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**ENGINEERING**  
TEXAS A&M UNIVERSITY

# Changing the Conversation

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Assistant Agency Director for Workforce Development, TEES

Assistant Dean for Academic Affairs

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# Changing the Conversation: Messages for Improving Public Understanding of Engineering

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Assistant Vice Chancellor for Academic Affairs

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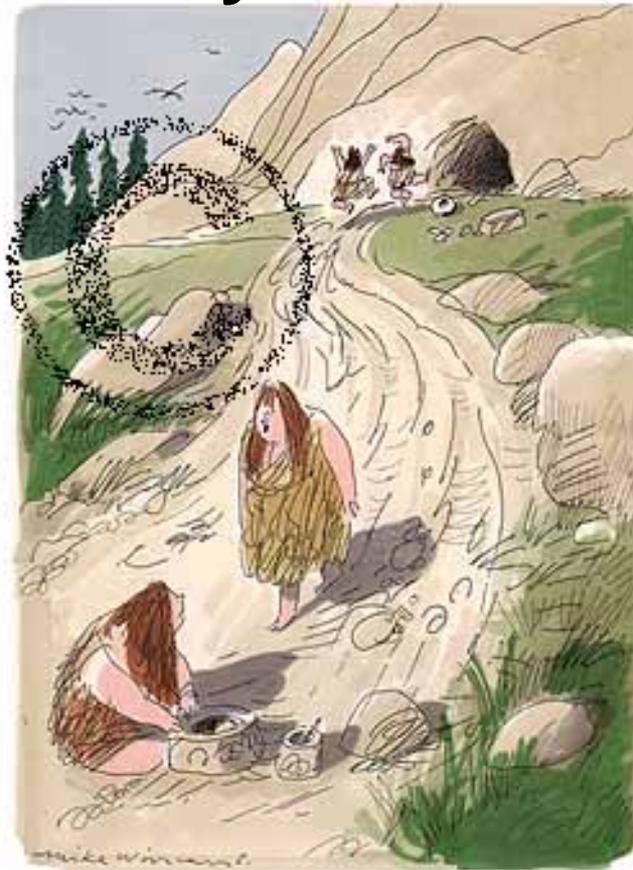
Assistant Dean for Academic Affairs

Associate Professor of the Department of Petroleum Engineering, Dwight Look College of Engineering Texas  
A&M University

# The earth is 4.5 billion years old



# Engineering can be traced back 2.5 million years



"...it's a wheeble or some such thing  
but still no sign of a deoderant."

**Engineering is the *art* of  
directing the great sources of  
power in nature for the  
*convenience* of humankind.**

**-Aristotle**



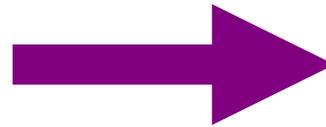
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## How are we doing?

Any sufficiently advanced technology is indistinguishable from magic.

- Arthur C. Clarke



**850 books  
(2/3 of a ton)**

# In fact, engineers are never satisfied!

## History of the Swiss army knife





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# And what about all those books?





# Motivation

- K-12 teachers and students generally have a poor understanding of what engineers do (Cunningham, 2005, 2004)
- Public believes engineers are not as engaged with societal and community concerns as scientists
- Or as likely to play a role in saving lives (Harris Interactive, 2004)
- Judging the relative prestige of professions, engineering ranks well below medicine, nursing, science and teaching (Harris Interactive, 2006)



## **Reasons for improving the public understanding of engineering:**

- Sustaining the US capacity for technical innovation (now headed toward global capacity)
- Attracting young people to careers in engineering
- Improving technological literacy



# Messaging Project

- Sponsored by NSF, Georgia Tech, and S.D. Bechtel, Jr. Foundation

## Objectives

- to identify a small number of messages likely to improve the public understanding of engineering
- to test the effectiveness of these messages in a variety of target audiences
- to disseminate the results of the message testing to the engineering community

# Research

- Assess general career motivators and barriers toward the engineering field
- Evaluate current messages being put forward to the target audience by the engineering community
- Explore messaging opportunities for increasing enrollment in the engineering field



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## **New Announcement**

**President's Council on Jobs and  
Competitiveness**

**10,000 More Engineers  
graduating a year!**

# **Project History**

## **Extraordinary Women Engineers**

**In 2004, 55 engineering groups formed a coalition to explore “why aren’t college-bound girls choosing engineering?”**

- Less than 20% of students enrolled in engineering degree programs are women, yet more women are now pursuing college degrees than men**
- Girls take math and science courses at the same rates as boys, and perform as well as or better**

# What Do High School Girls Think?

- Engineering is for people who **LOVE** both math and science
- Don't know what engineering is
- Aren't interested in the field nor do they think it is "for them."

