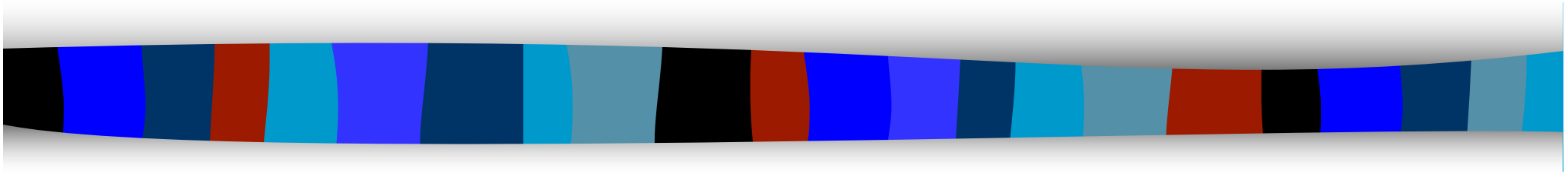
PROFESSIONAL ETHICS IN COMPUTER SCIENCE AND ENGINEERING

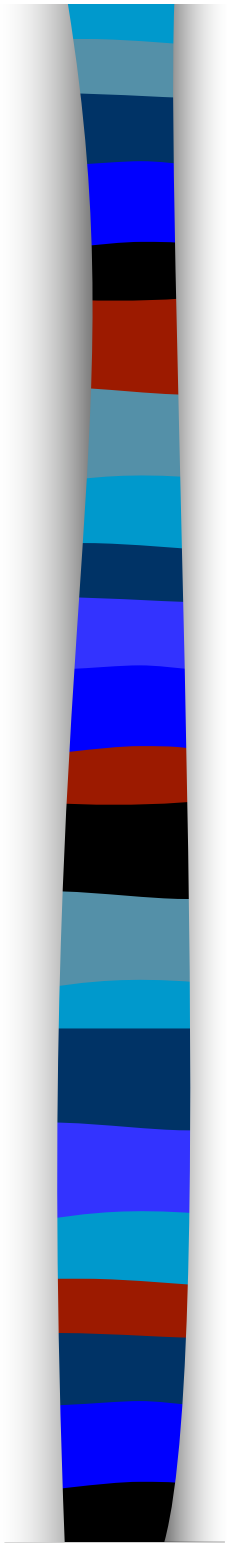


Gordana Dodig-Crnkovic

https://www.mdh.se/en/malardalen-university/staff?id=gdc01
http://www.gordana.se

Division of Computer Science and Software Engineering
School of Innovation, Design and Engineering,
Mälardalen University

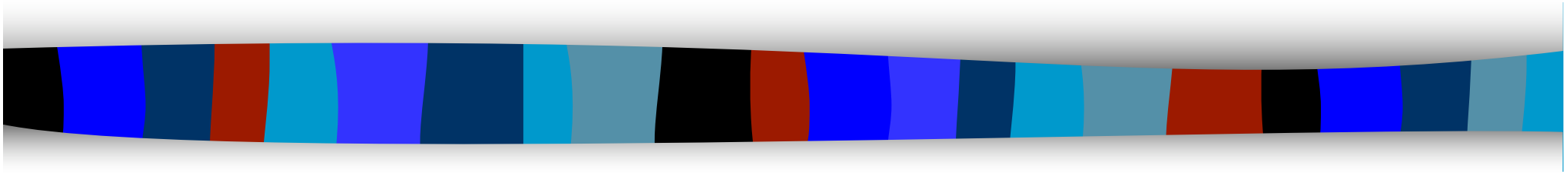
21 October 2021



CONTENT

- Identifying Ethical Issues
- Basic Ethical Orientations Overview
- What is Computer Ethics?
- Computer Ethics in the CS Curriculum
- Computer-Related Risks
- Professional And Ethical Responsibilities

Identifying Ethical Issues



Based on: Lawrence M. Hinman, Ph.D.
Director, The Values Institute
University of San Diego

Ethics and Morality
What are they?

The terms ethics and morality are often used interchangeably - indeed, they usually can mean the same thing, and in casual conversation there isn't a problem with switching between one and the other.

However, there is a distinction between them in philosophy!

