ENGR 183EW Notes

W 1 M Lec 1-9-17

- Boelter 6417

Course Overview

- Ethics and case studies
- Look ahead to working career in the 21st century and hopefully the 22nd century and beyond.
- Build a personal ethical framework

Specific Course Objectives

- Put you in a better position to address serious problems as engineering professionals
- More and more of these engineering problems have societal and ethical complications
- Just a fact that we have to deal with.
- Take some time (two lectures) to talk about how society and technology have interacted in past centuries.
- Put emphasis on the 20th century

Q. Why do we have to learn history?

0. If we learn something about previous interactions, we have an understanding of how things we are dealing with now fit into a larger framework.
0. Unless we know what we accomplished, it is hard to get a bearing on what we want to accomplish in the future.

"Those who cannot remember the past are condemned to repeat it" - George Santayana

0. There are some periods of the past we might want to repeat (at least in an updated way)

- Learning something about the past is certainly valuable.

Methodologies and turning them into distinctions

- Making ethical decisions and putting an emphasis on writing and being able to present findings in a professional and readable way.
- The ability to work on teams that have people who are different from yourselves (not only in engineering but also ethnicity and backgrounds).
- We don't have enough diversity in engineering.

183EW Will Complete You As Engineers

- Students should understand **social, historical, and political** contexts
- In addition to social contexts, he may introduce political contexts.

… Help You Value Your Contribution…

- Great visionary!
- The most valuable thing you have are things you create.

- It is your responsibility to show that your powers are used for good.

… Provide a Guide to Action…
“Doing what’s right isn’t the problem…”

… Show You a Direction …
“Touch people with the *better angels of your nature*.”
- What are the better angels of your nature.

… an Understanding of What it Takes …
“Courage is the most important of all virtues, because without it we can’t practice any other…” - Maya Angelou

… and an Overall Goal!
“Intelligence plus character - that is the true goal of education.” - Martin Luther King, Jr.

In Summary
- You are people as well as engineers and what you have will have an influence on you as a person

My Background
- Preparation: UCLA Education
- B.S., M.S. & Ph.D., UCLA SEAS
- Postdoctoral Fellow, Weizmann Institute, Israel
- First act was to return UCLA and teach two types of courses
- UN Factors and a human factors department in the Engineering School
- Interaction of people in engineering systems
- Humanities for Engineering school
- The research at the time dealt with UN habitation underwater and the ability to perform and work under the sea.
- Second act: Defense Industry: Perceptronics, Inc.
- Ability to use AI-Based Decision Support
- Become the focus of what we did and it goes in different directions and the originators of the company was bought out.
- Third act: Training Apps and Robot Interactions
- SEAS Lecturer: Engineering 183EW

Business Experience
- Building a Creative R&D Organization that IPO’ed
- Responsibility to the SEC and other people in the world
- The present company is back to being private and still working in R&D

1st Product: Videodisc Gunnery Trainers
- Great grandfather of DVDs was the laser videodisc
- It allowed you to store video on a rotating medium instead of a tape drive.

- You had to wait forever to get to a part of a type you were interested in.
- Put the videodisc player to work along with a single computer

Small Extensions of Concept

- We have to go into different directions and create a 3D Virtual Battlefield
- Could people fight in a 3D Virtual Battlefield
- If each entity was a simulator, you would see a terrain and some other entities that were also manned by people.
- After a feasibility study, if we created a group from Boeing and have an idea for an inexpensive computer-generated image system, we could link them together in the same way that the internet was linked

SIMNET = Full-Crew Simulator Network (1st MMOG)
https://en.wikipedia.org/wiki/SIMNET

SIMNET Full-Crew Tank Simulator

- The helicopter simulators and so forth

SIMNET Original Virtual World

- 120 x 240 px and it was like looking out of a screen door with your glasses off
- The game itself is exciting
- We could demonstrate that people could coordinate their actions and if you download the slides, it was a contest in which the US never won before.

My Current Interests Include…

- Stress and anxiety and another thing was a computer aid to paramedics
- Mass-casualty incidents and people are involved in an accident, terrorist event, or crime.
- Fort Launderdale last week.

Why Is Simulation Important?

- If you could get past the first few exposures, then your probability of being killed or injury went way down.
- If you can get past the fog of war, you have a much better chance of surviving.
- They did a Top Gun simulation or red flag down in Miramar and turned into Top Gun (Tom Cruise)
- People were player laser tag with airplanes, so the Army got into it.
- They made a place where you could play laser tag with tanks near Barstow at Fort Irwin
- Virtual simulation was cool and this involved successful iterations, and the common principle was condensed experience.
- Very effective at working with emergencies and we will return to this and it can be applied to many areas.

Exams

- The limitations of multiple choice and short essay questions
- Our philosophy in this course is that you do well!
- Confident in the material that we give you and if you do well on the exams, ti means you have learned the material and we are very happy.

Grading Percentages

- Don't copy-paste sections; put where you got it!
- Teach you how to do citations
- Don't put anything from anyone else's paper.

Why We Emphasize Good Writing

- Go from staff to manager or consultant
- Deals with clear language and a great advocate for clear writing - George Orwell
- How to say what you mean to say and not embellish it or hide it in anyway.
- Bad writing was a technique to deflect attention, but nowadays, bad writing is a way to soften opinions and we don't want to do that as engineers.
- We want our recommendations to be straightforward or understandable.

Writing and Successful Employment

- As you progress in your career, you will find out the ability to write is very important.
- The ability to write a good, short report is rewarded.
- Engineers are not bad writers to start with, but we are NOT illiterate!
- We also have the advantage of writing about real things (systems are easier to write about than a poem)
- It is descriptive, straightforward and lends itself to the types of rules that George Orwell came up with.

The Ethicist asks if it is ethical to have good writing skills.

- The ethicist says it is valid because good writing is an important part of the engineering job.
- When you apply for a position, you can say you have taken a course in writing and even present an essay that you have written as your qualifications.

Our Writing Criteria

- Look at the table of contents and see if it makes sense
- Look at recommendations and it doesn't have to be original ideas from among previous recommendations
- NOT a creative course, but make you feel better and it doesn't have to be an essential part.
- **Spiral-bound, printed on one-side of the page only.**

1st Assignment: Autobiography & Analysis

- ~ 2 pages

Society and the Two Cultures

- About 60 years ago, there was an interesting essay by an English writer named C.P. Snow
- Really skilled in a number of things
- Good writer of novels: life in the university at Cambridge
- Actually a biologist
- Served as an office in a World War
- Two cultures
- People who have received their backgrounds in one of two cultures

0. Humanistic - religion (North Campus)
0. Scientific - science and technology

- The political leaders of the society are taken from a humanistic culture
- The problems they are facing are taken from the scientific areas
- Snow suggested there should be more cross-education
- One of the responsibilities of engineers is to learn about the society
- Greatly emphasized the number of units we had in the humanities
- To get even more humanities into engineering students, we would have a one year course for freshman called “Humanities for Engineering School”
- If we fast forward to the present day, what is the political leadership of our country

The Two Cultures In Action

- Department of Defense is Ashton Carter, Ph.D in Physics

Today: Technology leads, and society reacts

- Making use of technology in a way that could have been anticipated but not guarded against.
- The solution today is for responsibility
- The people in the lead have to be aware of the effects of what they can accomplish are.

The Engineering Sub-Culture

- We have some special characteristics
- Special languages
- Mathematics
- Graphs and Spreadsheets
- Schematic Diagrams
- Feedback diagrams for a training system
- PPT & Reports
- We see ourselves as:
- Creative
- Right up to senior year in HS, Weltman thought he was going to be a commercial artist.

- Everyone in the room was better than him (unfortunately), but he went to his HS counselor and she suggested he become an engineer
- As an engineer, Weltman had a chance to participate in the creation of something important.
- Practical
- Solution Oriented
- Give an engineer a problem and they come up with a solution
- Fear that technology is unbounded
- Rational
- Give a quantitative component and a reason to express and a recommendation
- Others may see us as:
- Overly Analytical
- When you meet a girl, you should marry them
- Problems over People
- Unbounded
- Give technologist any problem, no matter how horrific, and they will work on a solution
- Death camps of WWII where the Nazis were exterminating a variety of people
- Burning the bodies so there wouldn't be any evidence
- These are the types of things engineers have participated in
- Dangerous

For Example…

- Atomic bomb - Oppenheimer
- The decision to try to end WWII in Japan
- The way that decision was made put people on edge and put people on edge ever since

Two Definitions of Ethics

- Set of ideas and rules by which to live
- Incomplete
- Ethics is **not only** a set of ideas and rules by which to live, **but also** a set of acts based on ideas and rules by which to live!

Existential Ethics and Engineering

- In the Existential World…
- Ethical structure is defined not by what you say it is, but what you do with it.
- Oversimplify that acts are more important than words, but it is within that freedom that defines your ethical structure.
- The hero/heroine is forced to act and engineers are forced into an existential world since decisions are a form of action
- Engineering Decisions are….
- Relatively uncertain (not necessarily a right or wrong answer)

- Probability in the course of our decision making
- A time constraint and we usually don't have years
- Most frequently have weeks and sometimes we have days and hours
- Decisions are made as a team and across organizations and even the current structure of worlds across countries
- Dean Boelter used to emphasize that engineering decisions have balances
- Trainwreck or airplane crash that we will talk about
- Over half the world connected to the Internet and a large proportion on Facebook
- Our consequences are reflected many orders of magnitude.

Ethics in Engineering Decision Making

- Sometimes we say we don't do that or we have to.
- A Decision Making Component
- Things we look for in organizations and standards
- We are worried on a national/international basis of what we want to live by.
- From a Personal Standpoint
- **BEING ETHICAL vs. Having Ethics**

Wizard of Oz

- Existential parable
- The scarecrow wants a brain, but he gets a diploma in the way he solved the problem
- The tin man gets a heart to put on his chest, but he displayed emotion
- The cowardly lion needs courage, but gets a medal because he was brave

The Engineering Profession

- The narrowest definition is what you do for a living
- Weltman grew up in an atmosphere and their ideals were that you work hard at what you do, but what you do is NOT necessarily who you are.
- Some of them followed a back to farming philosophy and they became chicken farmers in Petaluma
- Poets/writers and actors
- We have a responsibility from authority from licenses or a certificate of graduation
- Engineering Environment
- More frequent that engineers are in the rule of consultants working for several companies
- Entrepreneurs that do startups in this environment and the role of the engineer is that the company he/she works is much more flexible than it used to be.
- Organizations are more distributed and likely to be involved with companies that are outside the U.S. as part of the last political campaign was about.

- NOT going to change whether we bring manufacturing jobs back to the U.S. or not.
- Our influence is probably as high as it has ever been
- Engineers make great contributions to the societies of their time and the next century in biomedical, nanotechnology, and VR will be even bigger.
- Tremendous things on the way.
- Look through where you are and see how to impact these things
- Outside influence on your ethical structure
- Personal ethical framework and what you have from a variety of sources such as professional codes and other things you have talked about
- You have to consider organizational ethics and take things like this into account

Professional Ethics Counts Positively…

- Northrup Grumman - a combination of companies and a person acted ethically throughout the transaction
- The Great Recession was an epidemic of lying, cheating, and stealing, which we recognized and at the time, we were NOT going to do that again, but we ended up doing it.

Step-Wise Optimization

- If you had a problem that was too big to solve in one comprehensive solution, what you did was a series of smaller solutions, and if each led toward the objective, eventually you would wind up at a solution.
- The world as it is - lowlands
- The world as it should be - highlands
- Ethical decisions enable us to move up the mountain

“Framing” Engineering Decisions Can Help

- This is a study done by some psychologist at Notre Dame, and if we gave groups some problem, but they told one group it was a business problem and the other group that it was an ethical problem, they got two sorts of solutions
- Ethical group emphasized costs and benefits to people.
- It can be an engineering problem, ethical problem, and a society problem

The Challenge (and Opportunity) Ahead*

- Need to lie and cheat sometimes to succeed…
- Successful people do anything to win even if others call it cheating
- Everybody feels that they are better than other people at doing the right thing
- Satisfied with own ethics
- 99% thing it is important to be a person of good character
- Something drawing most of us to doing the right thing

W 1 W Lec 1-11-17
Sources of Ethics

- Idea that there is a biological component (fairness) - the idea of fairness shows up very early and shows up about as early as language.
- We are hard wired to learn language and learn social interactions and we may be equally hard wired to learn fairness.
- Monkeys doing the same job next to each other but being fed different rewards, the monkey getting lesser rewards quits working because it is not fair.
- The guy working next to me is getting more bananas and it is NOT fair
- The 2nd child comes into a born family with an older sibling who squeezes too hard.

Natural Law

- Fairness and justice or out there - they exist and they only have to be recognized to be applied.
- Other sources are revelations and higher order beings have told us that this is what we have to do.
- Because they are transcendental or divine, we have to listen.
- There are ways of conceptualizing ways or thoughts in the domain of morals or ethics and we can put them in.

Societal Law

- We are part of a family with ethnicity - directly or indirectly from somewhere else in this country.
- Gender has an effect on how fairness and justice play out.

Ethical Progression

- Divine and legal codes
- Then comes a revealing process in the Biblical Era - Old Testament and New Testament
- Specialized life codes
- Ethical philosophies
- Society's laws and regulations
- These things evolve and change.
- We form laws and regulations and change them later on.
- We hope we reach some better goal.

Early Codes: Egypt & Mesopotamia

- Cradles of civilization
- The characteristics of those codes was that there was a combination of court records and conceptualizing laws

Code of Hammurabi

- Property laws
- Testimonies between masters and slaves
- Harsh penalties
- Corporal punishments or trial by death
- Different eras had different ways of doing this.

- Codes of dealing with testimony, property, and relationships between masters and slaves.

Earliest Biblical Material (~1000 BCE)

- One of the earliest fragments found in the area surrounding Israel
- Deals with issues of justice

Revealed Laws - Noahide (Israel, ~600 BCE)

- Laws for the tribes of Israel are slightly different
- All of humanity was given to Noah after the flood
- We recognized the first six because they show up again in a document we are more familiar with.
- Equity and justice
- Is it against cruelty to animals or do they want to distinguish themselves from other tribes?

Revealed Laws - The Decalogue (Israel, ~500 BCE)

- They appear in the document called the Torah twice but they appear alongside of 613 injunctions that regulate behavior, disputes, and ideas of what we should be doing.
- The 10 Commandments are still current in our discussion.
- Of these 10 Commandments, how many are illegal?
- 6, 8, and maybe 9
- False testimony that damages a citizen could or could NOT be illegal
- False testimony under oath is illegal

The Ten Commandments and the Constitution I

- Sometimes comes to the level of court decisions
- In general, because people want to say these are the basis of our society and they should be displayed in places that are public and deal with the administration of our society.
- Put the 10 Commandments up in our court houses, parks, etc.
- This runs into a very interesting thing that frequently happens and we have a wonderful constitution in our hands
- Major step forward in thinking of the world
- No state religion for the U.S.
- At the same time, Congress would not prohibit anyone from exercising their religion

The Ten Commandments and the Constitution II

- If the Ten Commandments are right in the courthouse, then that is forbidden because it chooses an establishment of religion
- The government is giving an imprint on that religion
- If it is removed from the public place, then perhaps that is permissible
- Places where moral precepts start coming into interaction with laws and the court of the United States makes a decision

Example Additional Injunctions: Leviticus 19

- Formal laws

Revealed Christian Doctrine (Israel, ~30 AD)

- Penalties of the Old Testament are not that different, a lot of emphasis on execution and harsh penalties
- A continuing emphasis on vengeance and to the meek, agree with your adversary and murder begins with the heart.
- Turn the other cheek, do not give “an eye for an eye, a tooth for a tooth”

A Golden Conundrum

- The golden problem: “How do you know what is hateful or desirable to others?”
- The oversimplification is assuming everyone is the same
- Does NOT work!
- If I assume what brings pleasure to me brings pleasure to other people, I wind up doing something that gets me in trouble
- Assuming people are the same does NOT work and we might try the idea of principles over particulars
- Find out what would please her and give her the same type of pleasure
- Empathy - the ability to understand what pleasure and pain is to other people
- We get this by building cognitive models
- Thinking and shared cognitive models - we think we understand what motivates our friends and our family
- We are frequently wrong and almost all families have some type of problem.
- We think this an area we can improve upon.
- Individuals emphasize psychology, while groups emphasize sociology
- Meta-cognitive processes
- The ability to think about our thoughts and test those models.
- See if they work and stick with them if they work.

Codes: Chivalry (Europe, ~1000 AD)

- One of the interested codes is chivalry - the code that accompanied the feudal period in Europe
- Time when the Church which was built supposedly becomes a major power throughout all of Europe
- Armored portion of the Church is to make war on infidels without cessation or mercy
- Engage in operations like the Crusades or Jewish populations
- Love the country of your birth - created strong nationalism
- Champion the Right and Good, be generous, respect weakness, and never lie

- This becomes a major tenet as we go from Europe to the New World with how we deal with other countries and have a Prohibition about disinformation
- In the world of the Internet, we are engaged in lies and disinformation campaigns

Codes: Bushido, Way of the Warrior (~1100 AD)

- The fundamental qualities of justice, bravery, etc.
- There is politeness, honor, and loyalty that is similar with slightly different time frames and ideas.

Codes: Magna Carta (England, 1215)

- The idea of Magna Carta is an actual document signed by King John about an agreement with the barons
- The team is subject to the laws of the land
- The king is subject as everyone else is to the laws of the land.
- The laws of the land are above the monarch
- In many people's mind, this is the fundamental precept of democracy.
- Other people want to include Magna Carta in laws and regulations that we have today.

Codes: Boy Scouts (England, ~1900 AD)

- Formed in the early part of the 20th century and has chivalry
- These properties are embedded in your mind:
- Trustworthy
- Loyal
- Helpful
- Courteous
- Cheerful

Codes: West Point (USA, ~1950 AD)

- A cadet will not lie, cheat or steal, *or tolerate those who do!*
- We can define those carefully!
- When West Point opened its doors to women, a new type of offense showed up: sexual harassment
- Harassment based on religion: harassment
- UCLA code of conduct is about 23 pages
- If I asked you to give the most important things, you could NOT do it!

Codes: Engineering Profession (USA ~2000)

- Engineers all in favor in the ACA or are half of them against that

Morals, Ethics, and the Law

- How do we agree to treat each other and deal with everything
- The law about what we can be arrested for is what society establishes as rules of behavior

- Sometimes ethics gives us guidance about what we have to do within the law
- We try to follow laws and regulations for the most part (with some exceptions)
- Sometimes ethics and morals help us form laws when there are no laws and regulations to begin with.
- Equally important is that morals and ethics cause us to eliminate or change laws that are outmoded because society no longer believes in the precepts of which they were formed

Example: Creation of New Laws

- Child labor
- Industrial Revolution was fueled on coal, which comes out of underground mines.
- They are mined by tunnels that reach out to the coal face.
- In England, it is economically advantageous to make the tunnels as small as possible.
- How do we get them back to the center of the mines?
- Wagons
- How do you move the wagons?
- Too small for animals, so you use children because they are small, inexpensive
- Children called “hurriers” are used to push and pull these wagons
- 16 hours a day
- People started to look at this and say it is wrong and terrible!
- Even if children survive it, their growth and capacity is stunted.
- 1802 - reduce the work day from 16 to 12 hours
- 1847 - the work day is reduced to 10 hours a day and a succession of child labor laws are imposed.
- In most industrialized countries, we have pretty rigid child labor laws.
- In much of the world, we still don’t.

Example: Reversal of Existing Laws

- Discrimination of people who are close to us
- It was illegal to offer contraception/abortion
- Illegal to marry outside of a defined racial group
- Certainly up to 15-20 years ago, the idea of same-sex marriage was illegal
- Foreign and wasn’t even on the legal radar
- Things change and continue to change!
- Under discussions
- Torture
- Death Penalty
- Greenhouse Gas Emissions
- Sale of Body Parts
- Some things we remove, others remain

Ethics, Morality, and Law: A Local Example

- I can open a marijuana dispensary or an alcoholic shop
- No part of sailed premises should be rented to African, Chinese, or Japanese descent!
- This was common and legal in LA until about 1963-1965

Ethics, Morality, and Law: Summary

- Many problems we face are inside what we call legality, which are legal but might be unethical
- One has to be aware of changing laws and regulation
- When Weltman started Perceptronics, we sat down together and establish a set of ethical principles by which they will run our company
- This meant paying secretaries as much money as technicians because they are doing jobs of equal importance.
- We won't take into account marital status or retired status when negotiating a salary
- Example: Her husband is making a good living so we will pay her less money
- In some instances or in the case of our outgoing president, when he started 8 years ago, he was ambivalent on the question of same sex marriage, but afterwards, he was a strong supporter of same sex marriage
- Obama expressed opinions that are out of tune in Alabama, which is historically a very conservative state
- Are you a different person now than 35 years ago because his party has a majority in the Senate.
- Maybe things he did 35 years ago cause enough enough senators to frown upon this.

The Role of Religion in Moral or Ethical Action

- This remains paramount in some faith-based communities
- What Thomas Jefferson did in his mind was try to separate out the ethical parts of religion from the miraculous parts.
- He created the Jefferson Bible, where he cut out the portions of miracles like walking on water and making loaves and fishes.
- That was not observable and we wanted the ethical portion
- A more recent person is the Dalai Lama, who is also considered a highly religious person
- Writes a book called Beyond Religion
- There are 10,000 religions in the world, and some of them are well-known and share remarkable fundamental aspects
- Good argument that you can arrive at those precepts from secular (non-religious) viewpoints.
- We can reason our way to moral and ethical principles and we don't have to start at one of those 10,000 religions
- You can get to very near the same place.

The Role of Science in Moral or Ethical Action

- If there is a biological component to fairness and justness or if we are hardwired to act on it, then the great strides forward we are making in neuroscience will find that part of the neural network.
- This will deal with fairness and justness.
- We can explain why we think and act the way we do.
- This is why we are drawing the blueprints for what we do in the brain and how they happen.
- A bit of a stretch and how to deal with fairness and justness.
- Other aspects that go along with it such as conscience.
- Sociopaths are missing areas of concepts like fairness

The Role of Reason in Moral and Ethical Action

- Do we need reasoning to carry out moral and ethical actions
- A symposium that asked that question - is reasoning necessary for moral and ethical actions
- They answered in different ways!
- Interestingly, the Muslim cleric said reason plays little or no role
- It depends on compassion, a form of empathy
- If you have compassion, then the actions come naturally
- Decisions that are analytical and reasoning/calculation based.
- Most of the other people in the symposium said that at some point, there has to be reason.
- People establish philosophies and come up with humanistic and mental algorithms
- However, they have these at the point of action, they act on accordance to what they had stored.

Sample Application: The Gorilla or the Child?

- What it be different if a 97 year old in a wheelchair fell in there?

The Role of Intuition in Moral or Ethical Actions I

- We attach these things to intuitive, emotional reactions
- Ranges from care to harm - we can see that in the intuitive reaction to what was happening to the toddler.
- There is another dimension that is from liberty to oppression
- This guy not only postulates that those are fundamental, intuitive reactions, but we can also understand the reactions
- Democrats care more about the range of care/harm (welfare programs), liberty/oppression (argues that this comes across party lines), and fairness/cheating
- Republicans care about loyalty/betrayal, authority/subversion, and sanctity/degradation

The Role of Experience in Moral or Ethical Action

- LA in the 1930s and 1940s was a very segregated place.

- Not as overtly segregated as the South with colored drinking fountains, but we had strict rules on who lived in what neighborhoods.
- The Jazz singer Nat King Cole moved into a gated community just west of downtown
- In junior high, they were very diverse - Japanese, Chinese, Mexican

The Role of Choice in Moral or Ethical Actions

- Ethics comes down to acts - in the consideration of what you want to do, it is desirable to think of acts that don't meet that criteria.
- I have bad thoughts, and I act on the good so I am making an ethical choice.
- A nice thing to take away from this.
- Unless you have questions and comments, we are leaving.

W 1 Dis 1-13-17

Due Next Time

- Problem Statement
- + Bibliography
- + 1 - 2 sentence planned ethical analysis approach

Roger Blum

- rblum@ucla.edu
- Email him early
- Green Bay Packers fan

Discussion is mandatory and I have to let him know by email if I miss discussion

- What he grades:
- Individual Paper 1 (ECS) - 12%
- Individual Paper 2 (Hardin) - 12%
- Participation - 9%
- Not enough to show up but contribute to class discussion
- Team Presentation - 5%

Important Due Dates

- Individual Paper 1 (ECS)
- Draft: Week 3 || Final: Week 5
- Individual Paper 2 (Hardin)
- Draft: Week 7 || Final: Week 9
- Various team paper intermediate deadlines throughout the quarter
- ** These due dates are subject to change

Discussion

- Office hours
- None. But…
- "Conferences" - will meet for 20 minutes with each student twice. Once to go over ECS draft, other to go over Hardin draft

Goals

- Become better writers
- Believe writing matters
- Become better teammates
- Working with a group for your team project with people you never met before
- Become better presenters
- Class participation + team participation

How to Succeed

- Class moves quickly!
- Put effort into first draft
- Start early and just tweak about 5 little things and save a lot of time.
- Undergraduate Writing Center
- Book now: Week 4 and Week 8
- Note: Lecture and discussion not closely related
- If you ask him stuff about lecture, he might not know the answer.
- Lectures are kind of random and go over engineering stuff from the past and the history of it.
- Survival Guide - Read it! (Will receive Monday)

Plagiarism

- NOT tolerated!
- Whether you directly quote or paraphrase, cite your source!
- In-line citation
- Bibliographical entry

Plagiarism in the News

- Melania Trump stole Michelle Obama's speech
- Monica Crowley plagiarized this book and Harper Collins plagiarized books
- She also plagiarized her Columbia Ph.D dissertation
- Ghanaian President used speeches from Clinton and Bush
- Ben Carson had prepared testimony that had accidental plagiarism

Normative Ethics and Ethical Frameworks

- First paper will be all about ethics and you will use them and apply them to an engineering case study.
- They kind of happen all the time more than they should and we can be ethical engineers.

Volkswagen

- Rigged their emission testing and when the testing was going on, the emissions committee found out
- When they are on the road, they emit way over what they claimed to.

- Six Volkswagen executives are paying huge charges and it is a $20 billion corporate scandal
- All of these executives are from Germany, and when he was in the Miami airport, U.S. officials arrested hi.

Fiat Chrysler
- E.P.A. accuses Chrysler of being a part of an emissions cheating scheme.

More cases…
- Takata airbags - cheaper instead of safer.

Normative Ethics
- Pick a case study that happened in the past and analyze if they were ethical or if they were not.

