



UNIVERSITY OF  
SOUTH CAROLINA

# CSCE274 ROBOTIC APPLICATIONS AND DESIGN FALL 2021 ROBOTICS AND ETHICS

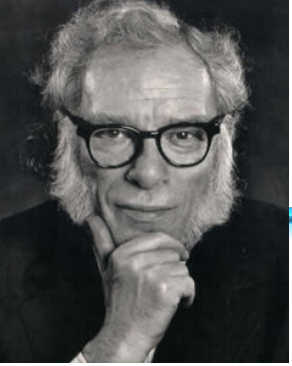
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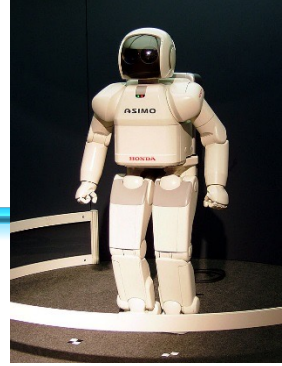
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# Three Laws of Robotics

In 1942 short story “Runaround” by I. Asimov



1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
  2. A robot must obey the orders given to it by human beings, except where such orders would conflict with the First Law.
  3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.
- 
0. A robot may not harm humanity, or, by inaction, allow humanity to come to harm.

# At Home



- Helping at home
- Eliminating many tedious tasks
- Improving life for elderly and disabled people
- Privacy concerns:
  - Do you want to share what is, and what you do, in your house with Company X and Agency Y?



# On the Road

- Safer
- More efficient
- Enable people



The Nevada law went into effect on **March 1, 2012**, and the Nevada Department of Motor Vehicles issued the first license for a self-driven car in **May 2012**. The license was issued to a Toyota Prius modified with Google's experimental driverless technology.

# Power-lines

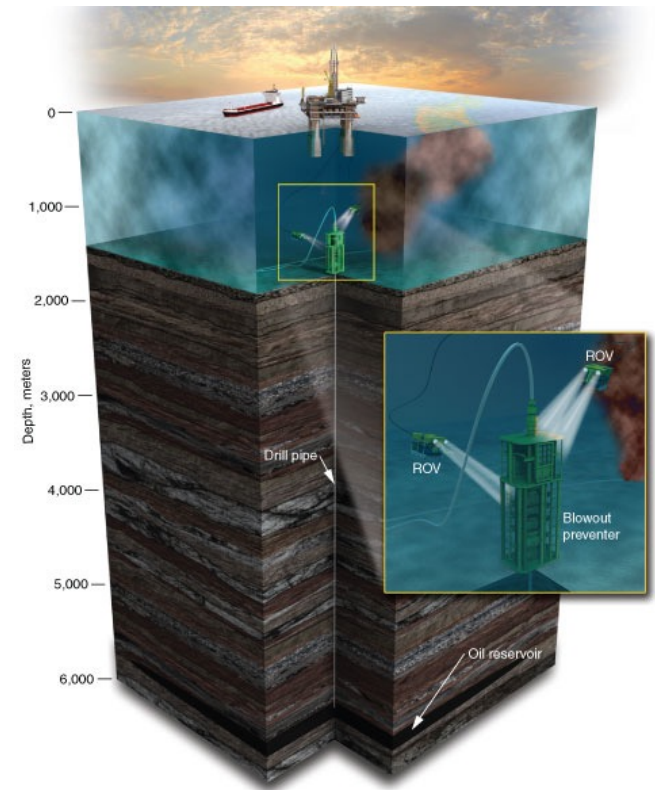
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- Robots can crawl along power-lines, inspecting for damages.
- Faster coverage
- Avoid forest fires
- Avoid black-outs



# Resource Utilization

- Good News:
  - Plug the hole at the Deepwater Horizon oil spill of 2010
  - Enable us to reach depths forbidding to humans
- ??? News
  - Enabling disasters in hard to reach places