Ethics and Morality

Etymology

Morality and ethics have same roots,
mores which means manner and customs from the Latin and
etos which means custom and habits from the Greek.

Robert Louden, Morality and Moral Theory

Ethics and Morality
What are they?

Strictly speaking, morality is used to refer to what we would call moral conduct while ethics is used to refer to the formal study of moral conduct.

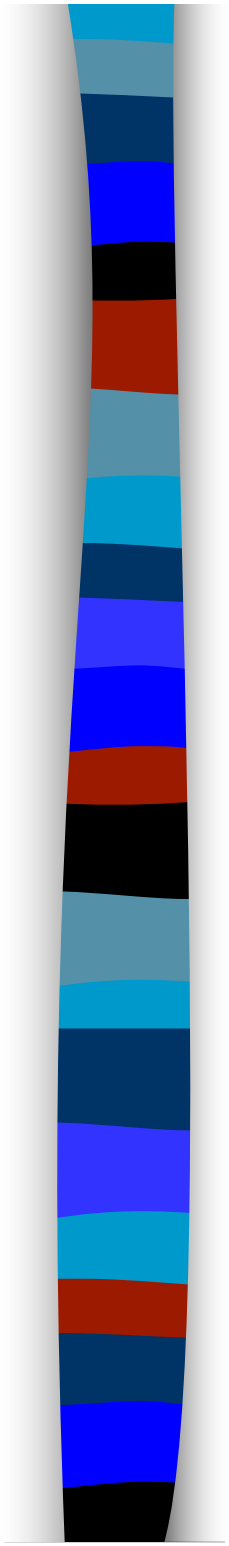
Ethics is also often called "moral philosophy."

Ethics and Morality

- Morality: first-order set of beliefs and practices about how to live a good life.
- Ethics: a second-order, conscious reflection on the adequacy of our moral beliefs.

