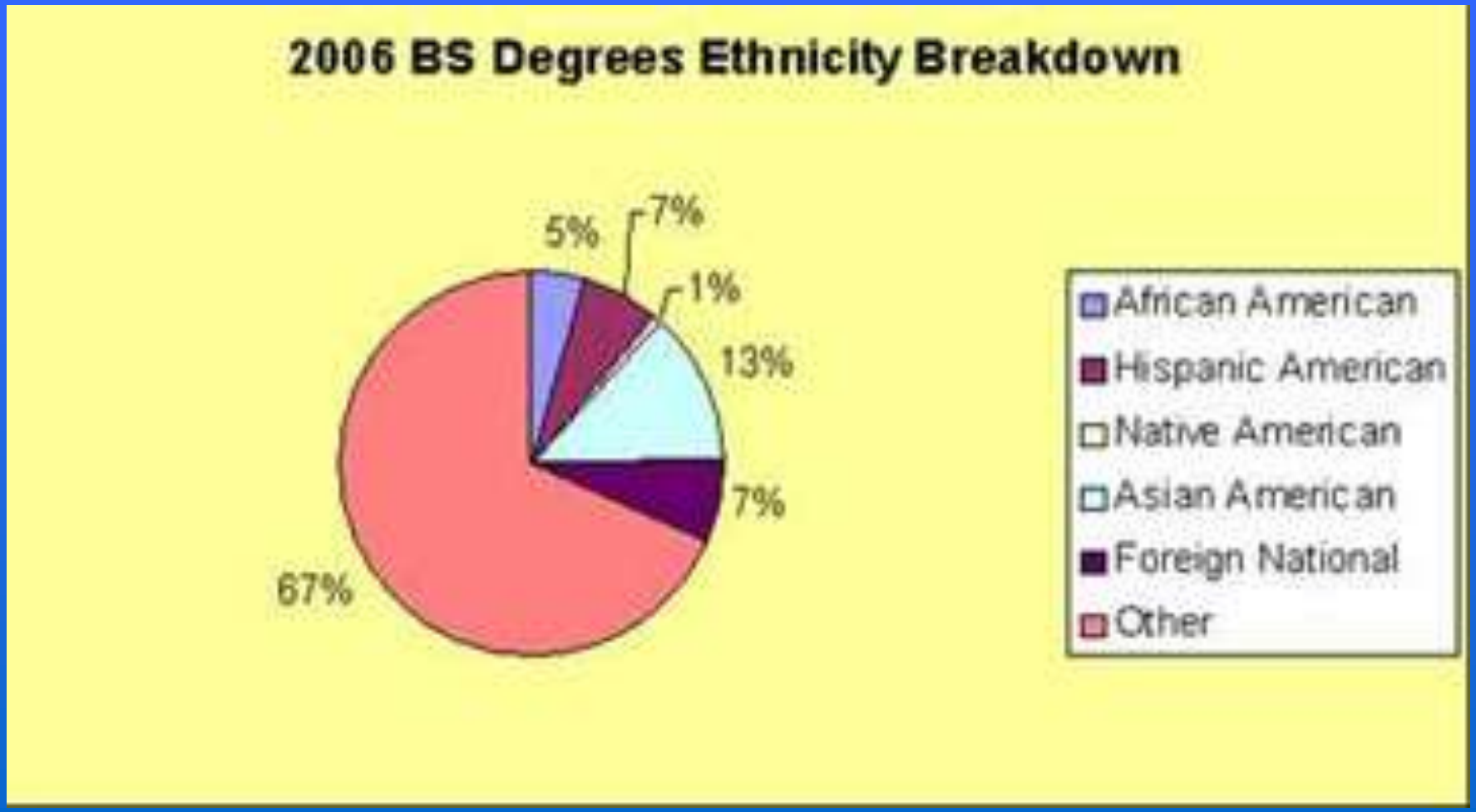


Decreases in enrollment from Asian and African-American students

Some increase in Hispanic students

