APPLIED SCIENCE 450
Professional Engineering Practice

Ethics – some basic concepts

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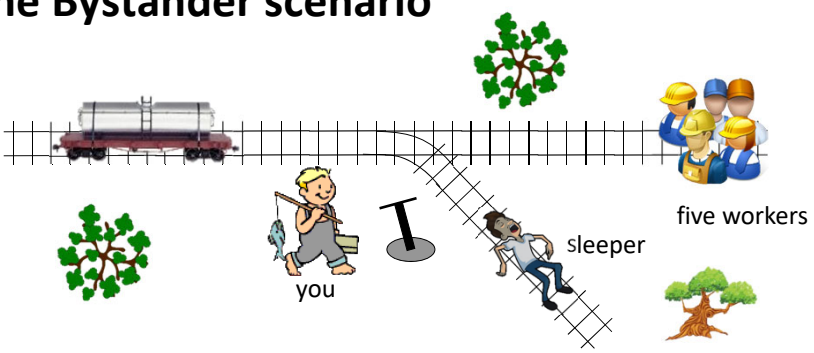
The Bystander scenario



You are walking by a railway track and notice a tank car full of propane heading toward five workers who cannot escape an inevitable explosion.
A man is sleeping on the siding.
Would you pull the lever and divert the tank car to the siding?

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Not just a thought experiment

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Friday, June 20, 2003, 11:58 am, Commerce, Ca

Thirty-one freight train cars carrying mostly lumber broke loose during a switching operation and rolled 27 miles before railroad officials switched the cars to a side track in Commerce.

Twenty-eight of the cars derailed, crashing into three homes and injuring 13 people.

Over a 20 minute period the runaway cars went through 25 highway rail crossings and reached estimated speeds of 95 mph.

Sources: CNN .com, NTSB accident report NTSB/RAB-04/03

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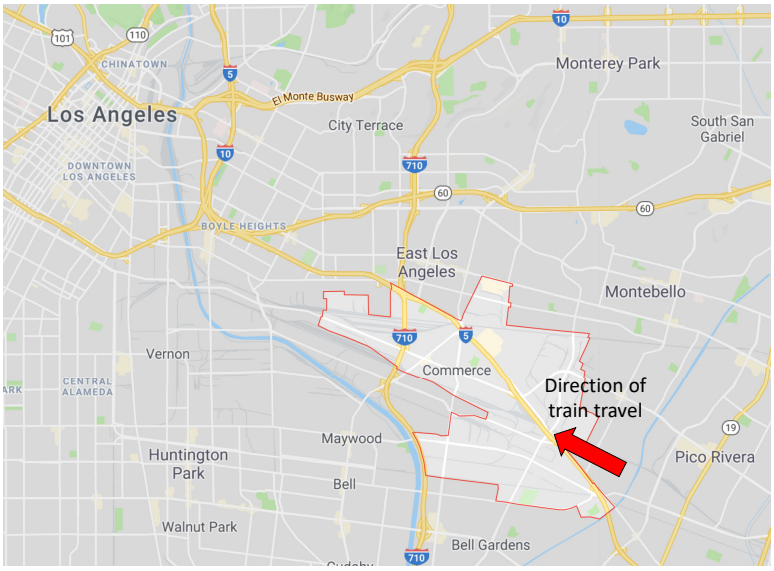
Google map view



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The results

Source: http://www.geo-tech-imagery.com/unionpacific.html

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No one was in this house!

AP / Damian Dovarganes

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Union Pacific spokesperson

"UP knew the maneuver was likely to cause a derailment, but it would have been more dangerous to allow the train to continue moving into central Los Angeles."

"... they did this [because] the train was headed to the more populated area of Los Angeles, where there are possibly commuter trains and more population."

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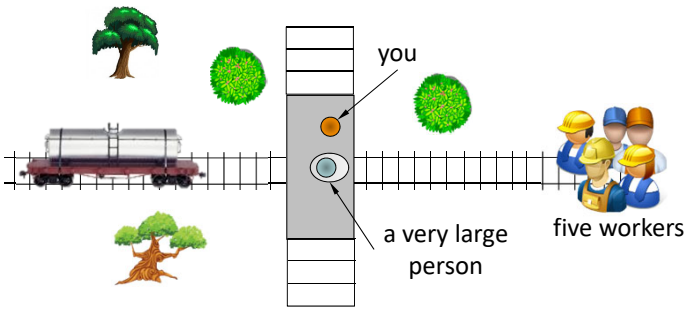
The Footbridge scenario



You are on a footbridge over a railway track and notice a tank car full of propane heading toward five workers who cannot escape an inevitable explosion.
Next to you is a very large person.
Would you push the large person off the footbridge to derail the train?

