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# An Innovative Program to Further the Careers of Women as Leaders in Engineering

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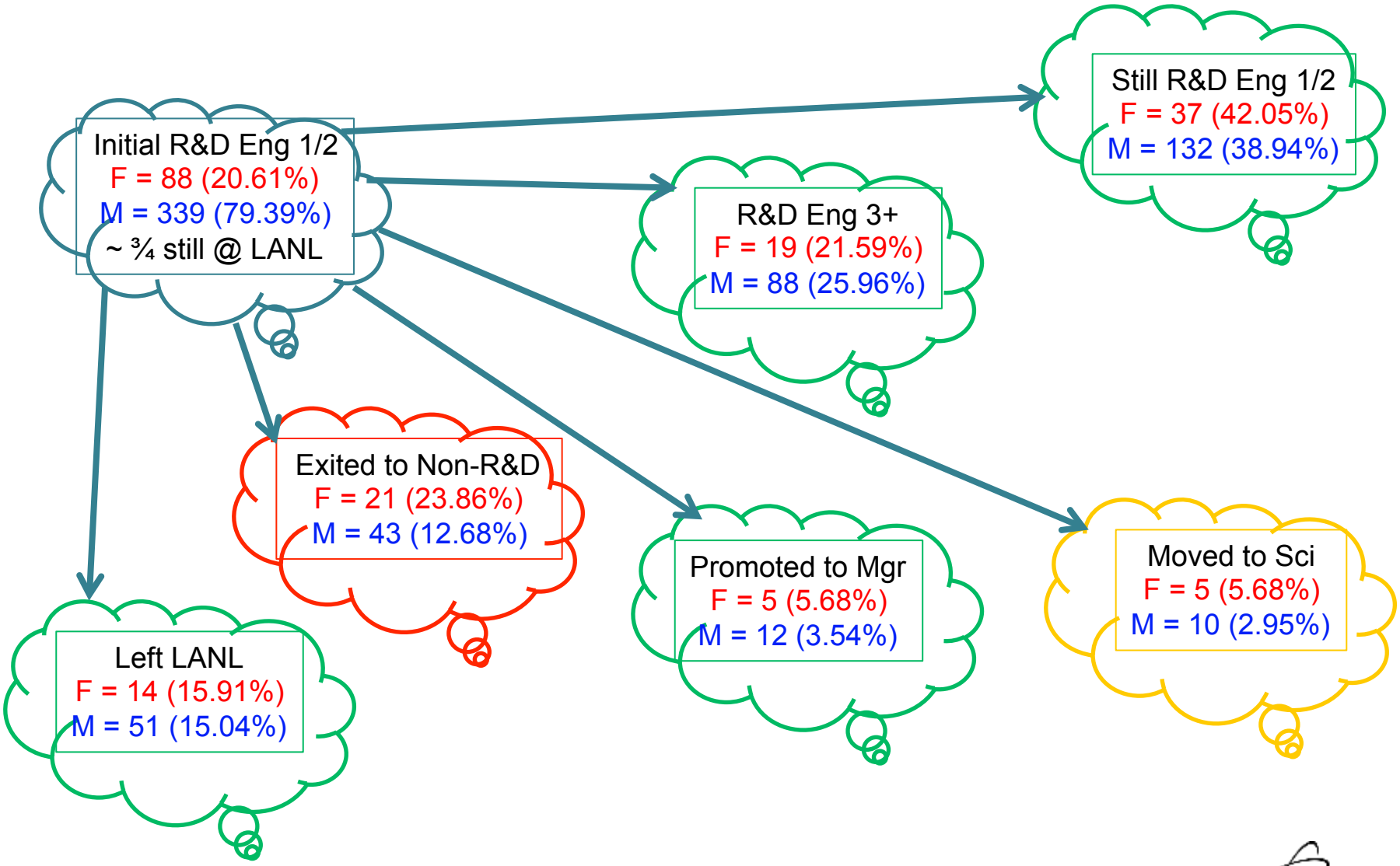
# Los Alamos National Laboratory (LANL) has experienced underutilization of mid-career female R&D Engineers over many years.