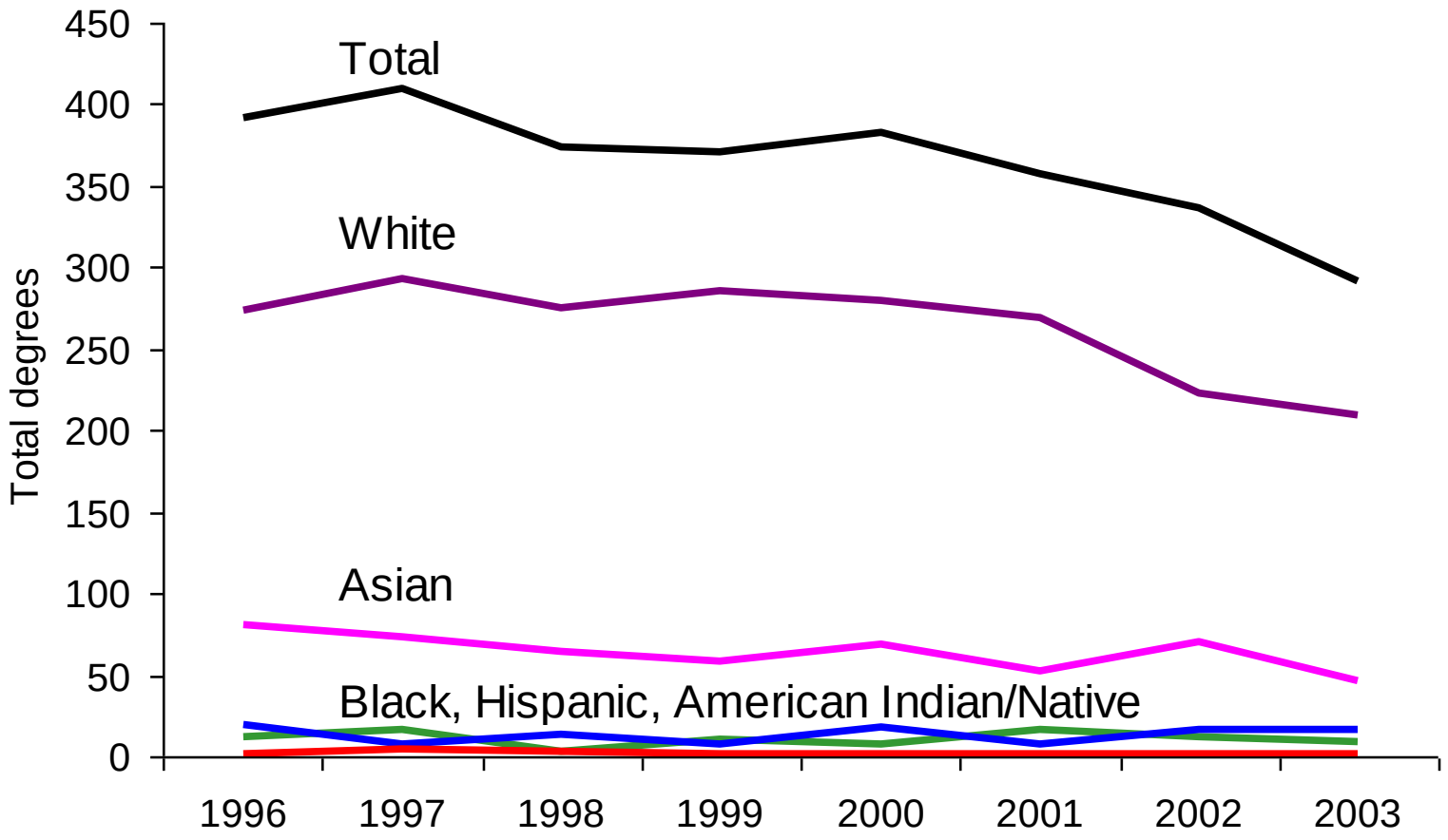
SOURCE: *Women, Minorities and Persons With Disabilities in Science and Engineering-2006*