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A Footbridge-like dilemma for you

You discover that a work colleague (and a close friend) has managed to embezzle a large sum of money from the company. He has denied it but you have enough evidence to know he is lying.

If you report him, he will be fired, possibly go to jail, and his life and job prospects will be ruined. If you don't report him, the embezzlement will likely continue, the company could go bankrupt, and you will be out of a job.

How would you handle such a situation?

Analogies:
Large person ↔ your friend
Five workers ↔ your company

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So what should one do?

What about the Golden rule?

Do to others as you would have them do to you

New Testament
Matthew 7:12, Luke 6:31

Basically: Treat others as you want to be treated

Maybe this is all we need to be good people as well as good professionals!

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It's a universal concept:

- **Buddhism:** "...a state that is not pleasing or delightful to me, how could I inflict that upon another?" *Samyutta NIkaya* v. 353
- **Islam:** "None of you [truly] believes until he wishes for his brother what he wishes for himself." Number 13 of Imam "*Al-Nawawi's Forty Hadiths*."
- **Judaism:** "What is hateful to you, do not to your fellow man. This is the law: all the rest is commentary." *Talmud, Shabbat* 31a.
- **Yoruba people:** (Nigeria): "One going to take a pointed stick to pinch a baby bird should first try it on himself to feel how it hurts."

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and a great idea, but …

The Golden Rule does not tell us what to do;
it is a *consistency principle*

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What is needed is an ethical norm

Similar to a design standard
Many ethical norms – here's two

RESULTS ⟺ **RULES**

Results of actions are used to make choices

Rules always applied to make choices

Take your pick (but be careful)

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Act Utilitarianism

Actions that produce the greatest benefit (or utility, or happiness) for the greatest number of people are morally correct

Jeremy Bentham
1748-1832

"Hedonic calculus":

An algorithm to estimate the moral status of any action by estimating the amount of happiness in the action

Each action considered individually

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But there are problems

How do you measure benefits?

What actions or practices should be considered?

What if results are uncertain?

How big a group is "the greatest number of people"?

Benefits may come at the expense of the rights of individuals. Injustice is possible.

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Rule-based ethics

Selection of moral actions must be based on rules

Selection is not exclusively a function of consequences

Immanuel Kant
1724-1804

For example

"Never lie"

No exceptions, even if lying would protect someone from harm

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Kant and rule-based ethics

Rules for moral conduct are absolute and

must be derived from rational thought, *independent of consequences* and experience

must be universal and consistent – they apply to everyone and to all similar cases

A rational rule is not self-defeating

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"Lie if it benefits you"

Should this be a universal moral rule?

If everyone lied, no one would believe anyone, including you, and the possibility that something is true would disappear.

It's an inconsistent rule, not rational, self-defeating

Can't be universal

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Rules can conflict

Two rational and consistent rules:

"Always tell the truth"

"Do not harm people"

What if telling the truth will harm someone?

Either

one of these rules is not rational and consistent or,

rule violation is possible if one accepts that others may do the same at <u>any time under the same circumstances</u>

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Is this consistent and rational?

EGBC Code of Ethics, Principle 5:

Uphold the principles of appropriate and adequate compensation for the performance of engineering and geoscience work.

Rational: to do otherwise would lower the value of engineering which would be self-defeating

Consistent: applies to every engineer or geoscientist

Yes and Yes

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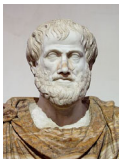
Virtue ethics – a different kind of norm

Actions guided by a set of virtues, not principles or rules.

Examples of virtues are honesty, bravery, and generosity.
The "golden mean" of these virtues is acquired by practice.



Aristotle
384–322 BC

Confucius
551–479 BC

For example

The golden mean of bravery lies between cowardice and recklessness.