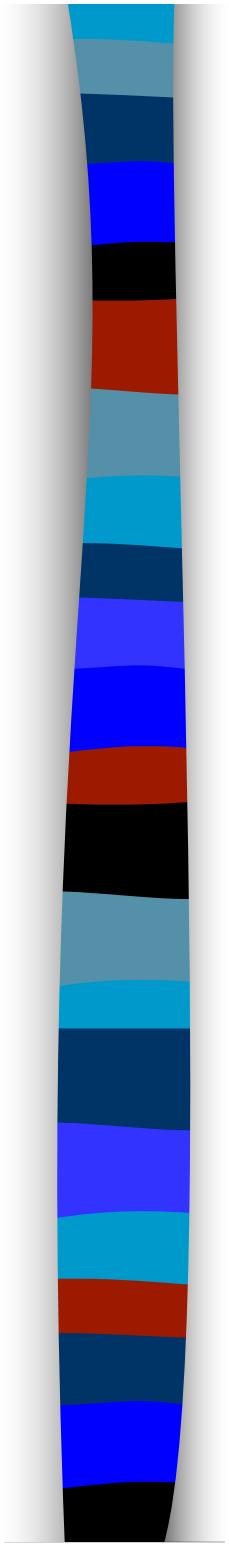
MORALITY vs. ETHIC

- MORALITY - PRAXIS
- ETHICS - THEORY



Practical Ethics

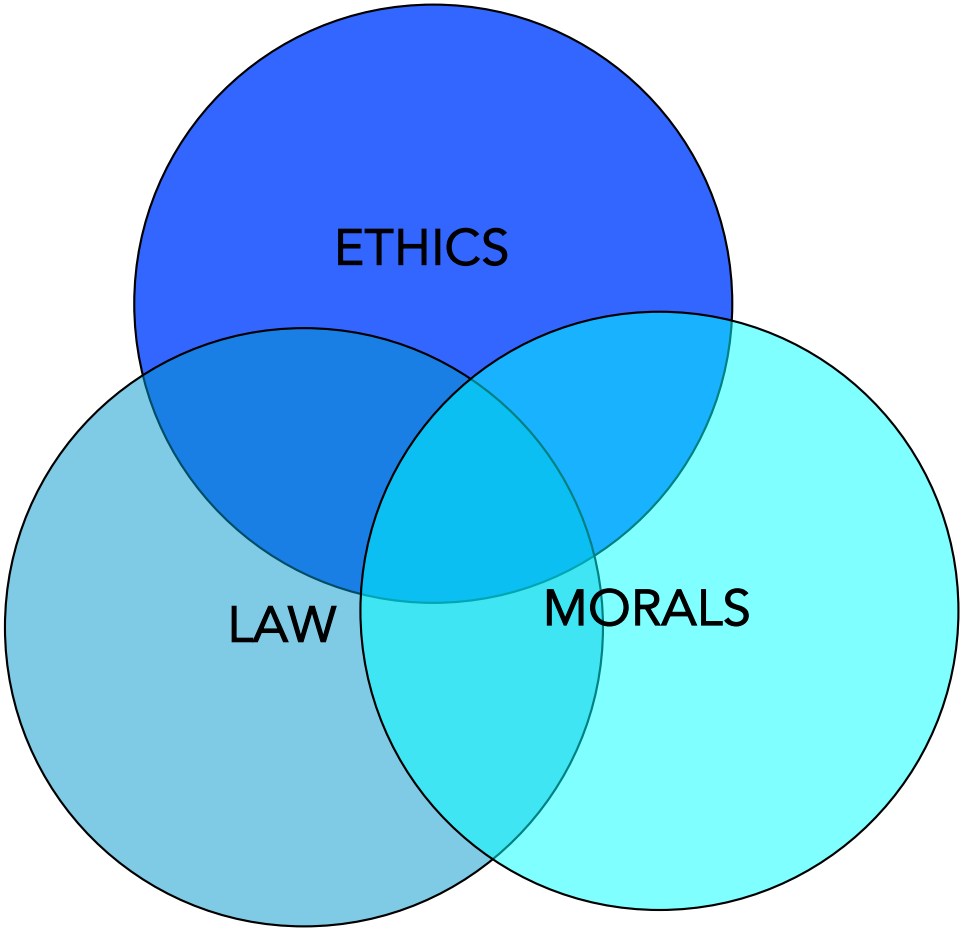
- Engineering ethics
- Ethics of science
- Bioethics
- Medical ethics
- Environmental ethics
- Public ethics
- Media ethics
- Political ethics



Normative Systems

- Games
- Law
- Religion
- Morality
- Habits

SOCIETAL VALUES



ETICS CONTINUUM
Ethics as an Ongoing Conversation

- World changes continually, and we have to interpret/construe it over and over again.
- We come back to ideas again and again, finding new meaning in them.
- Professional discussions of ethical issues in journals.

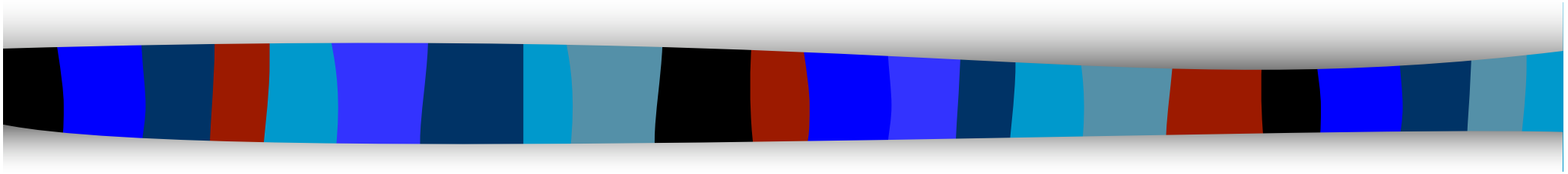
See http://www.utm.edu/research/iep/e/ethics.htm Internet Encyclopedia - Ethics

What to Expect from Ethics?

Functions of theory:

- Describe (What?)
- Explain (Why?)
- Prescribe (How?)
- Give strength (Support)
  - Open new possibilities and insights
  - Wonder

Basic Ethical Orientations Overview



On what Ethical Basis Do We Make Moral Decisions? (1)

- Divine Command Theories
- Utilitarianism (Consequentialism)

  The action is best, which procures the greatest happiness for the greatest number…
- Virtue Ethics –

  Maximize virtue, minimize vices

On What Ethical Basis Do We Make Moral Decisions? (2)