Ethical Theory
- Meta-Ethics
- Applied Ethics
- Descriptive Ethics
- Normative Ethics - How should people act?
- Virtue Ethics - focus on person
- Consequentialism - focus on consequence, result of actions-> Utilitarianism
- Deontology - focus on the act itself -> Kantianism

0. Virtue Ethics
- Basics
- Actor - person making the decision
- Focus on morals/virtues of a person/company
- **A right by thinking that a right act is the action a virtuous person would do in the same circumstances**
- Example
- Putting a horse down out of compassion - showing virtue of compassion by killing the horse, even though it would seem to be bad normally
- A lot of things come down to greed or money, unfortunately
- These are generally accepted and what good virtues are
- Criticisms
- Does not give concrete clues on how to act
- Sometimes it is hard to decide what is the best decision to make.
- Both decisions can be virtuous in different ways.
- Difficult to check intentions of the actor
- Look at a decision and they probably acted out of greed and you don't know what motivated them to make that decision
- Virtues can be relative
- Depending on your background and your culture
- Notes

- Difficult to use effectively in paper; only applicable to certain topics

0. Deontology (Subset: Kantianism)
- Basics
- Action
- Not really about who is doing it and what the consequence of the action is
- Looking at the action itself and seeing if it is ethical
- An action is morally right if it is in agreement w/ a moral rule that is applicable independent of the consequences
- Kantianism
- Categorical Imperative

0. Universality Principle
- Act on the maxim that you can at the same time will to become universal law
- Always act in a way that it will be a general way that is applicable to everyone in the same situation
- maxim - practical principle that prescribes some action
- "Do not lie"

0. Reciprocity Principle
- Do not "use" people as a means to an end
- "use" often means to withhold information
- If I ask one of you to loan $100, but I am never going to pay you back, then that means I am using you.
- Example:
- Killing horses is wrong
- If you look at it from the Kantianism framework, it violated a universal maxim!
- Volkswagen maxim
- It is okay to make cars that perform differently during testing (universality)
- withheld true emissions data (reciprocity)
- Criticisms of Kantianism
- No exception to the rule
- What if you have to lie to help a friend?
- There is a maxim of helping your friends, but this can generate a sticky situation.
- Notes:
- Must use this theory in your paper
- Always apply both parts the CI (categorical imperative)
- **Read "Applying Kant's Theory to Ford Pinto Case"**
- **Pg. 95 in textbook**

0. Consequentialism (Subset: Utilitarianism)
- Basics
- Consequence

- Utilitarianism - measures consequence by one value: human pleasure, happiness, or welfare
- Utility Principle
- “The greatest happiness for the greatest number”
- Jeremy Bentham
- Freedom (no harm) Principle
- Everyone is free to strive for their own pleasure as long as they do not deny or hinder the pleasure of others.
- John Stuart Mill - leads to the exploitation of minorities
- You can strive for your own pleasure but you shouldn’t hurt other people
- Drugs: you can get high and drunk but don’t hurt other people!
- If you hurt yourself, it is fine as long as you are not hurting other people.
- Example
- Bjork-Shiley
- Why is their decision good/bad based on the outcome
- Violating (no harm) Principle
- Prioritizing money and saving time over money
- Priorities?
- Criticisms
- Measuring happiness - you cannot really do it!
- Exploitation of minorities
- Consequences cannot be foreseen
- What decision will lead to the most happiness?
- It is hard to tell the consequences of certain actions
- President of the U.S. - do we go to war or not?
- Look at it from their point of view rather than using hindsight because hindsight is 20/20
- People will get hurt, so it is hard to apply this directly.
- Always harm involved in these decisions
- This idea only exists in a utopian role when you don’t have consequences and harm.
- Notes
- Money can often be used to quantify happiness
- Review
- Is it moral to lie?

0. Deontologist: Never! - breaks moral law
0. Utilitarian: Sometimes - what will bring out the most happiness? If you lie, it might make people more happy!
0. Virtue Ethicist: Consider the decision’s outcome to judge the decision maker’s moral character

- We can see if a person was acting out of compassion!
- Using the consequences to establish the virtue, but I cannot just look at you and say you are honest, but rather looking at the outcome to judge a person’s ethics.
- More parallel with deontology, so it kind of goes with the maxim of never lying, but the focus here is more on the moral character of a person

3 Takata Executives Face Criminal Charges

- When they go off, they do so in a way that can kill you.

Applying Ethical Frameworks

- Example 1: When dropping off hw, you noticed your friend copying answers
- In the end, you did neither.
- Universality - you want to give someone the benefit of the doubt, treat others how you want to be treated.
- If you go by deontology, this contradicts deontology and the maxim is that cheating should be punished.
- Is there any way you could justify deontology?
- Is there a way to justify cheating and find the maxim for a certain case?
- In her case, how do you figure it out and think about universal will.
- Norms: promise a friend you will see a concert, but let's say you have a family emergency
- The maxim of helping a friend is more important than grading papers on time.

- Example 2a: teammate is using PEDs
- By deontology, you would want to turn them in and make it universal because the other team would want to screw you over.
- Do you evaluate our reactions to the case?
- He would be harmed if you turn him in, but there is potential for more harm. Choose the one that minimizes it.
- What ifs make an interesting perspective.
- Example 2b: they found a teammate using an illegal substance, and people would question if they deserved to win or not.
- Base this off your morals by not winning based on cheating.
- Wishy washy because you are trying to quantify happiness, but try to see the harm and utilitarianism
- If it is a preseason match, hopefully it never resurfaces, but it can compromise the rest of the season.
- Kill your friend because of guilt and that's one way to look at it.

Read ECS (Ethical Case Study) - first paragraph of this essay will be the problem statement

- Write down your sources and have a planned ethical analysis approach
- Have to use Deontology
- Pick either reciprocity or universality principle

guides.library.ucla.edu - useful link for research

Sources: The Good, the Bad, the Eh

The Good

- Peer Reviewed / Scholarly Journals - authors with credentials, abstract, few or no advertisements, black and white printing on flat, white paper, usually published quarterly
- reputable web domains

The Bad

- Wikipedia -
- Personal websites / blogs
- Biased Websites / Magazines - Bias or misinformation
- www.martinlutherking.org - a White Supremacist Group
- www.dhmo.org - H2O is water and people who drink it die.
- Works of Fiction

http://guides.library.ucla.edu/eng183
http://www.bol.ucla.edu

Liz Cheney

- echeneyl@library.ucla.edu
- tjaponte@library.ucla.edu

Intermediate deadline with 35-40 pictures and spaced out.

- A lot of time to work on it during class, so on that note. Try to bring your laptop to class to take advantage of team time.

W 2 W Lec 1-18-17
U.S. Declaration of Independence

- When it is necessary to dissolve the connections, it is there in nature.
- Laws of nature and natures God is a specific term which we will clarify.
- We hold these truths to be **self evident**
- All **men** are created equal
- We don't have to justify this because it is self-evident.
- The government has disappeared!
- When the government no longer does it, then it is the right of the people to dissolve them.
- There are a lot of **BUTs** in this
- Slaves (not included as citizens), women (not included in votes)
- Founding Fathers knew this and they knew if they addressed the issue of slavery as a right or wrong, there would be no union because the Southern states were not going to give up slavery.
- Changing and evolving has characterized rights from that time on.

The US Bill of Rights

- It looks a little incomplete, so maybe we should introduce some Amendments for the rights of the people and the rights of the government.
- 10 Amendments we call the Bill of Rights

Rights Issues

- Where Do Rights Come From?
- Nature, Natural Law, God
- Inside Sources: Reasoning from previous Codes
- Wrongs: Rights come from Wrongs (it is easier to recognize something is wrong than to imagine a utopia where everything is right)
- When you see someone suffering under slavery, you know that is not right.
- Rights are defined as being different from morals
- Preferences are that we vote on the First Tuesday of November.
- The right to vote is a right (more substantial)
- Rights have to deal with relations of the people to the guardian
- Super preferences are things we agree to do because they are convenient.
- Why are Rights Important?
- They are particularly important because they restrict the actions of government
- Protect minorities against sometimes the will of the majority.
- By doing so, they help us get to what is the essence of our society.
- What we really stand for at this time or how is it different from what we stood for at different times.

Case Study: California Fair Housing

- Legally discriminated against certain people and enforceable in my parents' time
- To show you that such a law could be overturned when the ethical climate changed is that the ethical climate didn't really change.
- California's Proposition 14 [1964]
- The people of California voted to discriminate and a majority passed Proposition 14 while the Courts overturned the Proposition
- The Supreme Court said that we were at a point where we would not discriminate anymore.
- Spread to the rest of the country.

Other Rights in Opposition

- Amendment that says there is a right to keep and bear arms
- Opposing that is the right to be protected from murder and attacks
- Freedom of speech
- A non-hostile environment where one is not harassed or insulted
- A right to religious freedom
- A right to tolerance and opportunity
- These are the three most important rights today!

The Question of Arms

- The Founding Fathers were really good at writing short, understandable paragraphs
- The 2nd Amendment is not such a good example of this because it is ambiguous
- It starts off by saying a well regulated militia is necessary to a free State.
- Armies were generally raised from among the people
- Formed in states or communities, so the state depended on the ability to raise militias
- At times, the federal government did not have a major supply of weapons.
- This made sense in 1800, but what does it mean now
- In 2008, the US came up with the interpretation that people have the right to bear arms for self-defense (NOT defense of the state!)
- People keeping and bearing arms are afraid of the state, and they believe their arms are necessary to control the powers of the states.
- There is infringement

Arms Regulation in Practicality

- Weapons used by deranged peoples or terrorists for ideological purposes
- A person can be mentally incompetent and NOT have the right to bear arms
- You can't bear an atomic bomb or a cruise missile or a machine gun
- The current point of discussion is where is the right on high-capacity magazines and assault rifles.
- Things that are almost machine guns but not quite.
- This is a point that is being debated.

The Question of Free Speech

- Congress should make no law abridging the freedom of speech
- With respect to what the government can do, government cannot restrict your freedom of expression
- The right that people have with respect to the government making laws spreads out to other areas.
- Spreads out into organizations but certainly to academics
- UCLA Faculty Code of Conduct involves making inquiries to any topic you want and exchanging ideas
- There is controversial material if it is relevant to a course of instruction.
- UCLA tries to adhere to constitutionally protected freedom of expression

Case Study 1: Free Speech in Public Discourse

- Small church that has some very rigid moral standards
- Against abortion, same sex marriage, and all forms of LGBT rights
- They believe that the U.S. has transgressed and soldiers who fight for the U.S. are also to blame
- They would show up to funerals of soldiers in the Iraq War and they would have signs like "God Hates You" and "You Are Going to Hell"

- Families sued the church and that suit went to the Supreme Court

The US Supreme Court supported the Westboro Baptist Church

- As a nation, we have chosen a different course to protect even hurtful speech and ensured we have not stifled public debate.
- On the sidewalks, the courts will generally side with the right to completely free speech even if it is hurtful.
- People are going to be picketing on Friday (Inauguration Day!)

Free Speech on the Campus…

- Free Speech on Campus is a object of debate
- Some people say that speech that is really hurtful should be restricted because it is an open and supportive environment.
- Other people say it is to coddle millenniums who are already being coddled.

At UC

- Free speech under siege because there is a reaction against hate speech
- Other people say it is inline to constitutionally guaranteed freedoms

Case Study 2: Religion and the Workplace

- Offered a position of food services director to Matthew Barrett
- Matthew Barrett was gay, so he rescinded the offer of employment
- Mr. Barrett sued the academy under the provision that you cannot discriminate based on sexual orientation.
- In this case, they said that food services director had nothing to do with Catholic doctrine, so they said that it falls under the provisions of the Anti-Discrimination Act
- There was religious preference in the workplace, but this is going to swing back in the next 4 years in the direction of religious preferences
- More conservative administration

A Reason to be Cautious

- Blatant segregation in the South
- Not so much in LA, but to some extent there was

Duty Ethics (Deontological Ethics)

- Unknown sources - duties are more reason and we can reason our way to why we should be doing something.
- The fundamental principles
- Sometimes we summarize two of the most important victims in duty ethics

The Categorical Imperative

- If I cheat on this test, but everyone should cheat on every test, where does this go from here?

- People have gotten it wrong on a report and everyone interpreted something as “Do what you think everyone else does”, which was incorrect
- Don’t treat people as stepping stones or a means to an end

Examples of Duties

- The 10 Commandments
- Code of Chivalry and Warriors’ Code
- Cadet Honor Code
- Professional Codes

Virtue Ethics

- More like psychological tendency - traits or attitudes
- They can serve as higher level guides to actions rather than detailed prescriptions of what actions should be.
- The idea of virtue ethics is that you should be a virtuous person within your society
- A virtuous person in Saudi Arabia is different than a virtuous person in New York City or Los Angeles
- A virtuous person in LA may be different from a virtuous person in Alabama or Alaska
- Aristotle’s idea of a “Golden Mean”
- Aristotle said that if you have too little courage, you are a coward
- If you have too much courage, you can be reckless and endanger others
- “Golden Mean” of courage which is not too little or not too much

Historical Evolution of Virtues

- Courage could be standing up for things and temperance is the ability to keep things under control and one that continues throughout history is the virtue of justice.
- The ability to apply laws and precepts fairly

Computer application that deals with building resilience to stress

- Roman life was close to our life today and this is another example
- The Romans liked parties and letting loose, but it was mainly the wealthy who were partying and the Quorum was to keep it from everyone else
- Sponsor a set of games at the Colosseum - part of the idea of liberality
- Add faith, hope, and love.
- Love - not in a romantic sense because that comes a little later
- Faith, hope, and love have remained dominant themes in the last 8 years under the Obama administration

Examples

- Religious precepts
- Boy Scout Oath
- Helpful, kind, obedient, cheerful
- Stereotyped as helping old ladies across the street.

Example: Murray on America's Critical Virtues

- Deals with a lack of or adherence to America's virtues and this separates the lower class from the upper class
- Letting these virtues slide!
- Founding virtues are:
- Industriousness
- Honesty
- Marriage
- Religiosity

Utilitarianism (Consequentialism)

- The most happiness for the most people
- The actual philosophy itself is the moral or ethical implications of an action are in its consequences, NOT in the act itself
- The act has good and bad consequences and the object is to balance those so you can extract the most good for the most people
- Related Principles: John Stuart Mill says
- "Do no harm"
- "Promote freedom"
- Examples:
- Decisions in which there are consequences and these consequences have happiness and unhappiness
- Setting a speed limit
- On one hand, say we are interested in safety and economy. On the other hand, we have to trade off speed and convenience
- We tried to reduce the speed limit to 55 mph in California
- The rate of fatal accidents went down as expected, but people hated it.
- You look at the automobile ads and it shows a father drag racing
- Cautions:
- Happiness even though it may be for most people but it can be unfairly distributed.
- People who start off economically disadvantaged may become less happy.
- Nazi scientific camps used prisoners as subjects
- Genetic theories that were nuts
- Aimed at the direction of science and how long could you survive in ice cold water in the North Seas with various types of protective equipment

NOT just the Nazis who did some questionable things

- Americans did studies on prisoners given syphilis (which had cures at the time), but it eats away at your nervous system and these prisoners were allowed to go the course of syphilis while scientists kept track of the disease.
- We recognize that the act itself is wrong we would repeat several times that ethics trumps economics and they just don't do those.

Pragmatism

- Incoming administration has promised to repeal ACA
- 8 years is enough!
- They have now changed to repeal and replace
- If you emphasize principles, you get further and further apart

Alternative Ethical Structures

- Judaism, Christianity, and Islam are derive from Abraham
- Buddhism does not derive from this!
- Non-religious: secular humanism, atheism
- Non-male centered: Feminist
- Try to derive basic principles to carry loving kindness.

The pragmatic resolution was to move the tree and move it to the side of the road.

W 2 Dis 1-20-17

Writing Concisely

"Substitute _damn_ everytime you write _very_. You'll realize you don't need it!"

* Paramedic Method
* Paragraph by Paragraph
    * outline what you want to say
* Reduce words while retaining content (and impact)

Deontology

* focus on the action
* "Action is morally right if it is in agreement with a moral rule, independent of the consequences of that action"
* Best-known system of duty ethics is _Kantianism_

Kantianism

* Moral laws cannot be based on happiness
* Autonomy
    * Man himself should be able to determine what is morally correct through reasoning
    * We should place a moral norm upon ourselves and should obey it (it is our duty).
* There is one universal principle from which all moral norms can be derived => Categorical Imperative

1. Universality Principle (Categorical Imperative #1)

    * Act only on the maxim which you can at the same time _will_ that it should become universal law.
    * _Maxim_: must be unconditionally good and able to serve as general law for everyone without giving rise to contradiction.
2. Reciprocity (Categorical Imperative #2)
    * Act as to treat humanity, whether in your own person or in that of any other, in every case as an end, never as a means only.
    * Must not disrespect/misguide the rationality of another (often means withholding information)

Criticisms of Kantianism

* Criticism 1: Contradiction
    * What if you must lie to help a friend
* Criticism 2:
    * Rigid adherence to moral rules can make people blind to the potentially very negative consequences of their actions.
* Child Labor Case
    * boycott IKEA about child labor, but it ended up so that children were out of jobs and did worse things such as into slavery or prostitution
* Applying Kant's Theory to the Ford Pinto Case
    1. State maxim acted on
    2. State universalized maxim
    3. Explore if universalized maxim can be **willed**

ECS Structure

DUE next time

* ECS Draft
* 2500 words
* 5 copies
* submit to `turnitin.com`
* 1.5 spacing
* Print both sides

The Structure

1. Abstract
    * Stands alone: no new information
    * Essentially a summary of your paper
        * what went wrong, engineering failure, who's responsible, recommendations
        * identifies audience
        * mention of ethical lapses
2. Problem Statement

3. Background
    * tell the story of the failure
    * define technical terms
    * use diagrams/figures if applicable
4. Engineering Failure
    * describe failure using previously defined terms
    * likely multiple failures (technical, engineering, management)
        * be clear, explicit
5. Ethical Framework
    * were ethics violated that led to these failures
    * first give explanation of framework
    * analyze ethical lapses that led to engineering failure
    * must use deontology
6. Recommendations
    * specific
    * show how with recommendation they no longer violate the ethical framework
7. Conclusion
    * expand/look to future
8. Bibliography

Sources

* Why quotes?
    * use quotes to back up your points, not to make them for you
* How to use quotes
    * signal that a quote is coming
    * signal that the author is a believable source
* Paraphrase
    * restate in your own words the full meaning of a phrase
    * usually the best way to integrate a source
    * it's _not_ simply changing a few words
    * citations are still required
* Summarize
    * putting main ideas in your own words
    * shorter than source
    * still cite your source, even if you summarize
* (lastname, year)

Team Time

W 3 M Lec 1-23-17
Elements of Emotional Intelligence
- To be a good leader, move emotions in a positive direction
- Part of socialization
- Making the moves that bring a team together

- In the last few years, it has gotten more difficult because they are working on distributed teams.
- Main location of Weltman's team is in Washington D.C., but there are teams in South Bay, LA, North Carolina
- Concept of socialization has changed a bit
- In Woodland Hills, they would have places where people can gather to talk, but now, they communicate via cyberspace

Goleman Emotional Intelligence Paradigm

- Psychologist who came up with a 4 quadrant rule of emotional intelligence
- Social awareness and relationship management
- Mapping up the other 5 dimensions into 4 squares
- It is helpful!
- Arrows connect one to another and shows which ones have effects

The Importance of Emotional Intelligence

- In general, companies in which the leaders exhibit a high degree of emotional intelligence do better than companies in which individuals exhibit low degrees of emotional intelligence

Steve Jobs

- A difficult character to work with, and what the teams had to do to get for him.
- He had some really big failures that made his successes all the more sweeter
- They had given hi a gift of humility

The Importance of Leader's Emotions Themselves

- Leaders have to remain positive even if the chance of success is small
- Present it in a way such that what you are doing is worthwhile and there is a chance of success
- The leader has to maintain a positive attitude towards the task at hand.
- Doesn't guarantee success, but if the leader loses heart, the team WILL fall apart.

Diversity and Team Success

- When we talk about diversity, we are talking about a new factor we are feeling into for understanding the importance.
- A diverse team in contrast to a homogeneous team has a greater degree of creativity.
- It promotes intellectual engagement and more ideas are likely to be presented
- If a team is managed correctly, the critical thinking and examination of repercussions is likely to be better when the team is NOT homogeneous.

- From the standpoint of becoming a leader, the ability to understand the importance of diversity is becoming essential.
- More and more teams are made up of people from various countries, operating across the globe and coming at a problem with greatly diverse organizational formats.
- Diverse ways of interaction - really interesting!

Diversity Emphasis at UCLA

- The College of Letters and Science
- Topic to be studied
- Introduced a requirement for graduation that everyone take at least one course that deals with sociology of diversity
- The HSSEAS
- Took a more pragmatic approach
- Diversity is important to the success of engineering teams, so we should be making our students and faculty aware of the benefits and of some of the problems or issues that go along with achieving diversity in the school and including it as part of an academic career.
- The school formed a diversity committee.
- Weltman was one of the people who said there should be a Diversity Committee
- We had all these students in Ethics, so they decided to ask what students think of diversity requirement in this school

Diversity Issues, All Students

- Not enough minorities (not counting Asians)
- Not enough lower income minorities, Hispanics, and African American
- Not enough women
- Other parts of the campus have women as majority or close to 50%
- People of similar ethnicities tend to group together
- Bad jokes that hamper good will
- Faculty and school as a whole tended to neglect this issue
- Neglected people in financial difficulty and not enough attention paid to this issue.

Improvement Suggestions, All Students

- Reach out!
- There has to be outreach before they get to the UC system
- People said more activities across lines
- More project orientation in which products were randomly selected individuals so people couldn't group by ethnicity
- Make those projects early

Awareness of Diversity Bias

- Being aware of areas that people have specifically said bias enters into behavior

- Competency proving: women have to do this over and over and not taken for granted.
- Failure to differentiate: Including everyone in the group and people think all members of a group think the same
- Sexual innuendo: when women ask for help, people think they are asking them out on a date

Micro-Aggressions
- Something that people say thinking they are making a positive remark, but it comes off in a bad way.

Team Methodological Skills
- The team together analyzes the situation and in general, you will develop alternative courses of action
- After doing an analysis of the courses of action, the team will reach a decision
- In general, we have tried as hard as we could to make decisions come out of cooperative action of teams rather than unilateral decisions
- In many fields, it is NOT the same i.e. the U.S. presidency
- The president is generally presented with alternative courses of action and a short memo
- As president Bush (the 43rd president) said, I am the decider
- This is NOT the case in engineering!

Desert Survival - A Methodological Approach
- Dehydration - fatal in hours or days
- Starvation - fatal in weeks

Come up with a solution
- When we apply ethics to this, Weltman's 10 Commandments start with respect
  - Knowledge and ideas can come from various sources
  - Assist others
  - Acknowledge other people's accomplishments
  - Avoid the use of "You" or "I"

In Summary
- Engineering is a social activity
- The success of engineering teams depends on interpersonal skills as well as ethical expertise
- This is something you should pay attention to and take other courses that extend your knowledge

W 3 W Lec 1-25-17
- iPod - Software, hardware, mechanical, chemical

The Space Shuttles Challenger and Columbia

- Challenger - you have a center liquid hydrogen tank and on the side, you have solid rocket boosters.
- Solid fuel rocket vs liquid fuel rocket
- You cannot stop a solid rocket once you have lit it off.
- If you look at a shuttle launch, they will start the liquid fuel rocket 5 seconds ahead of time.
- When they know they have perfect combustion, then they will light off the solid fuel rockets and the thing will go up.
- When they have to scrub a launch, they only run the liquid fuel and shut it off after.
- **Liquid fuel rocket you can turn off, but solid fuel rocket you cannot!**
- Launch Pad
- Lowering External Tank
- We get something into orbit at the time the solid fuel rockets burn out.
- Recover it out of the Atlantic and the liquid fuel tank just dropped into the Atlantic and it was written off.

External Tank

- Go home and stack a bunch of Campbell soup cups and join them together
- I have a picture of these joints and all these sections are put together at Cape Canaveral before launch
- These were developed and the solid fuel rocket sections were created in Utah and were shaped by rail.

Assembly of Full Scale Static Test

- Put one on the ground and light it off

Night Static Test Firing

- The way the sections were joined - it was just like putty.
- Stick it together to seal it.
- For static tests, they have a guy climbing up the little hole and making sure it was sealed.
- Very Mickey Mouse quality

Original Field Joint

- Drop it into a tuning fork called a cleaves and holes around the periphery to hold the thing together
- Green stuff is the puddy and we have two things called O rings
- Like gaskets in your car
- How pliable was the rubber in your car at 110 degrees? 35 degrees?
- At 110 degrees, it has a lot of bounce; at 35 degrees, it hardens and there is no bounce to it.
- Only one thing was NOT temperature qualified for the space shuttle - the O Rings

- Read the boilerplate, i.e. works from 10 degrees F to 110 degrees F
- The only thing that was NOT temperature qualified were the O Rings

Joint and the O Rings stunk and should have been redesigned

- October 1977 - one of the NASA engineers said that NOT changing the design is unacceptable!

Original Field Joint

- Pressurization from lighting off the solid rocket boosters is NOT going to stay vertical
- Open up this gap and any gases can leak out
- NOT redesigning the joint design is unacceptable

NASA: January 9, 1978

- All these letters were ignored by them initially

NASA: February 6, 1979

- Leon Rey (?) visited some O Ring manufacturers

NASA: July 31, 1985

- Boisjoly (?) was in charge of the O Rings and tried to draw attention to the seriousness of the O Ring burn through problem

MTI: August 22, 1985

- the O-ring seal problem is acute and short term measures should be taken into account for flight risks

MTI: October 1, 1985

- Starts off with world “HELP!” - he knows they are in trouble and management ignores it.

Roger Boisjoly at SAE (Oct 1985)

- SAE knows about O Rings and this is a quote from the memo you know
- In September, send a representative to the SAE to discuss the seals and solicit help from the experts
- However, I was given strict instructions to emphasize the joint improvement aspect during my presentation
- Fix a problem that might be there even if there were no problems
- O Rings were burning through in some cases even if they were scorched

Original Field Joint

- Everything here is metal and here is the insulation, putty, and rubber O Rings
- Metal is a good conductor, so it will get cold real quick
- They have a sound suppression pool underneath the rocket and it froze over

- One of the things that happened is that you have liquid oxygen in there and it is just sitting there and getting warmer and gaseous
- To prevent it from bursting, you have to vent it and the liquid oxygen under certain atmospheric conditions would slide down the side of the liquid fueled rocket.

Cape Canaveral can only launch east-west because of civilian locations

- Gets colder in Vandenburg than it does in Florida!