# Warehouse Automation

- Amazon bought Kiva for \$775M



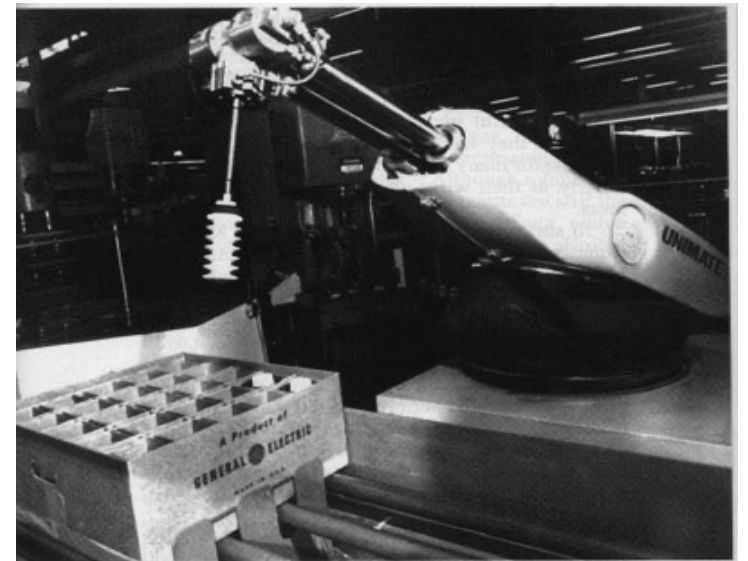
# Factory Automation





# Factory Automation

- 1950-Now
- Taking over many tasks; especially boring, repetitive, dangerous.
- Take over all tasks!
- No need for a workforce
- Who is going to buy the products?



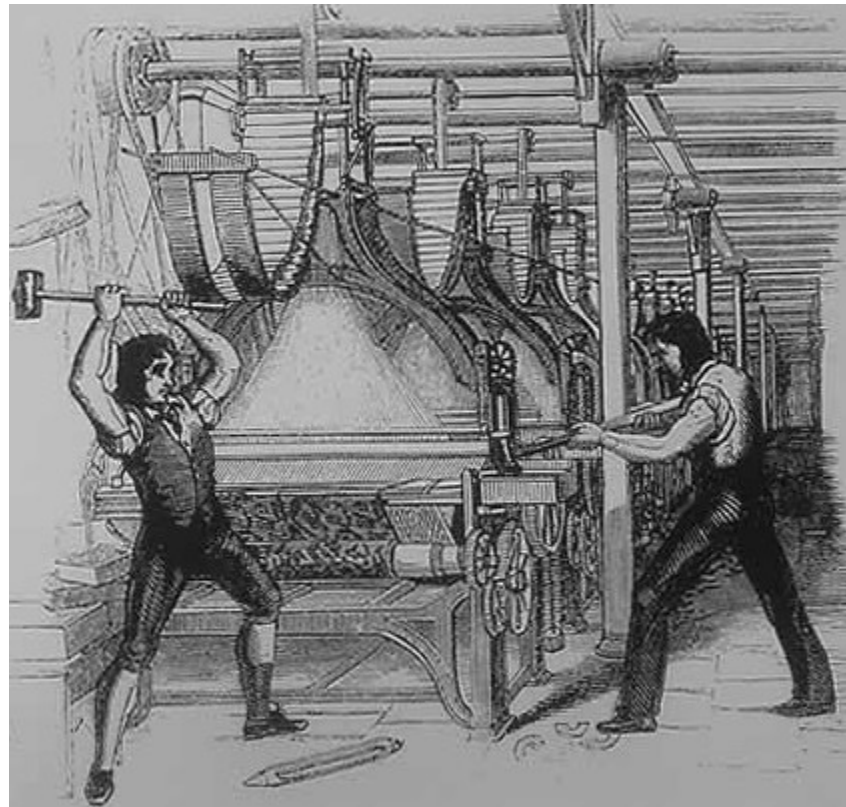
*Armed for duty. A Unimate robot—really, just an arm—picks up and puts down parts in a General Electric factory.*



# Factory Automation

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- What happens when a machine replaces a human?
- **Luddites?**
- What happens to the unemployed?