- The Ethics of Duty (Deontological* Ethics)
  - Immanuel Kant's Moral Theory.
    The categorical imperative: -- "Act so that the maxim [determining motive of the will] may be capable of becoming a universal law for all rational beings."
- Ethical Egoism
  - "Macciavelism" – "The end justifies the means"
    Nicollo Macchiavelli (book: The Prince) - justification of war

* 'deon' = duty

On What Ethical Basis Do We Make Moral Decisions? (3)

- The Ethics of Natural and Human Rights – all people are created …with certain basic rights
- Social Contract Ethics (We agree to be civil to one another under threat of punishment from a government established for this purpose. [Plato, Republic. Thomas Hobbes])
- Evolutionary Ethics – Being social increases our chances to survive

Moral Reason versus Moral Feeling

- Morality is strictly a matter of rational judgment:
  Samuel Clarke (1675-1729)
  - Since time of Plato: moral truths exist in a spiritual realm.
  - Moral truths like mathematical truths are eternal.

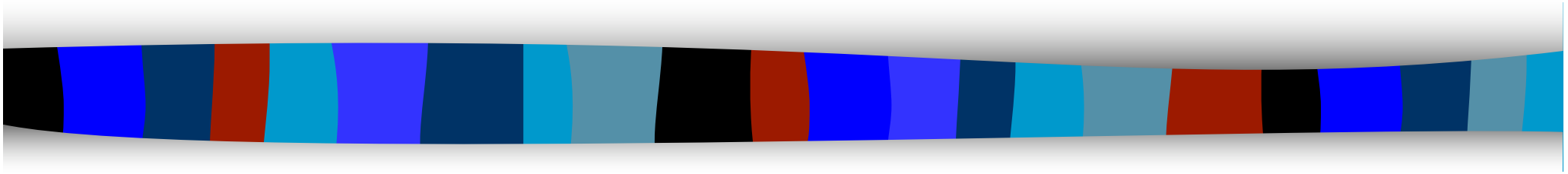
Samuel Clarke
(1675-1729)

Moral Reason versus Moral Feeling

- Morality is strictly a matter of feeling (emotion): David Hume (1711-1729)
  - We have a moral sense

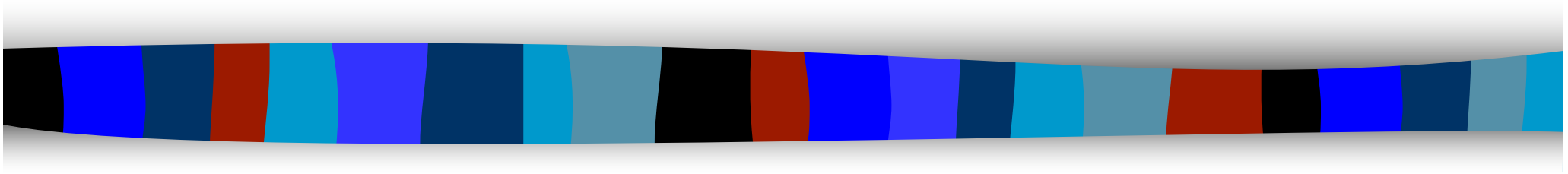
David Hume
(1711-1729)

Policy Vacuums



For “policy vacuum”, see
Moor, J, 1985. “What is Computer Ethics”,
Metaphilosophy 16(4): 266-75.

Computer Ethics in the Computer Science Curriculum



Based on:

James H. Moor

http://www.southernct.edu/organizations/rccs/resources/teaching/teaching_mono/moor/moor_definition.html

Terrell Ward Bynum

http://www.southernct.edu/organizations/rccs/resources/teaching/teaching_mono/bynum/bynum_human_values.html

THE QUESTION OF VALUES

Often new technology develops with little attention to its impact upon human values. It is rapidly changing with the advent of AI

Computers Relevance for the Society

- Computing has become a complex and growing part of society – with profound and deep social and ethical implications!
- AI with is long-range consequences have attracted a lot of attention

Computer Ethics -A Proposed Definition

- Computer ethics/Digital ethics is the analysis of the nature and social impact of computer technology and the corresponding formulation and justification of policies for the ethical use of such technology.

The Revolutionary Machine

What is so special about computers?