More Recent Trends:
Race/Ethnicity of 2006 BS Degree Recipients



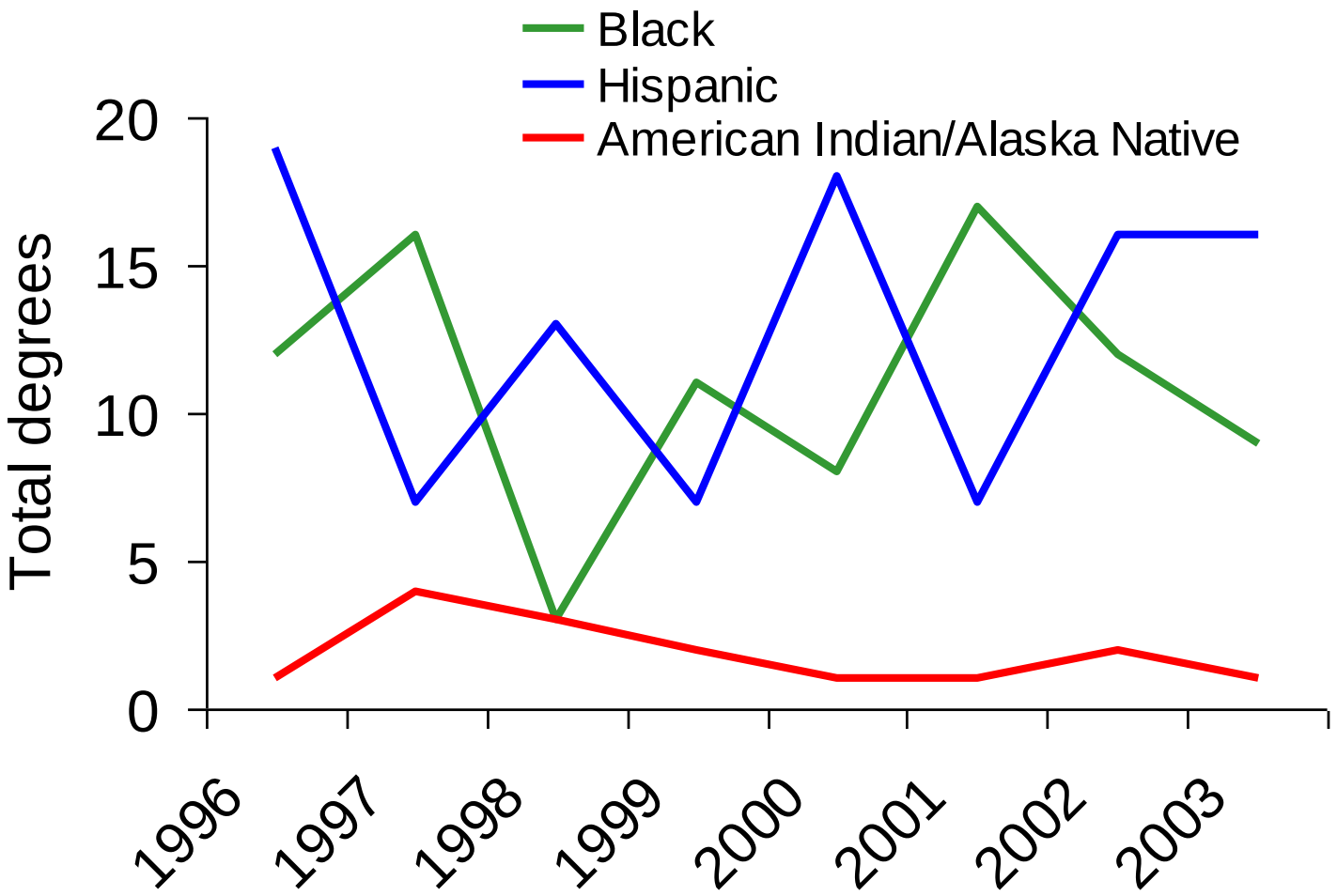
SOURCE: Engineering & Technology Degrees, 2006 survey undertaken by the Engineering Workforce Commission