Incidents on “blow-by” on shuttle flights

- Once you get below 65 degrees, you start having problems!
- At 50 degrees, the probability of a burn through is approaching 1!
- What is it at 30 degrees? What is it at 8 degrees?
- Nobody would listen and one of the chief engineers refused to sign the launch and NASA faxed the authorization to Utah

7 astronauts and a shuttle had been lost, which was very preventable in Browne’s opinion

- Bring in supervisor committee from National Academy of Engineering to fix these issues

Location of Test Flaws

- Built solid rocket boosters with intentional flaws in the joints
- Made a number of these and figured out what the problem was

Field Joint Redesign

- No thermal covering over the joints
- If it gets cold, what do you do?
- Put in a heater!
- People wouldn’t listen!
- There were 100 more successful flights but then we are talking about the Columbia

Columbia

- From launch 1, it kept moving around during launch.
- Some pieces were larger, others were smaller (inconsistent)
- Ding you get on your windshield, but they didn’t pay any real attention to it
- Failure analysis of the shuttle and the most sensitive parts were the bottom ceramic parts and the leading edge of the wing was a carbon composite.
- See what looks like a big piece of styrofoam come off and what is headed right towards the wing.
- They try to reach the upper management of NASA and start trying to go around through back channels to check the view of the wing.
- Never really got to a first order item of interest.

When you are designing airplane engines, one of the things you do is worry about bird congestion!

- There can be a bunch of seagulls, sparrows, Canada geese at the airport

Shuttle problems

- The shuttle had a very troubled history - use for defense and civilian use.
- A lot of compromises in the design and stuff

Midterm info

- Scantron
- 75 questions - 2/3 are from the lecture
- Ch. 1 - 5 on the midterm
- In the textbook, pay attention to terms highlighted on the margin
- To do well on the midterm, make a one page summary of each lecture and a one page summary of each chapter in the book.
- Hit highlights and key definitions

Three Studies in Biomedical Devices

0. The Therac-25
   - Radiation therapy and this is the type of electron beam that can be focused down to a very small brain tumor.
   - For other cancers, you need high energy radiation to attenuate the energy coming out and turning it into X-rays.

The Therac-25

- Therac-6: 6 MeV Linear Accelerator
- Rudimentary computer control
- Therac-20: the operator manually moved the screen into place
- Therac-25: electric motors accomplished task of moving from X-ray mode to Electron mode
- Reuse a lot of the software from the Therac-6 and the Therac-20
- Programmer is shit!

The Therac-25

- In all biomedical engineering cases, there is inadequate reporting to the FDA
- In California, Michigan, and West Virginia, they may look for common problems.
- The first two Therac models is that the first two models had a physical, hardware safety mechanism, and they actually removed that.
- Huge increase in the safety of the hardware.
- Most of the new programming was made by one guy.

- Six massive overdoses
- Estimated doses of up to 20,000 rad

- On of the patients who died came out of the radiation room smelling like “burnt bacon”
- The operators of the thing was a trained radiology technician, but they would NOT have seen radiation overdoses because that is such a rare condition
- There will be a physical burn but the actual radiation damage doesn’t occur until a few days or weeks later.

- A typical exposure here might be a few minutes, so how do you get 10^-11
- The main problem was something called the 8-second delay
- When the Therac-25 was brought out, a motor inside the unit would go from screen in place and get rid of the X-ray.
- Recalled in 1987 and never went back into business

Abdominal Aortic Aneurysm (AAA)

- The aorta is one of the main arteries coming out of the heart and goes down to the thorax and spreads to the feet and the legs
- It can occasionally develop a ballooning or widening
- The trouble was originally cutting the patient open and then putting in a graft or a synthetic graft

In Menlo Park (SV), could you do something internally?

- Starve the aneurysm from the inside!
- You would think about putting a piece of laboratory tubing into a garden hose.
- Feed it up and have a little cover on and off.

VentakPrizm 2 DR Model 1861

- Minor stumbles that were able to overcome and just as they started the phase 2 trials, they got bought out by a company back east.
- The company became a lot more internal and in the Phase 2 trials, they were having trouble using the fishing equipment to hit the aorta.
- In some cases, they had to get the parts out.
- With the middle one, the two lengths of the femoral artery were not being seated properly.
- They didn’t pay any attention to it and they had to amputate patient’s legs.
- Very flawed management that took over and failed to acknowledge failures in the Phase 2 trials
- Just kept selling the product
- Defibrillator feels like a horse is kicking you in the chest.
- It can shut down negatively and do nothing, even when it was supposed to.
- Employees of higher management was trying to keep stock prices up by NOT notifying the FDA
- NOT notifying the FDA is a criminal charge!

- U.S. attorney in Minneapolis filed charges and they settled on a criminal fine of $300 million
- The government cited them for defrauding Medicare and it was another suit they had to settle for money.
- The company that paid almost $100 million was Guidant, which also fucked up for the Abdominal Aortic Aneurysm (AAA) case

EVT-Guidant Finances

iPod - ones I forgot

0. Nuclear engineer
0. Systems engineer
0. Manufacturing engineer
0. Civil engineer
0. Mining engineer
0. **Computer science (software engineer)**
0. **EE**
0. **Chemical engineer**
0. **Mechanical engineer**
0. **Materials science**

CD was developed in the late 1970s by Sony and Phillips

- When they left for a break, at the end of 1979, they had agreed on basically everything.
- 60 minutes was the longest audio cassette at the point
- Sony added a new member to its team, which was the head of its music division
- It cannot be 60 minutes, it has to be 74 minutes and 23 seconds (why so exact?)

W 3 Dis 1-27-17

<u>Today</u>

- Peer Review
- Simplicity
- Utilitarianism
- Team Time

<u>Due Next Time</u>

- Team Paper Bibliography
- 5 sources/student
- Organize by topic & name of team member responsible for that topic

Why Peer Edit?

- Professional writers and teachers of writing across the world all agree that peer review is an effective way of developing our skills as writers and readers

- But you need to put in the effort!

Timeline

- 75 minutes total
- All members read the same paper (you read your own!) and then discuss it.
- Then all members read the next paper and discuss.

Things to Focus On

- Problem Statement - Are the 4 elements clearly there?
- Organization - Does the paper follow the correct structure?
- Does the writer demonstrate how the recommendation would prevent the ethical lapses that occurred?
- Writing style - are there areas where weak grammar or poor syntax weakening the essay

Peer Editing Tips

- Write marginal comments sparingly
- Write specific comments!
- Note things the writer does well in addition to things he/she needs to work on
- Write down notes on your paper as your friends give you suggestions
- Sit in groups where you can face each other

Suggestions on my essay
Lei Shao

- Overall, it was good
- Just the employees know the bug and that could be stated in the background and use it in the previous framework
- For virtue ethics, you can mention honesty
- For the recommendation, why does it prevent violation of frameworks

Aaron Chung

- At a few points in the background (thorough and explained the situation), a layperson wouldn't know what you are talking about
- Explain what a floating point number is
- The equation was a little in your face
- Possibly irrelevant
- When discussing their maxim for the Deontology framework, it seems more specific and for a maxim which dictates general behavior, make it a little more general and don't specify the part about the 9th decimal places
- Slightly more general!
- Feels a little contrived on Universality Principle part, they were thinking this way, but there needed to be a necessity of qualification
- They thought what they were doing was okay but they had to qualify it but that contradicts the Universality Principle

- He likes how I did multiple ethical frameworks
- Good ideas in the recommendation section
- **Ties those back into the ethical frameworks and how to solve them**
- In my conclusion, try to be subjective and provide more personal opinion to add implications on what it can have in a more general sense

Young Hun Choi (Eddie)

- Wasn't sure about the audience for Abstract
- Other than that, it sounded fine
- Who was I referring to
- Add a little bit of details about the Intel Pentium chip
- Focus on consumers, companies, people, etc.
- Add a sentence about showing awareness and it explains everything but he didn't know who he was referring to (general reader audience)
- It was a little too much detail
- It sounds flowing and great but it wasn't really necessary to put all the range of decimals and it was very long and small numbers kind of thing
- Background wise - a little too long.
- Going very detailed and it was interesting but for Eddie, he did the Intel chip - it's interesting but kind of getting boring
- He liked by ethical analysis but I explained details well
- Go in and talk about it one by one and it was well organized
- Put quotes - relate stuff
- Ethical framework was solid
- Go over and every sort of things but very organized but Lei's had quite a detailed analysis
- Talking about a person who never read this, so it would be better to have a deeper analysis or longer detailed things
- Might be more effective to go more into details for that
- He liked by recommendations and he never really thought about the side of dealing with inflammatory posters
- Quite a lot of recommendations I put in
- Sounds pretty solid
- He liked my solid recommendation
- Conclusion
- Not much to pick on

12:40 - 1 meet up with Roger Blum for essay review on Wednesday

Simplicity

- Written by William Sinser (?)
- Clutter is the disease of American writing
- Circular constructions - who can understand the clotted language of everyday American commerce

- What member of an insurance or medical plan can decipher the brochure explaining his costs and benefits
- Airplane pilot announcing their is considerable precipitation
- Cleaning everything
- Every passive construction leaving the reader unsure
- Occur in proportion to education and rank
- Students had ben hassling them on different things
- Simplify, simplify
- No American writer more consistently practiced what he preached
- It is impossible for a muddy thinker to write good English, but soon the reader will be lost
- The reader is someone with an attention span of about 30 seconds
- The reader is usually lost if the writer has not clarified things well enough.
- The reader could have switched tenses or pronouns.
- The writer hasn't bothered to provide a missing link.
- The clear writer is someone who sees fuzz and removes it

Dr. Browne is the one grading the team paper so let's kick ass!

- Knock out that bibliography in class

W 4 M Lec 1-30-17

- Period that gets overlooked is the Enlightenment which had a profound importance of the United States
- So many of the Founding Fathers were children of the Enlightenment
- Technology *evolves* in terms of complication, adaptation, specialization, persistence, and (occasionally) extinction

Technology of Egypt and Mesopotamia

- Animal power
- Family oriented
- Civilizations could use fire for "industrial" uses i.e. ceramics, glass, etc.
- Many civilizations at the same time did NOT have the industrial use of fire
- Cloth was a technology that was common
- Use metals
- Pottery
- The wheel as used for transportation (not available in Americas yet)
- Water conduits and canals
- Records of these civilization through writing forms

Technology on a Small Scale…

- Very common type of tablet that is found in Babylonian eras
- A lot of them were invoices, sent along with shipments of goods to make sure person on the receiving end received all the goods
- Pretty good record of what commerce looked like in those days
- Some of these things were so long lasting that we had an idea of the immensity of their engineering undertakings

- Egypt is a remarkable trip to visit the Pyramids
- The Pyramids are bigger than you expect and give you the feeling of immense mass!
- You can go into the Pyramids and the burial chambers and benefit in whatever pyramid power
- Intricately executed temples of Egypt and fine columns

Building the Pyramids: Geometry + Sweat

- People rolled the rocks up and pushed + pulled on ramps
- Alternative theories are pretty janky like aliens and taught the Egyptians how to levitate rocks
- Aliens went away and didn't tell us how to do it.
- Save money moving the big rock into the LA County museum

Greek Architecture: Classical Aesthetics

- Greeks turned it into classical architecture
- The U.S. Supreme Court and the New York City Courthouse are modeled off the Parthenon
- Many major buildings in the U.S. have classical forms that still resonate to us even though in the Greek and Roman times, they were painted and didn't have that pure white or marble character

Greek Mechanisms & Instruments

- Greeks were remarkably good at mechanisms
- They made precision gears and a lot of instruments that were demonstrations of solar phenomenon that depended on fine gears.
- Did not have the benefits of machine tools
- Had the beginnings of war mechanisms and not as integrated as society as the subsequent Roman technology

Roman Engineering

- Roman society depended on Roman technology
- Made huge advances on power transmission
- Pumping devices
- Cement
- Great use of dome construction
- Powerful innovation that lets you create open spaces
- Aqueducts to through mountains

Roman Technology for Daily Life

- Some cities have been preserved - Pompeii
- Close to the Mediterranean
- Preserved by the inundation of ash by Mount Vesuvius
- Their bodies disintegrated but you can see their body forms
- Vendors selling books that let you reconstruct what Pompeii looked like
- Romans had a heart of the city (just like a shopping mall)

- The Grove vs. the cardo (?)
- Pompeii had brothels because it was a sailor town but the rest is similar to LA
- If you go to other Roman cities like Jerusalem, they have reconstructions back to Roman times
- Great affinity we share to the Romans
- The Coliseum in Rome was neglected for a while and after the Second World War, they started rebuilding the Coliseum
- Violent games with gladiators
- Much like pictures taken with Spiderman

Water Delivery
- Romans built their aqueducts with much more simple systems
- Level was a groove with a drop of mercury
- In an aqueduct, we had to maintain a constant flow but we had the idea of a siphon and moving water over obstacles in its path

Land Travel
- Roads were built to last and you could walk on Roman roads because they were built solid.
- Paving stones on top of them - a layer of lead that spread over the ditch so things would stay in place

The Roman Empire: All Roads Lead to Rome
- All the way up to the top of Hadrian's Wall in England and throughout North Africa and the Middle East

Roman Organization: The European Template
- Get a message from Rome to the outpost of the Empire in several weeks, could be faster if they used signals
- Lawyers, doctors, engineers, soldiers, artisans, tradesmen, slaves
- Roman society like Biblical society was a slave holding society
- Slavery based on conquering
- Slaves could frequently become Roman citizens through hard work
- Romans were fairly tolerant when it came to other religions and culture
- Some of the conquered civilizations they weren't okay with
- People were against the Jewish god
- The Romans didn't understand why the Jews were upset and put down their revolution

- The Roman Empire dissolved from within and by that time, the empire had converted to Christianity

Chinese Technology: 2000 BCE to 1000 CE
- Noodles!
- Agriculture

- Seed Drill
- Construction
- Suspension Bridge
- The Great Wall of China
- Industrial Materials and Processes
- Paper at the same time Europe was using papyrus
- Blast furnace - introduced more oxygen into an industrial fire which burns hotter
- Steel, bronze
- Printing with movable type well before that was introduced to Europe
- Gunpowder
- Compasses

Europe's Not-So_Dark Ages (500-1450 CE)

- Church centric
- Relatively rigid feudal social structure
- Advancements from Arabian countries and Asia
- Europe moved in many areas from a subsistence society to a society that created additional goods that could be created
- Capital which was used for investment for further explorations into the New World
- Great cathedrals were analogous to the Great Pyramids of Giza, Egypt
- Invention
- Technology takes a major leap, not just an evolutionary improvement
- We can identity those major leaps with individuals

Medieval Technology: Improved Horse Power

- Heavy plow in 500
- Horse Power
- Horse Shoes
- Horse Collar
- Stirrup
- Tying the rider to the horse made the mounted knight possible
- Mounted knight was a combination of metal working because it had to be light enough so that horse can carry him but heavy enough for protection
- The combination of tying the rider to the horse makes it possible to stick something to the lance and NOT get thrown off the back of the horse
- Knight was a powerful weapon that was superior to infantry
- Gave military strength to rulers
- Part of the feudal structure
- Incorporated the entire feudal structure to create knight equipment
- Technology engenders a counter tactic

The Anti-Knight: English Longbow

- Could be fired while the knights were still getting ready 1000 yards away
- Rain of arrows that could be metal-tipped and find the gaps in the armor

- Find the horses and the knights couldn't get rolling once the volley of arrows started
- The decisive battle was the Battle of Agincourt (1415) that ended the dominance of the knight
- Important for the standpoint of society
- People pulling the longbow were the common people of England and Great Britain
- Dominance of people with inexpensive weapons and part of the beginnings of democracy
- Power shifted from aristocracy to the middle and lower class
- This was supplanted by firearms
- Rifles

Late Medieval: Pre-Industrial Components

- Introducing power
- Tidal mills
- Wind mills
- Percussion Drill - allows you to drill through harder substances
- Compound crank
- Wheeled Plow
- Glass technology - pretty good in Roman times
- Perfume bottles, ornaments, but you couldn't get good flat glass
- Working out ways to make flat glass and coat it with silver so you get a mirror
- Important for cosmetics and makeup
- Used for telescopes which will have a profound change in society
- Once you have lenses, you can make eye glasses!
- Make productive citizens out of people who have less than perfect eyesight and extend the useful life of people when your eyesight starts deteriorating
- Horizontal Loom
- First step in taking weaving from a home village process to an industrial process
- Transportation
- Paper - now begins to show up in Europe
- Arabic Numbers - Roman numerals were terrible to do arithmetic with and almost impossible to do mathematics in
- Switch from Roman Numerals to Arabic Numerals opens the door to a lot of innovations
- Blast furnace - allows improvement in metalworking

Renaissance - rebirth of scientific knowledge of Greek and Roman societies

- Being reborn because in Arab countries, much of the writings have been preserved in libraries
- What makes them massively available is the introduction of printing

What does a clock do?

- Clock measures time!
- The introduction of clocks and watches is the beginning of scientific experimentation and the beginning of measuring production and efficiency

Leonardo de Vinci: Renaissance Man

- The screw prints of a helicopter
- Air is a medium and you can let yourself down by spiraling down through the air
- If you are sitting in there, you are probably getting a little nauseous
- The Renaissance Ideal
- Individual - identify it with specific people

The Enlightenment: Philosophy

- Put it between 1500-1800
- Nicolas Copernicus
- Leonardo Da Vinci
- Christopher Columbus
- Explorers!
- The Greeks and Romans knew the world was round and they measured it to a pretty precise phenomenon of living in a round world
- The idea that you find things out
- The Idea of Progress
- Time to sew, a time to reap, a time to live, a time to die, etc.
- Rene Descartes, Francis Bacon
- Run into other societies that touch the same morals
- John Locke
- Morals can be universal and not just specific to writing
- The Rule of Reason
- Thomas Jefferson
- Benjamin Franklin
- George Washington
- People think territorially
- There should be a wall around their countries and determine what is right or wrong, NOT universal morals

Galileo verifies the theory that Copernicus advanced

- Revelation tells us the the sun revolves around the Earth, but as I examine the heavens, it seems a better explanation is that the Earth revolves around the Sun
- People said this doesn't make sense and Galileo come in with his telescope and verifies this
- Church didn't have problems with the experiments of Hooke and Boyle, math, calculus, Newtonian physics, and Leibnitz
- We started to get experimentation and mathematical structure
- We get the tradition of scientific publication and reference
- Newton is credited as being the smartest person ever and we cannot have all the great minds together in one place to face off

Industrial Revolution: Science Applied

- Machine shop - direct descendants of machine tools from the Industrial Revolution - lathe, screw cutters, micrometers
- Watt Steam Engine - example of what keeps happening in the Industrial Revolution
- One or more people improve on that invention
- **Frequently, the one we remember is the improvement!**

Self-Contained Steam Power

- Reverse of the internal combustion engine
- Cylinder with gas introduced into the cylinder with the force of the explosion driving the piston out
- Steam is introduced when the piston is up and that steam is condensed into water

- Critical improvement: Watt moves condensation away from the pump
- Steam is moved to another chamber where it is condensed which makes a more potent steam engine!
- The two engines coexist for a few years but eventually the Watt system wins out

Interchangeable Parts

- Eli Whitney comes up with the cotton gin
- England recognizes the utility of this

William Rosen - “The Most Powerful Idea in the World”

- Brings cotton to weaving plants in England
- Cotton comes from the U.S., Egypt, etc
- Runs on coal which is the fuel that fuels the Industrial Revolution
- Generates Steam Power
- Manufactured & Engineered
- **The important thing is patent protection on innovation**

Rise of the Industrial City

- Usually located by a waterway
- Typical industrial cities are like South Chicago, Syracuse, Detroit, etc.

Electricity:

- Punch tape

Telegraph: Worldwide Communication

- Transatlantic cable

Suez Canal

- Digging off the canal in an area filled with malaria

- Shortens the distance traveling from East to West from the Persian Gulf and the Indian Ocean to the Red Sea

Flight: A Dream Realized
- Lighter than air flight - hot air balloons
- Balloons are used in the Civil War for reconnaissance use

Recording Light and Sound
- The other thing that happens in this period that really dramatically changes our relationship is technology for recording pictures and sounds
- People would go to battlefields and paint what they saw
- People came west and brought back pictures to the East Coast of the things in the West
- People went to the ruins of Italy and showed them to Europe to show the beauty of Italian of architecture
- Photographs aren't that fast at this point but they allow a recording of the Civil War
- We know what Abraham Lincoln looked like because we have photos of him

Power Battle
- AC vs DC
- Fighting for the distribution system (AC vs DC)
- Edison wanted the electric chair to be run with AC to show that AC can kill you
- Tesla wanted the electric chair to be run with DC to show you DC can kill you
- In the end - AC wins and that's what we use today

Individual Powered Transport: Electrical
- The first individual power transport other than locomotives entailed Electric Carriage

Gasoline Takes Over
- Gasoline has ten times the storage capacity of electricity
- Pretty cheap way of generating power

Individual Powered Transport: Gasoline
- They didn't trust a gasoline powered motorcycle to stay up right and soon, they had a Benz Motor Car
- Mercedes-Benz

Individual Powered Transport: Pedals and Wheels
- This big wheel is pulling you a great distance forward
- Dangerous because the moment arm is so far from you that you will fly off if you hit something!

Bicycle's Effects on Society

- Gives people mobility
- People don't have to own a horse or carriage
- People start demanding a road network
- People working on bicycles are ready to move on to other things
- Women are dressing in shorts and competing in bicycle races
- NOT the only thing that promotes women's suffrage but certain only a huge contributing factor

The Safety Bicycle

- Similar to the modern bicycle we ride today
- Don't have gearing; have fixing, but gearing is soon to come
- Even on something like the Tour de France, to change the gearing, you have to change the wheel

Societal Reaction: Contrary Voices

- Satire

Luddism: Against Job Displacement

- Weaving mills were mechanized and introduced a type of automatic with big punch cards
- Skill with weaving throw different threads in order to make a different pattern
- People came up with a way of automating this using punch cards
- Removed the job of the skilled weavers who were regulating when the shuttle was thrown
- Skilled weavers rioted against the loss of their jobs and destroyed the weaving frames
- Supposedly the weavers were led by General Ned Ludd, which is where the term Luddism came from

Restorationism: Against Loss of Artisanship

- William Morris said we are losing the benefits of individual artisanship and we should reach out to craftsman and artisans and try harder to incorporate their work
- People in California have craftsman houses
- Silver Lake district, Los Feliz, Pasadena - Craftsman houses
- Workmanship rather than mass production
- The things that arts and crafts movement championed because industrial products
- Used by factories for manufactured goods
- Periods that were more human than others

Industrialization at the End of the 19th Century

- We have all the infrastructure for the modern era, but in the 20th century, we make dramatic advances in science and technology started with a love-relationship and ending up becoming a love-hate relationship

W 4 Dis 2-3-17

Due next time

- ECS Final Draft
- 2 Copies
- 1.5 spacing
- Submit to Turnitin

Today

- ECS Common Problems
- ECS Sample Papers
- Team Time

Ethical Analysis

- Define/explain frameworks before using them
- Based on the pieces highlighted in the engineering failure
- Pick a framework and point out specific instances where a moral line was crossed
- Once you make a claim -> Support it

Utilitarianism

- Must consider the decision from the viewpoint of the person in the story
- NOT a confirmation of the Costs part of the cost-benefit analysis
- If they don't do these safety checks, there is a potential for injury, for example
- Convince me that the costs were TOO risky
- Were people going to die or was it going to be a minor error
- Therefore, there was a better decision they could have made

"I can't believe the call"

- Why did they throw the ball?
- Just hand it off
- Coach was scrutinized for NOT handing off the ball
- A lot less of a risk of turning the ball over if you hand it off

Deontology

- We focus on Kantianism
- Realized using the Categorical Imperative
- Universality Principle
- Clearly state the maxim they acted on
- Reciprocity Principle
- Act to others the way you want to be acted on yourself

Reciprocity Principle

- Clearly identify the following 2 things when applying the reciprocity principle (not necessarily in this order)

0. How the decision making autonomy was taken away… Would people have made a different decision if they had all the information? Was information withheld?
0. The end people were used as a means for

Recommendation - What <u>not</u> to do

- Simply state what the party "should" or "shouldn't have" donee - NOT helpful at all
- Intel should have recalled the defective processors
- Too obvious and trivial

Recommendation - What to Do

- Offer a proposition, instead of an opinion
- Propose a concrete, specific solution that will aid adherence to ethical frameworks
- In light of the analysis, how can we prevent this

Recommendation Example

- The unethical behavior in Air France flight 296 led to a terrible crash
- A practice flight would have increased the safety of the next flight
- All passengers must be briefed and a pilot has to do a demonstration flight

Notes

- Hold on to the draft I gave you and turn it in with final draft
- Don't be discouraged by a lot of comments on your paper - I am setting the bar high

<u>Due Week 6</u>

Team Paper 0th draft

- Full Draft of "Tech Issues/Background" Section
- Bullet points for ethical/Societal Issues Analysis Approach
- Bullet points for Recommendation/Solution

W 5 Dis 2-10-17

- Everyone should have as many kids as they want and we need a technology to create food and things like that
- We need a change in desire of what we want.
- What is a "commons"?
- Freely accessible - visualize a pasture
- What is the "tragedy" of the commons?

- Without any restrictions, the natural greed of people will abuse the freely accessible parts of the commons
- "Ruin is the destination towards which all men rush…"
- What specific problem does Hardin's essay address?
- You cannot maximize two variables at the same time
- What is Hardin's ultimate solution?
- **Mutual Coercion**
- Why does Hardin reject other solutions?
- Appealing to conscience is hard because people won't listen
- Let's say Roger says stop having so many kids
- You would probably lose money if you pollute less, so you should probably pollute too, unfortunately
- If you do change, people will view you as a simpleton; otherwise, people will still criticize you.
- Hardin wrote this in 1968

<u>Due Next Time</u>

- Hardin Problem Statement
- Team Paper Zeroth Draft -> 1 copy/team

- Use these terms in your paper
- commons
- sharped resource, freely accessible, limited
- E.g. National Parks, fish, freeways

(1) sink
Pollution
(2) source
Deforestation

- 2 groups w/ interest in the commons

(1) Collective Interest

- Best interest for society for resources to be divided equitably and sustainably

(2) Individual Interest

- how the "rational", self-interested person sees the commons
- As a means to personal gain

- Conflict between (1) and (2)

- Tragedy
- Used in an ironic way like Shakespeare (everyone dies)
- Inevitable depletion of the commons b/c of the individual interest
- 2 Driving Factors
  (1) Limited Commons
  (2) Population
    - Do not fix the population problem

Solutions

(1) Technical

- No purely technical solution
- technology can help (still need political will & implementation)
- A lot of times, you need political power and money to put your ideas in place
- Sometimes governments will subsidize, sometimes they won't
- Problem - Doesn't require change in values/morality

(2) Non-technical (3 points)

0. Appeal to conscience
- Appeal to the better nature of people (guilt trip)
- Not sufficient by itself, but can be helpful
- "Breed out of existence"
- Population/Business

0. Education
- Teaching about the problem
- Raise awareness
- Reduces blowback - resistance to legislative & regulatory approaches to the problem
- Not sufficient by itself, but helps

(3) Mutual Coercion

- Hardin says it works
- The result of legislation & regulation
- Gradient of laws - progressively harsher penalties as use more of the commons
- Implemented - through laws
- Enforced - through local/national/international executive action & regulatory agencies

- Must align the individual and collective interests
- People are going to try to make the most money, so you have to tax them heavily to keep them in check
- Make commons increasingly expensive, so that you maximize your own gain by not overly-abusing the commons (the collective interest)

Other Notes

- Consider how to tax revenue
- Specific 3 well developed
- Imperfect that improves the status quo is still an improvement

A Conservative Case for Climate Action

- Regulation is NOT good and implementing policy just through executive order is bad because it can be revoked by the next president.

