

SAVE THE DATE 19TH ANNUAL EVENING WITH INDUSTRY

OCTOBER 3RD | 6:00 - 9:00PM

ELSON S. FLOYD CULTURAL CENTER

\$12 For Students Registered Before Sept. 19th

*Networking opportunities with company representatives
prior to the WSU Fall Career Expo & Technical Fair.*

Dinner will be provided!



Register to attend
EWI here!

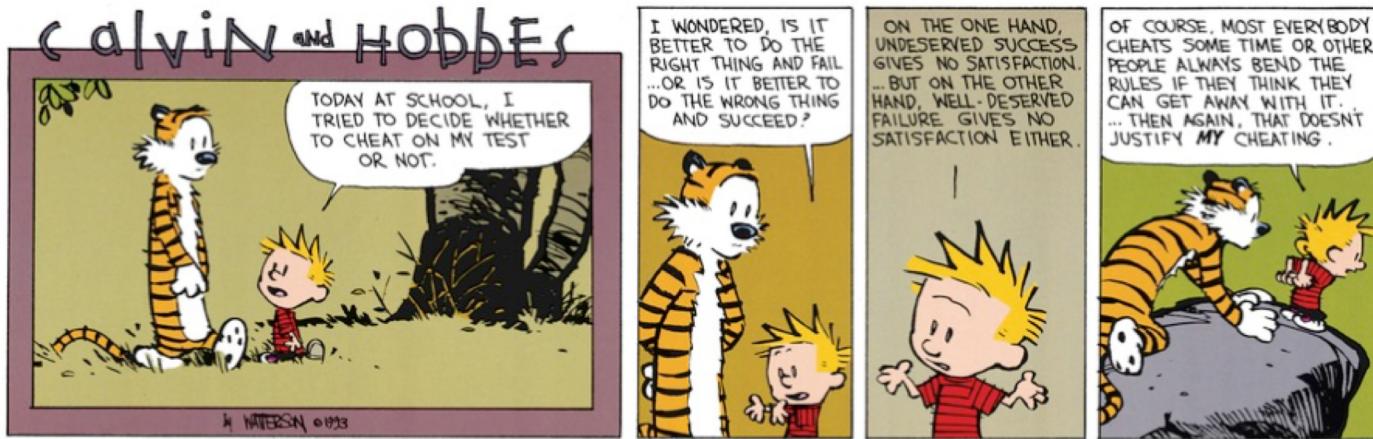


Register to volunteer
at EWI here!



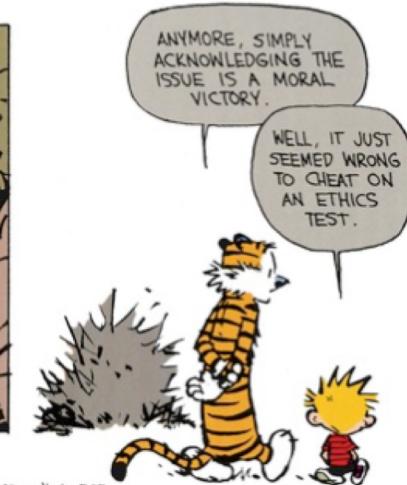
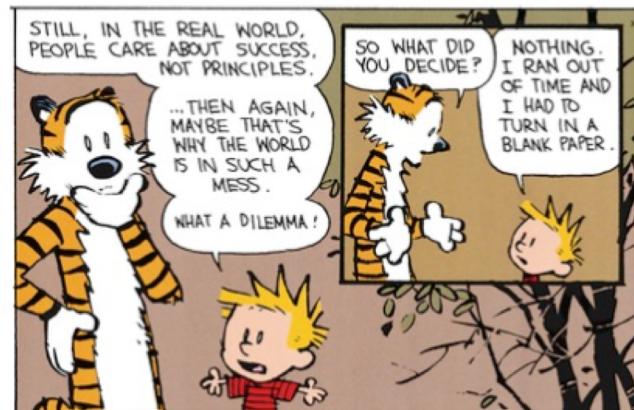
- \$12 any time
- 14 companies will attend
- Presentations by companies
- Free for volunteers
- Space is limited!

