



Being an Engineer.  
Exciting, Fun and a Good Career, but  
There are Responsibilities

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# A Little History

- My roots
- How I got into education
- How academe has changed
  - Research
  - Teaching
  - Service
- Why has it changed?



# What I Do

- Engineering Professor
  - Technical
  - Education
  - Research
  - Policy
- Design
- Manufacturing

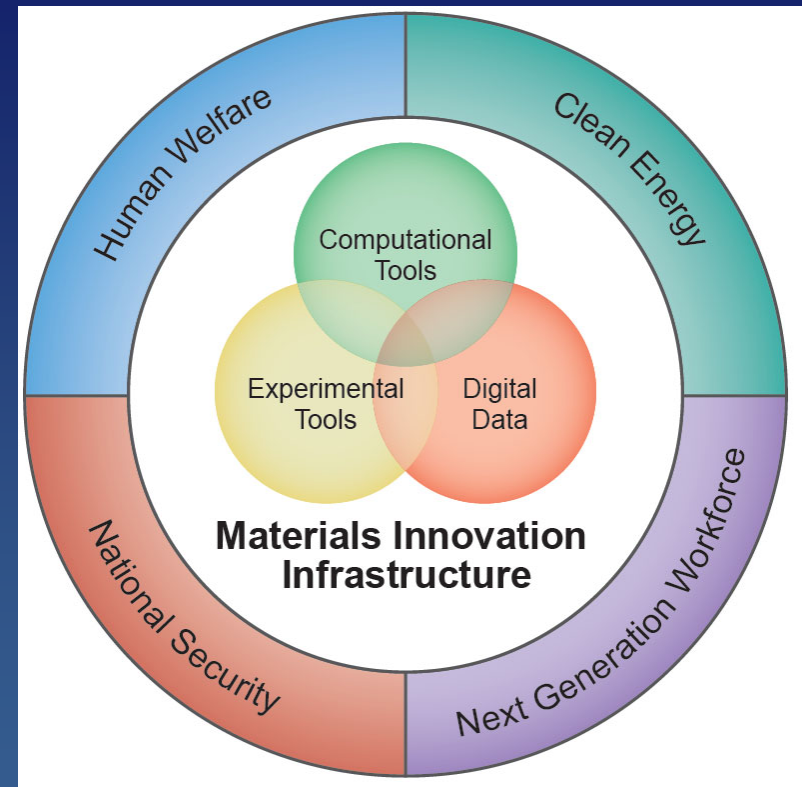


# What is Different Today?

- Technology integration into classroom
- Ethics and teaching ethics
- Technology in society
- Manufacturing
- Hands on experiences
- Our responsibility

# What I Have Learned – The Big Picture

- Economics
  - Local
  - National
  - International
  - Jobs
- National Security
- Technology driven
- Rapidly changing landscape



# Why Manufacturing Matters

- Conducts 70% of US R&D, 90% of patents issued
- Close connection between R&D, design, and manufacturing
- Health of industrial commons (know how, process engineering capability, workforce skills, suppliers)
- Manufacturing multiplier (\$1.40 for \$1 of manufacturing output)
- Critical for national security



“Our first priority is making America a magnet for new jobs and manufacturing.”

- President Barack Obama  
February 12, 2013



“Now is not the time to gut these job-creating investments in science and innovation. Now is the time to reach a level of research and development not seen since the height of the Space Race.”