- Computers are logically malleable (ductile/formable) - they can be shaped and moulded to do any activity that can be characterized in terms of inputs, outputs, and connecting logical operations.
- Computers as tools for representation, modelling and simulation
- Computers and their applications are everywhere – there is no sector of society and everyday life that is not affected – from education, healthcare, business, industry, transportation, government, politics to entertainment, culture, …

The Revolutionary Machine

What is special about computers?

Computers are used in:

- Communication
- Education/Learning
- Commerce
- Culture, Entertainment, Sports
- Healthcare
- Business
- Industry
- Transportation
- Government
- Politics …

Computing Technology and Human Values

- News stories about computer viruses, software ownership lawsuits, computer-aided bank robbery, harmful computer malfunctions, computerized weapons, mass disinformation and fake news etc.
- As the social impact of computers and information technology grows, such articles proliferate.

Computing Technology and Human Values

- Understand the impact of computing technology upon human values
- Minimize the damage that such technology can do to human values, and
- Identify ways to use computer technology to advance human values.

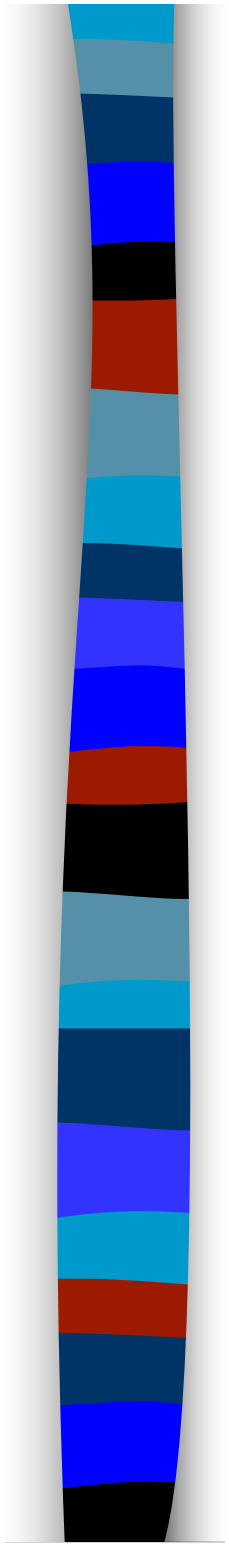
Computing Technology and Human Values

- How can we work to make computing technology advance human values?
- To integrate computing technology and human values in such a way that the technology advances and protects human values, rather than doing damage to them.

Why Learn Ethics?

- Convey a sense of professional responsibility not covered in other courses
- Deal with the true nature of computing as a service to other human beings.

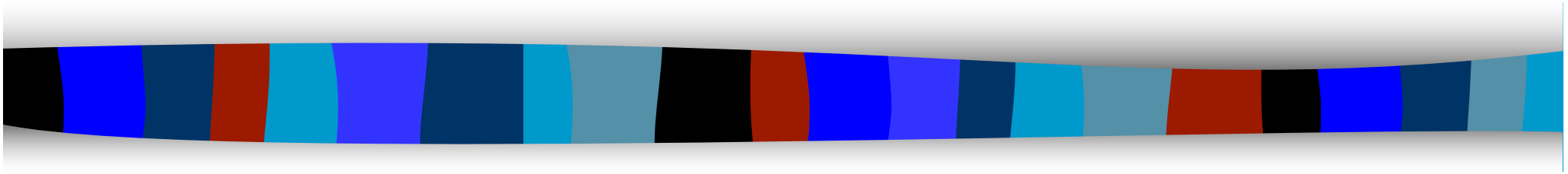
(Gotterbarn 1991)



Why Teach Ethics?

- Sensitize students to computer ethics issues
- Provide tools and methods for analyzing cases
- Provide practice in applying the tools and methods to actual or realistic cases
- Develop in the student good judgment and helpful intuitions -- ethical autonomy.