Lect. #10: Ethical Theories 2



THEN I THOUGHT, LOOK,
CHEATING ON ONE LITTLE TEST
ISN'T SUCH A BIG DEAL. IT
DOESNT HURT ANYONE .

...BUT THEN I WONDERED IF
I WAS JUST RATIONALIZING
MY UNWILLINGNESS TO ACCEPT
THE CONSEQUENCE OF NOT
STUDYING .



© 1993 UNIVERSAL PRESS SYNDICATE. 7.27

www.gocomics.com/calvinandhobbes/1993/09/12

Agenda for Today



1. Case Study: Space Shuttle Challenger Disaster



2. Ethical Theory: Rule Utilitarianism



3. Ethical Theory: Rule Deontology



4. Ethical Theory: Act Deontology



5. Ethical Theory: Contract Theory



6. Ethical Theory: Virtue Ethics

Case Study: Space Shuttle Challenger Disaster 36 Years Ago



Case Study: Space Shuttle Challenger Disaster

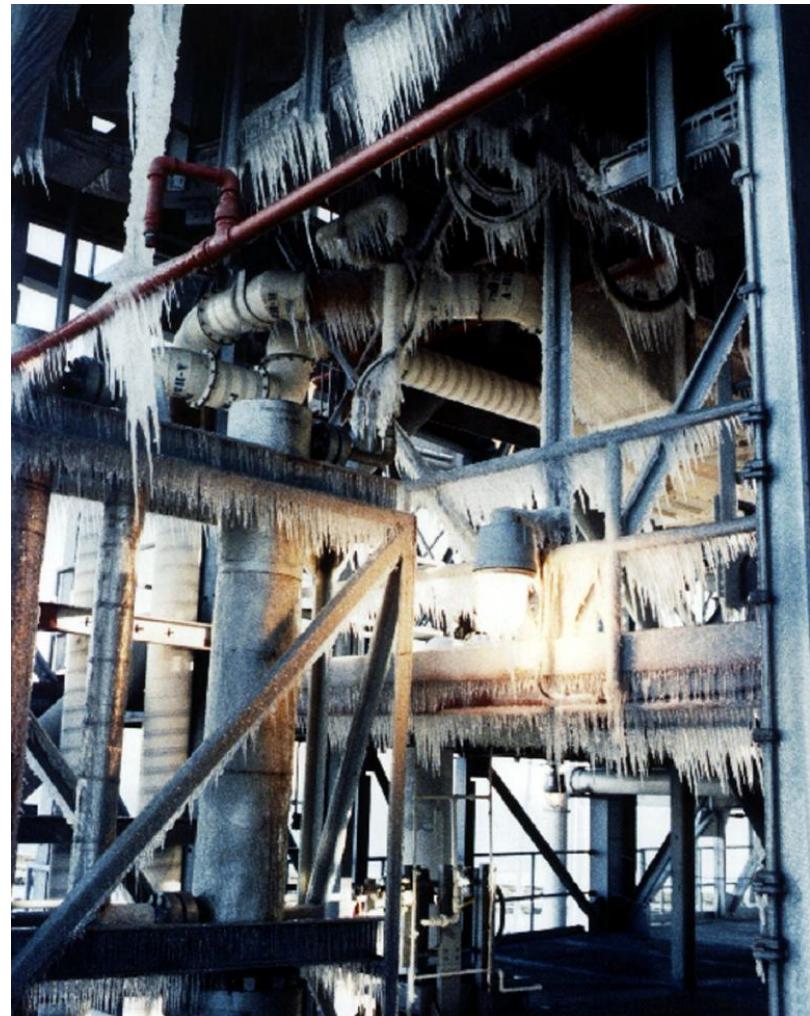
January 28, 1986



- NASA Space Shuttle Challenger exploded on January 28, 1986, 73 seconds after liftoff
- Seven astronauts died, including Christa McAuliffe, a teacher representing “ordinary” people
- Was this a tragic accident or could it have been prevented?