- President Barack Obama  
February 12, 2013

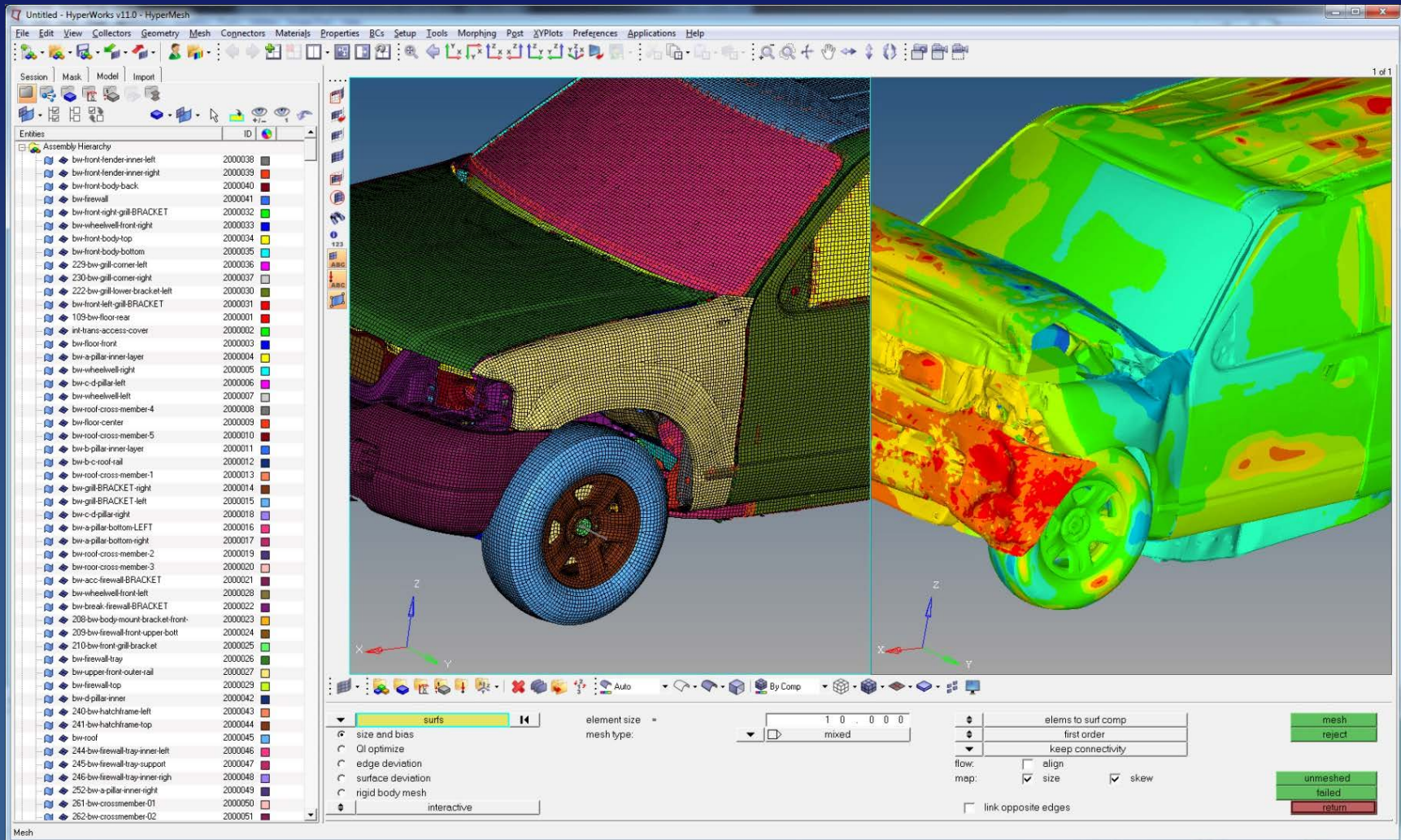


# Why Is Technology Important

1959 Chevrolet Bel Air vs. 2009 Chevrolet Malibu

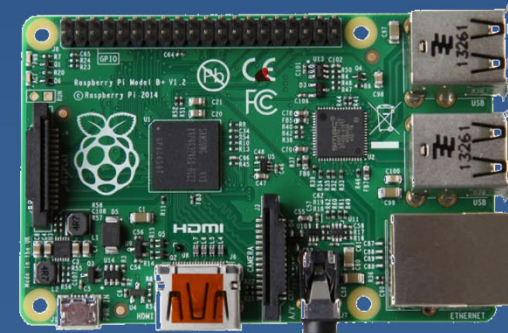
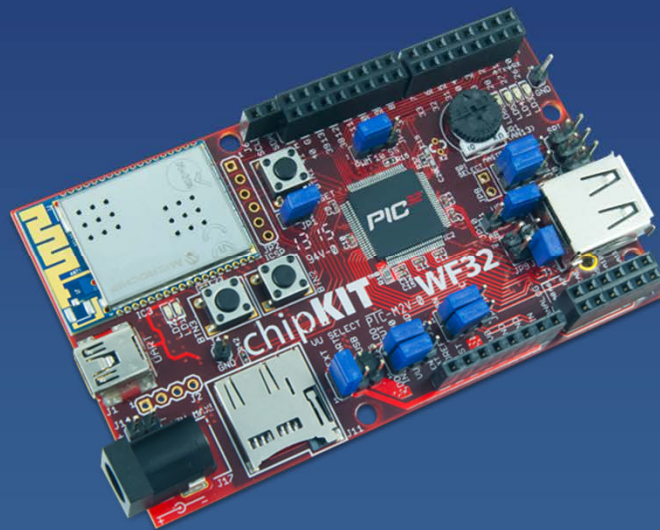
INSURANCE INSTITUTE  
FOR HIGHWAY SAFETY

# Economic Efficiency at the Wall



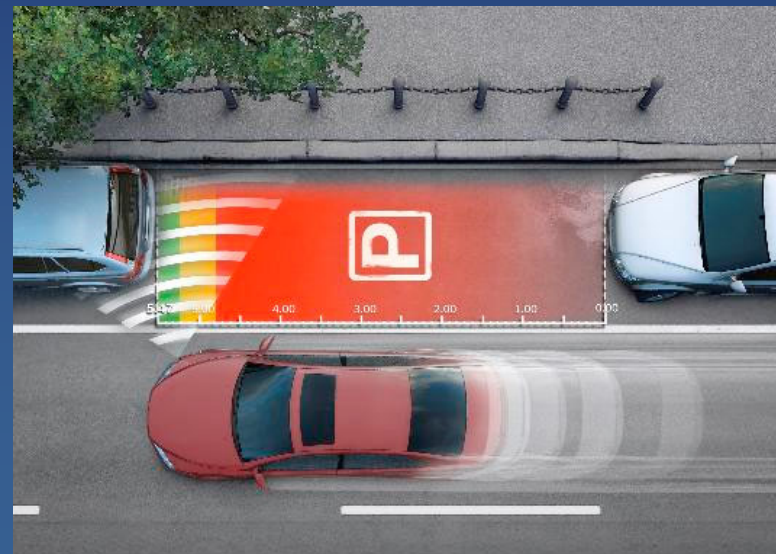
# There are 10 Types of People

1. Those that understand binary