"Someone who excels in math and science....Likes working out problems and working with other people.... Someone who is motivated, dedicated, and who doesn't mind sitting in a cubicle all day."

# What High School Girls Want

## **Enjoyable**

“How happy I will be—what’s the point of doing anything you don’t like?”

## **Good working environment**

“If I can’t interact with people...I will probably drop the job.”

## **To make a difference**

“That I would make a difference in some way, you know, make my mark on the world.”

## **Income**

“As shallow as it sounds, money is the one thing I have to consider when I’m choosing a job. I’m not going to do something that I know can’t help me pay bills.”

## **Flexibility**

“My career can’t consume all of my time...I need free time to do a lot of other things...before I die.”

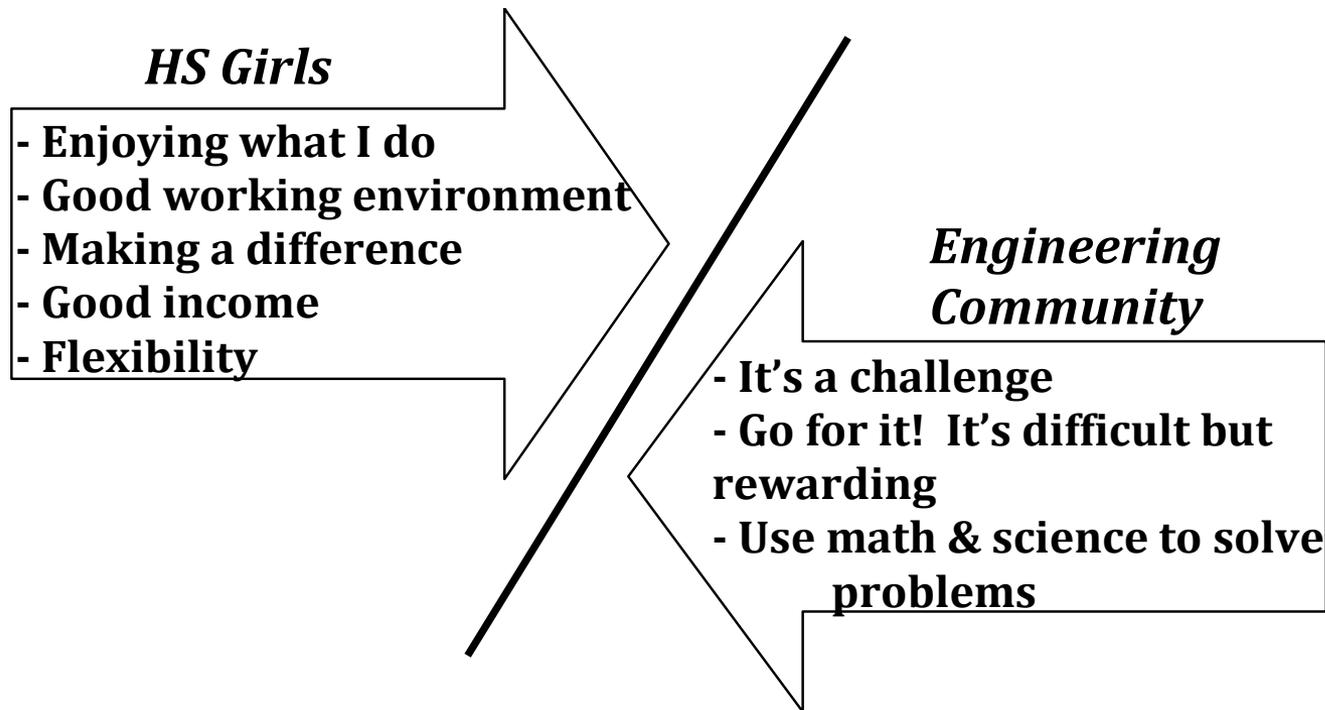
# What Engineers Tell Young People

- Engineering is stressful and challenging
- Stress the importance of **SUPERIOR** math and science abilities

“It’s not easy—but if you’re the type who when faced with a problem some would call impossible is even more driven to move mountains to find a solution, then you might have it in you to be an engineer.”

# Disconnect

The current messages that emphasize “the necessity of superior math and science skills” and the notion of “a challenging and stressful career” are not relevant to high school girls.