PhD Chemical Engineering degrees awarded, by race/ethnicity: 1990–2003



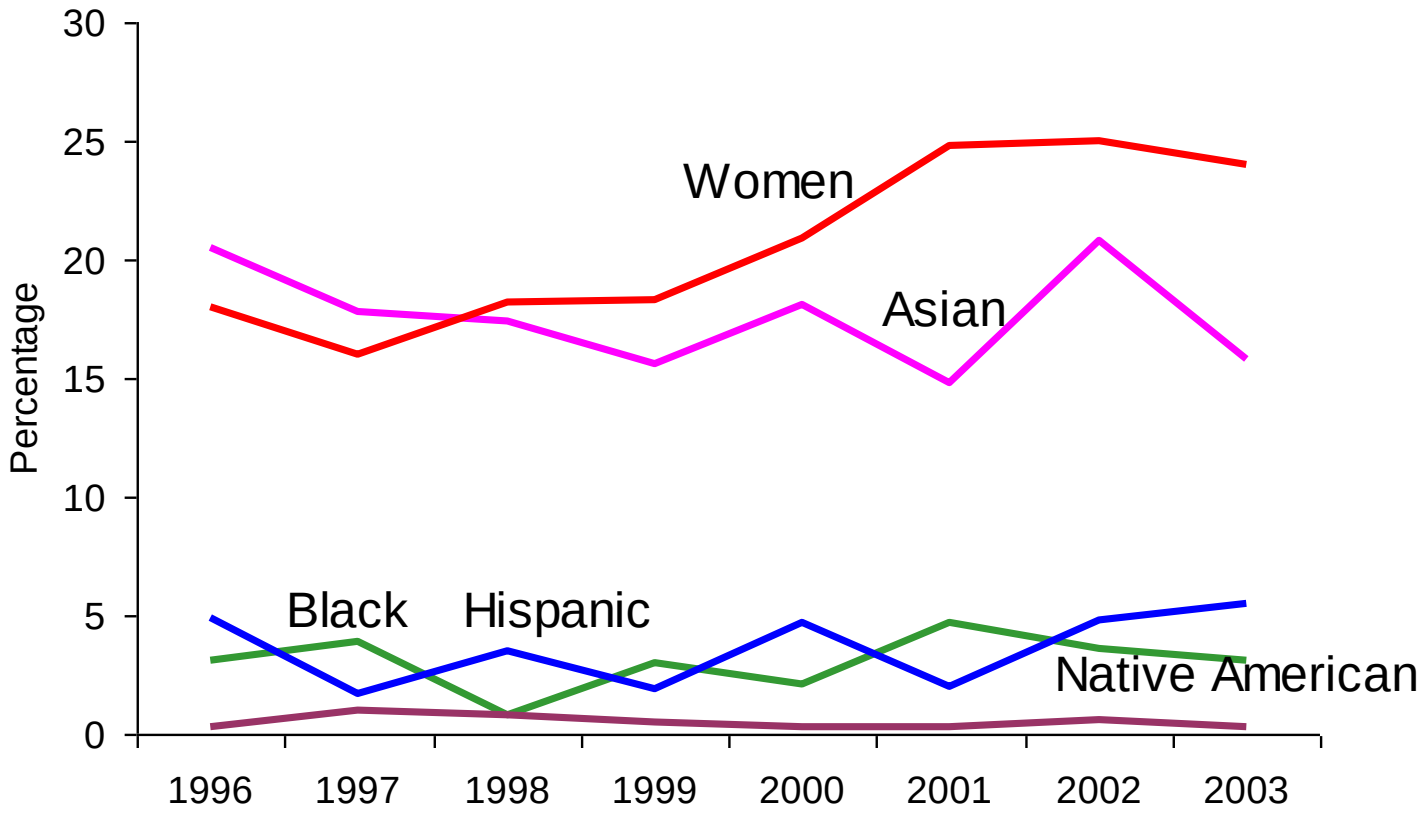
SOURCE: *Women, Minorities and Persons With Disabilities in Science and Engineering-2004*

PhD Chemical Engineering degrees awarded, by race/ethnicity: 1990–2003



SOURCE: *Women, Minorities and Persons With Disabilities in Science and Engineering-2004*