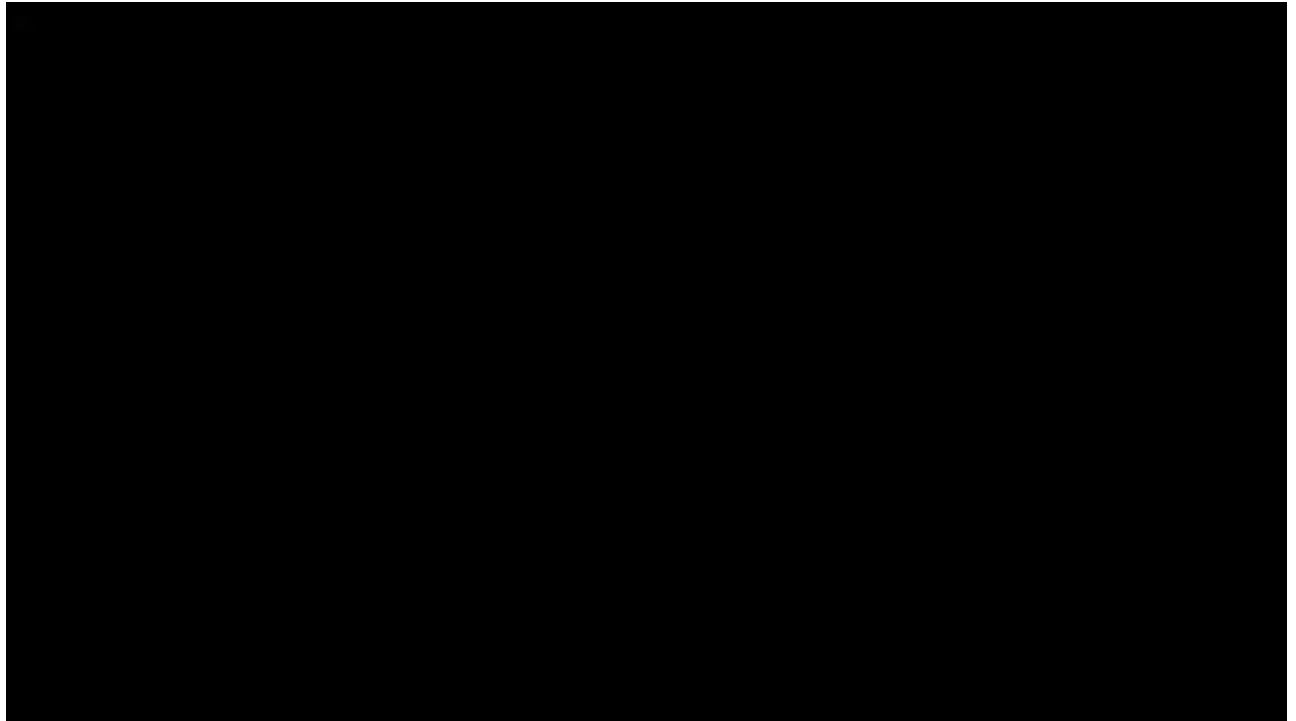


# In the Sky

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- **Hobbyists**
- Commercial
- Military

Privacy



# In the Sky

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- **Hobbyists**
- **Commercial**
- **Military**