# Tested Messages

<b>Project Messages</b>	<b>Appeal to</b>	
	<b>Girls</b>	<b>Boys</b>
Live your life, love what you do	82%	81%
Creativity has its rewards	74%	81%
Make a world of difference	72%	79%
Create possibilities	71%	77%
Engineer Your Life: Dream Big, Love What You Do	74%	67%



# Why Engineering?

1. Love your work, AND live your life too!
2. Be creative.
3. Work with great people.
4. Solve problems, design things that matter.
5. Never be bored.
6. Make a big salary.
7. Enjoy job flexibility.
8. Travel.
9. Make a difference.
10. Change the World.



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“Engineering will **challenge** you to turn **dreams** into **realities**, while giving you the chance to **travel**, work with **inspiring people** and **give back** to your **community**.”

Developing **ideas** and transforming  
them **to innovation**

Dream  
Big

Diversity

Creativity

Design

Think  
Impact

Make  
a Better  
World



# ENGINEERING THE FUTURE OF THE WORLD



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# Big Offers



Our engineering graduates are among the most highly recruited in the nation and typically have more than one job offer at higher-than-average salaries upon graduation.

# \$63,000

Average starting salary for 2012 bachelor's degree graduates

**Top Millionaire-  
Producing Degree:  
#1 Engineering**

# Inspiring Girls

## **So what about the math and science?**

Once you shared why you are passionate about engineering and what life is like as an engineering, then you can fill them in about the requirements. But remember to put it in to context.

“[Math] is the basis of engineering, but you don’t have to love it. You just have to be able to do it.”

-Judy Lee, Mechanical Engineer

# *Myths vs. Truth* about Engineers



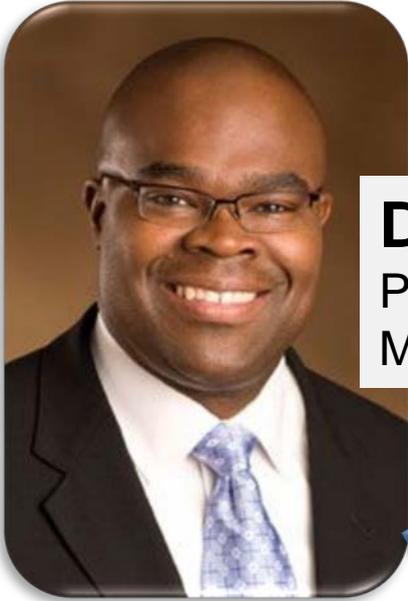
- Boring, Dorks who look like Dilbert
- **LOVE** Math & Science
- Sit at a computer all day
- Are very creative
- No communication skills
- Work on significant projects
- Engineers don't have fun or diverse interests
- Women can't be engineers
- Good at math and science you *should* be an engineer

# What Do Engineers Do?

	<b><u>2003</u></b>
Builds/constructs/makes things	38%
Designs/draws/plans	19%
Mechanic/mechanical work	9%
Train operator	<b>7%</b>
Creates/is creative	<b>3%</b>
Mathematics/physics	3%
Develops new technologies	<b>3%</b>
Application of technology	<b>2%</b>
Equipment maintenance repair	2%
Works with computers	2%

# Contributing To Society

	Engineers	Scientists
Make strong leaders	56%	32%
Care about the community	37%	51%
Sensitive to societal concerns	28%	61%
Save lives	14%	82%



**Don Thompson**

President & COO  
McDonald's Corp International

Who has the **Electrical Engineering** degree?



**Donald Trump**

Chairman & President  
The Trump Organization  
Founder of Trump Entertainment Resorts



# Who is an engineer?

- 17% of the Fortune 500 CEO's have a business degree
- 7% of the Fortune 200 CEO's have a business degree
- 20% of the Fortune 500 CEO's and 22% of the Fortune 200 CEO's have an engineering degree
- Patent law requires an Engineering or Science Degree



# History of Engineering

- The Pre-War apprentice (low tech, agriculture)
- Vannevar Bush with Frederick Terman – “A community of scholars”
- Sputnik – October 4, 1957
- 1987 Peak Graduation Rate
- 1990 – waning interest, but huge economic success

None of the top 10 jobs that will exist in 2012 exist today and these jobs will employ technology that hasn't been invented to solve problems we haven't yet imagined.