The golden mean of honesty lies between habitual lying and boasting.

Old ideas, but they have been applied to many current situations in politics, business, and environmental management.

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Ethics is …

a framework for the study of personal or professional dilemmas using *ethical norms*

Often morality ≡ ethics but a distinction is necessary:

Moral or amoral conduct is something personal and private and may or may not be ethical

For example, the conduct of a person acting as a professional is usually either ethical or unethical, not moral or amoral.

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Ethics is not …

Religion

Individual morality

Obeying the law

Blindly following professional codes of ethics

Following "standard practice"

Ethics stands independent, which means that acts in any of the above contexts are not necessarily ethical.

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Professional ethics

Standards used to guide conduct of professionals at all times, but especially when practicing their profession.

Ethics can be used to judge professional ethical standards.

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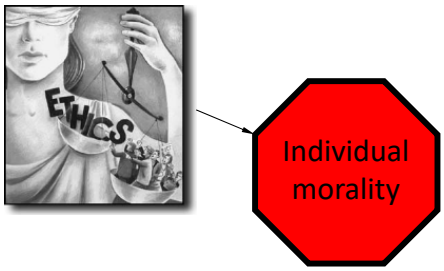
Individual morality (Personal ethics)

What you were taught by your parents, religion, and culture.

Ethics can be used to assess individual morality.



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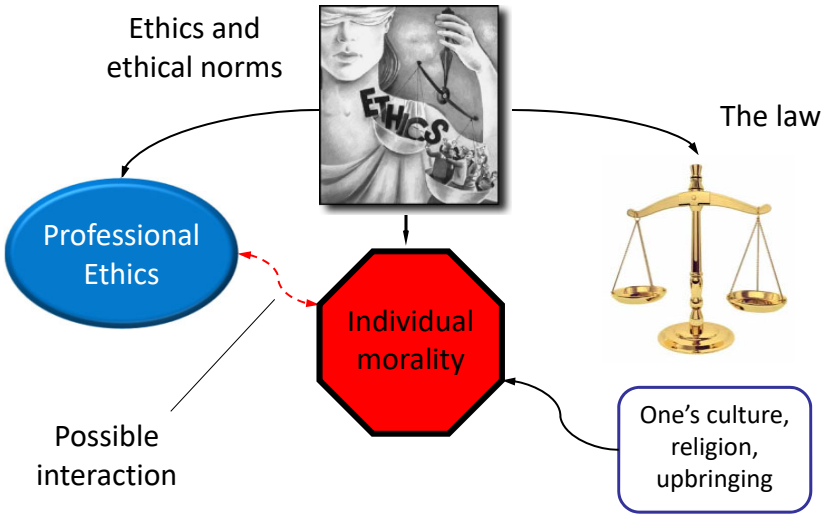
Some relationships



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Some macro-ethical issues for engineers

Should you use your skills to design these things?

- Large footprint projects:
  - dams, mines and other industrial projects, civil infrastructure
- The Internet: great tool but …
  - forum for perverts, pedophiles, pornographers, and terrorists
  - search algorithms can be used to create unwanted links between users and provide possibly questionable profile data
  - social media can be used to influence opinions
- Complex systems with emergent properties that cannot be predicted
  - digital control or AI systems, fossil fuel systems, aquifer use, gradual encroachment on ecosystems by infrastructure
  - decisions made by autonomous vehicles

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Professional ethics ⇔ Individual morality

Design of nuclear weapons systems
effective threat but significant "collateral damage"

Smart weapons design
less "collateral damage" if they work

Bio-engineering

Nuclear power development

"One has to look out for engineers. They begin with sewing machines and end up with the atomic bomb"

Marcel Pagnol French writer, producer, film director, 1895-1974

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Paul Cottle resigns from MDA

Paul Cottle, an engineer who had helped develop satellite technology for MacDonald Dettwiler and Associates (MDA), resigned from his job of three years after MDA announced it had been sold to Alliant Techsystems (ATK).

"I do not want to work for a company like ATK that manufactures weapons that kill civilians and soldiers indiscriminately"

https://www.cbc.ca/news/canada/second-employee-leaves-job-over-sale-of-space-contractor-1.717135

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What is it? The first decision or choice

Personal issue

Professional ethics

Legal issue

A non-issue

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This could be a legal issue

You discover that a work colleague (and a close friend) has managed to embezzle a large sum of money from the company. He has denied it but you have enough evidence to know he is lying.

