NAS 501 Research Methods and Scientific Ethics

Chapter 1: Introduction

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A recent graduate of Engineering Tech, you have been employed in the R & D Chemical Engineering Division of Larom, Inc. for the past several months. You were hired because of the promising research you did with catalysts as a student at Engineering Tech.

A meeting of your division is called by your supervisor, Alex Smith. He announces that your unit must make a recommendation within the next two days on what catalyst should be used by Larom in processing a major product. The overwhelming consensus of the engineers in your unit, based on many years of experience, is that catalyst A is best for the job. But the research you have been conducting at Larom provides preliminary evidence that catalyst B might be more reliable, more efficient, and considerably less costly. So, you ask if the recommendation can be delayed another month to see if firmer evidence can be found.

Alex replies, "We don't have a month. We have two days." He then asks you to write up the report, leaving out the preliminary data you have gathered about catalyst B. He says, "It might be nice to do some more research on B, but we've already taken too much time on this project. This is one of those times we have to be decisive--and we have to look decisive and quit beating around the bush. Management is really getting impatient with us on this one. Besides, we've had a lot of experience in this area."

You like working for Larom, and you feel fortunate to have landed such a good job right out of Engineering Tech. You have no desire to challenge your colleagues. Besides you don't necessarily disagree with them about which catalyst is best. Still, you wish you had been given more time to work on catalyst B, and you feel uncomfortable about leaving the preliminary data out of the report. What should you do?

- Ethics is the study of the **characteristics of morals.**

- Ethics also deals with the **moral choices** that are made by each person in his or her relationship with other persons.

- As scientists, we are concerned with ethics because these definitions apply to all of the choices an individual makes in life, including those made while practicing area of our expertise.

- Ethical cases can go far beyond issues of public safety and may involve bribery, fraud, environmental protection, fairness, honesty in research and testing, and conflicts of interest.

- During their undergraduate education, receive training in basic and engineering sciences, problem-solving methodology, and design, but generally receive little training in business practices, safety, and ethics.

- The purpose of this course is to provide a text and a resource for the study of ethics and to help future engineers be prepared for confronting and resolving ethical dilemmas, that they might encounter during their professional careers.

- The goal of this course is to sensitize you to important ethical issues before you have to confront them.

- You will study important cases from the past so that you will know what situations other engineers have faced and will know what to do when similar situations arise in your professional career.

- Finally, you will learn techniques for analyzing and resolving ethical problems when they arise.

- Our goal is frequently summed up using the term **“moral autonomy.”**

- **Moral autonomy** is the ability to think critically and independently about moral issues and to apply this moral thinking to situations that arise in the course of professional engineering practice.

- After all, at this point in your life, you’re already either a good person or a bad person.
- Good people already know the right thing to do, and bad people aren’t going to do the right thing no matter how much ethical training they receive.
- The answer to this question lies in the nature of the ethical problems that are often encountered by an engineer.
- In most situations, the correct response to an ethical problem is very obvious.
- However, many times, the ethical problems encountered in engineering practice are very complex and involve conflicting ethical principles.

- These are the types of situations that we will discuss in this course.
- The goal, then, is not to train you to do the right thing when the ethical choice is obvious and you already know the right thing to do.
- Rather, the goal is to train you to **analyze complex problems and learn to resolve these problems in the most ethical manner**

- One source of the ethical issues encountered in the course of practice is **a lack of knowledge.**
- Engineers often encounter situations in which they don’t have all of the information that is needed.
- By its nature, **engineering design is about creating new devices and products**.
- When something is new, many questions need to be answered.
  - How well does it work?
  - How will it affect people?
  - What changes will this lead to in society?
  - How well will this work under all of the conditions that it will be exposed to?
  - Is it safe?
  - If there are some safety concerns, how bad are they?
  - What are the effects of doing nothing?
  - The answers to these questions are often only partly known.