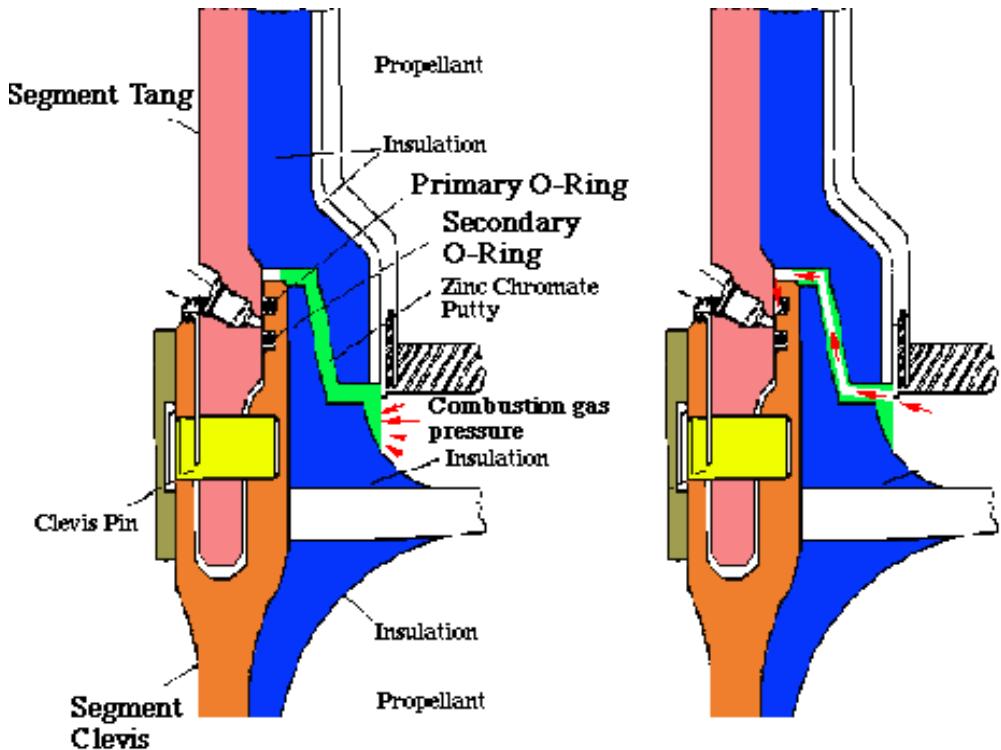
Case Study: Space Shuttle Challenger Disaster

- No one wanted the shuttle to explode
- No one knows reasons for decisions, but there were pressures on NASA
 - Launch earlier that month had been delayed six times
 - Lesson from space to occur on Friday; delay would throw a wrench into this
 - Maybe other unknown pressures, e.g., 25th launch
- Ultimately, human failure due to faulty decision-making



Case Study: Space Shuttle Challenger Disaster

- Role of MT engineers
 - Warned O-rings had not been tested at low temperatures
 - Recommended launch delay due to cold weather
 - Overruled by management
- Is there more engineers could have done?
- Hindsight is 20-20



Analysis of Engineers' Failure to Communicate

Edward Tufte, 1997

Engineers opposed to the launch presented the following:

HISTORY OF O-RING DAMAGE ON SRM FIELD JOINTS

APT
OCT 30, 1987

SRM No.	Cross Sectional View			Top View		Clocking Location (deg)
	Erosion Depth (in.)	Perimeter Affected (deg)	Nominal Dia. (in.)	Length Of Max Erosion (in.)	Total Heat Affected Length (in.)	
61A LH Center Field**	22A	None	None	0.280	None	36° -- 66°
61A LH CENTER FIELD**	22A	NONE	NONE	0.280	NONE	338° - 18°
51C LH Forward Field**	15A	0.010	154.0	0.280	4.25	163
51C RH Center Field (prim)***	15B	0.038	130.0	0.280	12.50	354
51C RH Center Field (sec)***	15B	None	45.0	0.280	29.50	354
41D RH Forward Field	13B	0.028	110.0	0.280	3.00	275
41C LH Aft Field*	11A	None	None	0.280	None	--
41B LH Forward Field	10A	0.040	217.0	0.280	3.00	351
STS-2 RH Aft Field	2B	0.053	116.0	0.280	--	90

Can you find temperature in this table?