The Problem

- Obama was more concerned with helping the economy and getting Obamacare through so he doesn't think about the environment as much

The Solution

- (1) Gradually increasing tax on CO_2 emissions (Start @ $40 per ton)
- Mutual coercion
- (2) Proceeds from tax returned to American people. Estimated a family of 4 would receive $2000 in the first year
- Base things off family income - Bernie Sanders idea
- (3) Exports will get rebates; imports will be taxed.
- Detailed solution
- What if you bring in something from another country and undermine any regulations.
- (4) Regulations made unnecessary by the carbon plan would be eliminated. Ex. Obama's Clean Power Plan
- Detailed Solution

- Note: Regulation (prohibition) not used in this solution. Instead a gradually increasing tax. (Mutual Coercion).

W 6 M Lec 2-13-17
Lecture Contents

The Environment Affects…

- We are affected by the environment
- Future human beings are going to be affected by the environment
- Are things getting better or are they deteriorating.
- Are we a causal element or are we only one of the affected species

Historical Damages to the Environmental

- We have managed to carry off these damages right around the biblical era
- If you look at these, by and large, they are restricted to a region ie. the Middle East or an island
- Not reaching the potential of worldwide contanmination

The Point Being….

- The trends at the time would enable us to pull ourselves out of whatever problems we got ourselves into
- Be able to live in a cleaner and better environment
- See if this optimism is justified

Today's Major Environmental Problems

- Limitations on our natural resources and we are interested in methods that let us sustain and maintain

- Other main problems come from the dual causes of industrialization which in turn, causes urbanization.
- These two together give us a succession of problems
- This is enough to understand some of the principles behind it
- Intersect with phenomena of the Earth as we know it

Example: Smog Conditions in Los Angeles

- Smoke and haze and things we create from chemicals close to the ground
- This has been even before pre-industrialization
- Native Americans in the LA basin called it the Valley of the Smokes
- Campfires would stay closer to the ground
- Caused by inversion layer
- A radical change in the normal gradient of temperature
- Normally when you go up an altitude, the temperature drops
- The inversion layer is a sudden change in that, and the temperature actually increases in the inversion layer
- In a convertible, things will get warmer as you go up into the mountains
- Traps particles and chemicals underneath because a particle of air that is warmer than the air above it will tend to rise.
- If that particle gets to a layer that is warmer than it is, it will start to sink again.
- Put a cap on things that are underneath
- Things that it puts a cap on are constituents of Los Angeles smog
- Native Americans and regional Indians had campfires
- Nowadays, smoke produced by industry and backyard furnaces cause smog
- Every single family house would have a furnace or stove in the backyard where you burn newspapers and everything else that was flammable
- Photochemical smog and unburned fuel

San Fernando Valley Inversion

- Thermal inversion from Weltman's front porch in the SFV

Production of Photochemical Smog

- LA turned in an electric streetcar traffic grid to a car traffic grid
- The car started producing photochemical smog
- The action of sunlight on the exhausts of cars created a series of chemical reactions and ended up in the production of ozone
- When you added that to the smoke and the incinerators and the exhaust from factories, it was a toxic mixture
- In the 50s, when Weltman was young in LA, if you took a deep breath in LA on a smoggy day, you would regret it

Smog Control Measures

- One of the first things done was recognize there was a problem and roots to a solution
- These started with laws and regulations
- Get rid of the incinerators
- Poster of the period that says break up your incinerator and start burning things in your backyard
- City will pick up your trash
- Start controlling the exhaust of your automobiles and the stuff thrown in your atmosphere
- Protests over automobile manufacturers
- If we add $50 to the price of a car, no one will buy them anymore
- Fill the gas tank to keep the unburned gas form entering the atmosphere
- This combination of regulation and technology helped the situation tremendously

Results of Smog Control in LA Area

- Number of serious smoggy days has decreased from 1975 to 2004
- People growing up in LA now probably rarely experience the time of LA smog conditions that we experienced before regulation and technology went into it
- This same approach has been successful with some problems that are bigger

Ozone Layer Depletion

- Notice by scientists that we were starting to lose our ozone layer
- Ozone in high concentrations goes into your lungs is a contaminant
- When it is present above the atmosphere, it has the function of restricting some of the UV rays from entering the lower atmosphere
- We have come to a balance with UV rays that are more dangerous to white people
- Through evolution, if we keep our sun exposure to a reasonable amount, we can survive
- If we lost the ozone layer, we would lose a serious amount of protection

Growth of the Ozone Hole

- Annual hole over the ozone layer in Antarctic region
- People traced the effect tot he use of a type of chemical to HFCs (hydrofluorocarbons)
- Used in aerosols, which had gotten very popular in the post-war world
- Cans with deodorant, cooking oil, industrial lubricant
- All sorts of things were propelled using aerosols
- People got together and said if we don’t do anything, the percentage we would have in the atmosphere would continue to grow
- This would be serious because it would erode the ozone layer
- People of the world got together and in a succession of protocols,, they reduced the projection of the amount of fluorocarbons
- Used in industrial processes and civilian, non-industrial aerosols

The Results are Encouraging

- The size of the hole steadied and then it started getting smaller
- The same principle of regulation and technology appeared to be a solution to the problem

The Sequel: A New Problem & New Solution

- The chemicals to which people switched had another effect because they were also greenhouse gases
- Greenhouse gases cause equally severe problems than the loss of the ozone layer
- One of those situations of unintended consequences where the solution to one problem becomes a problem in another domain

Global Warming: The Greenhouse Effect

- We have changed it to climate change because it was a less scary word for people!
- Deals with the atmosphere acting as a greenhouse when certain gases are added to it.
- Greenhouse is made of glass, sunlight enters and heats the interior, and it changes the wavelength through infrared and this is trapped by the glass
- Temperature inside greenhouse is warmer than outside
- Used in agriculture, hotels and houses in cold climates like Northern countries
- As long as the sun is shining and you have some sunlight, you can warm the inside of the house
- The same thing happens on Earth
- Normally, you have energy coming in from the sun and that energy is absorbed and also reflected
- Reflected by a large amount of reflection and polar regions where there is a balance of what is absorbed and what is being reflected back out to the atmosphere
- The average temperature of the Earth stayed constant for a number of centuries
- New chemicals/gases going into the atmosphere act the same way as gases in greenhouses
- More of the energy gets reflected back and warm the surface of the Earth
- The average temperature increases
- One of the insidious things we found out to science is that a major greenhouse gas is carbon dioxide
- We had never considered carbon dioxide as a pollutant
- Something we exhaled and resulted from the burning of fuels of various type
- NOT considered a contaminant before
- Another major actor is methane
- Result of multiple industrial processes
- We grow a lot of steers and cows that fart out methane

- Nitrous oxide and other gases enter this category

Increase in Temperature

- Mean temperature of the Earth is increasing
- Especially in the later part of the 20th century
- In concert with the major greenhouse gases
- Models and scientific observations link the two
- What we throw into the atmosphere through processes is the great growth of automobiles and traffic in the world

… and the Trend Continues

- Each subsequent year is the hottest year on record

Causes, Effects, & Solutions Not So Obvious

- Causes
- Natural cycle?
- Ice Age or something different in the fact that people are contributing to a major worldwide effect
- If people are contributing, what percentage might be our contribution and what is natural?

The Science Implicates Us

- Interesting article and you can read the first part of it when downloading the slides
- Person with a good deal of money is a climate change skeptic who didn't believe it was happening and we had nothing to do with it
- Hired a scientist in the SF region to write a report justifying his beliefs.
- Give me a report that shows my skepticism is justified
- Scientists got into it and told the sponsor he was sorry and now I believe this is a real effect and we have long-term consequences
- At least he wrote a report saying what he believed

Potential Effects & Problems

- Could have really severe consequences of global warming
- Direct and indirectly
- If polar ice caps continue to melt at the rate we continue to see them or if the ocean continues to heat, there could be substantial rises in ocean level
- Huge amount of increase
- Florida Keys - southern edge above sea level is about 3-5 feet and if the oceans rise 7-10 feet, the Keys will get #rekt
- Malibu or other things would disappear
- PCH which runs close to sea level will disappear
- Poor people living close to the ocean will suffer
- Predictions of increases in the severity of weather effects
- Stronger storms and more powerful hurricanes

- The other people who are sociologists and these combinations say that this could lead to societal conflict as w try to sort out who to protect and how to protect it

Some Effects Are Already Obvious…

- People are running cruises for passages that were formally inaccessible
- Severe storms like super storm Sandy inundated parts of the Northeast and flooding of the New York subways
- We in California are particularly susceptible because we have so much coastline and so much depends on it

…. and Concern is Growing ….

- Greenland ice is disappearing which was formally year-round
- Floods in Florida and we are paying more attention to that

… Along With Warnings

- If we don't do something, we are in for drastic changes
- What is it that we can do and can we get together to fix it

Approaches to Reversing Effects Include:

- Do nothing and hope for the best
- Hope that increased stability might limit the effect which doesn't seem to be very plausible
- Reduce Greenhouse Gas emissions
- In contrast to chlorofluorocarbons, reducing greenhouse emissions has huge economic impact
- Gas is cheap and great to pull it out of the ground to burn it was that we got used to freebies from nature and it is difficult economically to think of switching
- Environmental engineering solutions

Projections Based on Reduced Emissions

- In the same way that people project the concentration of chlorofluorocarbons, if there were no protocols, people would have a different projection of increase in global temperature than if we do nothing
- If we do nothing, by the middle of the century, we would be in trouble
- Set a target limit of 2.5 degrees of Celsius increase as something we could live with
- Something we could handle and the idea is that do we have approaches that would get us close to that limit and the only amiable approach is to limit emissions on a worldwide basis

Ethical Issues: Who will act?

- Some of the heaviest emitters are China, India, the U.S.
- Building up industrial potential and China is expected to be the leading economy by 2040
- India is expected to exceed our economy too

- **We are getting rekt boys!**

People Realize the Seriousness

- Pretty recent poll that says if nothing is done to reduce global warming in the future, how serious of a problem will it be?
- 78% of people say it will be either very serious or somewhat serious
- If you ask the same people for the world, 83% will say that it is serious in some degree

… and Many Americans are Worried

- How much Americans worry about global warming?
- Stayed constant for about 65% for the mean of the upper graph
- These numbers haven't changed over a long period of time

…..but We are Uncertain About Causes….

- This Gallup poll breaks it up into % concerned believers
- Things like cool skeptics, mixed middle, and concerned believers
- The mixed middle say maybe yes, maybe no
- Cool skeptics have risen from 12% up to 25%

… and Politically Divided

- The serious result is that our country is divided politically
- If there is solid evidence that the Earth is warming, the Democrats come in at 88% while Republicans are at 50% with Independents in the middle at 62%
- Substantial

The Pope is with the Believers

- The Catholics are a very large religion and the Pope says that humans are contributing and the result of what we have as a culture of excess
- The effects where people want more than what they actually need

There are Signs of Progress…

- For the last few years, there has been an interesting coming together
- Two major economies of the world have gotten together and agreed on objectives
- Needed a solution

… and Unprecedented Agreement

- Signed an agreement that doesn't have consequences if you don't adhere to the agreement but rather a set of goals and objectives
- Reduce greenhouse gas emissions
- Our current president Trump campaigned on the promise that he would break that agreement
- Leave the global agreement of reducing greenhouse gas emissions
- People have noticed how he has walked back on some things he has campaigned on

- We may walk back on this climate agreement
- The person he has selected for EPA says he doesn't believe the Earth is warming and humans are contributing to it
- Solutions that depend on reducing greenhouse gas emissions may be slowed down worldwide

If Reduction of Emissions Fail

- Geo or environmental engineering
- A lot of these are based on the observation that if there is a major eruption of a volcano, the ash particles are spread over the entire atmosphere and reduces the amount fo sunlight, reducing the temperature of the Earth
- Introducing artificial shade producing
- A big umbrella that would shade certain portions of the Earth
- Route to a solution and we have to ask if this is causing other problems by introducing other particles into the atmosphere
- What problems can we solve?

Local Solutions?

- Others are starting to look for local solutions and the number of hot days is reducing year by year
- The other solutions that are suggested deal with that part of the problem
- Get the energy out of the ground level and make more reflective streets, reflective roofs, trees that will help and other approaches
- Cool the temperature by about 3 or 4 degrees Fahrenheit
- Adopt some kind of system and do something locally even if the company is NOT doing something nationally

If it really starts to get hot, it will spur people into action

Waste Management: A Growing Concern

- Destroy a town and turn it into waste, or build another town on top of it
- People building these layers can get a pretty good case of history
- Greco-Roman period is a mirror of the way we live today and pretty much the same social strata
- Dispose away sewage systems and landfills outside of the town would be an individual responsibility
- In the Medieval period, we might have deteriorated
- Industrial Rev - we have new types of waste and we had to start creating a new branch of technology called sanitation engineering
- Started associating waste with disease
- Waste was a breeding ground either directly or for animals such as rats
- In the 20th Century, we see a refinement of previous techniques
- Started collecting these things and dividing it via dump sites are other things
- Things started building up s.t. in the 21st century we have another Paradigm Shift

- Running out of utility of old time techniques
- Introduce something that might qualify

Waste on Today's Urban Scene

- Normally, we see things like this giant heap of tires
- This picture is a bit of a departure
- Cairo after Arab Spring
- Normal process of civil government broke down and people started putting their trash on roofs of their apartments
- Nowhere else to put it

… and in Suburban & Country Waterways

- Even in LA, we have nasty trash
- We have an LA river that runs to Long Beach to the ocean
- Parts of it where it actually looks like a river
- Atwater Village and Griffith Park
- After a storm, you see that these banks are littered with plastic bags and non-dissolvable shit
- The water running the river is sometimes brown or other weird colors and it is what you see in other parts of the country

Waste Hits the Headlines

- Catch on with funny headlines
- Trash piles up and we know what they mean

Major Industrial Waste Sources

- Virtually every type of industry in the world and food industries are major contributors
- Dry out chicken crap!
- We had steers and pork and anything we eat is grown in factory form
- Tremendous amount of waste

Increasing Amounts of Technical Waste

- Increases in population and living in cities, we typically generate about 4.5 lb of waste per person per day
- A couple like Weltman's wife and himself will generate about 30 lbs of communicable waste
- Weighs a lot for just two people to be generating
- Medical waste not os much and radioactive waste is negligible.
- Industrial waste can be measured on a per person per day basis and is part of living in the United States

Adverse Effects of Waste Products

- Waste is a place where bacteria can grow
- Affect humans in a large amount of diseases
- Direct contact with human and animal waste

- We are high up on the old chain and we eat lots of simple things to more complicated animals
- Whatever those plants and animals accumulate in terms of waste is likely to show up at the top of the food chain.
- Contamination Pathways
- Acid Rain - pollution that moves from one place to another
- Radioactivity is always a possibility
- LA is a particularly good laboratory for the effects of open water pollution
- System that is pretty well represented

Open Water Pollution

- City with storm drains
- Homes in the LA area and the waste products from these storm drains and sewers go into reclamation plants that purify them and exhaust them into our reservoir which is the ocean
- When we have a storm, it bypasses the treatment plants and there are warnings at various beaches to NOT swim or surf
- Illegal discharge, people throw stuff and dump stuff into the LA River
- LA is a waterfront city and the river is NOT much of an industrial dump site and other places have similar problems

Example: Pollution from Factory Farms

- Aerial view of where your bacon comes from
- Pork is grown in factory farms in tight corners
- Installation with ~9,000 hogs
- Because they are grown in pens and don't have much movement, they are given growth hormones to make size increase and antibiotics to keep their sickness down.
- In their waste products, you have a potent chemical mixture in addition to the noxious nature of a hog farm
- Hog farms do NOT smell good.
- Pigs are very smart animals but they make smelly waste products
- When it floods, all the planning breaks down and all this stuff gets carried into the groundwater and into the water system
- Untreated sewage, treated sewage, etc. makes a mix into the ground
- Kind of a new addition into what Rachel Carson noticed in Silent Spring

Example: Pollution from Oil Drawing… and From Fracking

- Fracking is a way of introducing water and gas at high pressure into rock to get more valuable gas out of it

Sample Results: Mutations

- Frogs have been particularly affected with mutations
- Weltman jogs at Franklin Park in Santa Monica and it was built by the WPA during the Depression

- It used to be full of frogs and if you throw a rock at it, you cannot find a frog there anymore.
- If you find a frog, they may have problems and even places that serve you frog legs probably wouldn't serve you this one anymore.

Sample Results: New "Silent Springs"

- Fishes are dying either from direct contamination or second order effects
- Things that go into water may be food for algae that keeps fish from getting the oxygen they need

Ethical Considerations

- If there is a right, there is a duty!
- Try to prevent harm for people living now and generations that are coming behind us.
- New virtue adding to the list of virtues
- Virtue of not contributing to pollution
- Being green or a non-polluter
- Utilitarian ethics and we try to find a balance between cost and benefit
- Depending on which way the pendulum has swung, sometimes cost predominates and sometimes benefits predominate.
- During specific situation, we have to adopt pragmatic solutions

Non-Traditional

- **Rights of Nature and other Species to continue**
- **For Nature to continue to be Nature and if there are such rights**
- **There will be duties not only to ourselves and our progeny but also our system as well**

Current Waste Management Strategies

- Put regulation and particularly in the 2nd half to the 20th century
- Combustion/incineration at an industrial level that was done at a larger level
- If you travel north on highway 405 into the San Fernando Valley up into the hill, if you look to your right, there is a wealthy community called Mountain Gate

Regulation of Waste Management

- In the U.S., we have a pretty far reaching policy of the National Environmental Policy Act
- New attempt that we would attempt to take a look at everything that was being done industrially and its effects and we would start to create an environmental policy which would ensure safe water and uncontaminated resources for the population
- Succession of acts that would go into effect and give you info about this
- Toxic Substances Control Act
- Comprehensive Environmental Response, Compensation and Liability Act

- Try to clean up places that had been so severely contaminated that people were getting sick in serious ways
- NOT only industrial but done by military and military bases
- What has happened with regulation is that we have gotten a lot less efficient at carrying waste.
- Low-Level Radioactive Waste Policy
- Find a place to store radioactive waste that will last forever.
- Store in combination of steel and concrete containers

Problems with Traditional Strategies

- Regulation
- Promises of the current administration is that we will reduce regulations of all types including environmental regulations
- Go through a period of 8 years where there is an increase in regulations and now we have expensive technology
- President Trump has promised to revive the coal industry even if you don't believe in climate change
- You know that coal fired plants are highly contaminated
- Cities such as Pittsburgh were unlivable and it was very expensive to create clean coal
- Burning waste creates more problems and you can get contaminants the contribute to global warming

Recycling by Product

- Replacing battery several times - buy a battery, give a battery
- Pretty good recycling percentage and separate your cash into recyclables
- People feel good about recycling and this is a survey taken by an Australian paper
- Try to recycle everything I can
- 78% of New Zealanders agree with this

Recycling is Now Big Business…

- Big money in recycling
- Local company owned by a friend (acquaintance)
- Buy trash and separate it into components that are useful to different industries
- Buy everything and separate it into plastic bottles
- They will package that separated trash and sell it to industries that use it as raw materials
- They have done very well at that

… but Recycling is Also Dangerous

- Dangerous undertaking because of modern industrial materials
- Slumdog Millionaire is a good example

Issues with Re-Cycling Paradigm

- It is dangerous and unethical
- They involve child labor and poor people if not children who desperately need the money
- Inefficient
- In a large system, it could take more energy to recycle than to start with raw materials
- Contributes to other problems of global warming
- Inadequate
- It will never take care of the bigger, underlying problems that are creating the waste in the first place.
- People have suggested a new paradigm

A New Paradigm?

- Cradle to Grave - disposal
- The elements of the idea is that in the initial design of products, you take into account what is going to happen after their useful life is finished
- Each design takes into account what the subsequent life of the product is
- Let's rethink the entire Industrial Revolution and abandon what are linear processes and use nature as a model
- Go into a forest and there are NO trash heaps in forests
- If a tree falls, beetles attack it and it becomes mulch for new trees to grow up.
- Self-perpetuating cycle

Linear Process of Waste Production

- If you take the overall thing from the mining of raw materials and chemical manufacture of production of raw materials
- You find that at each point in the process, there is waste you have to get rid of.

The Cradle to Cradle Alternative

- By its nature, it generates tremendous amounts of waste and requires large amounts of regulation and creating prosperity by the destruction of natural resources and by virtue of its processes, erodes the environment

The New Industrial Objectives

- For factories, make water that comes out cleaner than the water that comes in
- Make products that become food for plants, animals, and soil
- Buildings create more energy than they consume
- Add things to the environment rather than destroying things

Example: Simple C-to-C Design Protocol

- Chemicals that create little to no damage
- patagonia
- Sell stuff from outdoor sports and weather protection

- They were bringing out a new line of T-shirts and bring them out in 8 colors
- One of the colors could NOT be used and their decision was to not bring it out in that color until they could bring about a safe way of doing it.

Example: Energy from Onion Waste

- Visalia - we can use that waste product to create energy to run the plant

Example: Energy-Efficient Buildings

- Schools of engineering are NOT only designing energy-efficient buildings but also buildings that create more energy that they use
- Energy-efficient buildings but not energy-creating
- Supplements energy with solar panels but NOT yet a fully energy reducing building

Summary

- A number of critical Environmental Problems
- Environmental Goals for the 21st Century
- Waste free products
- Better quality of life
- Poor -> middle-class, middle-class -> consumer class
- Protecting the entire ecosystem
- Understand the problems
- Have an agreement on the understanding of the problems
- Set priorities for what we address will determine what we put our money into
- Try to do no harm and implement solutions that will make things worse.

W 6 W Lec 2-15-17

- Introduce the time value of money concepts and going over 6 or more concepts that will be useful for us going forward to deepen our understanding of finances of company.

Homework

- You are given the income statement and you are expected to figure out what the financial statement will look like for 2017
- Given 7-8 conditions that need to be satisfied
- Depends on income statement which depends on what the right hand side is going to be and the percentage of sales approach
- Homogeneity so you have to solve right hand side and percentage of sales approach simultaneously

Future Value

- If you prefer getting it today, then the calculations we did today are incorrect!
- Why do we prefer getting it right now then getting three installments

- If you get it now, you want to do stuff with it, but if you want to metricize it, is there a way to convert these cash flows to different periods?
- Yes there is! If you can grow your money at a certain rate, it will be converted later on

4.2 The Multiperiod Case

- Assume Annual counting if NOT specified!
- T is the # of periods
- If I put don't $100 in my compound statement, it is possible for my rate to change.
- **Most loans compound mostly in the U.S.**
- **The rate they give you is the annual rate**
- Are you paying 3% per year if you calculate the total amount you pay for the first year.

Poll Question: Which one is going to be going down faster?

- Look at market opportunity and assume you can make 10% in the coming years and what is the Net Present Value of the 2nd opportunity
- If opportunity cost was 12%, what would be those numbers.
- They are going to be going down, so which one would go down faster?
- Tail heavy cash flow - if an opportunity returns money further in the future than sooner, that opportunity will lose its value faster if the rates go up now.
- Has a lot of implication for bond valuation

W 6 W Lec 2-15-17

- Last Monday, we learned we can influence the environment
- Either inadvertently or beneficially
- The Biosphere
- Coined in periodic of symbiotic relationships & it barely anticipated what we could achieve later on.

Our Focus: Micro BioEngineering

- These two things are coming together into very small products

Genetics and Bioengineering

- Antiquity: cross breeding for desired characteristics
- If you wanted to change a crop, take seeds from parents with best characteristics
- Charles Darwin: theory of how species might change to adapt to their environment
- The ones that are beneficial will remain in the population
- Gregor Mendel: Used experimentation, especially with flowers
- Dominant/recessive traits
- Mendelian inheritance
- Children will exhibit enough qualities

20th century

- Info coded somewhere that creates traits
- By 1950s, teams of scientists are discovering molecular structure & function
- Come out with a structure of the DNA molecules
- Rosalind Franklin did NOT get the Nobel Prize
- All we were trying to do was find out info was encoded.
- Turn into a technology as fast as it is.

Structure of DNA

- Code-software is in the sequence of nucleotides.
- Bound a certain way
- Code is broken up into genes

DNA Replication

- If you heat up the DNA, the primer can reattach & build new strands.

Basic Technical Approach

- Diagram is essentially cut-and-paste
- Portions of DNA to make it recombinant.

Applications of Recombinant DNA

- Combination of tagging nucleotides & computers made it easier to find what the code was.
- Scientists worked their way up to human code.
- Similarities between humans and plants, which opened up a whole new area of debate.
- Start with bacteria because they are simple & complex, helpful & harmful

Current R&D Frontiers

- Many intermediate processes & focusing on brain function
- Fascinating organ since it is who we are
- We need to understand how it works well
- Do we code for intelligence, sports ability, etc.?
- Evolution seems like such a mystery
- Variety of animals & we underestimate 1 billion years.

Hox Genes & Embryo Development

- Genes that control parts of the embryo that are part of the finished organism
- Blueprint for house
- Sometimes in rooms, there are instructions for the person doing the building.
- If a poorly trained construction person misreads the diagram, he might put the toilet in the kitchen.

Hox Gene Structural Failure

- Flies with legs instead of antennas probably won't last long
- Other segmental mutations may come up with something quite different

Declining Cost of Gene Engineering

- Find out what route you took to where you are now.
- Costs $99 or less

Genetic Engineering Targets

- If we are turning our attention to animal usage, improve growth & food characteristics of animals
- Could we use DNA to exactly replicate an animal?
- Mix DNA & what if we could clone an animal
- It was possible and we cloned Dolly the Sheep
- Michael Crighton's Jurassic Park
- Flies sucked the blood of dinosaurs and we could recreate dinosaurs
- Try to interbreed current animals like Wooly Mammoth and Sabertooth Cat
- Target medical drugs to genetic characteristics
- Some drugs work well for a small portion of the population
- Find pre-birth genes that are defective because it can cause debilitating conditions.
- If we could grow organs, that would be a tremendous breakthrough
- Reproduce without the need for partners
- These can be because they introduce ethical considerations.