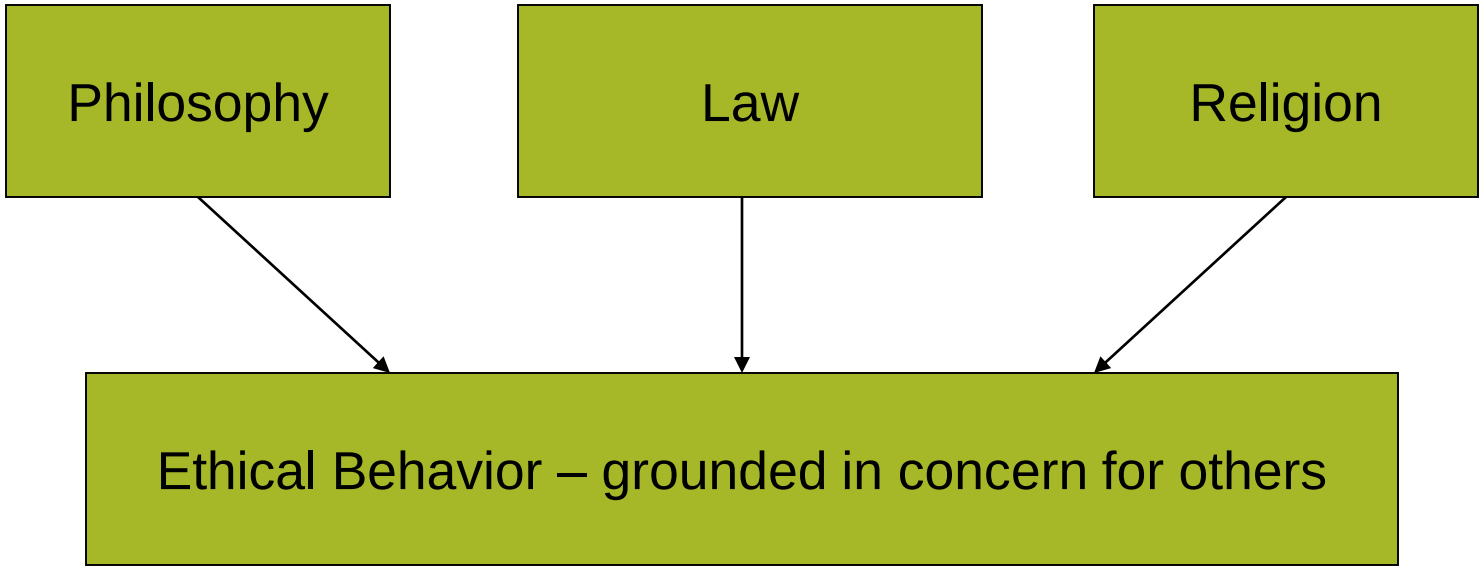
- So, to a large extent, your job is to **manage the unknown.**
- How does an scientist accomplish this?
- Really, as an engineer you can never be absolutely certain that your design will never harm anyone or cause detrimental changes to society.
- But you must test your design as thoroughly as time and resources permit to ensure that it operates safely and as planned.
- Also, you must use your creativity to attempt to foresee the possible consequences of your work.

Origins of today’s ethics

- Ancient Greeks - especially Socrates, Aristotle
- Judeo – Christian tradition
- Islam
- Buddhists
- Hindus

Western ethics have principally evolved from first two.

Origins - continued



Ethics and religion

- Some people's ethics are based in religion (however, nominally religious people may not be ethical).
- Persons who are ethical don't have to be religious.

Ethics and law

Engineering and business are governed by laws at the international, federal, state and local levels.

- Things that are legal might be considered unethical – e.g., releasing a known toxic material that is unregulated into the air.
- As an engineer, you are minimally safe if you follow the law.

Personal vs. Business Ethics

- Personal ethics deal with how we treat others in our day-to-day lives.
- Professional (business) ethics often involves choices on an organizational level rather than a personal level.

Ethics problems

- Rarely have a correct answer that everyone will come up with.
- There will be a range of solutions that are clearly right, some of which will be better than others.
- There will be a range of solutions that are clearly wrong.