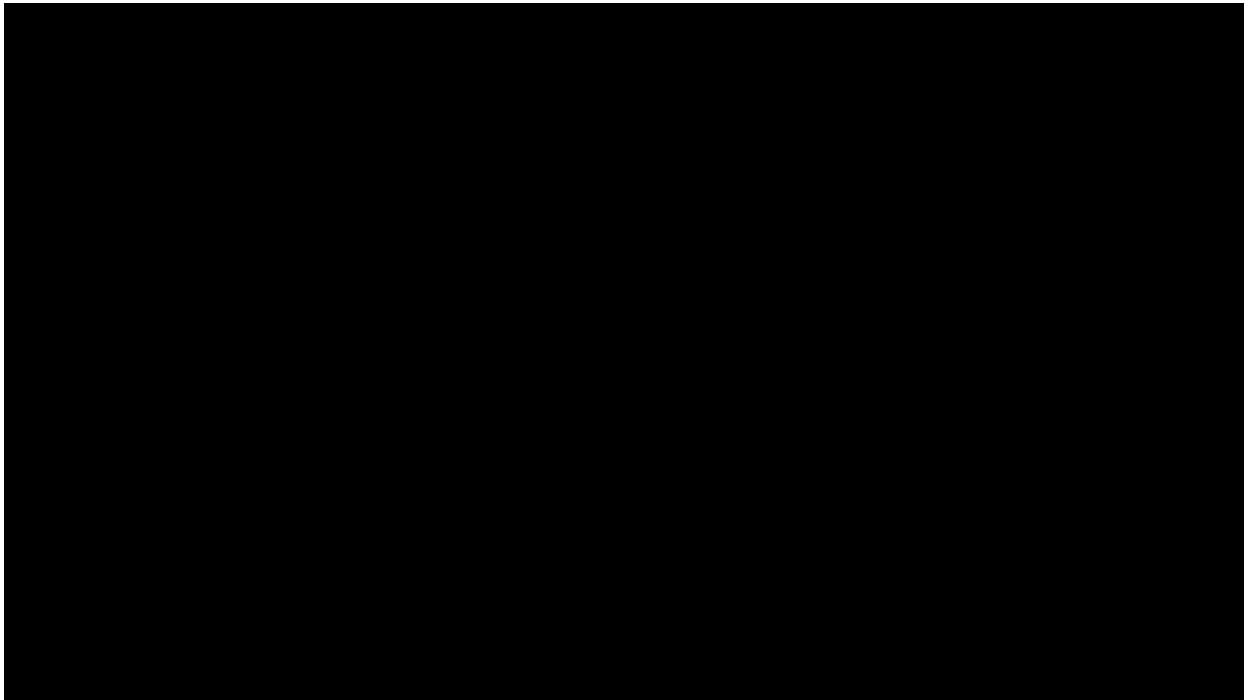
Privacy

# In the Sky

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- Hobbyists
- **Commercial**
- Military

Privacy



# In the Sky

- Hobbyists
- Commercial
- **Military**

The [Bureau of Investigative Journalism](#) estimates the following cumulative statistics about US drone strikes:

(As of January 2014)

- Total strikes: 381
- Total reported killed: 2,537 - 3,646
- Civilians reported killed: 416 - 951
- **Children reported killed: 168 - 200**
- Total reported injured: 1,128 - 1,557



From CNN: According to a senior U.S. official, an estimated 2,000 militants and **50 civilians** have been killed in strikes since 2001. Since May 2010, the strikes have killed 600 militants, the official said.



# Battlefield Robots

- More efficient
- Saving soldier lives
- Rational thinkers
- Responsibility
  - Buggy s/w?
- War with no cost
- **I was just obeying orders!**

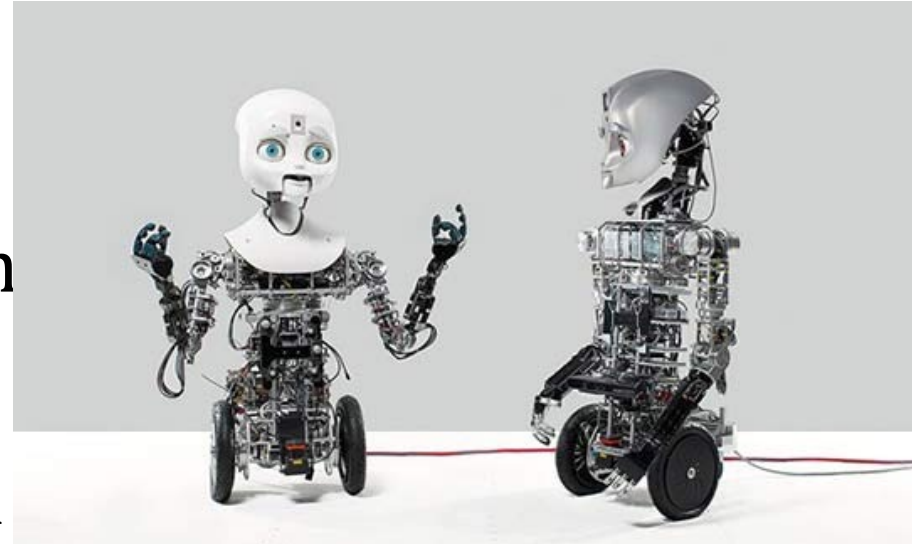


Concentration camp guards, following orders, hanged after WWII

# Social Robots



- Fuzzy, furry and cute
- Help people in rehabilitation
- Provide companionship
- At CSCE, Charlie was used in autism therapy
- See: L. Boccanfuso, J. M. O'Kane. CHARLIE: An Adaptive Robot Design with Hand and Face Tracking for Use in Autism Therapy. International Journal of Social Robotics, 2011.