Tufte, E. (1997). *Visual Explanations*. Cheshire, CT: Graphics Press, p. 41.

A Failure to Communicate

Edward Tufte, 1997

Engineers did present a history of O-ring temperatures:

BLOW BY HISTORY		HISTORY OF O-RING TEMPERATURES (DEGREES - F)				
		MOTOR	MBT	AMB	O-RING	WIND
SRM-15 WORST BLOW-BY		DM-1	68	36	47	10 MPH
o 2 CASE JOINTS (80°), (110°) <u>ARC</u>		DM-2	76	45	52	10 MPH
o MUCH WORSE VISUALLY THAN SRM-22		QM-3	72.5	40	48	10 MPH
SRM 22 BLOW-BY		QM-4	76	48	51	10 MPH
o 2 CASE JOINTS ($30-40^\circ$)		SRM-15	52	64	53	10 MPH
SRM-13A, 15, 16A, 18, 23A 24A		SRM-22	77	78	75	10 MPH
o NOZZLE BLOW-BY		SRM-25	55	26	29	10 MPH
					27	25 MPH

Can you make a compelling case from these data?

Tufte, E. (1997). *Visual Explanations*. Cheshire, CT: Graphics Press.

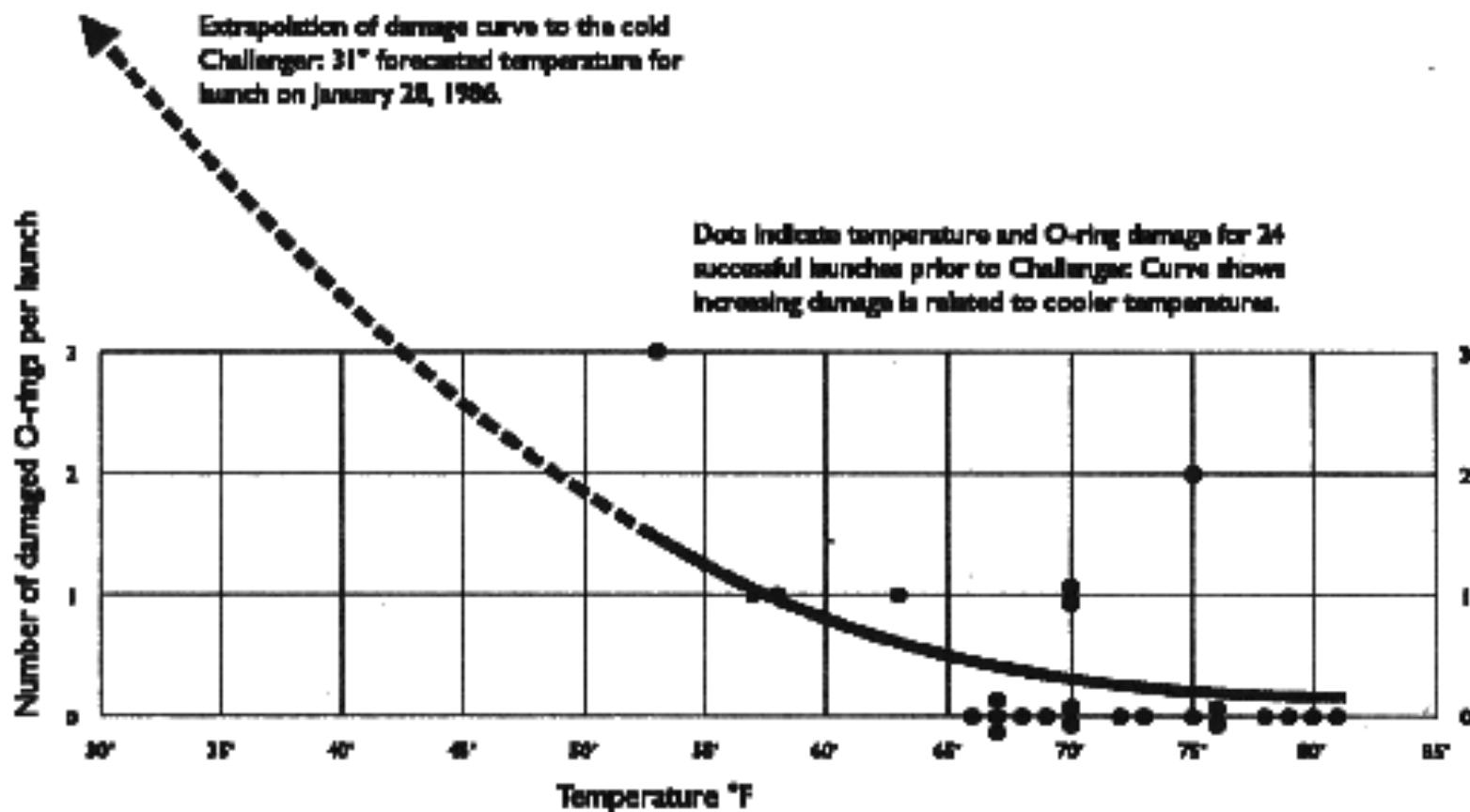
A Better Way to Communicate

Edward Tufte, 1997

Flight	Date	Temperature °F	Erosion incidents	Blow-by incidents	Damage index	Comments