4 Ethical Theories

- Utilitarianism
- Duty Ethics
- Rights Ethics
- Virtue Ethics

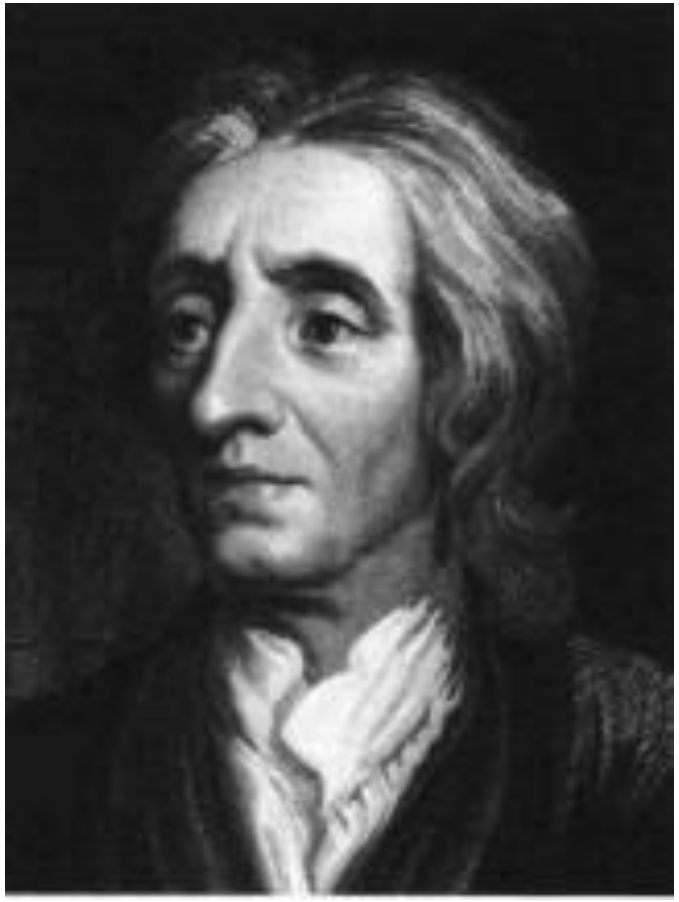
Utilitarianism

- John Stuart Mill (1806 – 1873)
- Individual actions should be judged on whether the most good was produced in a given situation.
- Rules should be broken if doing so will lead to the most good.
- Considers a balance of good & bad consequences for everyone affected (society)
- Actions are good that serve to promote human well-being
- Cost-Benefit analysis is an application
- Consideration of most benefit to the most people outweighs needs of a few individuals

Duty ethics

- Immanuel Kant (1724 – 1804)
- Duty ethics – ethical acts are the result of proper performance of one's duties.
- Be honest, be fair, don't cause suffering.
- There are duties that should be performed (e.g.. Duty to treat others fairly or not to injure others) regardless of whether these acts do the most good or not.

Rights ethics



- John Locke (1632 – 1704)
- People have fundamental rights that other people have a duty to respect.
- Humans have a right to –
  - Life
  - Liberty
  - Property

Virtue ethics

- What kind of people we should be?
- Actions are right if they support good character qualities – virtues: responsibility, honesty, competence, loyalty.
- Actions are wrong if they support bad character qualities – vices: dishonesty, disloyalty, irresponsibility.

Three Ethical Models

- Malpractice, or Minimalist, Model
- Reasonable-Care, or Due-Care, Model
- Good Works Model

Malpractice, or Minimalist, Model

- This is a minimalist model in which the professional is concerned only with **meeting standards and requirements** of the profession and any other laws or **codes** that apply. This model looks to find fault when problems or accidents arise from someone's failure to meet a requirement.

Reasonable-Care, or Due-Care, Model

- A model of engineering practice in which the engineer is expected to take **reasonable precautions** or care in the practice of his profession. The model strives to prevent harm, and it appeals to a "**standard of reasonableness as seen by a normal, prudent nonprofessional**."

Good Works Model

- A model of engineering practice in which engineers go beyond the basics of what is required by standards and codes and do what they "**ought" to do to improve product safety, social health or social well-being.**

Codes of Ethics Commonly Hold

- **Engineers and technologists have a duty to hold the heath and safety of the public as a primary concern**.
- Other duties are summarized in order of importance with most important first e.g. **Safety is more important than conflict of interest**.

Part 1

R&M Machinery had for years provided XYZ Inc. with sophisticated equipment and reliable repair service. XYZ Inc. returned a failed piece of equipment. A meeting was held which included Archie Hunter, a representative from XYZ Inc.; Norm Nash, R&M's returned goods area representative, and Walt Winters, an R&M engineer intimately acquainted with the kind of equipment XYZ Inc. had returned.

Norm Nash represented R&M's "official position": the piece of equipment is all right. However, during the course of the meeting it becomes apparent to Walt Winters that the problem has to be R&M's. He suspects that the equipment was not properly tested out by R&M, and that it failed because of an internal problem.

Discussion Question #1:

Should Walt say anything about this in the presence of the customer, or should he wait until after the meeting to discuss this with Norm Nash?

Part 2

Walt keeps silent during the meeting. After the meeting he talks with Norm about his diagnosis. He suggests they tell XYZ Inc. that the problem is R&M's fault, and that R&M will replace the defective equipment. Norm replies, "I don't think it's wise to acknowledge that it's our fault. There's no need to hang out our wash and lessen XYZ Inc.'s confidence in the quality of our work. A 'good will' gesture to replace the equipment should suffice."

R&M management decides to tell XYZ Inc. that they will adjust to the customer's needs "because you have been such a good customer all these years." Although R&M replaces the equipment at its own expense, it does not tell XYZ Inc. the real nature of the problem.

Discussion Question #2:

Discuss R&M's resolution of the problem. Should R&M's way of handling the problem be of any concern to Walt Winters at this point, or is it basically a "management problem"?

Part 3

Many engineers eventually move into management positions. If Walt Winters moves into management, what lessons, if any, might he take with him from the above situation?

References

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