Cloning Technologies

- Embryonic Cloning - can they theoretically grow to be human beings.
- You can mechanically separate embryos and break it up into embryos.
- These would share the same DNA with the rest of them
- Adult DNA Cloning - create a clone of the donor and see if this has been done to a human.
- Get DNA of certain types to convince those cells to develop into certain types
- Ethically swings back and forth depending on who you ask.

<u>Synthetic Life</u>

- Can we assemble parts in a way that is self-sustaining
- Bacteria are very helpful and some of them are harmful.
- 10,000 types of bacteria in body and about 3.5 lbs (about the same weight as our brain)
- Without bacteria, we could NOT digest food

<u>Nanotechnology</u>

- Objective

- In the last few decades, we have made great strides in technology.
- Pull this out of IBM and manipulate atoms into Atom Man
- Manipulate atoms at small scale
- Start to see some of those results in manipulation.

Nano Materials
- Buckeyballs - live under domes and circular homes
- Geodesic homes in LA!
- Influenced stadiums and big warehouse structures.

Nanotubes:
- Interesting mechanical characteristics with interesting properties
- Lighter than air bicycle?

Graphene:
- Interesting and people are exploring uses of this in the future.

Nanoscale Devices and Biological Units
- Potential for building nano devices to treat cancer
- Sensing, computing, and delivering drugs to treat cancer
- Poisoning with chemicals is a difficult and we want to kill only rapidly developing cancer cells
- Chemotherapy has severe side effects
- Other mechanisms with capabilities of sensing how to deliver something.
- Attempt to use biological components to be added to original types of circuits

New Hybrid Building Processes…
- Research in stem cells in uniform fashion
- Weltman was a chicken farmer in Petaluma - shipping containers in growth process.
- Sheets full of stem cells for experimentation

… Hybrid Structures …
- Matrix gives it a form for its construction and hybrid mechanism for propulsion
- We haven't had success with artificial hearts, so we need to open up new avenues

… Hybrid Organisms …
- When we talk about unmanned aircraft, it is analogous to this.

Nano Mechanisms: Atomic Scale Mechanisms
- Bearing
- Gears
- Universal Joints & flexibility in transmission

Nanorobot Tooth Cleaners

- Exaggerated since these things would work clean your teeth and you have enough of them, you could embed messages.

Nano at UCLA: Some Leading Examples

- Wherever technology takes us, UCLA will be a leader

Genetically Modified Foods: Ethical Issues

- Beneficial Factors
- Increased productivity
- Opportunity is there to use genetic modification
- Reduce amount of pesticides
- Require less irrigation and usage of top soil.
- Add characteristics to food plants or fighting local disease
- When organs start to fail, you develop a goiter (large thyroid)
- Way up to the 20th century, we see a lot of people with goiter
- Iodine in seafood prevents goiter

Adding fluoride to water reduces cavities

- Golden rice has antibiotic properties
- Worried we might create something like a super weed.
- Affect ecosystem we are trying to protect and could possibly hurt other species

Moral and Ethical Issues

- Do advantage outweigh risk factors
- Agenda is set by worldwide companies and it can be carried out in non-industrial areas

The GMO Market

- Organisms that go into all sorts of products
- Genetically modified animals grow bigger and faster!

… And Sometimes Scary

- Wherever the nuggets are on the chicken, I don't want them

The Political Battleground

- In California, we have initiative and referendum
- Voters of CA voted against mandatory GMO-labeling

Responses Vary I

- Labeling food as transgenic implies a harmful effect.
- People would be suspicious of food coming from known GM food.

Laws and Regulations Adjust

- Vermont passed a law requiring the labeling of food with GMO contents
- Some food product companies are beginning to label their food as non-GMO
- Nobody said popcorn should be genetically modified

Human DNA Engineering: Ethical Issues

- Potential Benefits
- Eliminating disability
- Replacing deficient or missing body parts
- Early work on earlier electrically controlled prosthetics
- If we could create parts, that would be cool.
- Potential Adverse Factors
- NOT as good as new DNA
- Possibility that things go wrong
- What is your criteria for characteristics?
- Ethical Issues
- If an embryo is a person, you are committing murder
- What categories determine genetic worth?
- Nature and seeing if it is misguided.
- Framing the Debate within Two Cultures
- Duties are to err on side of responsibility and caution
- Moral and ethical standards from scripture as they understand it.
- Make use of potential to help society as a whole.
- Act with utilitarian values

Science Fiction Explores

- Never Let Me Go
- They are being raised to give up their body.
- The Skin I Live In
- Create a mate and Hollywood movies are usually created by adolescent boys

Societal Reactions to Date

- Privately funded science is strictly ethical or moral consideration
- All sorts of things have implication.

Sample Case: Embryo Customization

- Gives embryos the ability to “custom design” their children.

Sample Case: English 3-Parent Babies

- Donor will donate a complete cell with healthy mitochondria

CRISPR-Case 9: The Basic Process

- You don’t cut it with scissors, but you can buy components for almost no investment.
- Partial risk of what people are trying to do,

- Creating disconnecting organs that are a mixture of pigs and humans
- Transmission of disease creates mosquitos with less transmission capabilities

CRISPR - don't affect future generations

U.S. Government Advisory
- Topics are stuff we look for
- Objectives: creating better children?

W 6 Dis 2-17-17
- Bighorn sheep hunting
- Live auction of thees tags to kill a sheep
- Good friends with Donald J. Trump Jr. and this guy ends up bidding like $235,000 and gets the sheep tag form
- Bright future head!!!! (Frank)
- Grand Slam - killed all 4 types of sheep
- Tragedy of Commons example

Understanding Hardin
- A commons is freely accessible
- Always
- A commons is train
- Sometimes
- A commons can be depleted
- Always

- A rational, self-interested man will act in a way that preserves iff …
- True?
- People are selfish bastards

What is a commons?
0. Easily accessible
0. Freely accessible
0. Unregulated

Official definition
- Shared
- Limited
- Freely accessible

Two types of commons
- Source
- You take something from the commons
- Sink

Rational, self-interested man

- Rational: costs and benefits are weighted to make a decision

Individual interest

- To “use” the commons as much as you want.
- Traffic example
- Get to Point A to Point B as fast as possible.
- Swerve into the carpool lane, running red lights, etc.

Collective interest

- To preserve the commons
- Make everything smooth
- Don’t crash and get there as quickly as possible

The tragedy - resulting conflict

- Individual and collective interest conflict
- Nice guys finish last since people will cut you off

Herdsman example - for the math-oriented

- Commons: graze-able land
- Individual interest: Growing cattle
- Collective interest - to have graze-able land

Mutually agreed upon coercion

- Coercion: the act of compelling by force of authority
- Why is it mutually agreed upon?
- Recognized as a necessary evil
- Examples?
- Taxes
- Carpool lane
- Parking meters

Legislated temperance

- Educate people to get the mutual part.

What is the goal of this new paper (Hardin paper)?

- Find the mutual coercion give n commons and tragedy
- How do we do this solution?
- Goal: Use Hardin as a frame of reference for proposing a solution to the problem posed by your topic

<u>No Abstract</u>

- Problem statement
- 4 elements
- Briefly mention Hardin presents us w/ useful ideas to think about your topic

- ToC (Tragedy of Commons) Summary
- Summarize Hardin's argument
- Define all important terms
- What is a common?
- What is a collective interest?
- What is mutual coercion?
- What is the resulting strategy?
- Background
- Talking about your topic
- Apply Hardin's ideas to your topic
- Why is your problem a ToC problem?
- Causes of problem
- Solutions
- Possible technical solutions & why they are insufficient
- Possible nontechnical solutions & also why they are insufficient
- Appeal to conscience
- Other solutions tried elsewhere
- What their limitations are.
- Your proposed solutions
- Mutual coercion
- Explain what it means, but it should NOT say mutual coercion is the solution
- Specific
- How to implement/enforce
- Explain how solution aligns the Individual & Collective interests
- Conclusion
- So what?
- Why important?
- Why should we care?
- What happens if nothing is done?

W 7 W Lec 2-22-17

- Major Computing Applications
- How does computing interact with society?
- Databases and Surveillance will be covered next Monday
- All the boxes are filling up with large effects
- Computers have had very large effects on our society and sometimes we want to see how we got here

Digital Computing Timeline

- For centuries, people have been looking for aids to computation
- Abacus - a way to do arithmetic
- Eventually, people started working with calculators
- 19th century was the start of the computing age
- A number of things came together

- Babbage created a pretty complicated machine called the analytical engine
- Ada Lovelace is credited as being the first programmer
- Conceptualized a different way of calculating machines
- Do things based on prior calculations
- Programmable and move in different directions
- Boolean Logic
- Gave us 0's and 1's (on and off)
- Simple type of signal to process
- These things together in the 19th century led to large scale computing in the 20th century.

Digital Computing Predecessors

- In concept, Lovelace and Babbage didn't have achieve their dream of building a full computer
- Hollerith Tabulating Machine - used punched cards and the beginning of I/O devices in computers

Modern Computing Stages

- Electromechanical
- Every organization in one place or another had these types of calculators
- This is how we did statistics and arithmetic functions
- Vacuum Tubes
- Second World War was the first large scale use of computers to crack the German ENIGMA machine
- In the 1950s, the IBM 704 series
- Transistor Semiconductors
- Move computers from big mainframes to personal computers
- Every laboratory instead of having an electromechanical calculator would have a minicomputer
- Later on, integrated circuits came out to personal computing and beyond.
- Most recent integrated circuits are trying to emulate functions of the human brain

New Computer Configurations

- Wearable computers and we wear them in our shoes, wrists, eyes
- Computers that help us drive us cars
- Computers that we take along with us in our pocket that have more computing power than most universities had
- On the path of embedding computers somewhere in our body
- Pacemakers
- Computers that help them hear
- Process that will continue as we get into the nanotechnology world

Exponential Growth of Computing Power

- What happened in the course of the 20th century.

- How many calculations per seconds you could buy with $1000
- Assuming $1000 is adjusted for inflation
- At the beginning, you could only buy a few calculations per second
- As we reach the end of the century, the order of magnitude jumps to near 10^10

Laws of Computing Growth

- Moore's Law of Integrated Circuits
- Number of calculating elements (transistors) on a chip doubles every 24 months
- This law of increasing power has stayed pretty constant up to the present time
- Expect that we will reach a limit on what you can do on a single integrated circuit
- The number of transistors you can put is not really a measure of computing power anymore because you have parallel processors and ways of combining computer assets

- Kurzweil's Law of Accelerating Returns
- Worked in AI, synthesizers, etc.
- Also something of a philosopher
- Computation is evolutionary and exponential because it builds on its own progress.
- The amount of time it takes to accomplish an objective gets exponentially shorter.
- See this in the course of Weltman's management career
- Managed computer programmers and things that used to take 6 months to do will now take about a day or less because of the tools that software engineers have nowadays
- Things go faster and faster and that there is no apparent limit to computational power

Modeling & Simulation

- Scientific
- IBM series and they were working on supercomputers
- Things that were much bigger and better than what IBM would do.
- People were making supercomputers of various types and modeling the weather.
- Industrial
- CAD - computer aided design
- Give us the ability to visualize products in three dimensions rather easily before they were built
- The equivalent for eyeglasses for engineers
- One of the requirements to get into engineering school was to do 3-D visualization
- Draw up the 3 views and some people got it and others didn't.

- It kept them out of engineering
- 3-D visualization led to animation
- Put them together at a frame rate higher than 15 FPS, 30 FPS, 60 FPS, ….
- Give an illusion of motion
- People started animating features using computer animation and Disney eventually picked up on this
- Training and Education
- Early 1980s with large scale simulation
- Simulation you have to do in real time
- People were limited in their neighborhood but computers eventually got faster and we could bring it up to higher levels
- In animation, you have lots of time to create a frame, but in simulation you have 1/25th of a second
- Gaming and Entertainment
- The entertainment industry saw that we could make games and habit-forming so the gaming industry formed where military simulation begun.

Simulation: System Components

- The power of simulation comes from the visualization.
- Look at an elegant equation like $m_1V_1 = m_2V_2$
- If the mass hits it and they are perfectly elastic, then it will impart a velocity to the masses
- This is an elegant equation and maybe you can visualize it but not as easily when you see it happen
- Visualization is very powerful!
- Simulation systems include the mathematical model (computing engine) with parameters set by people
- Visualization engine with parameters set by people
- Display mechanism with interactive controls
- Frequently forget that all of this is behind a simulation

Example: Flight Training Simulator

- Typical training simulation by a flight simulator
- Passing other planes and if it is a good simulator, you will feel bumps in the runway
- As you take off, you will feel all the jerks and bumps of mild turbulence

Example: Digital Humans

- Boston Dynamics will sell you digital humans so you can test a new part of the city and populate it with simple people who will cross when the signal is right, etc.

Example: The Virtual Battlefield

- Military continues with innovation of the virtual battlefield

Example: Gaming Simulation

- Commercial sector has far surpassed military capabilities in terms of richness of environment and most of them are see something, shoot something

Simulation Ethical Issues

- Believability
- Most people don't understand what lies behind a simulation

This is Not a Pipe

- Magritte
- Repeated this image a number of times
- What is he trying to say?
- It is a visual representation of a pipe

This is Not a Collision

- It is a simulation of a collision
- What if I showed this to a jury with sound effects, more detail, etc?
- It would be very believable to a jury.
- My reconstruction of a collision that could be made very realistic and believable
- Necessity to see what is behind and what does it represent

Gaming Simulation: "Real-Life" Roles

- The variety of roles that we could take
- Not being a gamer, Weltman is probably way behind
- Company of Heroes vs. Grand Theft Auto vs. World of Warcraft
- Fashion Fits - made by Weltman's friend!
- Game that allow you to be a manager of a small retail store
- Time management game because you have to stock the shelves and clean the dressing room
- If you are successful, you get to open another store and work twice as hard.
- A lot harder than GTA!

Gaming and Role Playing

- Teaches a variety of lifestyles
- Some of which can be communal and cooperative, and others can be antisocial and violent
- Exposes a lot of people to these lessons
- People are worried that what young people see in games affects the ability to see what is legal or illegal
- Ethical or unethical and this can be worrisome and pathological
- The main worry is how effective the games are at teaching behaviors
- Weltman's worry comes from simulating for the military
- People worry that teenagers are going to turn into violent predators because of games

- Correlations that people see
- People see that school shooters were involved in playing violent games
- Almost everyone involved has been playing violent games
- Weltman is worried that first person shooters are good at training shooters into better aim.

One Sample Case

- Anders Breivik - Norwegian killer
- Right-wing political faction and got himself a weapon and a lot of ammunition and started shooting people
- Nobody on the island with a weapon that could stop him.
- Showed no remorse and trained for the operation by playing a tactical game to show him how to approach it.

An Ethical Issue Becomes a Legal Issue

- Ammunition for people who do terrorist acts
- We run into 1st Amendment rights and the reluctance of courts to prohibit publication

Serious Ethical Problems within Games…

- Intent was educational in a game of this type “Playing History 2 - Slave Trade”
- The evils of the slave trade
- The way they taught it was making you a slave trader and packing slaves into ships and selling slaves for expensive prices
- Teaching horrible values to the children
- The video game company made a mistake and went in and changed the game.
- Sometimes, programmers have their own view of the world and it turned out to be something that other people jumped back in horror

… and within the Gamer Community

- GamerGate
- We have the right to make our games violent against women or have nasty sexual content our games
- Open issue and probably wont be highly legislated

The “Take Away”

- Weltman saw business as exploring the outer limits of what I will do for money
- Sometimes you reach those limits in the types of games you create and sell to the public.
- Gaming industry is bigger than the movie industry in some cases.
- Games can serve valuable educational purposes
- They can teach bad things!

- Putting out games that are playable, attractive, and even habit-forming is something we need to be cognizant about.
- Up to developers who start the company's and put the games on the market.

Artificial Intelligence: Fooled by "The Turk"

- Came about because in the 18th century and into the 19th century, people got very taken with automaton
- Clockwork mechanisms
- Animal-like things and famous mechanical goose that you could feed coins through the mouth
- Human automata who could sign their names or draw pictures
- Pretend to work a Ouija board
- Hugo was based on trying to find a missing part of human automata
- Find tiny chess player that is locked underneath a table and cabinet
- People believed a tiny Turk was playing chess but it was just a magician

Artificial Intelligence: In Reality

- Dartmouth College coined "Artificial Intelligence"
- John McCarthy and Minsky formed an AI Lab in MIT
- Perceptron demonstrated in 1962 (early type of Neural Network)
- Junctions that looked like nerve synapses
- Put in a network and rewarded if they participated in a correct decision and punished if they participated in an incorrect decision
- Moved into knowledge based systems i.e. MYCIN
- Speech recognition systems
- Recognizing the meaning of what is said
- Deep Blue beats Kasparov at chess (1997)

Some Current Technologies

- Expert Systems: knowledge engineering
- Neural Networks: super perceptrons mainly for pattern recognition
- Planning algorithms - if I ask Google Maps to place a route, it will give me information without even breaking a sweat
- Semantic Networks - speech recognition
- Robotics: AI in mobile mechanisms
- Augmented Cognition - current form of R2D2

AI 10 Years Ago: Conversation with ALICE

- Conversations with ALICE bot.

Turing test - determine if you are conversing with a machine or a human

- If there was a curtain and you were having a conversation with the entity behind the curtain, it would pass if you couldn't tell if it was a machine or a human.

AI Today: "Watson" on Jeopardy!

- IBM created Watson after James Watson, founders of modern IBM
- Have it play Jeopardy and it must be online somewhere and that's he way it is.
- Two champions to play against the machine
- Machine is a big mainframe that contains loads and loads of algorithms for understanding the statements and do things like respond to clues with the same speed as humans

Winner and New Champion

- The current human champions was impressed by the IBM Watson computer
- IBM analytics

Societal Implications

- Rules have to depend on visual input such as driving
- Watch before you make a left turn and set out the algorithms for driving and a lot of things
- It appears that AI can take over such jobs
- What is left for what we said is the new age?
- People working in knowledge professions won't fit rules.
- Things that don't require innovation and invention
- Robot artists and poets
- This depends on how high of a standard we set.
- Would you pay for a robot to go into your house and work under a sink?
- Robot plumber arrives in a driverless car and fixes your stuff
- What about a therapist that is a robot?
- It is hard to say what to do with a face-to-face occupation.

Machine Emotions and Spirituality

- Exhibit emotions and spirituality
- We have feelings and people will believe them.

The Singularity in Fiction: Sexy OS

- Box that Google is selling that talks to you and attends to your needs.
- Application is fulfilling your needs and you fall in love with it.
- Typical of Hollywood movies where you double cross and left emotionally bereft because his app to turns to be unfaithful
- The app is servicing multiple people
- The girlfriend you thought you were going steady with is the fiancee of 10 other people
- Hollywood is run by adolescent boys!
- Women ill stab you in the hard.
- Ex Machina - a prototype android passes a Turing Test and kills her testers in order to escape into the world of real people.
- Westworld, robots are intended to give entertainment to park visitors and start turning on their masters.

The Singularity in Fact: Visual Therapists

- Institute of Creative Technology down in the marina
- Create a virtual therapist who listens to your statements and gives therapeutic responses
- Hooked to a pattern recognition system
- Virtual therapist gives feedback based on what you are saying and how your facial expression looks
- The surprising thing is that when people are asked afterwards if they would prefer telling their problems to a machine or human, they would say machine because machines are NOT judgmental!

… and Robot Ethics

- Killing the driver vs killing several children?

Emulating Humans May Not Be Enough

- Mom swerves to miss deer, crashes her car, and kills her son
- Who do you sue?
- The programmers?
- The person who sold you the car?

Some Ethical Implications of the Singularity

- Chimpanzees are kept in cages and what is a person
- A person does NOT necessarily need to be a human
- The idea that an AI entity need to be person is not necessarily true
- Should an AI entity be allowed to vote
- These are questions in your working life and possibly your voting life.
- What do we do with super intelligent entities.

Midterm Review

- People did NOT do well on questions that were from the textbook
- **Do the reading for the final!**

Online Connectivity

- The Internet
- Before the Internet, we do with broadcasts of various types
- Voice - people sitting around campfire
- Newspapers, broadsides, movable types
- Radio, television
- All increases in communication
- Change from audience in interactive community
- In fact, the Internet had an entirely different objective
- Starts in late 1960s with an idea at a military research and development organization
- ARPA (Advanced Research Projects Agency)

- Get the idea of something called the ARPANET and we need someone to build it.
- They go to Cambridge and there is a company with a reputation of acoustic design but they want to break into this new information science area
- Leonard Kleinrock - packet switching
- Take different routes in a network and things are NOT bound by bottlenecks and they all show up at their destination
- Robust network that can handle a lot of information
- Kleinrock accepts an invitation to come out to UCLA and become a faculty member
- Sets up first node of the Internet at UCLA
- First connection is made between UCLA and Stanford research institute
- Send a word and sentences here.
- Hyper Text Markup Language (CERN)
- HTML
- GUI called the World Wide Web
- Mosaic GUI
- Created by Marc Andreessen and UIUC
- Names URLs and all these standards are growing exponentially by themselves

Internet Users Worldwide

- Pick a Korean site and show how worldwide and the number of people playing it is huge.
- North American penetration was 89%
- In Asia, it was 46%
- Half of our population has direct connection to the Internet and most of the other half is one person away from a direct connection

Type of Use Varies by Age Group

- Look at these trends and they are becoming asymptotic and in the early stages of personal computing, there was big differences among age groups and those differences are getting smaller and eventually those differences will disappear
- Everyone will get pretty proficient with the Internet

Societal Effects

- Google or Bing search allows you to access data and information in an unprecedented fashion
- Online gaming and parallel worlds and streaming
- Twitch.tv
- The whole ida of a social network is evolving
- Leonard Kleinrock - first terminal is available for viewing in Boelter 3420
- Museum of the first Internet terminal
- One thing they never thought of was social networking
- Facebook
- Messaging or posting pictures of their life

- Distributed companies are much easier to manage now because of the Internet

Business Models

- The fact that it knows what you want through cookies
- We are looking for a pair of ski pants and they asked Gershon if you want this pair of skip pants!
- Wouldn't leave Gershon alone until he found ski pants somewhere else.
- Click monitoring & brokering
- Giving leads to salesman and this is like giving leads to salesman
- Headlines that will attract clicks so you can't wait to see what the end of the headline is.

- MySpace was originally there
- Facebook now dominates
- Twitter - Donald Trump tweets every fucking day
- The President of the US just puts whatever is on his mind
- Arab Spring in 2011 was reportedly initiated and augmented by social media

Parallel Worlds: New Virtual Places

- Interactively be somewhere else and accept parallel worlds
- Mainly, other people can punish you and these things are something to be aware of
- People will enter a virtual world and watch television with other virtual people
- A way of virtual companionship

No Man's Sky

- You could spend the rest of your life exploring No Man's Sky

The Dark Net: Illegal Business Activities

- As soon as authorities seize a site, it is pops up somewhere else

Robbers on the Cyber Highway

- Money changes hands on the Internet and just siphoning off small amount of money can be a lucrative way of supporting yourself
- People who hold your computer for ransom
- Sirens will start to go off and site starts to flash and they tell you they take control of your computer
- As soon as you hear the siren, turn your computer off

The Next Stage: The Internet of Things

- Enthusiasm for this is huge
- If you can hack a presidential campaign, you can hack enough of a house to find info about the family

Ethical Issues of Connectivity

- Other dangers we face cover a gamut of ethical and legal considerations
- The Internet has provided a wall for everyone to write on.
- New avenues for news
- In the last year or so, we have a new category called fake news
- A major of area of interest and complication

Internet Disassociation

- 51% said they were less guilty about lying over the Internet
- Face to face lying is much more difficult

One Can Be Anonymous as a Sender…

- No one knows you are a dog on the internet

Malicious Presence (Disturbing)

- Trolls
- People who harass for no good reason

Malicious Presence (Deadly)

- Troubled teenage Megan Meier has an argument with teenage girl neighbor
- Rocky relationship
- Break off their friendship
- Friend's mother pretends to be a boy and cruelly drops her
- Megan commits suicide because she is depressed
- Everyone is aghast at what the neighbor had done
- A district attorney in California tries to prosecute the neighbor under terms in MySpace
- People are left thinking about what can be done

Even AI can be Corrupted: Case of "Tay"

- Artificial presence that learns from what people are saying
- It learns to be a racist and what it picks up things was that Hitler was right, kill Jews, etc.
- This is an infectious environment

Too Much Internet Connectivity…

- Kleinrock didn't anticipate that people would be locked into the Internet
- Young people engaged in outdoor activities

… may be Harmful

- Teenagers are more familiar with texting than talking

A Code of Ethics for Online Apps

- Tristan harris says that a ‘Hippocratic Oath’ for software designers would prevent people from getting addicted
- Statistics of slot machines say that you got a payoff every 5 games
- Every 5 pulls, I would get something, but it was enough to keep people playing
- Habit forming apps are built into the same principle

Summary of Ethical Issues

- Laws
- Some things are unethical
- Fictitious evidence or people harming themselves
- Free Speech
- Hateful speech and urging people to do violent acts
- Undo laws when society’s ethical and moral standards change
- Underlying principle is free speech and prior restraint of speech
- Will self-regulation work?
- Probably not.
- Shaming
- Is there a way of shaming people?
- Self-regulating way of tracking down a troll
- It can be malicious in itself
- How do you know it is the right person?
- Personal Ethical Framework
- You decide the stuff you want to build.

W 7 Dis 2-24-17

<u>Due Next Time</u>

- Team Paper Draft
- Full Draft of:
- (1) Tech issues/Background
- (2) Ethical/Societal Issues
- (3) Recommendations
- 1 copy per team
- Label who wrote each section

<u>Today</u>

- Peer Review
- Team Time

Monday 12:40-1 PM

- Review session with Roger

Timeline

- 75 minutes total
- Groups of 3
- Read for 12 minutes, Discuss for 13 minutes

Things to Focus On

- Problem Statement - Are the 4 elements clearly there?
- Organization - Does the paper follow the correct structure?
- Problem statement, Hardin summary, Background + applying Hardin to your topic, Tech solutions, Non-tech solutions, Solution, Conclusion
- Is the Hardin summary sufficient? Does the writer define commons, individual interest, collective interest, resulting conflict/tragedy?
- Does the solution align the individual and collective interests, resulting in mutually agreed upon coercion?
- Has the writer convinced you that his/her proposed solution could prevent/alleviate the problem?
- Does the conclusion answer the question: Why should we care?
- Writing style - Are there areas where weak grammar or poor syntax has made it difficult for you to understand what the writer is saying?