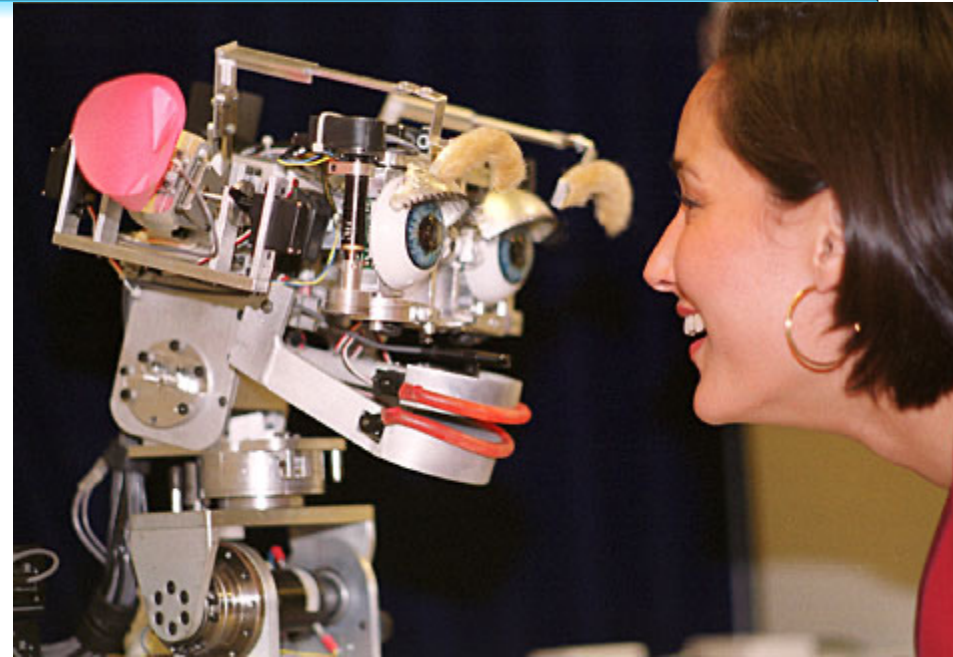


# Social Robots – Care for the Elderly

## Concerns:

- Reduced human contact
- Loss of privacy
- Deception and infantilisation
- Loss of control
- Loss of personal liberty
- Questions about responsibility
  - if something goes wrong when older people are in control of the robot, who is to blame?

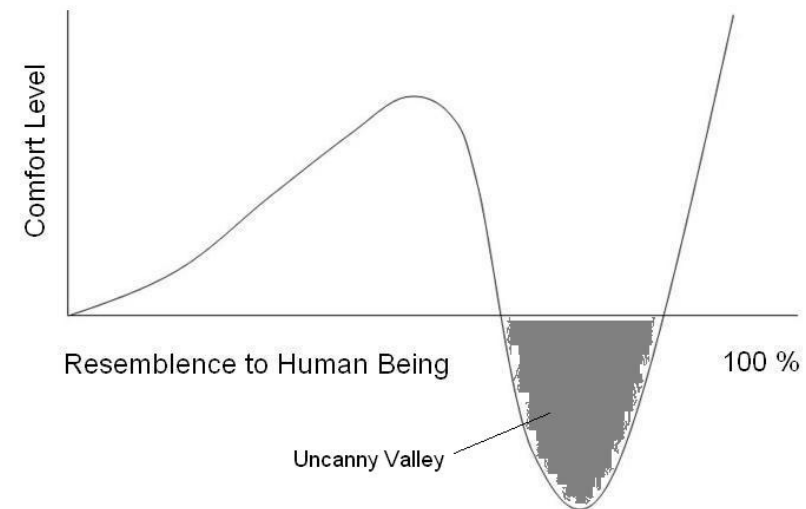
From: Sharkey A, Sharkey N (2012) “Granny and the robots: ethical issues in robot care for the elderly”. *Ethics Inf Technol* 14(1):27–40