51-C	01.24.85	53°	3		11	Most erosion any flight; blow-by; back-up rings heated.
41-B	02.03.84	57°	1		4	Deep, extensive erosion.
61-C	01.12.86	58°	1		4	O-ring erosion on launch two weeks before Challenger.
41-C	04.06.84	63°	1		2	O-rings showed signs of heating, but no damage.
1	04.12.81	66°			0	Coolest (66°) launch without O-ring problems.
6	04.04.83	67°			0	
51-A	11.08.84	67°			0	
51-D	04.12.85	67°			0	
5	11.11.82	68°			0	
3	03.22.82	69°			0	
2	11.12.81	70°	1		4	Extent of erosion not fully known.
9	11.28.83	70°			0	
41-D	08.30.84	70°	1		4	
51-G	06.17.85	70°			0	
7	06.18.83	72°			0	
8	08.30.83	73°			0	
51-B	04.29.85	75°			0	
61-A	10.30.85	75°		2	4	No erosion. Soot found behind two primary O-rings.
51-I	08.27.85	76°			0	
61-B	11.26.85	76°			0	
41-G	10.05.84	78°			0	
51-J	10.03.85	79°			?	O-ring condition unknown; rocket casing lost at sea.
4	06.27.82	80°			0	
51-F	07.29.85	81°			0	