- **Required to implement an Affirmative Action Plan (AAP)**
- **Central premise: workforce should reflect the gender, racial, and ethnic profiles of the labor pools from which employees are recruited and selected**
- ***Underutilization* exists when the representation of female and minority incumbents in a particular job group is less than 80% of availability**
  - 12.3% females employed as mid-career R&D Engineers at LANL vs 18.5% availability; nine additional needed to meet availability

**The Future Female Leaders in Engineering (FFLIE) program is a pipeline strategy that addresses this problem.**

# A “leaky pipeline” leads to this underutilization problem.



# LANL is not alone in experiencing the “leaky pipeline” phenomenon.

- **Silbey (2016): Women leave the engineering profession at higher rates than men**
  - Women are 20% of engineering graduates
  - Nearly 40% of women who earn engineering degrees either quit or never enter the profession
  - In 2013, women made up only 12% of the US engineering workforce (Corbett and Hill, 2015)
- **In a survey of 5500 women with engineering degrees, Fouad, Singh, Fitzpatrick, and Liu (2012) found that while more than half of the respondents were working as engineers, another quarter had once worked as engineers but left the fields and the rest had never entered the engineering workforce**

# Work environment factors appear to be the main contributor to the “leaky pipeline” problem.

- **Fouad et. al. (2012) found two workplace variables that correlated strongly with lowered job satisfaction**
  - Excessive and ill-defined work goals
  - Incivility at work
- **Silbey (2016) describes gender stereotyping and stereotype-based work assignments, blatant sexual harassment, and lack of supportive social networks as key environment-related factors that contribute to lack of retention**
- **Dasgupta (2016) points to the importance of a feeling of “belonging” in retention of women in STEM**

# There are two main perspectives on interventions to attract and retain women in engineering.

- **“ Fix the women” to enable them to navigate the work environment**
  - “Soft skills” development
- **“Fix the culture” of the organization so that the workplace is comfortable for everyone**
  - Structural and policy changes that create equal opportunity
  - Diversity and inclusion initiatives to promote tolerance and understanding of differences

# Corbett and Hill (2015) provide several recommendations to employers interested in "solving the equation" of representation of women in engineering.

- **Maintain management practices that are fair, consistent, and support a healthy work environment**
- **Promote diversity and affirmative action programs**
- **Protect against gender bias**
- **Encourage a sense of belonging**
  - Dasgupta (2016) recommends exposure to technical female role models, peer mentoring, and gender balancing work teams
- **Provide opportunities to work on socially relevant projects**

**Corbett and Hill (2015) avoid the "fix the women" vs "fix the culture" debate and take a more inclusive view.**

# LANL has also adopted a “do both” approach

- **Many systemic structural initiatives**
  - Full-time diversity staff coordinate senior-level diversity committees and provide diversity training
    - Ex., Monitoring for gender bias in vacancy postings
  - Anti-harassment policies
    - Prompt investigation of complaints
    - Progressive discipline applied where warranted
  - Flexible work schedules and paid parental leave
  - Affirmative action programs
    - Future Female Leaders in Engineering (FFLIE) is one such program

# FFLIE is a "Relationship Program" that builds loyalty and encourages female engineers to pursue a career at LANL.

**To be eligible for the program, candidates must be female undergraduate students majoring in any engineering discipline at a US university and must:**

- **Have completed 100 credit hours of course work prior to starting the FFLIE program**
- **Have at least a 3.5 GPA**
- **Have an interest in a career at LANL**
- **Be eligible to obtain a security clearance, which usually requires US citizenship**


**GPA requirement higher than the normal Undergraduate student program attracts the highest caliber students and assures graduate school acceptance.**