– U.S. Education Secretary Richard Riley quoted in 2004



## Today

- New China > 350,000
- New India > 200,000
- USA = 78, 000



# Out of 100 9<sup>th</sup> graders in Texas

- 62 graduate from High School
- 32 enter college
- 19 are still in college 2<sup>nd</sup> year
- 11 will obtain a degree
- <2 will be engineers

# Who is the Engineer?

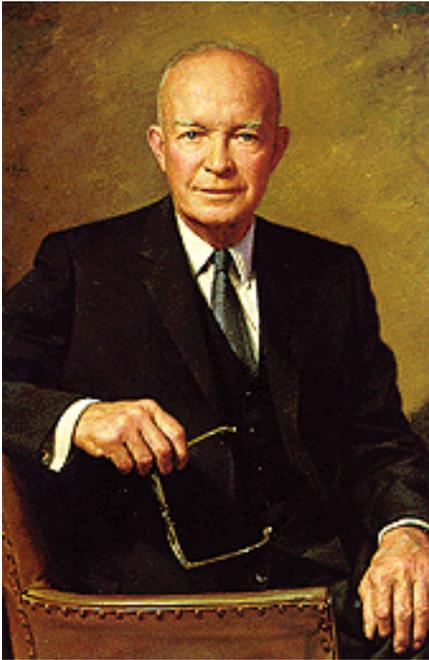


Neil Armstrong

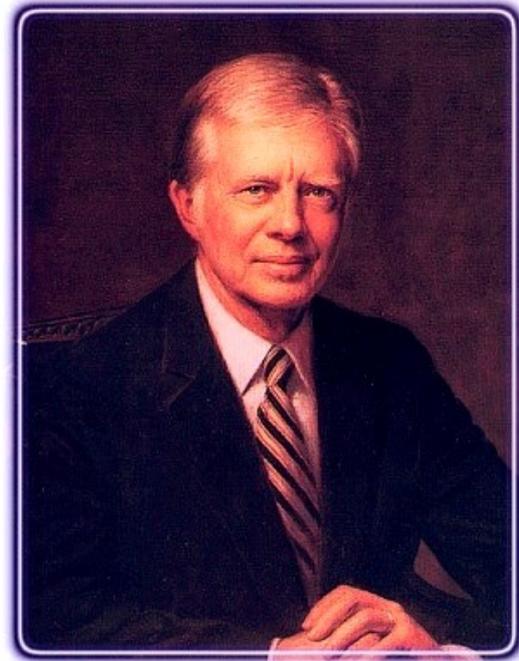


Albert Einstein

# Who is the Engineer?



Dwight D. Eisenhower



Jimmie Carter

# Who is the Engineer?



Lillian Gilbreth

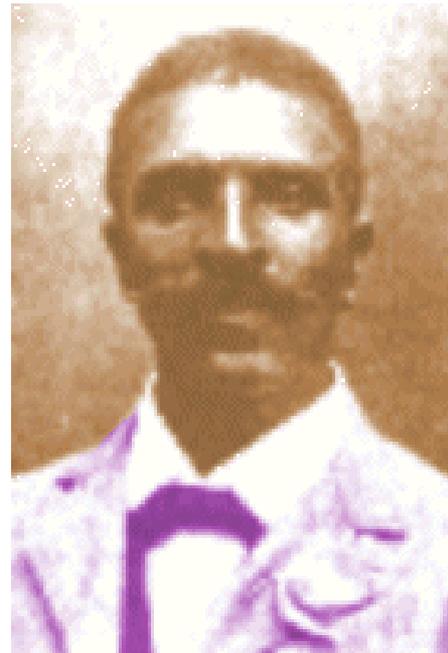


Madame Currie

# Who is the Engineer?



Lewis Latimer



George Washington Carver

# Who is the Engineer?

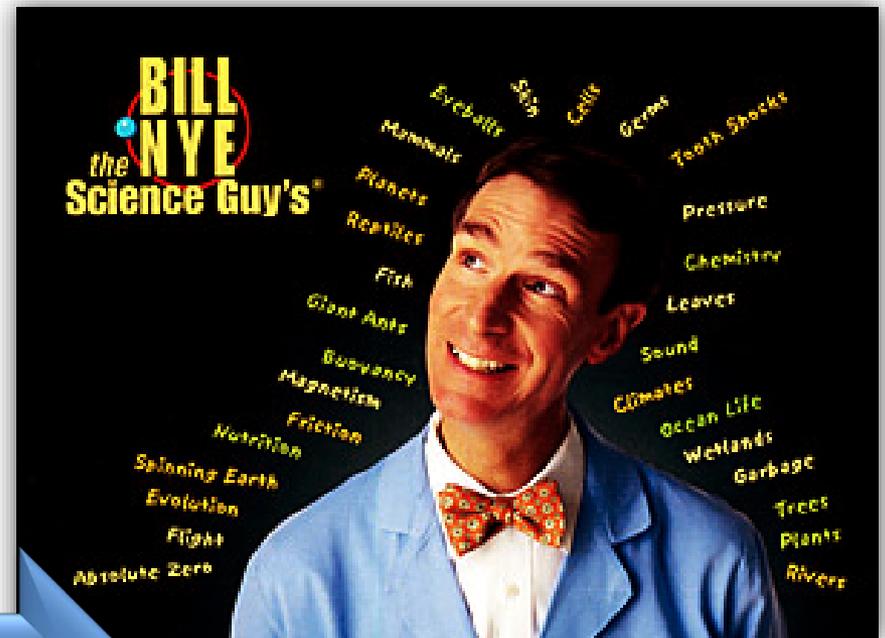


Tom Landry



Mike Ditka

# Who has the Engineering degree?



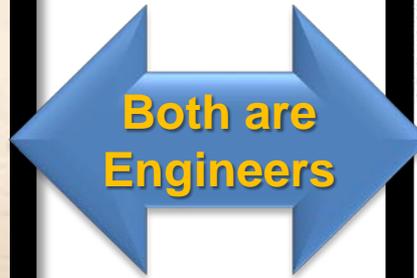
Both are  
Engineers

# Who has the Engineering degree?



**Gauri Nanda**

Creator of "Clocky"  
the ultimate alarm clock.



**Jyothsna Chakravarthy**

Telecom engineer by *degree*  
Supermodel by *design*