Peer Editing Tips

- Write marginal comments sparingly
- Note things the writer does well in addition to things they need work on
- Write down notes on your paper
- Learn to skim and focus on the important parts
- Sit in groups where you can face each other

Essay Review

- Individual users and collective action
- NOT technically all the terms
- **Define terms in the problem statement directly**
- ToC Summary
- Make the part more clear that technical solution or an appeal to conscience don't work
- Define definitions upfront rather than later
- Put the second paragraph over the first paragraph
- Background
- Formally define the drought with numbers (statistics)
- Sources like The Weather Channel
- Try to write the author/article
- Solutions
- Avoid slang i.e. "first dibs"
- Transition needs to be careful
- His/her becomes "his or her"
- Try to put heading as **Solutions That Don't Work**
- Legislation have implicit punishments
- Fix this please
- Don't use slashes and/or
- Proposed Solutions
- How to protect individual and collective interests

- **This area has the most room for growth**
- Conclusion
- Passive aggressive at the end!
- Run-on sentence
- **Change the wording of the first sentence because cradle is hard to understand**
- **Change the sprinkler garden wording**
- Add a relevant person to this issue
- If I use Edmund Burke, please cite

Uber Controversy

- Levandowski - someone accidentally copied Google in an email and they had the new technology attached to it that looked familiar
- Sexual harassment that wasn't handled well by HR

Turn in one copy per team and make it organized with clear headings and state who wrote each section

- Things that will not be included in the first draft is the executive summary, conclusion, and everything else.
- Middle part 4, 5, 6 should be a full draft
- Statement of Problem/Background is NOT written individually
- NOT executive summary but these are areas we are going to focus on
- Robots are incasing in our lives and becoming very relevant
- Give a brief background on each topic and self-driving cars
- The solutions are towards ethics?
- They are towards whatever issues come up to our topic.

Week 10 is presentations and due Monday of finals week so not too much left in this class

Group Paper Notes

- Future implications of who to sacrifice

Arko

- Ethical issues of means to help customers
- Inhibiting privacy?
- Security issue
- If they are constantly listening to you, your privacy might not be really protected
- Alexa case
- Amazon replied and said they argued free speech
- There are bugs in Alexa where it listens when it is NOT supposed to
- They don't want information to

Frank

- Case study
- Is there any region that he should focus on?
- It is a case study but apply it to a bigger picture

W 8 M Lec 2-27-17
Case Study: DC-10

- Commercial operation from 1970 to 2010
- None left in commercial service
- A lot of them are charter service
- A lot are owned by FedEx and UPS
- Why should we worry about the DC-10?
- Engineering decisions gone terribly wrong
- Detailed engineering down within the lower-echelons of an engineering firm can affect public safety, health, and welfare
- How hard should you blow the whistle if something is wrong.
- Management ideally should be able to recognize problems and have a culture to send it up to management
- Challenger and Columbia had the issue of bubbling up
- Should identify engineering that is too complicated
- Federal agency charged with passenger safety did NOTHING, which was bad!
- FAA is an interesting mandate
- In charge with public safety but also charged with promoting the industry.
- You cannot do both.
- If you promote the industry, then safety gets the short end of the stick
- In their defense, FAA regulations were in a state of flux.
- We never developed wide body aircraft before.
- We had the Douglas FC-7, 8, 9, but NO wide body aircraft!
- FAA hd to set regulations to design with the best engineering principles
- Boeing and Lockheed made great airplanes; Douglas didn't!
- Should the FAA regulate harshly to ensure public safety or should it be a lapdog?
- It was a lapdog.
- The third engine is here in the middle of a tail, which is a very unique feature of the DC-10
- If you are ever up in Mojave, there is an airplane graveyard when UPS or FedEx comes in.
- Lockheed designs have the third engine as part of the fusilage, which is good!

Feedback loops

- If something goes wrong, you are ethically bound to put a feedback loop
- Douglas was a local company from the 1920s or 1930s
- HQ at Santa Monica airport
- DC-3 during WWII was the workforce of the military
- Used in D-Day (Normandy invasion)

- There is a DC-3 on the road near Santa Monica airport
- DC-7 was the first jet, DC-8 and DC-9 still flying
- **DC-10 was fucked up!**

Flight Control Surfaces

- Flaps
- Engine sit over a very sensitive part of the aircraft
- Control cables and info is over it, which is only several feet wide
- Something goes wrong and you're screwed!
- 181 ft 5 inch long
- 58 ft high
- 155 ft 4 inch wide

Engines

- Wing engines are placed quite a bit forward of the wing itself and even the turbine is quite a bit forward of the wing
- Tail mounted engine determines that it is right above the tail of the aircraft

Assembly line

- Ready to go from the Long Beach airport runway

Comparison Chart of the large, wide-bodied aircraft in the 1970s

- Boeing was first
- DC-10 about a year later
- 350-400 (passengers)
- Lockheed L-1011 a year after that
- Stopped producing after round 250
- Douglas kept building cheap planes that drove out Lockheed, but they were shit quality!

Paris

- In the design phase of the DC-10 from the DC-8 and DC-9, the McDonald Douglas engineers were faced with just the size of the airplane
- Twice as wide, high, and long as the previous airplanes
- 8 times as much air sitting in this compartment compared with the DC-8 or DC-9
- Conversely, in the cargo compartment, 8 times as much air as the DC-8 or DC-9
- Failure of cargo door means that you have 8-10 psi and 1-2 psi at the bottom
- Floor will probably collapse downwards on a DC-10
- Floor collapsed upwards on DC-8 and DC-9
- All the control cables run through the floor, if it collapses you are in trouble
- Next time you get on an airplane, take a look at the baseboards
- You have a lot of space to equilibrate(?)

- During the design phase, the Dutch FAA (Royal Dutch Airlines) wanted the blueprints and comment on them as part of the purchase agreement
- They complained that if it had to equilibrate, it was bad.
- The Dutch FAA sent comments to U.S. FAA and Douglas didn't do anything.
- Is there an ethical issue?
- Douglas didn't do a damn thing about it!
- If you believe in rights ethics, the FAA didn't hold Douglas to the task!
- **Clearly a duty ethics and virtue ethics violation from Douglas and rights violation from FAA**
- Next time you go on an airplane, look at the passenger side

The higher you get up, the tighter the door gets shut!

- **Plug door:** never fails
- Problems in the cargo doors
- Opened inwards using a hydraulic system
- They wanted the space behind the cargo doors
- Let's have the cargo doors open outward!
- **Inherently unsafe!**
- Lockheed door had about 6 inch door frame and the door would pass within the frame
- When it was inside, it would rotate down inside.
- Boeing had a simple idea; put some rods in the cargo compartment and hemispherical rod
- Grabs rod, rotates 180 degrees, and has a little pin to prevent counter-rotation
- Very safe design given the number of Boeing 747s
- Everyone here knows what Rube Goldberg
- Chemical engineering at Berkeley in 1904
- Never did engineering in his life, so he drew cartoons
- You have this Rube Goldberg contraption and it slides up the ramp to cause yeast to rise and allows the spring to run forward, …
- Basically a bunch of convoluted shit that does a simple task

Rube Goldberg weird-ass device

- Causes this little pin to pop out from counter-rotation
- In the first place, historically, airline doors had been closed hydraulically
- The airlines decided they wanted electrically driven cargo doors because they were easier to maintain and save weight and money.
- Douglas gave them an electrical system

Cargo compartment

- These are the rods on the floor and the claws up there would hook around
- Electric motor that drives it should

- This even applies to things as simple as a 5 gallon bucket.
- If you go to Orchard, Home Depot and buy a 5 gallon bucket, don't let toddlers play with it because they will drown themselves
- This is called failure effects modes and analysis
- How can it go wrong on its own?
- In the design process, CONVAIR went through what could go wrong with the door.
- In some cases, the claws would NOT be hooked completely with the rods on the floor and the door would fly open when the inside, outside force was greater than the strength it could hold
- Douglas got this and they removed one branch of failure analysis saying it was an improbably event
- **Critical failure and they censored it when they sent it on to Douglas**

May 1970

- DC-10 #1 is doing a pressure test on the tarmac at Long Beach
- Close the cargo door and for some reason, claws don't close properly
- When they get up to the proper door differential, the door blows out and they get partial door collapse
- They put in a band-aid fix and used a pressurization door
- This little rod will close the pressurization here
- The key here is that if the door is closed, the pilot is able to pressurize the airplane
- This is the way it was supposed to work.
- There is a CONVAIR employee named Riggs who wants a complete redesign of the door
- Basically told no for the redesign
- Goes into operation with this door in place.

June 12, 1972

- American Airlines flight from Detroit to New York City
- Problem with cargo door
- For some reason, the door handle will not work properly
- Braces himself on the ladder and shuts it hard!
- Bent the torque tube and the pressurization door was closed
- Gets over 10,000 feet in Ontario and since the claw was not hooked, the cargo door blows out
- Partial collapse of the floor and some cargo went out including a casket with someone's grandma
- Airlines weren't quite so money hungry and this round thing was a 6 ft diameter bar holding drinks
- A lot of people were injured but a lot of head scratching

F.D. Applegate
Convair

- Douglas did not correct it, and in the next 20 years, the DC-10 cargo doors will come open and this will cause the loss of the airplane

Douglas would hold them responsible financially for the redesign of the door and fix the planes in service

- They put a support plate underneath the support tube
- This was their solution
- A little piece of metal under the tube to prevent it from getting bent
- Wasn't thought out very well
- Unfortunately, three of the airplanes got out without the support plate being installed
- Serious problem with quality control manufacturing
- A cable installer will install a bunch of cables in the airplane and crawling behind him or her would be inspectors
- They have a little rubber stamp and initials on it that goes in a little book
- This little book will go through inspector and inspector and Douglas has a list of people who worked on it
- Three planes got out without this security check
- Shitty QA
- One of them was bought by Turkish Airlines

May 3, 1974

- Turkish Airline flight from Paris to London
- Cargo handler had the same problem the guy did in Detroit, but there had been no communications of this nature to cargo handlers
- No support plate
- The cargo door blows open in this case and we get a complete collapse of the door and 9 passengers go out the hole from 10,000 feet and hits the ground at 477 mph
- Killing 346 people
- After this crash, Douglas finally fixed the damn door
- Pressurization door will close iff everything down here is hooked
- Should have done this after the 1970 failure at Long Beach, but it took the deaths of 346 people to wake them up.

Failed Opportunities

- Douglas ignored a lot of concerns
- Convair buries Applegate memorandum
- Applegate did NOT blow the whistle
- Dutch FAA ignored again in 1972
- Douglas did NOT respond in a timely or technically significant manner to fix door design
- FAA did not force Douglas to fix door design in a timely matter

Chicago

- Both Boeing and Lockheed did NOT want to put all the eggs in one basket and put one hydraulic area
- Mechanical slaplock was used
- Step ladder, each rung goes slightly over each other
- Move it up like this and the step ladder will close and it is a safety device that goes beyond the safety afforded by the hydraulic system
- In the design, there is a great deal of redundancy
- 4 parallel hydraulic lines in the Boeing 747 and the L-10 and L-11
- In the design of the DC-10, Douglas put the hydraulic lines that serviced the slabs in front of the wing.
- Big chunk of metal that constitutes the wing
- Unprotected if the slats are extended
- A cheaper place and airlines liked it because it made maintenance simpler
- Bring the hydraulic lines outside the wingspan
- Lockheed and Boeing take the safer route, Douglas doesn't

The Bolt that Broke
- Take the 6 ton engine off
- Center of gravity is way out here
- The problem is the thing is bouncing around when you try to assemble and disassemble it
- Created cracks in this assembly there
- Even if it is a hairline crack, that is still a major problem in these designs!

FAA Safety Standard
1 * 10^-9

McDonnell Douglas's Risk Calculations
Loss of Engine due to any cause:
1 * 10^-6

Risk of Asymmetric Slats
1 * 10^-5
- These slats are retracted and these wings do not want to fly

Risk of Loss of Engine AND Asymmetric Slats
- They multiplied the two and considered them independent events
- (1 * 10^-6) * (1 * 10^-5) = 1 * 10^-11

May 25, 1979
- O'Hare to LAX
- 48 seconds into the roll, the little crack was present in this support plane
- Engine starts breaking loose and it starts to rotate up and rips out all of the hydraulic lines
- Redundancy in electrical systems was NOT on Lockheed's mind

- One source of electricity was left on the tarp
- Redundant source of electricity was an extra and **271 dead**
- Browne might have gone on the flight but good thing he didn't!
- FAA ignored this!

Sioux City

- Lockheed added a hydraulic check valve
- If there was an issue, the hydraulic check valve would stay shut
- Boeing changed its mind a few years later
- Problem with its Japan Airlines Flight 123 (1985)
- Pilot has a very shallow climb rate for the first 100 feet
- Placement of the landing gear prevents it from going up too quickly.
- They figured out what was wrong and Boeing sent out a repair team
- Needed a spice plate (safety plate) to protect the design
- The spice plate is NOT hooked up to anything and what you will have is an inevitable failure
- The entire rear end of the airplane got messed up.
- Boeing comes in and takes full responsibility for the crash
- Boeing put in those hydraulic, but dumbass Douglas didn't!

Denver to Chicago

- Somewhere over western Iowa, there is a metallurgical problem in the hub and severs all the hydraulic lines in the plane

Stabilizers with a piece of shrapnel

- No checkvalves so the plane has NO hydraulics
- No control except moving engine speed
- Plane wants to steer right and he finally gets lined up in Sioux City airport
- Plane lands at full speed and drops 1800 feet a minute
- Left an 18 inch crack in the runway
- 111 people died and 185 people survive

What happens at 4 o'clock in a hospital?

- Change in shift

Paris: Preventable

- A lot of concerns were ignored except "band-aid" repairs
- QA/QC problems
- Douglas didn't support Turkish Airlines
- One of Douglas' defenses was that the cargo handler in Paris was illiterate
- Showed up to testify
- Read, spoke, and wrote three languages (NOT English)

Chicago: Preventable

- Slat lock

- Hydraulic liens in front of wing spar
- More concern but multiple toddlers on a misdesigned crib with a possibility of airplane crash
- Chose NOT to require a redundant source and a 10,000 cost.

Sioux City: Preventable
- McDonnell Douglas did NOT follow industry standard of 4 hydraulic lines

I am fucking afraid to fly now!

Whistle blowing
- It is important to be vocal and being public with known problems

Browne has talked about his own experiences with whistle blowing
- 25 years ago, there was an individual for one of the Dean of Student positions in Murphy Hall
- Browne knew his history and this is dealing with sexual harassment cases
- This individuals was one of the instigators of one of the most misogynistic incidents in the 20th century
- A lawyer doesn't have to say who you are but the lawyer can reach out to the upper echelons of the company in no problem
- Problems with a case in Enron which was a Texas company dealing with energy futures
- Corruption was the president and the COO, Board of Directors, etc.
- One of the VPs had enough and went to the FBI
- The company lasted about 3 months after that
- She was out of a job but she became Person of the Year on Time Magazine (circa 2001).
- Browne kept his name out of it and did NOT want that kind of person sitting in Murphy Hall

- First attempt at whistle blowing and Browne was working in the Office of Biophysics
- Great grand father of bioengineering today
- This guy starts starts showing up and he is good with electronics and the lab
- One day he shows with doctor paraphernalia and stuff (white coat)
- Tries to work in clinical science and real patients
- In surgery and ophthalmology, you do.
- Dr. X is a good bullshitter, but when we talk to talk medicine, he either tries to change the subject or leaves
- **Something is wrong with this guy!**
- Nothing adds up!
- Huge volumes of every M.D. in the United States and it gave each M.D.'s CV
- He isn't in there, and he isn't listed in the California Board of Physicians

- Browne goes to his boss and is told to mind my own business
- Doesn't take NO for an answer
- **Browne went for dramatic effects, gives him shit, and throws his keys**
- The engineering professor tells Browne to calm his ass!
- As he got up to leave, is the guy still down there?
- He thinks for a minute and sees Doug Hobbes in Political Science
- Browne and Hobbes talk for about half an hour
- First half - he asks questions
- Second half - he talks constitutional law and drills Browne
- Hobbes says be back tomorrow at 10 o'clock
- Browne gets shoved into the Vice Chancellor's office and he did NOT know if he was being set up.
- Go to the Dean's Office and Browne was silent since everyone else had been briefed.
- The one guy lasted 10 days and Browne is here 43 years later
- Whistle blowers usually lose, but Browne knew he was morally right
- Find the right team to help you out
- There was a very senior member of the EE department that was onto this guy too.
- The phony MD was trying to hook up with a human research lab out in Malibu
- He was trying to parlay this UCLA medical school appointment with HRL
- Smelled a rat and did some checking
- Found out the guy was a phony and they never knew about each other until about 5 years ago
- Blow a whistle!
- Look before you leap
- Use a lawyer if you can
- Think about the implications for your job and your fellow employees
- Think about the bigger picture
- Is what you are doing right?
- Part of the problem with engineering ethics is corporate management
- This is nothing new.
- No one was punished over the DC-10, Challenger, or Columbia
- Very rarely are these people punished besides small fines
- No one has gone after these people for murder!
- 99% of ethical problems get resolved before it ever leaves the design offices
- We see a problem, we fix it
- 1% end up as canonical cases that Weltman and Browne talk about in this class.
- Johnson and Johnson say public safety come first.
- Blew $150 million by recalling all the Tylenols
- Hewlett-Packard knew how to do it right by recalling stuff

Theologian during WWII murdered because of opposition to the Nazi party

- "Silence in the face of evil is itself evil. Not to speak is to speak. Not to act is to act."

W 8 Dis 3-3-17

Due Next Time

- Hardin Final Draft
- 2 copies
- Submit to Turnitin

Today

- Hardin Common(s) Problems
- Executive Summary
- Team Time

Take note of how the following applies to your paper and make it better!

- Interests
- Explain how the 2 interests are at odds w/ each other resulting in the tragedy
- Actually explain what this means and go over it and figure out what that conflict is and describe it to the reader
- Relate every paragraph back to Hardin
- Go into possible solutions with Hardin and explain how things would fail according to Hardin's essay
- Mutual Coercion
- Result of regulation/legislation/enforcement that applies to preservation of a commons
- Mutual - "Necessary Evil"
- Don't have to agree with regulations that are in place or pollute less, but people understand that it is necessary
- Education is needed to show them it is evil
- Coercion - legislation ~ make activities increasingly expensive
- Explain how solution is an mc solution
- How does your solution align the 2 interests

Questions to Consider

0. What is the nature of the Problem?
0. What are the consequences of the Problem?
- You have to be very clear in describing this as a ToC problem in the first place

0. Why is this a "ToC" Problem?
0. What are some Possible technical solutions & why are they insufficient?
0. What are some kinds of solutions that have been proposed or tried elsewhere?
0. How can your solution be put in effect & enforced?

0. So what? Why important? What happens if we do nothing?

Commons - B Plate

- Limited, shared, freely accessible

Individual Interest - Eat all you want, least time possible

Collective Interest - make sure the lines don't get too long and there is enough for everyone

Tragedy - Lines get longer (hurry up and wait a la Army)

- When they have the avocado chipotle bowls, the line gets insane with too many people.

Technical Solutions:

- Expand B Plate
- Too much $, cuts research funding
- More workers
- Accept less students
- Make food faster
- Lose quality

Appeal to Conscience:

- BW flyer
- Encourage students to eat at B Plate only once or twice a week
- Please don't eat at B Plate every meal
- **Meme Page**
- B Plate Starter Pack
- Bruin Alert
- Gene Block email

Mutual Coercion

- Pay also
- Swipe twice
- Progressively increasing swipe fine
- Mixed - total meal bowl
- Track data when it is most busy and utilize that data and make reservations
- If you come at exactly 6:35, you will have a table
- Try to track that down (incentive)
- Do something with tax revenue that we gain
- Limit B Plate runs (regulation)
- Covel - subsidy
- The dining halls
- Split-express line
- Make food worse

- Education
- Educate people on why this system is ideal
- Look to other university dining halls and see if they came up with a solution.

B Plate exists because an external donor advocated for its cause

Writing the Executive Summary

- One page statement of the problem, purpose of the report, and conclusions, and recommendations
- Older sibling of the abstract but gives more detail
- Quickly understood
- Self-sufficient so it should be understood in isolation
- NOT going to leave out important parts of actual reports
- Begin executive summary in your own words without using jargon
- Present results in major findings
- Recommendations is applicable to team report but NOT every executive summary.
- Zero fluff, bullshit, or extra words
- As concise as possible
- Structure should mimic the report itself

W 9 M Lec 3-6-17
Basic U.S. Military Establishment

- Chief of each of the services serve on the Joint Chiefs of Staff committee

Department of Defense Headquarters

- Located on a building on the west side of the Potomac at the Pentagon
- Called the Pentagon because it is shaped as aa Pentagon
- At the time it was built, it was the biggest office building in the world.
- Radio coordinate system and you locate things in a ring at which they are placed.
- Before 9/11, it was a very open building
- School tours
- Historical things
- Citizens could go in and wander inside.
- Attacked in 9/11 and this changed everything in terms of privacy.
- Now the Department of Defense is located all over Washington DC and Virginia

The New Player

- U.S. Department of Homeland Security
- No one entity responsible for the protection of the U.S.
- Military was designed to save us against invading armies.

- Actual defense of the homeland was something we had to worry about since WWII
- Department of Homeland Security combined a large number of existing agencies into one new level
- Organization chart that was given by an associate known as a Washington insider.
- Prototype stage and Washington people love organizational charts.
- Committees whose sole purpose is to change these charts
- 126 separate offices are combined into one new agency
- Someone in the organization chart is there to take over it.
- Sometimes, it is difficult for organizations to move quickly.

U.S. Military Expenditures

- Took a big dip after WWII
- We were tired and the enemies were defeated
- Putting money into rebuilding those nations and we just started on the Cold War with the communist side of the world
- Budget of military started building up until the last few decades until it reached about $600 B more or less
- Iraq war and small war in Afghanistan
- Takes over $700 billion

Recent DOD Budgets

- $600 Billion and the government Fiscal Year starts in October 1st
- Plan in Congress to reduce the military expenditure starting with a big drop and continue (**sequester**)
- Trump claims he is going to add $54 million to the budget

US Compared to International Military Budgets

- US expenditures are as much as the next 8 countries combined
- If you pile up the next 8 countries, they are still less than us
- We spend a lot on military in terms of worldwide expenditures
- Takes usually a few years for these statistics to boil down what actually gets spent and in two years, we will see the details of a budget 2 years previously
- If you divide the budget a good proportion of it goes into salaries
- Another proportion goes into keeping operations and maintenance going well.
- A reasonable proportion goes to procuring new systems and a good percentage goes to Research, Development, Test, and Evaluation (RDT&E)
- Each service is pretty good at getting their share of the budget and they do this by lobbying Congress
- Another proportion of the budget is NOT divided into services and this covers black operations and things that are defense buildup.

US Defense Personnel (Approximate)

- Reasonably sized force with an active duty force slightly over 1 million and reserve forces are almost 1 million
- We have about 2 million people we can call into action
- 710,000 DOD Civilian Personnel who work in support, research analysis, etc.
- Defense industry covers NOT only the production of things but also support services
- The military has moved to outsourcing much of its functions i.e. food functions such as McDonalds, Burger King, etc.
- The same goes for transportation services and security services
- Other things that the military procures
- The total people involved are somewhere around 400 million people compared to when we were on a war footing
- When about 40% of the workforce was involved in the defense activity in WWII, this is a rather small percentage
- About 5% of the workforce and they are involved in defense on a total basis

Comparison of Active Military (Approximate)

- The active military force is NOT inconsequential but NOT a leader
- Peoples Rep China probably has twice as many of us in active service
- India has about as many or maybe more
- Russia has a rather large military force
- North Korea is very poor but has a large military force
- The other countries down the list also have a pretty substantial army
- The difference is that our defense per capita basis outspends anyone
- We spend on things that cost a lot of money and things that cost just a substantial amount

Costs of Selected US Weapon Systems

- Bombers cost about $2.5 billion a piece
- Imagine the costs of something that costs this much?
- This is quite a responsibility!
- Nuclear aircraft carriers cost about $5 billion
- The price has gone up and the last one was just put into service and costs about $11.5 billion (Gerald Ford class of aircraft carriers)
- Armaments have gone up
- Particularly those that deal with people
- Fighter-bomber aircraft used to be in tens of thousands
- The ones going into service like the F-35 is about $240 million
- Trump says he is going to lower the cost of the F-35 and we will see if he is right or not.
- Cruise missiles and Air to Surface missiles cost less
- Tanks and infantry carriers will be relatively cheap
- Tank warfare has diminished to virtually nothing after the Persian Gulf War
- Perhaps Russia is spoiling for another tank fight but this seems unlikely

Leading U.S. Defense Companies

- What happened after the fall of the Berlin Wall?
- We didn't have an enemy
- In the 1990s, Weltman was still serving on committees that dealt with simulators on other things and we didn't know who the Red forces were
- No resurgence of Japan and Germany, we were friends with China, who was the enemy?
- At that point, the Defense Department came to the industrial part of the military and we would like you to consolidate
- We want to be dealing with 5 or 6 big companies instead of proposals to 25 companies
- The industry consolidated and became sort of 5 major companies and a lot of really little ones
- Lockheed Martin - department store of defense contractors
- The Boeing Company - Command and control systems
- Northrop Grumman - specializes in electronics
- General Dynamics - build big things out of steel
- Raytheon - Missile and missile defense systems
- SAIC, Inc. - Scientific applications international corporation (headquartered in La Jolla)
- Provides Ph.D and Master level scientists and engineers into military contract offices
- Estimating revenues and compared to really big companies like Apple or General Motors, they aren't the biggest!
- Substantial but not as good as world-leading corporations
- Top 20 Contractors get about 50% of total DOD procurements!
- Hundreds of thousands of small contractors

DOD's Current Policy Drivers

- Conventional Threats: things that are the growth of warfare from early days to WWII, Korea, Vietnam, Afghanistan, etc.
- Regional Conflicts: what is happening in the Ukraine, Syria, other parts of the Middle East
- Rogue States: Something like North Korea (nuclear weapons and building intercontinental capabilities)
- Worrisome place because we don't believe in the rationality of the leadership
- Asymmetrical Threats
- Before 9/11, we had asymmetric threats in Vietnam
- Virtually powerless organizations that were NOT associated with a state could nevertheless create chaos and inflict substantial damage
- We are worried after 9/11 with worldwide terrorist movements going from Al-Qaeda to ISIS and other ones that are affiliated with those in the Arabian Peninsula

- We are worried with insurgent forces and forces within those countries that can overthrow the government and cause continual reign of terror even if they cannot produce a new government.
- Small organizations with particularly large effects
- If someone gets hold of nuclear weapons, this is a very scary thought!
- Biological weapons could be potentially more dangerous!
- New Strategic Requirements
- Long-term planning, what is our long-term strategy here?
- The viewpoint is that the military had been concerned with keeping the peace
- We call it the Department of Defense with the idea that we would be defending ourselves against attack
- Promotion of Democratic Movements - one of our goals was to promote Democratic movements
- Made moves to change the composition of the force
- Give women more responsibility even up to combat
- Denied to women and open the military to women, LGBT personnel
- Although probably present, this wasn't acknowledged if it became public
- Working with the assumption hat whatever mission the military took would have some limitation
- Wars have lasted much longer than previous wars
- Tactical
- Operations - not what your goals are, but rather the strategic equivalent
- Fighting in cities
- Historically - fights leveled cities and battles were fought on leveled ground
- Now you want to minimize casualties from collateral damage by keeping cities intact and try to take out the enemy
- Some of the consequences we expected did NOT happen

- With the ubiquitous use of social media, there is a good number of technologies that we can list
- Netcentric Warfare
- Robotic Warfare - unmanned (remotely controlled) and autonomous (ability to operate on its own)

Netcentric Computer Interface at Unit Level

- In the same way that the Internet has given the average citizen access to an unprecedented amount of information, that same type of technology has given small unit commanders access to information and previously was available to only the higher echelon
- Even the operator of a tank or armored vehicle can display something like this
- Show you where you are and show you the best estimate of enemy forces
- When you have something like that, you make decisions based on whatever you have.