# The FFLIE program design leverages many of Corbett and Hill's (2015) recommendations.

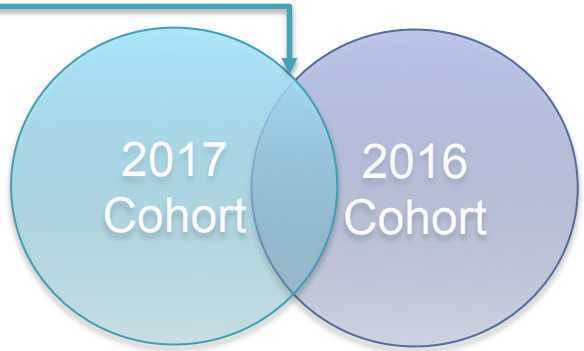
- **As an affirmative action program, FFLIE supports Corbett and Hill's (2015) recommendation regarding promoting diversity and affirmative action policies**
- **Three main program elements:**
  - Technical work assignment
    - Minimum of two eight-week summer internships in a LANL R&D organization
  - Professional enrichment activities during the summer internships
  - Graduate education through a MS
- **Intent is that graduates come back to LANL to start their careers as Female Engineering**

# Work assignments are crafted to challenge the student and help her develop and strengthen new technical skills.

- **LANL's broad mission space affords opportunities to match nearly any student's interests with an organizational need**
- **Each LANL student has a work plan that sets out clear responsibilities, goals, and success paths**
- **Technical hosts are encouraged to assign a female technical mentor, where possible, and to expose the student to as many female engineers as are available in their organization**

# Professional enrichment activities are delivered in a cohort format to help students develop their social network.

- **Professional enrichment activities are intended to develop skills that will enable participants to successfully apply their technical capabilities in the LANL work environment**
- **Professional development is delivered by four female professional development mentors, three of whom are engineers**
- **Program includes networking opportunities with female engineers from various professional backgrounds**
- **New this year: program includes near-peer mentoring and networking**



# Professional development activities focus on skills that enable successful application of students' technical capabilities in the LANL work environment.

- **First year enrichment activities revolve around the LANL R&D Engineering Primer**
  - Navigating the R&D Engineering Enterprise @ LANL
  - Mission Assurance Framework
    - Integrated application of systems engineering (SE), project management (PM), and engineering quality and rigor (QA)
    - Focus is on activities and artifacts more than theory
    - Includes hands-on practice on a demonstration project
  - Technical writing and presentation skills
- **Second year enrichment activities involve a Design Thinking project and ongoing honing of technical writing and presentation skills**

**Professional development activities "equip the women."**

# It's too early to declare success.

- **5 of 6 (83%) students in the first cohort were retained in the program; an additional 1 of 4 students who participated in the first year enrichment activities took the opportunity to formally join the program**
- **In the first year, 3 of 9 offers were declined; in the second year, 6 of 6 offers were accepted**
- **Numbers of qualified applicants increased from Year 1 to Year 2 (15 vs 18, 19.2% and 35.3%, respectively)**
  - Applicants disqualified due to gender drastically reduced in Year 2 (from 57.7% down to 2.0%)

## There are hopeful signs!

# Feedback from participants was generally positive.

- **Most participants (7 of 8 respondents, 87.5%) cited networking within the cohort and with female engineering professionals as the most valuable part of the program**
- **Survey responses (on a 5 point Likert scale) were generally favorable**
  - Program overall 4.67
  - Technical work assignment 4.33
  - Logistical factors 4.26
  - Quality of instructors 4.33
- **The summer enrichment component received lower marks 3.17**
  - Dissatisfied with the technical content of and the skill exercising opportunities afforded by the project used to illustrate SE and PM concepts

# Student feedback has been incorporated into the summer enrichment program.

- ✓ More tours
- ✓ More social activities
- ✓ More female engineers – lunch sessions
- ✓ More practice on technical writing and presentations
- ✓ More soft skills
- ✓ Remove redundancy, more technical explanation on slides, more technical aspects to project [relative to Primer]
- ✓ Less lecture, more videos
- x No conflicts with other student activity schedules

# Caution with a largely "equip the women" approach may be warranted.

- **The Center for Gender in Organizations (1998) states that these types of programs:**
  - Improve the situation for individual women
  - Are ineffective at the organizational level
    - Do not address systemic factors underlying gender difference in the organization

**But, can Palmer's (2016) vicious cycle be turned to virtuous ones?**

# Where to from here?

- **Continuous improvement of the professional development program**
- **Opportunities for ongoing engagement of graduate students and program graduates to maintain their own social networks and to give undergraduate students expanded opportunities to build networks**
- **Correlational study of work environment factors and retention in the LANL workforce**

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