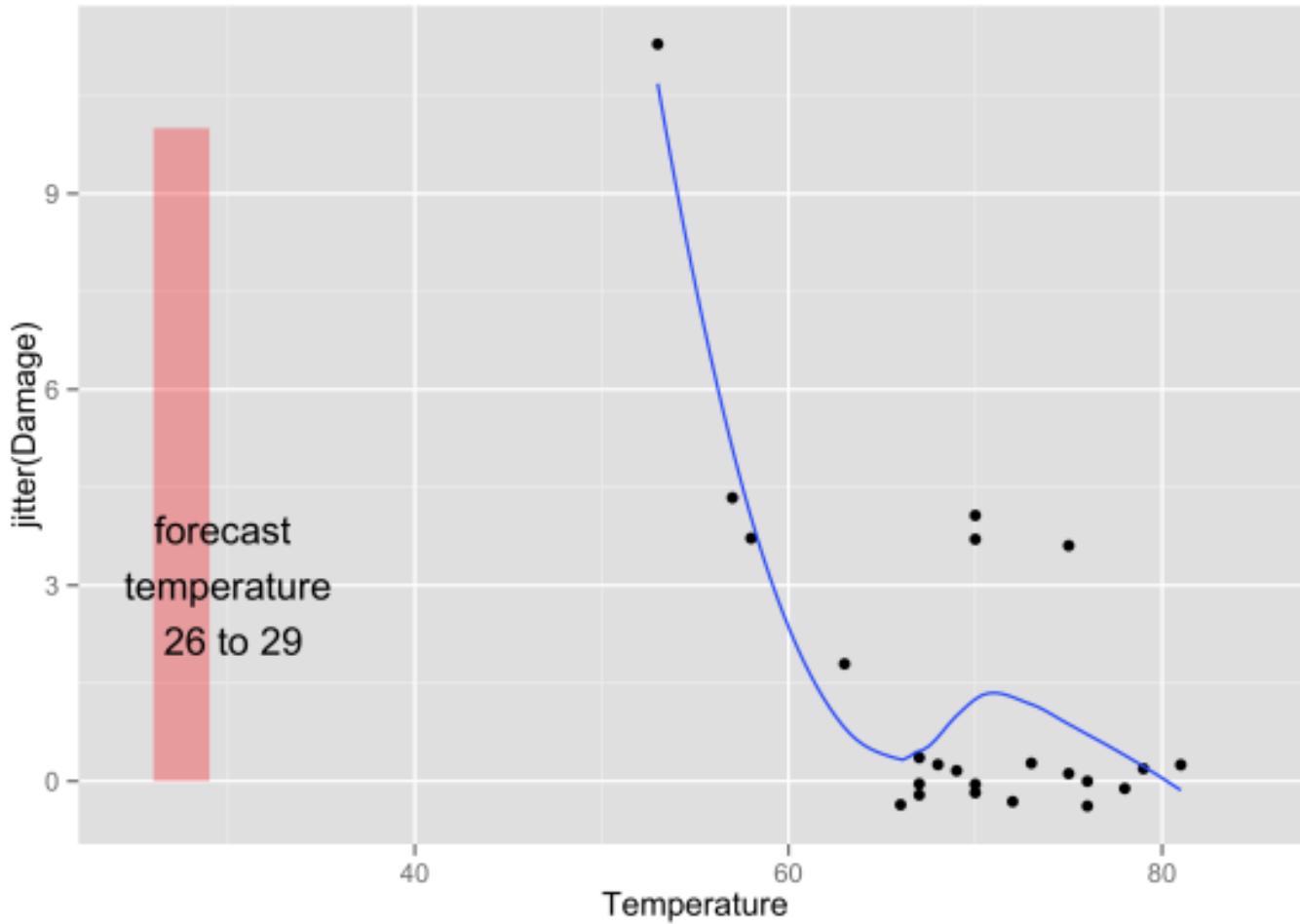
Tufte, E. (1997). *Visual Explanations*. Cheshire, CT: Graphics Press.

An Even Better Way To Communicate: Use Visualization (1997)



Tufte, E. (1997). *Visual Explanations*. Cheshire, CT: Graphics Press.

An Even Better Way To Communicate: Use Visualization (2015)



vizdatar.wordpress.com/2015/05/06/space-shuttle-challenger-explosion-2/

Poll

Could the MT engineers have done more to prevent the shuttle disaster?

- A. Yes
- B. No

Four Ethical Theories

- Consequence-based: Based on the principle of social utility; act to yield the greatest good for the greatest number
- Duty-based: Based on the principle of duty or obligations humans have to one another and never on the consequences of human behavior
- Contract-based: Based on the idea that humans should act to satisfy their own natural desires, but because humans are rational, this will result in a system that will protect them from harm by others
- Character-based: Based on the idea that individuals with strong moral character will do the right thing

Rule Utilitarianism

John Stuart Mill (1806-1873)