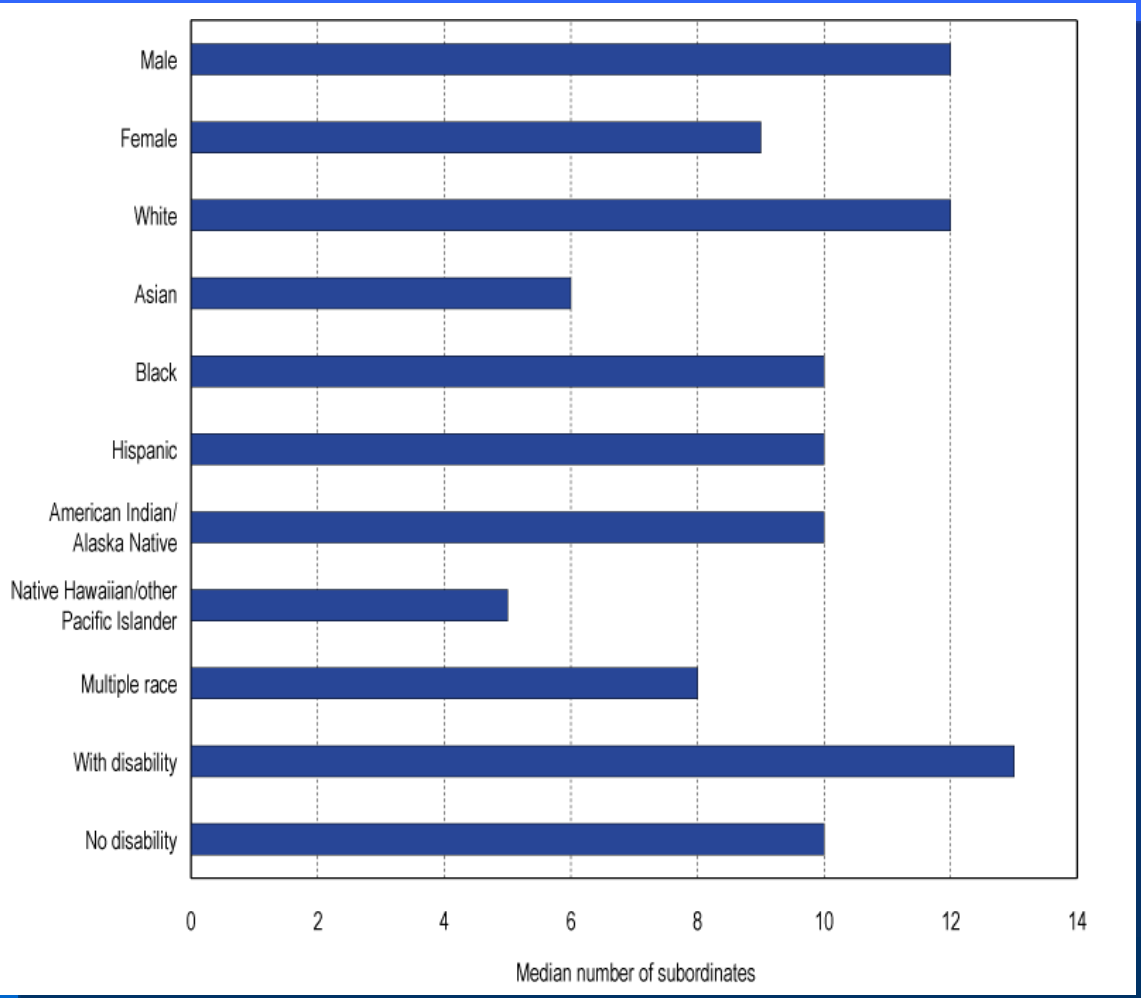
Percentage of PhD Chemical Engineering degrees awarded, by gender and race/ethnicity, 1990-2003



SOURCE: *Women, Minorities and Persons With Disabilities in Science and Engineering-2004*

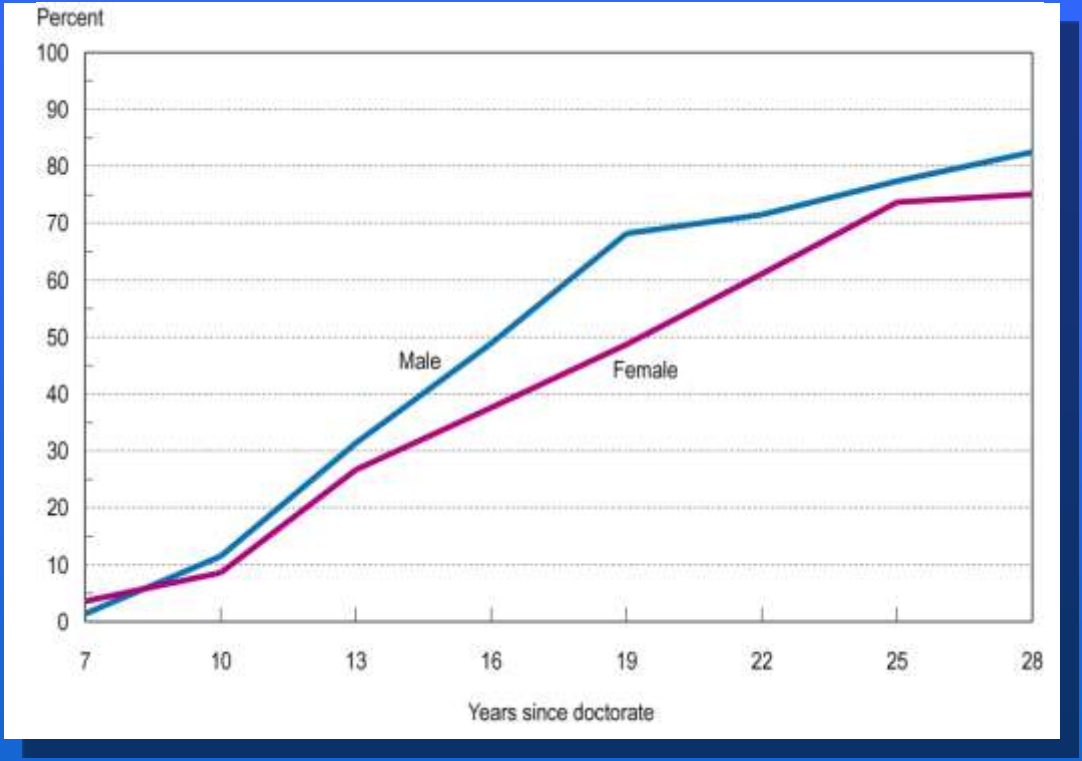
What Happens After the Degree?