10. Those that do not.



# Automated Parallel Parking

- Available on Lexus LS460
- Optional on Toyota Prius
- Similar system by Bosch available in 2008



# Lexus Automatic Parking



# Do Not Underestimate the Human Factor



# Who Understands?

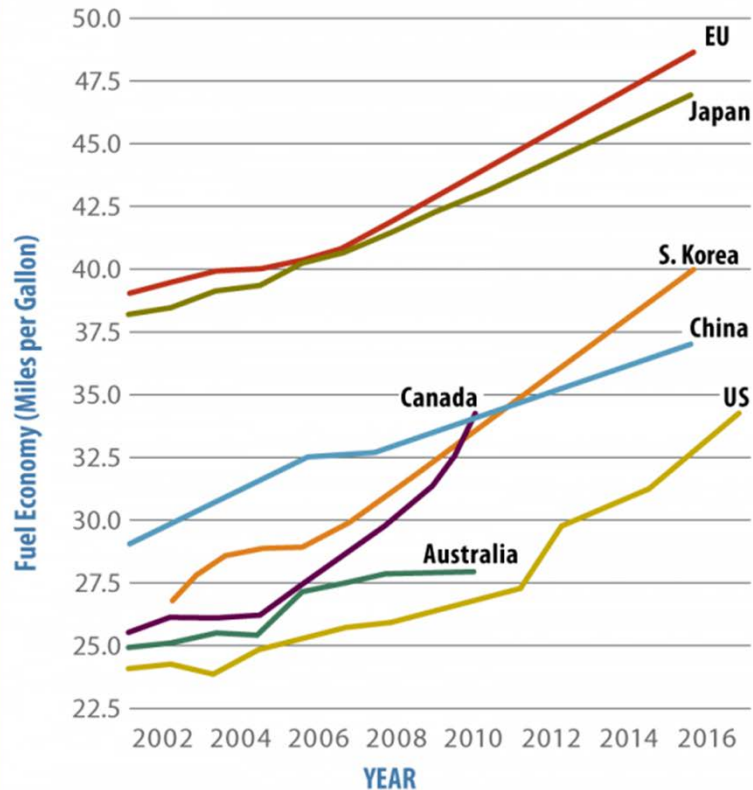
- Georgia Tech
- The State of Georgia
- The United States
- The world
- Our students