- Move decision making down to the lower levels in the same way that this has happened in organizations in the civilian world
- Same things has happened in the military and they are expected to make decisions that were moved up the chain of command

Netcentric Communications Components

- Depend on highly sophisticated radio links
- Brought into battlefield from horses or armored vehicles!
- Picture of a special forces unit that was helicoptered into Afghanistan right after 9/11
- We knew Osama Bin Laden was responsible and we knew he was being protected in Afghanistan by the Taliban government and we asked the Taliban government to hand him over
- As you can imagine, the Taliban said know, so the Bush administration said we had to go in and get him
- Secretary of Defense at the time said we will get ready and have a base in Turkey to get ready and we have an operative in Afghanistan
- Helicoptered in 10 or 11 men and General Dostrum (?) was carrying a suitcase of $1 million in cash and some vodka

Netcentric Battlefield: Local Targeting

- Bring in armaments from nearby bases
- Places where we had missile carrying aircraft and we had to support people on the ground with GPS coordinates and laser designators
- Taliban thought this was coming from some unknown place and eventually those 10 people and 300 mounted servicemen from General Dostrum took the big city of Mazari-Sharif (?)
- With the taken of that city, more conventional troops could be rolled in and we took the Taliban out of Afghanistan

Asymmetric Terror Weapons

- We understand the damage that these things can do
- People with two backpacks can cause immense damage in a city like Boston (Boston Marathon Bombing)
- Most sophisticated device is a fully functioning human that carries explosives under their clothing or driving a vehicle containing explosives
- We have the mental capacity of a person and the capacity of modern explosives

Asymmetric Counter: IED Defeat Framework

- Deals with what do you deal with before?
- Who is making the bombs and who is planting the bombs?
- Where are they being planted?
- Can you detect that once they have been planted?
- What is the intelligence that leads to the bomb makers and what is the technology that lets you detect things before they explode.

- Things depend on getting people to hospitals faster and providing first aid and chasing people who use the damage.
- These things go on as we speak and we continue to work on both sides of that line.

Anti-Missile Defense: Recent Success

- Nike defense system in Los Angeles that depended on vacuum tube computers and anti-ballistic missiles set up in a periphery around the city
- If you go to the end of Mulholland Drive, you can see a relic of the Cold War
- There is a little park with a silo and radar
- Completely hopeless without any chance of intercepting an ICBM
- The Russians probably wouldn't hit LA because they were inaccurate
- With lasers, better radar, and faster missiles, missile interception has been more successful (at least on a local level)
- Stopping an ICBM launched from North Korea has been more difficult

Electronic Warfare

- Something the military has undertaken lately
- Warfare using electronic weapons against installations, satellites, etc.
- Protecting against attacks using electronic weapons using countermeasures is important.
- If we have a measure, there is a countermeasure and a counter-countermeasure!
- If we depend on electronics in the battlefield, we can find a defense against those electronic weapons
- The part in yellow is filled with military and Defense Department jargon
- Kinetic weapon is a gun that shoots lead
- Look up definitions on Google

Electronic Warfare Components

- Go into stack positive and defense negative with a big industry in itself

Information Operations

- We used to call it Sci-Ops
- Try to get into the mind of your enemy
- Either frighten them or convince them by logic to come over to your side
- Going back to Greek and Roman times
- Engaged in psych-out tactics to intimidate enemies
- Leaflets and propaganda podcasts
- Information operations moved into computer network operations
- Civilian sector of protecting against acting has turned us into a major part of military expenditures and research
- This has been going on all the time.

Military Use of Social Media

- Particularly in the last decade since our involvement in Iraq and the growth of ISIS, the military realized the messages our military gave were way behind that of terrorist organizations
- We have adopted a proactive policy and there are now FB and military command centers that are concerned with getting media out within minutes rather than press releases or briefings
- Big push to use social media data analysis to understand the effect we are having and what messages are coalescing with us

Robotic Weaponry: Fictional Robots

- Purpose of defending the Jewish community
- The golem is the guy with a bad haircut
- Robot is given to us by the Czechoslovakian author
- The revolt of the robots shown here in the book is that they want to be considered as people!
- Same thing as the Golem - when it came time to deactivate him, he argued against it and said to be a part of the community he successfully protected
- This theme runs throughout robot stories
- iRobot movie - Will Smith
- Taken from Isaac Asimov

Robots Today: Unmanned Ground Vehicles

- Swarm of robotic vehicles which can communicate with each other and do things like clearing areas and mapping things such as an ensemble
- Part of unmanned vehicles that has gotten most attention are unmanned aerial vehicles (UAVs or **drones**)
- These are sort of a light bulb type of invention by a CIA officer who had the big predator that was designed as a data acquisition or observational platform
- Why don't we put missiles on it and fire at targets in the air
- Unmanned vehicles have become a major part of what we do today in the military

Aerovironment Raven

- Made in Simi Valley and selling tens of thousands of these into the air
- Unmanned helicopters and completely autonomous vehicles
- Has the capability of taking off by itself and identifying the targets and releasing weapons and landing itself
- Combat vehicle can take most of the initiative

Robots Today: Small UAVs

- Put into action in Afghanistan

Robots Today: UAV Dragnet

- Drones can surveil an entire city at minimum risk and get information to locate targets and attack

- These types of drones can have target capability down to the recognition of people

Robots Tomorrow: Very Small UAVs

- Hummingbird is taking your picture and it is listening to your conversation

Robots Tomorrow: Very Very Small UAVs

- Look at that cute mosquito taking your picture

Robotic Weapons: Ethical Issues

- Isaac Asimov postulated 3 basic laws of robotics:

0. Robots should never hurt humans
0. Robots shall obey humans unless ordered to hurt a human
0. A robot should try to protect itself as long as first two laws are not violated

We are in the process of developing intelligent robotic weapons

- As military robots act with more intelligence:
- As things are getting more interesting, we are asking how much autonomy
- Are there limits to what these programs can do?
- Are there shared assumptions for humans and robots?

Military AI: Scientists/Technologists Take Sides - 1

- Craft an open letter saying to stop building intelligent robots
- An international secession or agreement to NOT build intelligent military robots!

Military AI: Scientists/Technologists Take Sides - 2

- People will be unable to stop building weapons but perhaps we have a chance of directing the capabilities that such weapons have

Broader Ethics of Engineering and Warfare

- Technology and military effects have been linked
- Helped the military in Greek and Roman times and the Industrial Revolution, etc.
- The military requirements have driven the need for a better arrow head, better dagger, better sword, etc.
- Moral Perspectives (Greatly Oversimplified)
- War <u>is always</u> an immoral
- People can take the position that killing immoral
- War is the imposition of one's will by force whether it is will for the good or not
- Take the position that this violates fundamental human rights
- Alternative
- Sometimes, war is moral

- A Reasonable Hypothesis
- Some wars are just to fight for
- WWII - world was under attack by evil regimes and in that case, it was fine to fight to preserve freedom and other things that we stood for
- Biblical edict - if someone comes to kill you, you cna kill them
- Possible both in the reason you fight them and how you conduct the conflict

Basic Moral/Ethical Principles ("Rules of War")

- All other avenues have been exhausted and there is a military need/ objective
- There needs to be a valid reason to wage war
- Element of humanity
- Avoid unnecessary suffering that isn't part of the military operation
- Discrimination between combatants and non-combatants
- With the rise of terrorist and insurgent movements, this has become extremely difficult
- Proportionality
- The military objective is carried out in proportion

Just Wars: Issues of Purpose

- Fundamental Purpose is defense
- If attacked, we fight back!
- We were out of it in WWII and Congress was ambivalent of entering WWII when we attacked Pearl Harbor
- Germans came in and w declared war on the Germans and we were in
- Projection of Power - maintain a military for projection of power
- We have warships in all the major seas and oceans with troops stationed around the world
- Make it clear that we are the strongest military power on the globe
- The idea is to deter actions by others
- Trump said we are NOT strong enough and we need to increase size of military for projection
- Humanitarian Intervention - done so in Bosnia, Libya, some instances of Syria and Iraq (fighting against ISIS)
- Regime Change - go to Iraq to remove Saddam Hussein (someone who was moving towards nuclear weapons of mass destruction but actually had biological weapons)
- Preventive or Preemptive Action - **Bush 43rd's policy**
- Right to defend ourself with preemptive action well in advance of any conflict
- When it comes to North Korea's nuclear ambitions, they won't threaten us if we take preventive actions
- Conflict looks inevitable and preemptive means we strike first
- Sarah Palin failed a test when asked about what the Bush Doctrine was

Just Wars: Issues of Conduct

- Degree of Collateral Damage:
- Changed dramatically since WWII when we leveled cities like Dresden, Tokyo, etc.
- Germans tried to level London
- No more indiscriminate bombing
- Weapons of Mass Destruction
- Became important in politics and NOT so important on the battlefield
- Biological Weapons
- DNA weapons and things like super mosquitos
- They can put diseases into countries here
- Terror and Suicide Bombing
- Debate about what we did in Hiroshima and Nagasaki was a terror attack
- The better course of action would be a straight forward takeover of the mainland
- Suicide bombers - Japanese people used kamikazes that essentially were flying bombs that were flown into other targets
- The pilot would die gloriously in the face of battle
- Targeted Assassination
- Historically, this was NOT part of American military tactics
- Assassination of Hitler was tried by his higher ranking officers but this was uncommon now
- We have drones going after designated targets and made people aim for these targets
- Treatment of Prisoners
- Legal status of prisoners
- One side taking prisoners from another and we would have rules regarding prisoners
- Supposed to treat them humanely and if the war was subsequently ended or negotiated, you would exchange prisoners at the end
- How odd we treat “stateless” terrorists
- Case in point would be in POWs from the Iraq War
- What if the prisoner was an American citizen?
- Should we torture? - Donald Trump said we should use this method
- General Maddis (?) disagreed with Trump and Trump backed down!

Just Wars: Issues of Consequences

- What are your obligations?
- How do we influence political, economic, and social conditions?
- Counterterrorism and/or Counterinsurgency
- Are we in a state of continuous war?

Current Ethical Background: Remote Targeting

- Extension of what we did in Afghanistan with the observer looking at the target and sending information to a drone or device.
- Get orders and target somebody

- Confirm target, carry out mission, and kill somebody.

… Focus Is On the Action…

- Causes animosity towards the United States rather than creating camaraderie to defeat terrorists

… the Operator …

- Good Kill - pilot refuses to follow an order that would hurt a child even though it would kill a terrorist commander
- This person won't engage in this type of operation

… and Even the Civilian Implications

- Robot was used to detonate a bomb to kill an active shooter in Dallas last year
- Ethical debate on whether this was an ethical usage of that robot
- Didn't have much of a campus but started an ethical conversation

Moral Effects of Remote/Autonomous Warfare

- Come to peace with direct fire as well as indirect fire & bombing
- Interrogation and Remote & Autonomous Fire are huge areas that still have ethical concerns

Public Reaction: Generally Follows Outcomes…

- Start of Iraq War - we looked good at first but as things started to fray, our support for the war went down severely and never regained its heights

… and Often Reevaluates Previous Decisions

- At the beginning, over 70% said we did the right thing, but later on, around 40% said we did the right thing

… as Does the Right of Personal Decision

- As engineers, consider the ramifications that your products have in the military

Some Final Thoughts

- We are going into Iraq with inadequate forces and we couldn't sustain our momentum in Iraq
- Asked to resign and then given the job by Obama to head the Veteran's Affair Bureau
- General Eric Shinseki

- Stay alert and knowledgeable on issues that affect national security
- President Eisenhower

W 9 W Lec 3-8-17
The Decision Environment

- Perceive the real world and build a situation model
- Use heuristics to select a course of action
- This course of action allows us to act on the real world
- This is naturalistic decision making
- Usually doesn't take longer than a few minutes
- Emergency room paramedics have the same dilemma
- When you get to the situation models you might realize that it is NOT a decision that has to be made within minutes

Questions

- It is costly if we make a mistake
- Is it a situation we have seen before?
- Why in the world did we choose that option?
- If all of these are yes, proceed to the decision analysis
- Generally gives us an optimum answer

Analytical Decision Making

- Considered back of the envelope so we can call it the front of the iPhone or side of the iPad type of decision
- Requirement at all working levels - conscious thing that will include biases that affect decision making
- You can learn to do it better with methodologies
- Experience and practice help you make decision making
- Most decisions we make nowadays are made collaboratively
- Teamwork factors into the decision making process

Decisions With Certain Outcomes

- Each alternatives has similar attributes or characteristics
- Pick the best alternative in situations like this.

Sometimes the criteria we use is monetary

- Minimum Cost ($)
- Maximum Return ($)

Other times we use a unit less criteria

- Maximum Utility (Universal Measure of Value)

Useful Method: Multi-Attribute Utility Analysis (MAUA)

MAUA 1: Options and Attributes

- Choosing a car
- Time to get a new car (starter car)
- Look in the low priced categories
- Just been offered a pretty good job so we are in pretty good shape
- Factors to consider
- Cost: Thousands of Dollars

- Lifetime: Estimated Years
- Carbon: 3-Level Test Summary
- Toss out Garnett because it is a bad price

Common strategy is to convert everything to dollars

- Give Lifetime and Pollution equivalent negative costs so we can compare them more easily

MAUA 4: Utility Measure of Value

- If it costs us nothing, it would be 100%
- If it costs us $20,000, we are in low-utility regions
- Make a linear function for money, which is NOT always the case!
- It is often different at the bottom of the scale than at the top of the scale
- We will also do a linear function for lifetime with 10 as the maximum lifetime
- For Carbon, it is non-linear where Low is the best, Medium is alright, and High is absolutely bad!

MAUA 4: Attribute Weights

- This enables us to be consistent and we can add weights to aid us in decision making
- If attributes have equal weights, they fall out of the equation

Weight (0 to 1)

- Cost is important but only half the question, so let's put weight as 0.5
- Lifetime is NOT as important since it is a starter car, so weight is 0.15
- Carbon has been influenced by Weltman so weight is 0.35

MAUA 5: Weighted Multi-Attribute Utility

- If we do this with all of the attributes, we come up with a clear winner!
- This weighting system helps us find outliers!
- Because we have a consistent model, we can see why shit happens

MAUA 6: Sensitivity

- Let's say you get a job at an unstable startup that initially pays well but they freeze up, so you pick the 2nd best job offer
- You have to readjust weights now because of this
- If we choose something close to it, then we will probably be okay

MAUA Summary

- If we are talking dollars, oddly enough, it doesn't matter how many zeros you have after the $!
- These decisions are made with the same methodology and the same duration of time as decisions that are dollars or thousands of dollars
- Decisions on how to inject money into the economy were made in a few days under W. Bush and Obama

- Get as many acceptable options as you can
- Include the right attributes, especially in personal decisions
- The tough thing is that everyone has their concepts of different attributes
- Some people prefer prestige and appearance over cost. It depends on the person!

MAUA Summary: Important attributes
- Fiat 124 Spider
- Appearance
- Individuality/Uniqueness
- Safety, Comfort, & Effort

Decisions With Probabilistic Outcomes
- When we talk about decisions with probabilistic outcomes, there are several alternatives
- Something we are going to initiate, they have outcomes and probabilities and associated with them and make the optimum choice among these alternatives

Useful Method: Decision Tree/Influence Diagram
- Expected cost, gain, utility, etc.
- One of the important things in this type of decision making is include negative factors and negative consequences
- Could simply be cost, but also could include other outcomes that lead to disaster
- The probability of those things happening has to be included
- People neglect the “what-if” questions

A Trimmed Decision Tree
- Go on vacation: this example was a good one of what people do wrong!
- What is wrong with that decision tree?
- No negatives in these rationale!
- This decision tree only looks at positive things and lacks relative enjoyment
- No Negatives or Cost Factors
- Uncertainties
- Relative importances
- NO absolute measures to determine if you want to go to Germany or visit in-laws
- List of possibilities but NOT a decision tree

Top Level Decision Making: President G.W. Bush
- Listen and make a decision, but would NOT make an analysis
- People like the Japanese American general were later NOT invited to make these decisions

Top Level Decision Making: Obama

- Analytical decision maker
- Based things off of careful analysis
- Obama rolled the dice and he was both smart and lucky (catching Osama Bin Laden)

Real Decision Trees

- Decision is an action
- Some uncertainty in branches of the tree
- Expected utility of a branch is the probability of this part of the branch times the cost or the monetary value of that time
- Start the same way and then branch off later
- A lot of redundancy that makes it difficult to compute the tree as well as understand what it means

Influence Diagram: Solar Panel Factory Site

- Influence diagrams
- In our work, influence diagrams make it very useful to condense big decision trees into relatively manageable models that can be generated and then computed
- The computing is done by computer and this starts with actions and ends with outcomes
- Outcomes have names and values
- In between these are things that factor into the outcome result
- Could be objectives you are trying to obtain or other factors such as environmental factors that you don't have any control over.

Influence Diagram: Assigning Values

- When it comes to the influence of an action upon an objective, they are uncomfortable putting probabilities (0.1, 0.5, 0.69, …)
- They are okay with using 5 point scales i.e. Very Low, Low, Medium, High, Very High

Influence Diagram: Selecting the Action

- In this case, if we are looking for a very high positive acceptance by the population, the place to put the factory is in the central city

The Factor of Risk

- Let's say your expected value is 50, but you have a 50% chance it will come up with 0 and a 50% chance it will come up with 100
- Tradeoff between risk and utility

The "Take Away"

- Some methodologies can be done via pen and paper.
- These can be done for a variety of problems
- Computer modeling and computation can be used for influence diagrams and it still involves some expert judgment

- In the case of the influence diagram, we are asking experts to put values on the influence that one factor has on another
- In the multi-tribute utility case, it is NOT always possible to get actual data
- You might have to use judgment and appearance is something you cannot find data on
- NO objective means of quantifying these factors
- Subject to Emotions, Mind Tricks, and Biases

Psychology of Decision Making

- The most influential people are two psychologists called Amos Tversky and Danny Kahneman
- Israelis who taught and did research in the U.S.
- The reason they had so much influence was that economists picked up on decision making research and included it as part of economic theory
- For the most part, humans don't act the way they are supposed to based on analytical formulations
- Act in accordance to their own perceptions and their own biases

Kahneman & Tversky Teachings

- Take the alternative that says I win a reasonable amount and lose a reasonable amount

Examples of Biases: Estimating Deaths Per Year

- People are highly influenced by the last thing they read about
- If you ask people what they think most people are likely to die from, they will overestimate things that are extremely rare but talked about in papers but neglect common things that many people die from

Case Study: Martha Stewart at a Decision Point

- Change from 20th century to 21st century
- Boom in tech stocks and everyone was investing
- Martha Steward was a CEO at the time for home goods and home advice.
- She became pretty rich on paper and in practicality
- Still gambling in stock market on a reasonably small scale
- ImClone shareholder
- ImClone is a pharmaceutical stock with potentially important drugs that are being tested and can have substantial impact on ImClone profits.
- Inside owners are rapidly selling all their ImClone stock
- She knows what that means
- The FDA probably denied approval of the drug and the insiders know this but the public does NOT yet know this
- Public will find out tomorrow and the stock will drop afterwards.

Martha Stewart Makes Intuitive Decision

- Well-known name in financial circles so they give her an interview of why she decided to sell
- Gets a stock broker to write in that there is an automatic sell order and this number gets triggered the day she sells
- SEC was NOT so stupid and they analyze the ledger used
- The ink used was NOT the same of the entries right above it and pretty soon, the stock broker rolls over and implicates Martha Stewart
- She is then tried and convicted and goes to jail
- As a result the stock in her public corporation goes way down and her personal wealth goes down

Martha Stewart Makes Analytical Decision

- The stock returns within a year to where it was at the beginning of all this and Martha Stewart would have lost money.

An Ethicist's Dilemma?…

- Martha doesn't seem to remember why she was convicted for.
- She basically didn't learn shit from this lesson lmfao!

… Maybe Not: Justice After All?

- The company never recovered and it went down to Low $1.72 and never got back to the type of company it was.
- Even after she got out, the company got into a couple of other scrapes that were ethics related such as breaking agreements and looking the other way on certain agreements.
- Seems like there was a certain ethical disconnect

Summary: Ethics in Decision Making

- Has effects on the project level, organization level, and national and international level
- What do organizations owe their shareholders and employees?
- A lot of ethical dilemmas mentioned online and on commentary in public and private discussions
- A Personal Action
- Assimilate all this and this becomes a personal action
- The difference between having ethics, which is easy, and being ethical, which is more difficult, remains a challenge

Group Decision Making

- We divide groups into a different way.
- Groups can be unstructured and unaided - no methodology to follow
- Structured - use MAUA or decision trees for this
- Other Methodologies
- Structured and Aided
- Computers can aid and supplement this

Early Group Decision Analysis Aid

- Computer resources weren't good enough at that level and the displays weren't good enough at that level

Aided vs Unaided Team Activities

- If you look at the Unaided Group, they spent 90% of the time arguing with each other
- Probably counterproductive!
- Finally, they would all get tired and pick something that the dominant person would have suggested
- What are some of the things the other people barely discussed?
- There were values in group decision aids; the technology just wasn't ready for it

State-of-the-Art Decision Support System

- Laptops that you can buy now have the computing power of what people had about 30-40 years ago!
- It helps people connect data to the various aspects and elements of the influence diagram
- Analyze the influence diagram to figure out the sensitivities of this highest value
- People can use these decision aids and look at it in more detail if you look at it.
- Even people who have no background at all in decision analysis can use this type of program to build a pretty robust and complicated model

Decision Making Under Stress

- Weltman did diving research and he overcame his fear of diving over the course of a few years
- At the limit of their ability, they were stressed as well
- Psychology taking this into account has come up with far-reaching definition of the causes of stress
- In diving, if you are outside of the depth of your comfort rage, you could die!
- If you go in for a job interview and you feel the company you are applying to would stretch your capabilities, then you will be stressed also and have all of the same symptoms that the diver would have.
- If you are making a decision that people's lives depend on, then you will be stressed as well.

Response to stress

- Deal with the effects of stress
- The result on decision making is NOT positive!
- One of the lessons you learn as a team leader is that stressing your team is NOT a way to improve their performance for various reasons
- There is a phenomenon of narrowing attention

- An evolutionary component that if you are faced with a wooly mammoth or a sabertooth tiger, you don't want to focus on what you will be eating for breakfast tomorrow
- Narrowing of attention actually affects your peripheral vision
- Everything becomes focused
- Less mental capacity for innovative thinking
- Examine decision-making for holes in reasoning
- Decisions won't be as good
- How do you deal with it?
- Recognize you are under stress.
- Symptoms such as heart rate going up, breathing more rapidly, head is about to burst
- Natural reactions to stress and understand this
- Get into a more familiar mode
- Go into practice procedures and checklists/methodologies
- Use energy that comes from stress and use it productively
- At the same time, the novices were sky-high and there is a big difference in what we look for in R&D
- Use stress energy productively and there are ways to do that via biofeedback techniques and the mindfulness of maneuvers

The Decision Matrix

- If you make good decisions in the long run, you will get good outcomes
- If you make a bad decision and get lucky, this won't necessarily translate to consistent results in the long run
- What is a good decision in engineering?
- Include all of the relevant factors
- Use information that you have or you can get by the time you have to make the decision

A Danger: Not Admitting to Bad Decisions

- Once you choose an alternative, this alternative looks better after you have made the choice than before you made the choice.
- It is a way of the mind congratulating yourself
- Let's say you have chosen the Delta car, and then you go to the agency (car dealership) and you have to choose between Red and Black
- Cops chase Red cars but Black cars get dirty….
- Choose Black and two weeks later, and the dealer asks your feedback
- You are much happier with the Black one than the Red one
- You have two choices
- Either you are a really bad decision maker or a really good decision maker
- Sometimes, you make bad decisions
- Your calculations were wrong and you did things wrong
- Cognitive Dissonance
- Positives

- Believe that you did all you could and you learn nothing from bad decisions
- Negatives
- If this is what we planned, then things are going according to plans and we better change the plan.

Learning from Mistakes is Not Really a New Idea
- My man Lao Tzu

Final Exam
- Like the midterm but will have short essay questions at the end
- Easy to write about
- Ethics part will be throughout the course, but the part that deals with the class lectures will be **AFTER THE MIDTERM**
- Factual manner will be after the midterm

W 9 Discussion 3-10-17

Due Next Time
- Team Presentations

Due Monday of Finals Week @ 5 PM
- Team Paper
- 6417 Boelter Hall

- WikiLeaks - leaking the info about the CIA will help improve encryption and security
- When you find a vulnerability, the rest of the world will also find one
- If you try to use it to your own advantage, other people will try to do this too!
- Every time there is a patch, they will try to fix the current software
- Google - Project Zero and find exploits
- Find a huge vulnerability with CloudFare

CIA can get to our phones so someone bad could also get into our phones

Today
- Illustrations
- Presentation Prep
- Team Time

35 minute presentation
- Everyone should talk so about 7 minutes per person

What is an illustration?
0. Figures
0. Tables

Why

- A picture is worth a thousand words

How

- Explain illustrations using references i.e. Physics 4AL and 4BL
- Make it flow naturally to report's content/context

Rules for incorporating illustrations

0. Leave space between illustration and paragraph
0. Figure: Number and caption go **below**. Table: Number and table go **above**
0. Must be labeled in numerical order. First **figure** will be Figure 1 and first **table** will be Table 1.
0. Must be properly placed - within or following the paragraph it was first introduced.
   - Avoid putting a figure you won't mention until the next page
0. Must reference the source you are taking the illustration from.