# Human-like Robots



The Uncanny Valley Effect

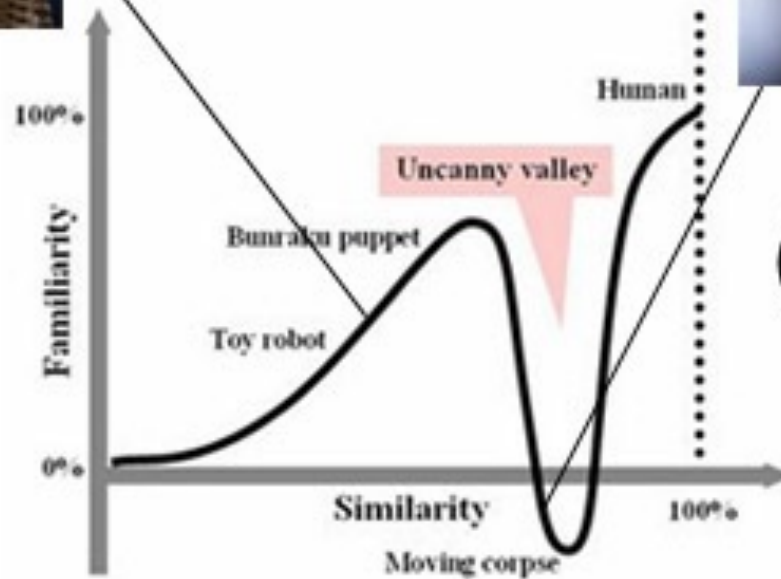


# The Uncanny valley



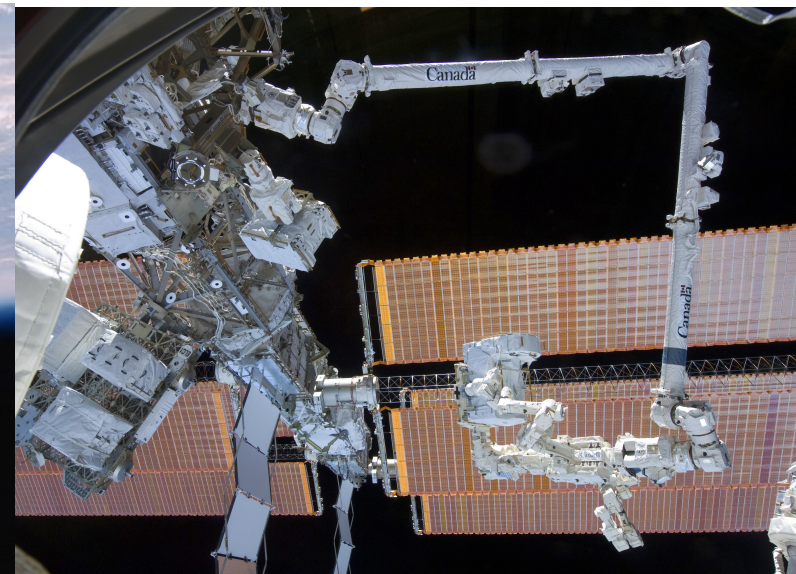
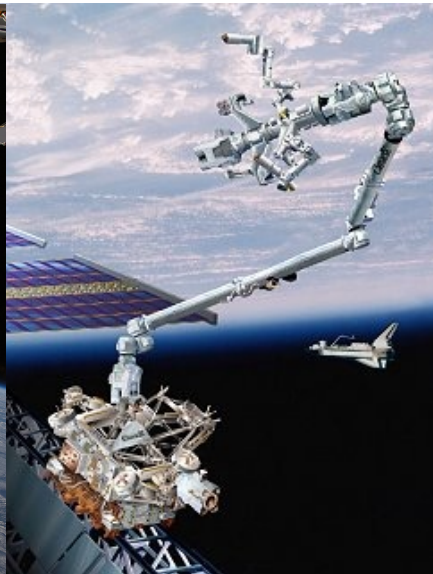
**CUTE**