Median number of subordinates of scientists and engineers employed in business or industry, by sex, race/ethnicity, and disability status: 2003



SOURCE: *Women, Minorities and Persons With Disabilities in Science and Engineering-2006*

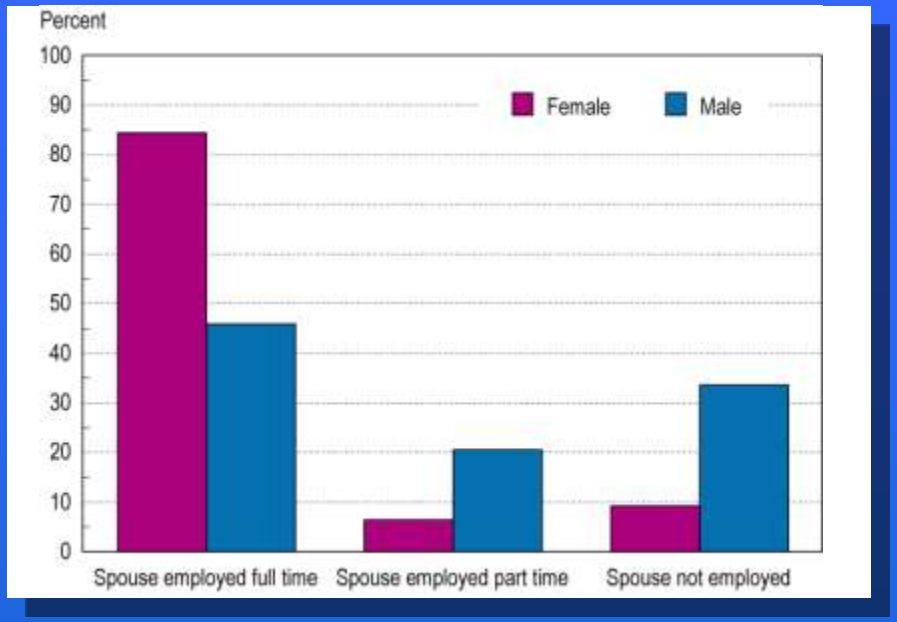
Full professors as a percentage of full-time ranked S&E doctorate holders in 4-year colleges and universities, by sex and years since doctorate: 2001



- Females are less likely than males to be full professors and more likely to be assistant professors.
- Few differences in rank exist between males and females in their early careers and greater differences exist between 15 and 20 years after receipt of the doctorate.

SOURCE: *Women, Minorities and Persons With Disabilities in Science and Engineering-2004*

Employment status of spouses of employed S&E doctorate holders, by gender: 2001



Employed female S&E workers are more likely than their male counterparts to face the challenges of a dual-career household.

- Female S&E doctorate holders are almost twice as likely as males to have spouses employed full time: 80 percent of the married females and 46 percent of the married males had spouses employed full time in 2003.
  - Numbers higher for some minority groups (87% for Asian women, 82% for black women
- Only 13 percent of the married females but 38 percent of the married males had spouses who were not employed.

SOURCE: *Women, Minorities and Persons With Disabilities in Science and Engineering-2004*

What can be done?