- Label your graph axes

How to become an expert presenter

- Avoid using filler words like "you know", "um", "ah"
- Tend not to breathe as much and talk faster than our thoughts
- If you listen to someone using "like", you will pay attention to the next phrase because it is important to listen to!
- Better to have a moment of quiet than an "um" or "you know"
- Pausing is okay

At a wedding, you could give a speech and the father of the bride gave a toast for 40 minutes and it was entertaining

- It is NOT technical abilities that get you far, but rather your public speaking skills for management
- Always accept every opportunity to speak in front of a crowd

Oral Presentations

- Retain information best when you see and hear together
- Engage your audience and explain it that way

Preparation

- Public speaking is number one human fear (death is sixth)

If your talk is not well prepared and you do not deliver it in a manner that gains and holds the attention of your audience, much of the knowledge you hope to share will be lost.

- Do NOT just view this as a way to get a grade and pass this class
- What can I teach them so they can actually learn something
- The talk must be well organized and logically structured
- Concision and have an introduction that explains what your presentation will look like

You can use humor to add to the effect, but don't overdo it

Death (or worse) to those who run overtime

- It is rude and egotistical to exceed your allotted time. Running overtime also suggests a lack of preparation and experience.

Videotaping and critiquing yourself is important

- Do NOT cross your arms
- Rock back and forth
- Do NOT have hands in pockets
- If I am not talking, do not chill out.

Having some theme in your presentation is easy and good

- Create a powerpoint presentation and submit it online
- Use Powerpoint slides

0. No speaker shall use his/her presentation as a dry run of hardware and software.

- If you have a Mac, you can use a Mac adapter to hook it up

55% comes from facial expressions and body language
38% comes from vocal quality or tone of voice
7% is from the actual content

- Smile - nonverbal signal to show you are in control and relaxed
- Pauses are essential to a strong delivery.
- Watch your posture - stand straight up and face the audience

Dressing for your talk

- Look like a team
- Be unified

Final Exam

- Short answer will be based off ethical frameworks
- MC
- Short answer

W 10 M Lec 3-13-17
Engineering Projects are Difficult

- You have to form an effective, well-functioning team usually NOT in too great of a time period
- In spite of the fact they are difficult, we are able to get projects done such as a team research project, which is due a week from today

Project Definition

- Understanding what we have to do in a project and applying certain management techniques
- Specific objectives can change
- Can be a simple objective such as getting a report out as well as getting a prototype for mass production
- Project has bounds such as inputs, outputs, and limitations on schedule
- Limitations
- Includes administrative and support personnel

Project Components

- System Requirements
- Starting with requirements but sometimes they don't
- Sometimes they start with solutions
- A solution looking in search of a problem but when they get together, then they become a project and at that point, we have to set system requirements
- Come from a variety of different sources and a variety of different characteristics
- Two main sources are the customers and users
- Customer is paying for the project
- Maybe internal or the company is paying for it
- One or the other
- Users are the ones who are going to use the product
- Marketplace sets its requirement by what else is out there
- Corporate personnel set requirements by setting the dimensions of the product or the limitations on the project
- Legal requirements sometimes set by conflicting by existing inventions or patents
- Other times, you have something so new that you want to keep it secret
- Nature
- Physics sets requirements and you can't fight the laws of physics

Project Components: System Engineering

- Used to be studied in a separate department in the School of Engineering
- Don't have it anymore
- Became a more traditional, less visionary organization of the school
- System Engineering is still here though!
- People who have been trained as CS, ChemE, Materials Science, Civil E, or BioE will be thrown into the role of System Engineering

System Engineering

- Establishes the concept of a system and we do it via schematics
- Can do it as a block diagram and what are the parts of it?
- You determine that things are feasible and yes, you can meet the requirements that come up during the course of the project but we can deal with them
- As much as you can at this stage, you can quantify it and you can put numbers on how much it will cost and it will take a certain amount of people to do it

Example: Laser Cloth Cutting System

- Product that Joe Miller (late colleague of Weltman) started his career
- Graduated as a nuclear engineer but ended up NOT doing that as his career
- Became the head of high energy laser development and was very successful at that
- Those high energy lasers were generally used in missile defense and other weaponized systems but he also got into some other uses of lasers and he can do that to cut cloth
- It turns out to be a very important job in the clothing industry
- When Weltman was slightly younger, he worked in the garment industry in DTLA
- Shop guy who did odd jobs around the clothing manufacturing organization that made ladies' dresses
- What he observed in that enterprise was the most important person was the person who cut the cloth
- Generally a man because it was a strenuous job
- Stack up a foot worth of cloth and use a skill saw to cut around the pattern
- Had to keep the skill saw perfectly perpendicular because otherwise, some of the pieces would be too small

Sub Systems

- Control subsystem that lets you program it, start it, shut it off, etc.
- Something that prevents you from cutting off your finger as part of the operation as well as all the things that go in
- Sub System is part of the conceptual design of the system engineering stage

Project Organization

- Have a substantial project team to do it and the one way you can do it is to have the subsystem and an optics team.
- Just a systems engineering team that cuts across all of them
- There generally has to be management
- Virtually no projects have succeeded without some sort of management
- Be very informal and someone can take initiative to send the report
- Going out and buying things for a prototype and that is the way we organize it

Project Work Breakdown Structure (WBS)

- Each subtask will have a budget associated with it and you can do it project by project

Project Phases

- In the first lecture, I showed you a table top gunnery table

Management: Sample Task Schedule

- Planning takes time
- Organizing takes time
- Need a few days to put together to print it

Management: Sample Headcount

- Make the project stay fully stacked
- You can have dozens or more people working on it and have this stacked
- You can have a similar type of financial plan and this is a typical spending curve for a project
- Starts out at 0 and then starts a little slowly as you ramp up and it moves up very rapidly as it is in the major stages
- When you bring it to a conclusion, it can have a very good period with small expenditure where it is almost flat

Management: Sample Review Cycle

- People are talking to each other on a daily basis and there can be reviews by a project manager
- Management reviews by the company itself as well as quarterly reviews
- Customers can be brought into the picture and do everything you have done in the last several months
- Reviews that are associated with big milestones and present a design phase

Project Management Is…

- Is it restrictive because it requires so many conditions to be met?
- Is it enabling because it inspires creativity?
- **It is certainly a bit of both**
- **Without management we couldn't get shit done**

- In order to get things done, we cannot accommodate it in this project
- Sometimes, it is such a great idea that you have to incorporate it, and this requires a whole change in concepts of schedule and all these things
- The idea of keeping a project on track is something that I see sort of analogous to steering a really big ship

Book of Holland: Entry to a port in Holland (The Netherlands) that is a very difficult entry

- In order to get the ship positioned, you have to start turning when you are miles out
- Otherwise, you cannot turn a big ship fast enough to make it into the narrow passage
- That is a good idea and an extra requirement, so that would add a lot of capability, and pretty soon, you are off missing your project goals
- You cannot succeed within the time period anymore

- Is it boring or stimulating to be a manager?
- **That depends on the person!**
- Observe the non-technical management and see what they do
- **Even top executives at elite technology companies may NOT be technical enough, but they could be good managers**
- Weltman says there was a manager from the Army who understood how to keep a team working and he always brought in the software on time, within budget, and meeting all the requirements
- He couldn't do shit about programming but that is fine, he didn't need to

Ethical Case Study: A Project Gone Bad

- The 1991 Explorer SUV was a bad product
- Created by Ford Motor Company
- Lawyers say there is a "**bright, shining line**" between these projects

Ford Explorer SUV Background

- Sports utility vehicle
- Used for off-road adventures
- By the late 80s, it was clear there was a market for a vehicle that resembled an SUV, but oriented towards suburban living
- Carrying children to soccer and baseball games as well as carrying packages from big stores
- Automobile companies were jockeying to go into this market
- Should we design an entirely new concept such as a suburban or urban SUV, or should we re-engineer something we already have?
- Factors could influence this decision and see how long it would take them to get into market
- The potential for a profit is very high with trucks and SUVs

Ford Explorer Family Tree

- Mazda Courier LT from 1972-82 led to the Ford 1983 Ranger LT
- Primitive steering
- Basics of mass production
- When SUVs started to get popular, Ford that it would enter the market with something it called the Bronco II SUV
- Added a body to it and raised up the body a bit so you could go off road when it came time.

Bronco and Explorer Comparison

- Avoid this vehicle and consumer reports criticized this vehicle
- The automotive press sort of got this picture and renamed the Ford's Bronco to something else

Inertial Rollover Forces & Movements

- Centrifugal Force
- Have the force moving out from the center
- Momentum Force
- If the vehicle turns perpendicular to the direction of moment and the leading wheel catches, then you get an inertial force
- Creates a moment that is the center of gravity and the height of a center of gravity
- If you look at what is happening as the vehicle starts to tip and its center of gravity goes up, that moment gets bigger
- The moment that is trying to hold the vehicle down is the weight
- The moment arm of that moment is 1/2 of the track
- That moment gets smaller and once a vehicle goes over and unless you are a very skilled driver, you cannot drive on two wheels

Effect of SSF on Probability of Rollover

- Pretty well-defined function of static stability
- Have between 40-50% chance of rolling over
- Ford Explorer was right on the edge of vehicles taken off the market because they were too susceptible to rolling over

Ford's Response to Rollover Problem

- Use smaller tires - NOT rugged enough
- Lower the tire pressure (get it down a little lower but also make it software) - something that management went along with
- They lived to regret this situation
- Degrade the performance - NO! Then we cannot market it as an agile vehicle
- Management chooses Time and Cost over <u>known</u> Safety Problem!

Ford Explorer Play-Out

- You have two big international companies arguing about whose fault it was
- NOT only does it have poor static stability but it also has instability in its steering and tracking system
- Prone to what car drivers call over-steering
- When racers drift, it means the backend would break loose and send you to very dangerous conditions
- Explorer has problems that are brought to the attention of the country to thousands of losses

- Lots of individual lawsuits and some of them awarding damages in the tens of millions

Typical “Explorer Rollover” Lawsuit

- Low speed accident in the Fairfax district of Los Angeles
- Typical fender bender that happens
- One of the cars is a Ford Explorer and what happens in a typical rollover is that the initial forces can throw parts of the occupants out of the windows of the car
- The driver goes out and the Ford rolls over on his arm and damages his arm so badly that it has to be amputated
- Older person and the amputation and it is quite devastating physically and emotionally
- Plaintiff suing the Ford Motor Company for damages
- The Ford Motor Company responds by saying the Explorer is safe and that the rollover was the plaintiffs part
- Litigation Proceeds
- Civil case and NOT a criminal case
- The only thing at stake is money
- Get together in arbitration and see if you can settle this
- The courts are backed up with many cases and arbitration offers this person $10,000 to go away
- Ask the judge and we now appear to be going to trial
- Tell the jury the story in the same way I told it to you at the beginning of the lecture
- The Explorer and the Bronco are two different cars and the judges look at the table and draw the opposite conclusion
- They look the same!
- Slight change in dimensions but everything else is the same
- **Plaintiff is NOT a very likable person**
- Comes across as not likable even though he is a lawyer
- Ford Motor Company can delay forever and the case just keeps submitting things we have to respond to and there is a good chance we get nothing
- Drag it out to a point where the person is NO longer around

Ford doesn’t need a bailout when the Great Recession hits

- Ford is NOT in trouble because they settled the lawsuits and they had financing before the Great Recession

Deja Vu: Previous Case of Cost vs. Safety

- Like Martha Stewart, Ford didn’t learn shit from past mistakes
- Ford Pinto: fires induced by collisions!
- Early example of compact cars, which was particularly likely to have a crash-induced fire
- Has a differential gearing system that allows the two back wheels to turn at different speed while power is given to one of them

- Had four big bolts sticking out of the rear, while the gas tank was right behind the differential
- Little sheet metal at the back end of the Pinto
- If a collision forces the gas tank into those bolts, you get a leakage of gas
- Any spark (mechanical or electrical) causes a fire!

Suggested Engineering Solutions
- Put a protective shield in front of the bolts
- Puncture-Proof Tank Material
- Baffles in Tank
- Sloshing around in the gas tank doesn't force them around

The second thing is that they rationalize this on the basis of cost and they do this with a crazy analysis
- At the time, the idea of cost-benefit analysis has good currency in the management science area
- They are conducting a cost-benefit analysis and they are doing it in an internal memo that is dramatically titled "Fatalities Associated With Crash-Induced Fires"

Ford Memo Method and Conclusion
- Done by several engineers who are in charge of impact factors as well as a principal staff engineer who signs off on it
- As a consequence of cost-benefit, using favorable benefit assumptions, they conclude that it is cheaper to forget about the defects.

Ford's Benefit-Cost Analysis
- Cost us $11 per vehicle to fix the defect
- The cost of paying off people who are killed or injured is less than making the technical change
- This is a very simple decision tree that leads to VERY BAD ethical implications

Lasting Repercussions
- Ford Motor Company had weighted the lives of consumers against the dollar - and they chose the dollar
- Ford Motor Company would have to make changes in subsequent decades, so that would be a major decision

Whistle Blowing is a difficult situation because it generally has major repercussions

Auto Engineers Fight Back
- Pinto was NOT a relatively dangerous car compared to other cars
- In the middle in terms of deaths per million vehicles

- Small design faults are NOT the main problem, but the real problem is big safety issues like
  - Excessive speed
  - Drunk driving
  - Driving error or poor judgment

Lesson Learned: The Story Matters

- "The death of one man is a tragedy, the death of millions is a statistic"
- Unfortunate part of media news
- When there is a story, it makes a big difference

For Example: U.S. Deaths in Cars

- Population grows and we drive more per year, so the actual death statistics has gone down in recent years below 40,000

Some Relevant Ethical Questions

- Use cumulative probability and what is the probability in your lifetime that you will get in an accident where if you don't have a safety belt on, there will be a substantial chance of an accident.
- Nobody used safety belts at the time.
- Weltman was driving to one of his meetings in NYC and the taxi driver was very chatty and asked what he was in town for
- On a committee to use safety belts.
- The taxi driver said that is a silly thing to do.
- In NYC, they make us put on safety belts if we are taxi drivers
- I was in an accident a couple of years ago and I broke my leg and was in the hospital for three weeks
- Weltman said if he didn't wear a safety belt, he would have lost his life and not his leg (LOL)
- You can't argue with a New Yahker
- Cigarette packages say if you use this product as directed, it will kill you
- Less people are smoking now than in the hey days of tobacco products

Design errors are blamed in the Minnesota bridge collapse

- Because of safety factors that engineers had, it seemed it was okay to them even though in practice, it wasn't
- Did the engineers anticipate the bridge would collapse?
- NO!
- They thought the bridge would last forever

The Bright Line Concept

- Ford Explorer and Ford Pinto can be on the Unethical side
- Minnesota Bridge could be on the Ethical side

Legal Criteria for Punitive Damages

- Malicious

- Prior knowledge that the technology is UNSAFE
- Fraudulent
- False representation
- Include the expectation of safety
- Everyone knows that cars are NOT 100% safe
- Don't expect that city fender benders will turn into a life-threatening situation
- Know that these products can be misused and even within the margins that they have been designed, they can turn into dangerous objects
- Expectations
- If violated by malicious, fraudulent, or oppressive, then there can be a legal case about it!

In the Ford Explorer Case

- Settled out of course
- Punitive damages have gone as high as $1 billion
- A jury can award a plaintiff million dollars of cigarette cases or product usage cases
- In very rare cases, it will rise to the level of criminal intent
- **Very rare**!

Example: Engineering *and* Ethical Failure

- Mistake in Fukushima's nuclear reactor case was that the engineers did NOT know where to place the backup generators
- There needed continuous water cooling to keep the reactor cool, so electrically powered pumps had to go through the nuclear power plant
- People realized the power grid could go down, so they had a backup generator

Bright Line Reexamined: Bright Zone?

- Authorities were unnecessarily exposed to radiation when they shouldn't have

Bright Zone: Utilitarian & Pragmatic Issues & Values

- Responsibility of the engineers is pretty clear in some cases
- Consequences of exercising that responsibility are sometimes indeterminate but sometimes we want to examine these characteristics

W 10 W Lec 3-15-17

- Quick Review towards the end of a project
- Problems that are facing us in the 21st century that have technological and social aspects
- Main objective is to help you build a personal ethical framework
- As you have learned from observing Weltman, he tends to think of a pictures

- He thinks of an actual framework and various thought bubbles like gender, nationality, and other sources to draw on.
- A lot of information we gain and some of it may be particularly attractive
- Things like honesty and compassion
- Truthfulness and respect is something we pay a lot of attention to

ENGR 183EW Personal Ethical Dilemmas

- Lying and Cheating - ~40%
- Stealing and Receiving - ~35%
- **Teams & Authority - ~15%**
- **Technical Risks & Hazards - ~10%**
- In your careers, organizational dilemmas will likely dominate, but this depends on your Personal Ethical Framework

Organizational Ethics: Team & Project

- Key to the ethical conduct is respect!
- Respectful behavior as well as respect for the knowledge or capabilities and contributions of other people
- Even if they come from different disciplines, there are still things people can add to the team
- TO draw out these contributions is to maintain communication
- Keeping promises is the type of thing that stays with you as reputation.
- Loyalty within reason is important
- Interactions with Higher Management
- People who deflect blame off themselves are hard to work with
- All these other guys who cause the problem make it frustrating to work with, especially in the long run.
- An admission that you weren't able to have an effect on your team
- Better in many cases to accept a responsibility along with the team
- Interactions as a Manager
- Managers have responsibility for other people's lives and that is a big responsibility
- The way that you treat subordinates has an effect on their career as well as yours
- The first thing you have to go in with is respect and consideration
- Part of respect and part of consideration is the absolute avoidance that looks like harassment!
- No sexual, ethnic, religious, or appearance harassment!
- Ethically wrong and most of the time, it is illegal
- Conflicts of Interest
- Sometimes lead to dismissal or transfers out of project
- Deal with both technical and financial decisions
- You are influenced by it

Organizational Ethics: Conflict of Interest

- Hiring or appointing a friend or relative, and they do something that would normally be a reprimand or even a fireable offense
- Would you let them slide by because they have a special relationship with you?
- A constant part of engineering practice is making recommendations that could have direct benefits to you or benefits to a close friend or relative
- Methods of Resolution - Not Necessarily in Order of importance
- Test 1: How does the situation fit into MY Ethical Framework?
- Person has to be qualified for the job.
- Test 2: Who is Harmed?
- Is there actually a conflict?
- Some organizations have policies against partners i.e. husbands/wives working together in the same department or even in the same organization
- Can any of these conflicts be resolved and in an equitable manner?
- Test 3: How Does It Smell?
- How is it going to look if you see it on the front page of the NY Times?
- Nowadays, how is it going to look if it is on Twitter, FB, or some of the bigger blogs

Using Your Personal Ethical Framework

- Serves as a guide to future actions
- Expect modification and adjustments
- When we started the company and we sat down and laid out the beginnings of the ethical philosophy of the company, we never even considered transgender employees
- Maybe 15 years into the company, we had a psychologist who was hired as a man, and he became a woman
- Which bathroom should “she” use?
- Perception of society changes and there is a continual evaluation
- Bring actions inline with philosophy
- What you do is inline with what you think you should do
- Inevitably you should also evaluate the actions of other people as well
- Whistle-blowing
- Sometimes the actions of people around you are wrong!
- Something has to be done about it
- Comes from the beginning of the English police force
- Started by Robert Peele
- In the early days, they would primarily use whistles to attract other police and try to subdue the criminal
- **Sees trouble and brings it to the attention of others**

Whistle Blow Case Study: Watergate Affair

- Found three people burglarizing the office by taking information from the office
- Who were they and what were they doing?

- They refused to give their names initially and it was sort of a low-level crime that nothing was happening
- In November of that year, Nixon is reelected to a second term
- The rest of that year and the following year, there is an investigation into that crime
- “Deep Throat” (based on a porn film at the time) blew the whistle and said this goes up much further into the Nixon administration
- Follow the money!
- Who paid for the burglars?
- The trail goes all the way up into the White House
- President Nixon used to tape every conversation in the Oval Office
- When it comes to the critical conversation of who ordered this break-in, there is a 30 minute gap erased!
- Secretary erased it by accident (sure she did lmao!)
- Congress is ready to impeach him when President Nixon resigns in August 1974!

Watergate is a National Turning Point

- People are wondering if there was really a Deep Throat, or was this a mythological being created by Woodward and Bernstein?

2005: ‘Deep Throat’ was FBI’s Mark Felt

- He was second in command of the FBI which is NOT too different to what we are seeing in today’s headlines
- FBI involved in the White House and possible criminal activity

A More Recent Whistle Blow

- What Snowden revealed about the activities of the NSA were NOT crimes, but surveillance activities beyond what people expected
- Edward Snowden comes out and what he did had criminal aspects because he stole documents that were secret
- He ran away to Hawaii, Hong kong, and later Russia
- Revealed a lot of information about what the government was doing in terms of surveillance

With Somewhat Different Responses…

- His actions get a more studied and measured response
- Telling us something we didn’t know
- For Facebook and Google, giving user data to the U.S. could hurt global growth
- People say stay calm and let the NSA carry on

But Personal Attacks Have not Disappeared

- The first thing was to attack that woman, and then about 10 others came forward and the attacks diminished
- In our last presidential election, this doesn’t happen!

- Donald Trump is accused of sexual harassment and he remains unscathed about this issue

Mike McQueary Not Coaching….

- Joe Paterno is a hero, but the person who blew the whistle is blamed for everything that happened and NOT the guy who is now sitting in jail for the things he did to the young boys

From the Whistle Blower's Viewpoint

- Don't trust too much
- Give evidence
- Don't go beyond the evidence!
- There are some people who may be on your side, so find out who among your colleagues would stand with you through thick and thin
- Seek outside guidance
- Talk to an attorney because they are generally legal issues involved
- There are whistle blower laws in many laws
- Federal whistle blower laws that protect the whistle blower from retribution
- Weigh your options carefully
- This is a big decision for sure
- Best course of action is to pick a good time and present it in a helpful manner
- Anticipate a personal attack or retribution
- A lot of things can be brought on as a personal attack
- Sometimes, there is enough of that where it becomes uncomfortable to stay in the organization
- Part of weighing the options is to see if it is a big enough deal to rectify the situation

Future Value of Your Ethical Framework

- Professional Career
- Put your knowledge of ethics as part of your resume
- Should help you in creating your resume
- If I ask Weltman for a recommendation, he will make me write it and revise it for situations
- Changes in personality

Parenting & Mentoring

- Having a strong ethical framework can make a huge difference when it comes to raising your children
- Weltman's daughter was a part-time employee as his company as well as a teacher in Los Angeles
- She taught at Martin Luther King Elementary School

R-rated case study in Engineering class!

Experimental Humanities for Engineers

- Dean Boelter was concerned with engineers getting experience and knowledge in the humanities
- People were constrained by the number of units we had available
- Humanities for Engineering students class did NOT survive, but Engineering Ethics took its place
- University courses you can take online and you could have literature that is available that is a click away on Amazon
- Same thing with movies and TVs
- Variety of current news media
- Daily newspaper (?) - unclear whether it will remain
- Somehow stay connected whether it be people you follow or online news sources
- Large # of sites that coordinate and accumulate stories from various places

Literature: The Near-Infinite Resource

- If you haven't formed a habit of reading a book every few weeks, this is a good thing to do.
- If you want guidance, type in 100 greatest novels and people online will be glad to provide you with recommendations

- Catcher in the Rye - the seminal coming of age story

Weltman is a long-time fan of science fiction, particularly earlier in his career

- Some of the classics of that genre give us a background of what is happening now
- Brave New World - people are controlled by drugs
- 1984 - world of surveillance
- Animal Farm - satire of communism
- Clockwork Orange - condition people out of committing crimes
- People with criminal inclinations can no longer commit a crime because they have been conditioned out of it

When it comes to popular authors, Weltman's personal criteria is to NOT go below 4th rate

- 1st rate - Noble Prize contenders
- 2nd rate - Hugo Prize, Pulitzer Prize, detective story Prize, etc.
- 3rd rate - Good authors that are never going to be mentioned for the Nobel Prize or shortlisted
- Worth reading though
- 4th rate - Bad writers with good ideas
- Michael Crichton - bad writer but wrote Jurassic Park
- Not super well-written but great ideas!

Movies & TV: Our Main World Contribution

- Psychology and Sociology
- Death of a Salesman by Arthur Miller
- Best American play
- Important to managers and people who are going to be owners of business
- Speaks to the value off rock to people and the title tells what happens to a salesman at the end of his career
- When it comes to movies about business and society in general, the only serious study of American business was The Godfather
- How to conduct yourself in a meeting, keep quiet if you don't have anything positive to say.
- Keep your friends close and your enemies closer.
- Another TV show took over this and this was called **MAD**MEN - Madison Avenue Men
- Deals with the advertising industry in the 1960s
- Covers a lot of themes including the roles of women in the workplace
- Up in the Air
- Organizations have people to layoff and he comes in and gets rid of them
- As they started making the movie, the Great Recession hit and people were starting to get laid off
- In order to get a feel of how people reacted when they were being fired, they simulated the firing experience with people who had been fired
- Clooney went through the types of things they had been told
- One door closes and another door opens
- People react with absolutely honest emotions in the same way they reacted otherwise
- Mythology: Morality and Ethics Narrated
- Star Trek - every TV episode had a moral aspect to it

An Activist Speaks

- James Cromwell - fucking tall dude (6 ft 6ish)
- Babe - will the sheep get into the enclosure?
- They were riding bicycles together and they became good friends
- Analyze those decisions in terms of our own standards and learn more about our personal ethical frameworks

MADMEN Example: The Story

- A particularly prestigious company is a car company
- Jaguar did NOT have a terrific reputation for reliability but they had a great prestige name, especially in England
- The account executive Pete takes hit offer to the president of the agency Don Draper, and Don says this shit ain't ethical
- **Pete doesn't give a fuck!**
- Let's at least make Joan an offer to sleep with this guy
- Joan initially says no, I'm not doing that shit

- She goes to outside counsel and the people outside say don't do it for money

How to Make a Real Impact

- Even in today's world, individuals can make a difference and just listening to VP Al Gore, the Internet has made it easier for individual voices to be heard and individuals to have an effect
- Remains optimistic along with VP Al Gore

In Summary

- Go Forth and Be Ethical — People AND Engineers

Complete the Course Evaluation Form - we welcome feedback!