- Consequence-based ethical theory based on rules rather than acts; goal still greatest good for greatest number
- To use rule utilitarianism, identify an applicable **general** rule that, if followed, yields greatest net happiness
- Examples of general rules:
 - Always respect other's property
 - Do not steal other's property
 - Always follow company policies during employment

Breakout Discussion (3 min)

- Come up with several general rules applicable to the Challenger shuttle disaster. Note that a general rule should be independent of the situation.
- Decide among yourselves which one is the strongest and why it is the strongest.
- Determine your group's position (to launch or not to launch) based on your rule

Case Study: Space Shuttle Challenger Disaster

Rule Utilitarianism: General Rules

- If even one of the following general rules had been followed, the launch would have been delayed
 - Always heed the recommendations of experienced engineers over management.
 - Always ensure the safety of others; don't require proof that an action is **not** safe but rather proof that an action **is** safe.
 - Always follow the path that minimizes company liability.

Critique of Utilitarianism

- No intrinsic motivation for being moral
- Act utilitarianism can justify exploitation of the minority
 - Harvest organs from healthy individual to save five in need of organ transplants
 - Enslave 1% for happiness of 99%
- Fundamentally flawed because morality is tied to happiness or pleasure and determined by consequences of acts or rules
- Morality can't be grounded in consequences or in happiness

Four Ethical Theories

- Consequence-based: Based on the principle of social utility; act to yield the greatest good for the greatest number
- Duty-based: Based on the principle of duty or obligations humans have to one another and never on the consequences of human behavior
- Contract-based: Based on the idea that humans should act to satisfy their own natural desires, but because humans are rational, this will result in a system that will protect them from harm by others
- Character-based: Based on the idea that individuals with strong moral character will do the right thing

Rule Deontology

Immanuel Kant (1724-1804)

- Duty-based ethical theory; morality must be based on obligations humans have to one another and never on the consequences of human actions
- Need to apply Kant's two categorical imperatives:
 - Impartiality: No individual should be favored over another; no one should be treated as a means to an end
 - Universality: Same rules must apply to everyone
- Must address **both** categorical imperatives when using rule deontology in an argument

POLL

Impartiality: No individual should be favored over another; no one should be treated as a means to an end

Was impartiality satisfied in the Space Shuttle Challenger disaster?

- A. Yes
- B. No
- C. Not sure

Case Study: Space Shuttle Challenger Disaster Rule Deontology

Universality: Same rules must apply to everyone

- Devise rules analogous to those used in rule utilitarianism
 - Always ensure the safety of others
 - Make decisions based on best available data
- Based on poll results and the rules above, should the shuttle launch have been postponed?
 - **YES!**

Critique of Rule Deontology

- It will not help us in cases where we have two or more conflicting duties
 - Always ensure the safety of others → Delay launch
 - Always follow directives of management → Don't delay
- Leads to moral dilemmas
- Many ethicists, however, thought deontology was good and could be formulated to avoid dilemmas

Act Deontology

David Ross (1877-1971)

- Duty-based ethical theory; morality must be based on obligations humans have to one another and never on the consequences of human actions
- Identify *prima facie* (self-evident) duties that are relevant to the situation
- Reflect on competing *prima facie* duties and prioritize them
- Weigh evidence at hand to determine which course of action is required for the situation

Case Study: Space Shuttle Challenger Disaster

Act Deontology: *Prima Facie* Duties

- **Honesty:** Be open and honest about known facts, the reasoning process used to come to a decision, and the potential consequences of the decision
- **Diligence:** Scrutinize relevant data and make informed decision based on that data
- **Integrity:** Make decision consistent with NASA's code of ethics

Breakout Discussion (4 min)

- Choose a notetaker.
- Discuss *prima facie* duties besides honesty, diligence, and integrity to be considered.
- Prioritize the duties and decide the course of action (launch or delay) by weighing the evidence that was at hand for the launch.
- Notetaker will present results to the class

Four Ethical Theories

- Consequence-based: Based on the principle of social utility; act to yield the greatest good for the greatest number
- Duty-based: Based on the principle of duty or obligations humans have to one another and never on the consequences of human behavior
- Contract-based: Based on the idea that humans should act to satisfy their own natural desires, but because humans are rational, this will result in a system that will protect them from harm by others
- Character-based: Based on the idea that individuals with strong moral character will do the right thing