- Creating a supportive and collegial work environment
- Finding a supportive and collegial work environment
- Identifying mentors and role models
- Understanding differences in communication and negotiation styles

Creating a Supportive Environment
(beyond the obvious)

- Understand that each individual faces unique challenges
  - Avoid comments referring to why particular individuals received admission, an offer, a promotion, etc. Work and school are not the place to voice these opinions.
  - Be understanding about the personal challenges that your colleagues are facing, even when they are not voiced.
- Respect the talents and experiences of each individual
- Be willing to serve as a mentor and reach out to new colleagues
- Realize that you may need to adapt YOUR interactions with colleagues or management style to account for differences in communication and negotiation styles

Finding a Supportive Environment

- Research environment before interviewing
  - List of “Top 50” companies from Woman Engineer and Minority Engineer magazines
    - http://www.eop.com/wetop50.html
    - http://www.eop.com/metop50.html
- Be alert to the environment on your visit/interview and trust your instincts
  - Are there women and minority with decision-making power (senior faculty, team leaders, managers)?
  - Are current employees/students happy?
  - Are institutional policies implemented in a fair way?
  - Is there a support network of female or minority employees/students?
  - Do younger employees/students receive mentoring and guidance?

Finding a Supportive Environment

- Find out about policies that are important to you:
  - Formal or informal mentoring programs
  - Opportunities for professional development
  - Parental leave
  - Flex-time
  - Dual-career policies
  - Can sometimes find this information from HR or on the web
  - If not, may want to wait until **after you have an offer** to discuss

Importance of Mentoring

- Studies show that finding a mentor crucial to the success of female and minority engineers (but it's a good idea for everyone!!)
- Mentors can be formal or informal
- Formal mentoring programs
  - Assigned a mentor when you start
  - Regularly-scheduled meetings and activities with mentor
  - Advantage: No new employees/students are left on their own
  - Disadvantage: You may not have any chemistry with your mentor!
    - "Logical" pairings according to technical area, gender, or ethnicity may not work out
    - Differences in personal style can exist

Informal Mentoring

- Advantage
  - More likely to find mentors with whom you have a personal connection
  - Mentoring relationship is more likely to be successful
- Disadvantage
  - Puts most of the burden of identifying a mentor on the new employee
- Even if you are assigned a formal mentor, good idea to identify informal mentors

Finding a Mentor

- ASK FOR HELP when you need it
- Don't just sit alone in your office – network with colleagues and identify those whom you admire and trust
- Seek out colleagues who have had similar life experiences as you (only if you want to)
  - Do not have to select mentors that are the same gender/ethnicity as you!
- Identify more than one mentor for guidance in different areas
- Keep in mind that mentors within your organization are still colleagues – keep discussions and interactions professional
- Identify mentors outside of your group or company with which to discuss sensitive issues
  - Former professors
  - Former classmates and alumni
  - Individuals from professional conferences and workshops
  - "Electronic" mentoring programs (e.g., Mentornet, www.mentornet.org)
  - Web discussions and workshops at conferences on work-life balance, negotiation, etc.

Being a Mentor

- ***Why be a good mentor?***
  - "It doesn't 'count' for anything"
  - "Service doesn't matter"
  - "A big time sink"

- **Be a good mentor to:**

- **Share knowledge and experience**

- **Achieve satisfaction.** For some mentors, having a mentee succeed and eventually become a friend and colleague is their greatest joy.

- **Attract good people.** The best mentors are most likely to be able to recruit—and keep—students and coworkers of high caliber who can help produce better products, research, papers, and grant proposals.

- **Stay on top of your field.** There is no better way to keep sharp professionally than to coach junior colleagues.

- **Develop your professional network.** In making contacts for your mentees, you strengthen your own contacts and make new ones.

- **Extend your contribution.** The results of good mentoring live after you, as former mentees continue to contribute even after you have retired.

Adapted from "Entering Mentoring" Handbook, http://bcrc.bio.umass.edu/hhmi/node/17

Tips for Being a Mentor

- **Listen patiently.** Give the mentee time to get to issues they find sensitive or embarrassing.
- **Build a relationship.** Simple joint activities—walks, informal conversations over coffee, attending a lecture together—will help to develop rapport. **Take cues from the mentee as to how close they wish this relationship to be**. (Consider sexual harassment and cultural issues carefully).
- **Don't abuse your authority.** Don't ask mentees to do personal work, such as mowing lawn, baby-sitting, and typing.
- **Nurture self-sufficiency.** Your goal is not to "clone" yourself but to encourage confidence and independent thinking.
- **Establish "protected time" together.** Try to minimize interruptions by telephone calls or visitors.