**CREEPY**

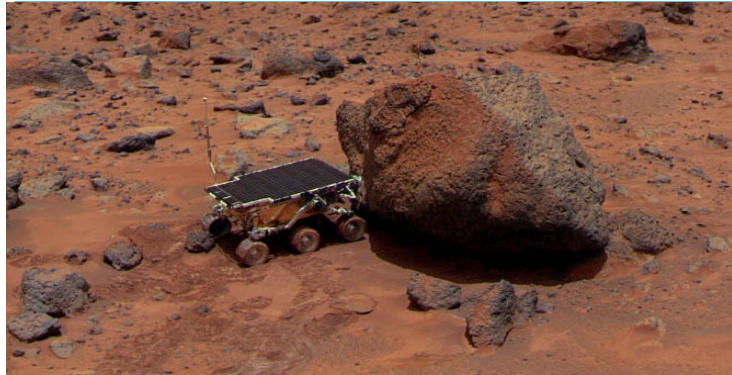


# Space – On-Orbit

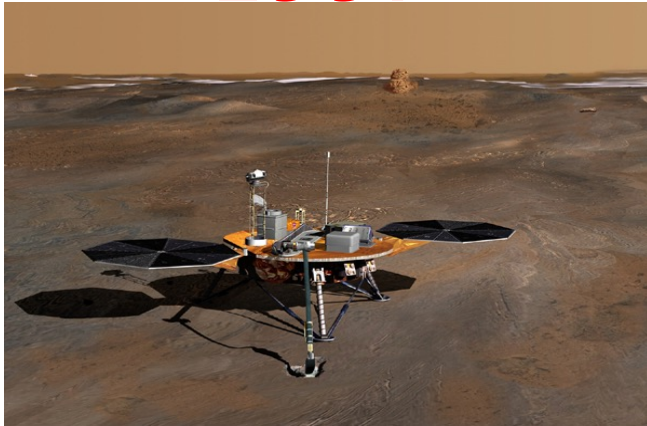
- International Space Station
- Robonaut
- Canadarm
- Canadarm2



# Space - Exploring Mars

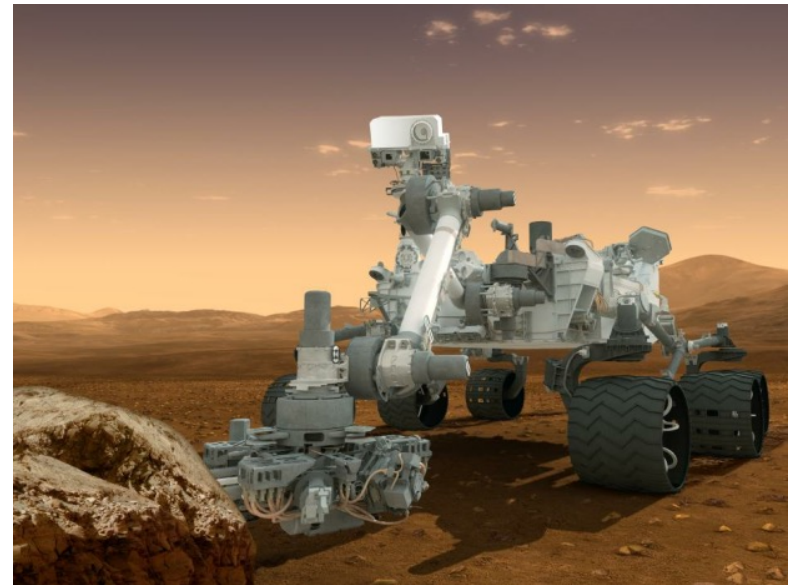


**Sojourner  
1997**



**Phoenix-2008**

**Spirit and  
Opportunity  
2003**



**Mars Science Laboratory  
Curiosity (2012)**



# Space Expenditures

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## Technology developed for space:

- Invisible Braces
- Scratch-resistant Lenses
- Memory Foam
- Ear Thermometer
- Shoe Insoles
- Long-distance Telecommunications
- Adjustable Smoke Detector
- Safety Grooving
- Cordless Tools
- Water Filters
- Artificial Limbs
- Ventricular Assist Device
- Anti-Icing Systems
- Improved Radial Tires
- Fire-Resistant Reinforcement
- Firefighter Gear
- Freeze Drying Technology
- Harnessing Solar Energy
- Pollution Remediation
- Refrigerated Internet-Connected Wall Ovens
- Improved Mine Safety
- Light-Emitting Diodes (LEDs)



# Issues

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- Privacy
- Responsibility
- Asimov's Law #1
- Asimov's Law #0
- Job loss



# Questions?

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