Social Contract and Rights-Based Contract Theory

Thomas Hobbes (1588-1679)

- Contract-based ethical theory which provides motivation for being moral, unlike either utilitarianism or deontology
- We establish a “social contract” in order to establish social order. For our own good and good of society, we are motivated to follow established contracts (laws) that preserve *natural rights* (e.g., property, freedom, privacy)
- To apply this theory, ask the following question: What legal contracts and natural rights are applicable to this situation?

Case Study: Space Shuttle Challenger Disaster Social Contract and Rights-Based Contract Theory

Relevant contracts:

- Professional codes of engineering ethics
- NASA's code of ethics
- Implicit or explicit contract between MT engineers and MT management
- Others?

Critique of Contract-Based Theory

- Contracts may not be legally binding, so they cannot truly enforce morality; minimalist morality
- Social contracts
 - Doing no harm is not the same as doing good
 - Kitty Genovese was murdered outside her apartment as 38 neighbors in her apartment watched without helping or even calling the police; when asked why they hadn't helped, some replied that they hadn't done anything wrong
 - Child drowning in four feet of water; social contract theory does not require you to help

Four Ethical Theories

- Consequence-based: Based on the principle of social utility; act to yield the greatest good for the greatest number
- Duty-based: Based on the principle of duty or obligations humans have to one another and never on the consequences of human behavior
- Contract-based: Based on the idea that humans should act to satisfy their own natural desires, but because humans are rational, this will result in a system that will protect them from harm by others
- Character-based: Based on the idea that individuals with strong moral character will do the right thing

Virtue Ethics

Plato and Aristotle

- Character-based ethical theory 2500 years old
- Ignores the roles that consequences, duties, and social contracts play in moral systems
- Practice virtues such as honesty, integrity, and generosity and this will lead to strong moral character.
- Ask “What kind of person should I be?” in a given situation, not “What should I do in this situation?” If you’re of strong moral character, you’ll do what’s right.

Case Study: Space Shuttle Challenger Disaster

Virtue Ethics

- A virtue is a moral characteristic that a person must have to live well
- Virtues relevant to shuttle
 - Prudence (cautiousness)
 - Justice (fairness)
 - Fortitude / Bravery (courage in pain or adversity)
 - Temperance (moderation or self-restraint)
 - Fidelity (faithfulness to a person, cause, or belief)
 - Honesty (truthfulness)

Poll

Based on the virtues listed and discussed on the previous slide, what would a person of strong moral character have recommended?

- A. Delay launch
- B. Proceed with launch
- C. Other

Analysis of Virtue Ethics

- Virtue ethics is limited because:
 - it doesn't resolve conflicts between competing virtues
 - it doesn't encourage examination of consequences
- It's probably best used in cultures where society as a whole is more important than the individual and where populations are homogeneous, e.g., in a country like Japan
- Still, virtue ethics is useful in technology because it can assist us in developing sensitivity to the ethical aspects of our professions

Ethical Theories

Advantages and Disadvantages

TABLE 2.3 Four Types of Ethical Theory

Type of Theory	Advantages	Disadvantages
Consequence-based (utilitarian)	Stresses promotion of happiness and utility	Ignores concerns of justice for the minority population
Duty-based (deontology)	Stresses the role of duty and respect for persons	Underestimates the importance of happiness and social utility
Contract-based (rights)	Provides a motivation for morality	Offers only a minimal morality
Character-based (virtue)	Stresses character development and moral education	Depends on homogeneous community standards for morality

Ethical Theory Wrap-up

- Recall that all the ethical theories we considered are old; in fact, we could call them classical ethical theories
- Philosophers and ethicists have continued to develop ethical theories
- Act deontology the basis for many modern theories
- In practice, combination of these theories is applied
- Ethical theories summary sheet has been provided in Ethics Information module in Canvas