## Jim Henson

[Sesame Street](#) (TV series)  
(voice of Ernie)

## [The Muppet Show](#)

(writer and voices of Kermit the Frog, Swedish Chef and more)



# Who has the engineering degree?



## Bob Peterson

### [Up](#)

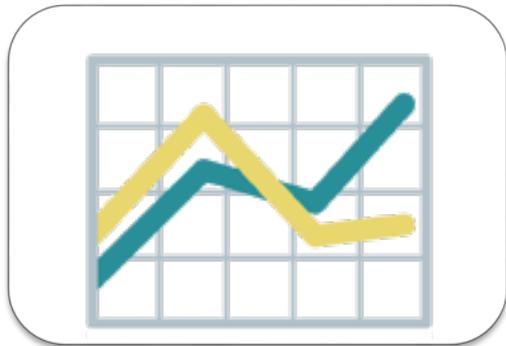
(story, screenplay, co-director,  
voices of Dug and Alpha)

### [Finding Nemo](#)

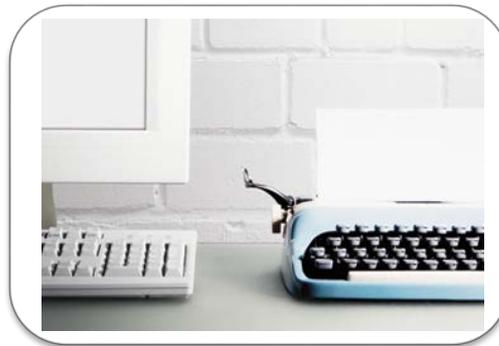
(screenplay, Voice of Mr. Ray  
and additional Voices)

# Skills Needed to Succeed

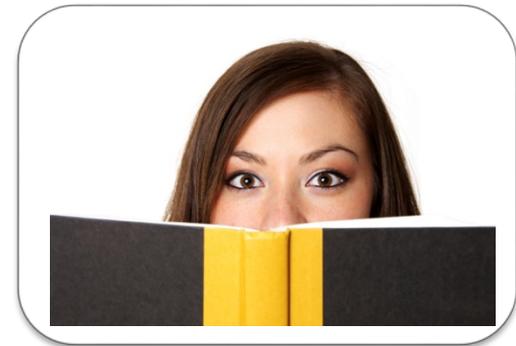
- Problem-identifying and problem-solving
- Design and innovation
- Global perspective and ethics
- Team dynamics and communication



*Predicting performance*



*Adapting to change*



*Learning to learn*



# Greatest Engineering Achievements of the 20th Century

1. Electrification
2. Automobile
3. Airplane
4. Water Supply and Distribution
5. Electronics
6. Radio and Television
7. Agricultural Mechanization
8. Computers
9. Telephone
10. Air Conditioning and Refrigeration



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**With your help –**

**we can change the message!**