Secretary of Commerce, Penny Pritzker  
The White House December 2013.

# Policy – Driving Technical Diversity

Comparison of Actual and Projected Corporate Average Fuel Economy for New Passenger Vehicles

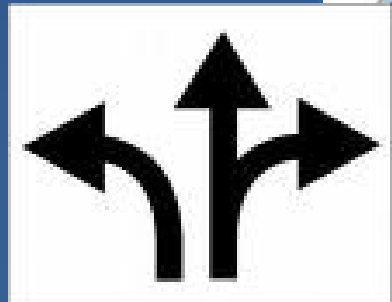


Source: Data for Fuel Economy Standards and GHG Standards Charts, November, 2009,  
[http://www.theicct.org/documents/ICCT\\_PVStd\\_Nov\\_09\(Data\\_Sheet\).xls](http://www.theicct.org/documents/ICCT_PVStd_Nov_09(Data_Sheet).xls).

Regulations differ across countries. Large costs of meeting new requirements suggests coordinated efforts and/or globally diversified portfolios.



# Changing Powertrain Technology



# More than Technology

## Changing the System, Keeping the Foundation

- Government – faster more modern responses

- IP issues

- Security

- Energy

- Business

- Access to capital

- Policies for long term investment

- Academe – Reward system

- A more informed population

- Technically

- On how the world works

# Roadblocks

- Security
- Thinking in the old way – what is the value proposition?
- The mind set of our children and parents
- Getting the workforce to think in the 21<sup>st</sup> century
- Education
  - Costs / scaling
  - Taking the easy way out – reducing the load

# Understanding vs. Pattern Matching

What we teach to a student:

$$\lim_{x \rightarrow 8} \frac{1}{x - 8} = \infty$$

The student's response to a quiz question:

$$\lim_{x \rightarrow 5} \frac{1}{x - 5} = 5$$

# Heartening Realities

- Manufacturing is high tech
- SMEs (Jobs / Economy) – Supplier vs. OEM
- Rate of innovation & speed to market
- Productivity is up (2X every 10 years)
- Open source / repurposed hardware will rule
- Higher education



# The Winds of Change in a Digital World

- Improve reputation of technology and science
- Thinking in a completely new fashion
- Develop educational baseline for technical advancement
- Acceptance / integration of TRL 4-9 work
- Leveraging our new workforce foundation
- Upgrade our policy HVAC to the 21<sup>st</sup> century



# Do Not be the No-Names on the Landing Party





“Think about the America within our reach: A country that leads the world in educating its people. An America that attracts a new generation of high-tech manufacturing and high-paying jobs. A future where we’re in control of our own energy, and our security and prosperity aren’t so tied to unstable parts of the world. An economy built to last, where hard work pays off, and responsibility is rewarded.”

- President Barack Obama

January 24, 2012



# Back to the Big Picture - Responsibility

- Altruistic – making the world a better place
- Economic – wealth creation
- A new workforce foundation
- New technical leadership for policy
- The United States of America
  - Enabling innovation
  - Ensuring the talent pipeline
- The World – Making a difference
- Education is paramount



**“In times of change, learners inherit the earth;  
while the learned find themselves beautifully  
equipped to deal with a world that no longer  
exists.” (Eric Hoffer 1902-1983)**