Engineering Ethics

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AWMA Conference

October 17, 2019

References:

Martin, Mike W., and Schinzinger, Roland, *Ethics in Engineering*, 3d. Ed., McGraw-Hill, 1996.

Seebauer, E. G., and Barry, R. L., *Fundamentals of Ethics for Scientists and Engineers*, Oxford, 2001

Outline

- Why study engineering ethics?
- Stages of Moral Development
- Ethical Responsibility
- Professionalism
- Codes of Ethics
- Professional Responsibilities
- Conclusions

Morality and Ethics

- Concerns the goodness of voluntary human conduct that affects the self or other living things
- Morality (Latin *mores*) usually refers to any aspect of human action
- Ethics (Greek *ethos*) commonly refers only to professional behavior

Why study ethics?

- To responsibly confront moral issues raised by technological activity
- To recognize and resolve moral dilemmas
- To achieve ***moral autonomy***

Moral Dilemmas

- Situations in which two or more moral obligations, duties, rights, or ideals come into conflict
- To resolve we must
  - identify the factors,
  - gather facts,
  - rank moral considerations,
  - consider alternative courses of actions, and
  - arrive at a judgment

Stages of Moral Development

- **Pre-conventional Level**
  Whatever benefits oneself or avoids punishment
- **Conventional Level**
  Uncritical acceptance of society's rules
- **Post-conventional Level**
  Moral autonomy

Moral Autonomy

- Autonomous individuals think for themselves and do not assume that customs are always right
- They seek to reason and live by general principles
- Their motivation is to do what is morally reasonable for its own sake, maintaining integrity, self-respect, and respect for others

An example of moral autonomy

- "One who breaks an unjust law must do so openly, lovingly, and with a willingness to accept the penalty. I submit that an individual who breaks a law that conscience tells him is unjust and willingly accepts the penalty… is in reality expressing the highest respect for the law." *Rev. Martin Luther King, Jr.* in **Letter from a Birmingham Jail**, 1963.

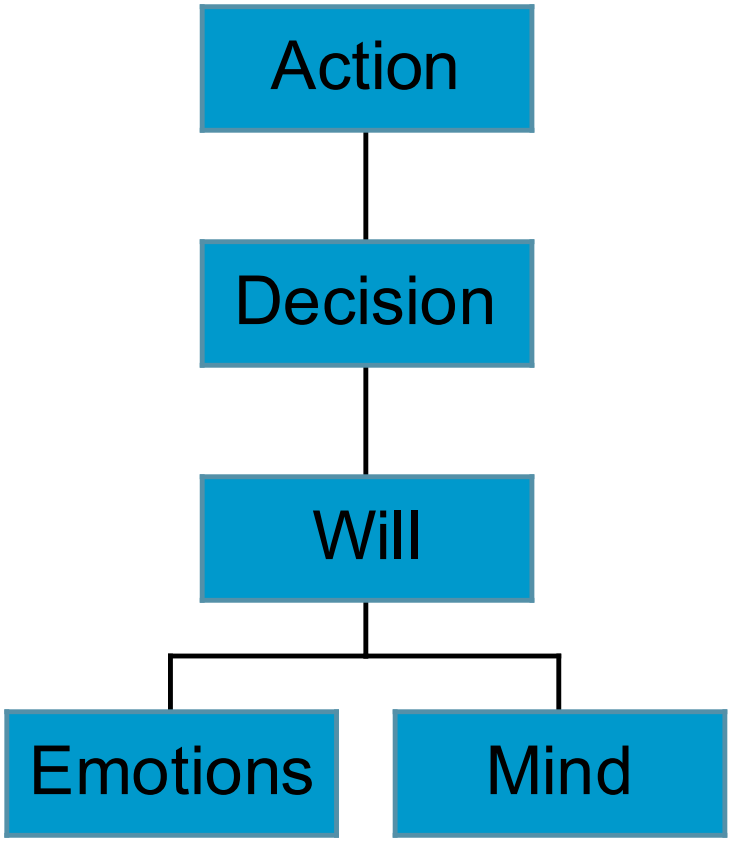
The Existence of Right and Wrong

- **Principle:** *Certain aspects of right and wrong exist objectively, independent of culture or personal opinion*
- Accepting this principle is essential for ethics to discern an objective reality rather than just define a subjective standard

Virtue Ethics

- *"The unexamined life is not worth living"* (Socrates, c.470-399 B.C.)
- *"The happy life is thought to be virtuous; now a virtuous life requires exertion, and does not consist in amusement"* (Aristotle, 384-322 B.C.)

Simple Model of a Person



The Four Main Virtues

- **Prudence** (mind): to think about a moral problem clearly and completely
- **Temperance** (emotions): control attraction to positive emotions
- **Fortitude** (emotions): control aversion for negative emotions
- **Justice** (will): choose according to truth and fairness.