Adapted from "Entering Mentoring" Handbook, http://bcrc.bio.umass.edu/hhmi/node/17

More Tips for Being a Mentor

- **Share yourself.** Invite mentees to see what you do. Tell of your own successes and failures. Let the mentee see your human side and encourage the mentee to reciprocate.
- **Provide introductions.** Help the mentee develop a professional network and build a community of mentors.
- **Share important information**. Be sure to let your mentor know about lab safety, group protocols, etc.
- **Be constructive.** Critical feedback is essential to spur improvement, but do it kindly and temper criticism with praise when deserved.
- **Don't be overbearing.** Avoid dictating choices or controlling a mentee's behavior.
- **Find your own mentors for advice on mentoring.** New advisers, like new students, benefit from guidance by those with more experience.

Adapted from "Entering Mentoring" Handbook, http://bcrc.bio.umass.edu/hhmi/node/17

Mentoring a Student Researcher: Establishing a Relationship

- Goals:
  - Get to know one another.
  - Begin to define your working relationship and establish expectations.
  - Define the goals of your summer research project.
- Students (Mentees):
  - Who are you? Where is your home? How/when did you become interested in a career in science?
  - What is your major and what are your future career plans?
  - Why do you want to do research and how will it help you reach your career goals?
  - What would success in this research program look like to you?
  - Do you have any previous research experience? If so, what did you do? What did you like about it? What did you dislike about it?
  - How do you learn best (e.g., hands-on experience, reading literature about a topic, verbal explanations, process diagrams, etc.)? What is the most useful kind of assistance your mentor can provide?
  - Do you prefer to work alone or in groups? What kind of group or collaborative work experience have you had?
  - Do you have any questions about the background reading your mentor sent you before the start of the program?

Adapted from “Entering Mentoring” Handbook, http://bcrc.bio.umass.edu/hhmi/node/17

Mentoring a Student Researcher: Establishing a Relationship

- Mentors:
  - Who are you? How did you become a scientist?
  - Why have you chosen to be an undergraduate research mentor?
  - What do you hope to gain from this experience?
  - What would success in this research program look like to you? What skills (technical, communication) should your mentee develop?
  - Who are the people who work in your lab? What are their responsibilities and how should your mentee expect to interact with each of them? What are the proper channels of communication?
  - How many hours per week do you expect your mentee to work in the lab? Are there specific times of day that you expect your student to be in the lab?
  - What is your teaching style? How do you prefer to help students learn to conduct research? Is there a process that you normally follow?

Adapted from “Entering Mentoring” Handbook, http://bcrc.bio.umass.edu/hhmi/node/17

Mentoring a Student Researcher: Defining a Path

- Goals:
  - Reaffirm expectations between mentor and student.
  - Clearly define the research project and a timeline for completion of specific experiments.
- Students (Mentees):
  - What do you like best about working in your lab so far?
  - What do you find most challenging about working in your lab? How can your mentor help you deal with this?
  - What have you learned about working in a lab that you did not expect before arriving on campus?
  - Are you comfortable working with the other members of your laboratory? If not, how can your mentor facilitate these interactions?
  - What aspects of the research project are still unclear to you?
  - What aspects are the most exciting and interesting?
  - Which of the research techniques that you will learn, or have learned, do you find most challenging? How can your mentor facilitate your learning this technique?
  - How much time do you expect it will take to complete your research project?
  - Would you like to be able to spend more time with your mentor? Do you feel you are ready to work more independently?

Adapted from “Entering Mentoring” Handbook, http://bcrc.bio.umass.edu/hhmi/node/17

Mentoring a Student Researcher: Defining a Path

- Mentors:
  - What do you see as your mentee's greatest strength(s) in the laboratory so far?
  - What area(s) do you think your mentee should focus on developing? How do you suggest they do this, and how can you facilitate this process?
  - How much time do you expect it will take to complete your mentee's research project?
  - What have you learned about working with your mentee that you did not expect to learn?

Adapted from "Entering Mentoring" Handbook, http://bcrc.bio.umass.edu/hhmi/node/17