If you report him, he will be fired, possibly go to jail, and his life and job prospects will be ruined. If you don't report him, the embezzlement will likely continue, the company could go bankrupt, and you will be out of a job.

How would you handle such a situation?

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Too many job interviews

You live in Vancouver and are invited to two job interviews, one in Toronto, the other in nearby Burlington. Both companies allow you to claim expenses for the trip but each will want the original receipts.

You have no idea whether either company will hire you, but claiming expenses from one company and not the other seems unfair.

What should you do and why?

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Hmmm…

You are a registered electrical engineer. An unregistered but qualified electrical engineer offers you a fee to review his design of a control system for electrical power in a private hospital and to seal the plans once you have reviewed them.

What should you do?

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The hallmark of a profession

EGBC Code of Ethics, Principle 1:

Hold paramount the **safety, health and welfare of the public**, the **protection of the environment** and the promotion of health and safety within the workplace.

BC College of Social Workers Code of Ethics, Principle 1:

A social worker shall maintain the best interest of the client as the primary professional obligation.

The essential aspect is:

Commitment to society: Place the public's needs first before your own

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So who is the public?

Davis (p. 165)[1] suggests:

> ... "public" would refer to those persons whose lack of information, technical knowledge, or time for deliberation renders them more or less vulnerable to the power an engineer wields on behalf of his client or employer.

In other words, it is those who do not or could not know any better.

This places a responsibility on the engineer to define his/her public.

It's not simple.

[1]Davis, M, 1991. Thinking like an Engineer: The Place of a Code of Ethics in the Practice of a Profession, *Philosophy and Public Affairs*. 20 (Spring): 150-167

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Should I do engineering for the armed forces?

First thought:

No because it's partly about endangering the safety of the public of the other side who indeed do not or could not know better.

On second thought:

Actually, it's about endangering the *soldiers* of the other side who are not helpless innocents – they know the dangers of the job and may have knowingly signed up for it.

So I can take that $150K job and have fun designing systems that shoot pointy things at buildings and enemy soldiers, right?

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You could try that argument ...

but (there are always some buts) ...

- Innocent civilians do get killed in war, often by mistake
- Bombing infrastructure is a good way to destroy an economy, but that affects and endangers innocent people.
- There's war for a good cause and war for a bad cause and you really can't be selective.
- What about the morality of it?

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The fact is ...

an engineering code of ethics can't help you with this decision

It's a personal ethics/morality issue

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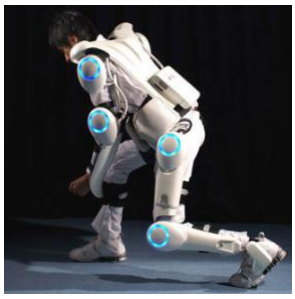
But if you decide to take that defence job …

your public becomes the armed forces who expect this stuff to work



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Nature of ethical issues

- Often a choice between "right and right" – a dilemma
  - Either choice results in a loss. Which loss is important?
- Choice within a discrete set or a continuous range of alternatives
- Unstructured, at least initially
- Uncertainty usually present
- Involve human emotions and human foibles

May seem unfamiliar and intimidating but engineering itself is often like this

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Common ethical issues for engineers

- Public welfare, health and safety
- Fairness to other engineers
- Duties to employers and clients
  - Confidentiality
  - Conflicts of interest
- Fair compensation
- Whistle-blowing
- Bribery and fraud

Thankfully usually not life and death

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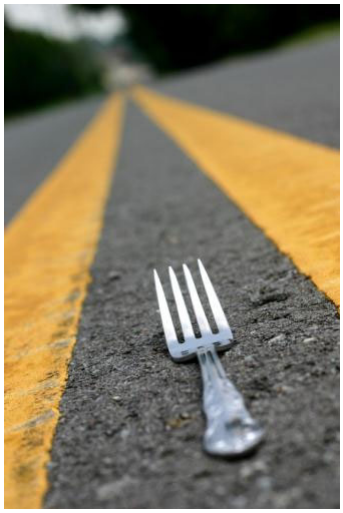
If you come to a fork in the road …

Take it!



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