Habits and Morals

- A person has a unique ability to choose between good and bad
- This is acquired through training, the formation of habits
- A class of good habits exists for each of the three parts of the psyche
- A virtue is the customary direction of one part of the psyche toward moral good
- Acquiring virtues is analogous to acquiring athletic abilities

A fundamental principle of morality:

People should try insofar as possible to continue to progress in the moral life

Ranking of Ethical Values

- Selecting principles and methods: consistency
- Importance of objects, actions, and attitudes
- Ranking of virtues:
  - Justice vs. Malice
  - Temperance vs. Indulgence
  - Fortitude vs. Cowardice
  - Prudence vs. Negligence

Exterior and Interior Ethics

- Analyzing the goodness of actions viewed from outside the person
- Analyzing the internal attitudes and personal intentions of the individual

Analyzing Exterior Acts

- **Who** is involved?
  List all characters
- **What** are their interests?
- **When**? If relevant
- **Where**? If relevant
- List each option and their possible consequences for each character (an event tree format is helpful)

Evaluating Exterior Acts

- List options and their consequences
- Classify **good** and **bad** consequences
- **Importance** of each consequence: high, moderate, low, or zero
- **Likelihood** of each consequence: high, moderate, low, or zero
- Weigh the consequences and decide

Analyzing Attitudes

- **Why** might this action be chosen?
- *Intention* is the purpose for which an action is done
- Attitudes toward an action can be classified as: **approval, disapproval, mixed,** and **indifferent**
- Good intentions create good habits: *"You become what you do"*

Judging Intention

- Examine attitudes: **approval** or **disapproval** of the consequence
- Strength of attitude: strong, tolerate, weak
- Effect on your character
- Effect on others

Limits on responsibility

- **Lack of knowledge:** ignorance of certain aspects of the situation
- **Lack of freedom:** threats of violence, or acting under the influence of alcohol or drugs, or by force of habit
- **Lack of approval:** insufficient time for reflection
- Knowledge, freedom, and responsibility, can exist in varying degrees

Professionalism

What is a professional?

- Possesses specialized knowledge and skills
- Belongs to and abides by the standards of a society, e.g., AWMA
- Serves an important aspect of the public good

What is a professional engineer?

- Has a bachelor's degree in engineering from an accredited school
- Performs engineering work
- Is a registered P.E.
- Acts in a morally responsible way while practicing engineering

A Professional Engineer

- Can serve an employer or work independently for clients
- Must satisfy two general criteria:
  (1) Attain high standards of achievement in education, job performance, and creativity.
  (2) Accept ethical responsibilities to the public, their employers, clients, colleagues, and subordinates.

Codes of Ethics

- A code of ethics isn't something you post on a bulletin board.
  It's something you live every day.

Engineering Code of Ethics

Engineers shall uphold and advance the integrity, honor, and dignity of the engineering profession by:

- *using their knowledge and skill for the enhancement of the human race;*
- *being honest and impartial and serving with fidelity the public, their employers, and clients;*
- *striving to increase the competence and prestige of the engineering profession.*

Fundamental Canons

- Engineers shall
  - *hold paramount the safety, health, and welfare of the public in the performance of their duties;*
  - *perform service only in areas of their competence;*
  - *issue public statements only in an objective and truthful way;*
  - *act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest;*

Fundamental Canons (Continued)

- *build their professional reputations on the merits of their services;*
- *act in such manner as to uphold and enhance the honor of the engineering profession;*
- *continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers under their supervision.*

Engineer's Responsibilities

- Safety
- Environment
- Employer - Client

Safety

- *"A ship in harbor is safe, but that is not what ships are built for."* (John Shedd)
- *"A thing is safe if its risks are judged to be acceptable."* (William Lowrance)
- *"A thing is safe if, were its risks fully known, those risks would be judged acceptable in light of settled value principles."* (Martin & Schinzinger)

Environment

- *"I am therefore I pollute."*
  (Louis J. Thibodeaux)
- Up there with economics and safety among the main professional responsibilities of the engineer
- Waste avoidance and minimization
- Treatment of continuous emissions
- Proper final disposal of waste

Responsibility to Employers

- Collegiality—team work
- Loyalty
- Respect for authority
- Confidentiality
- Avoid conflicts of interest
- Act as faithful agent

The Athenian Oath

- We will never bring disgrace on this our City by an act of dishonesty or cowardice Let **City = Engineering Profession**
- We will fight for the ideals and Sacred Things of the City both alone and with many
- We will revere and obey the City's laws, and do our best to incite a like reverence and respect in those who are prone to annul them or set them at naught
- We will strive increasingly to quicken the public's sense of civic duty
- Thus in all these ways we will transmit this City, not only not less, but greater and more beautiful than it was transmitted to us.

(from *A Book of Virtues*, by William Bennett)

Conclusions

- Engineering is our profession, not just a job
- Study of engineering ethics can guide us in resolving the moral dilemmas we might encounter
- Being responsible is what a professional is all about
- Our goal must be to become morally autonomous in the performance of our duties.

It's been nice, but…
I'd rather be sailing!