Professional And Ethical Responsibilities



Ethics

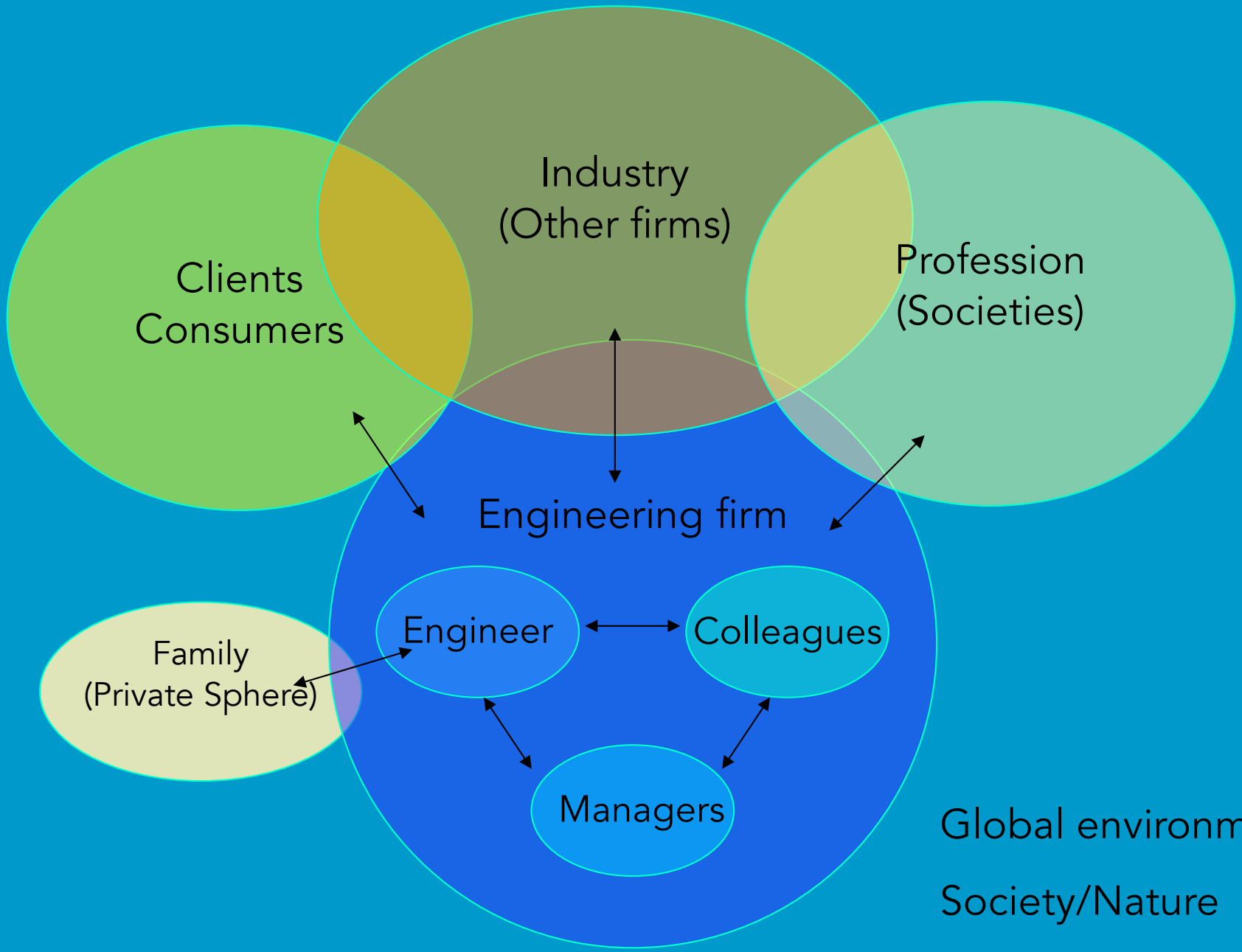
- Ethical theory is the study of ethics at a conceptual level.
- Applied ethics is aimed at the everyday life of the typical person.
- Professional ethics is aimed at a person engaged in the practice of a particular profession.

Professional Ethics is about Relations

…between…

- practicing professionals
- employee and employer
- professionals and their clients
- and on specialized technical details of the professions

Ethics Contexts



Engineering as Social Experimentation

"All products of technology present some potential dangers, and thus engineering is an inherently risky activity. In order to underscore this fact and help in exploring its ethical implications, we suggest that engineering should be viewed as an experimental process. It is not, of course, an experiment conducted solely in a laboratory under controlled conditions. Rather, it is an experiment on a social scale involving human subjects."

Ethics in Engineering, Martin Mike and Schinzinger Roland, McGraw-Hill, 2005
https://www.amazon.com/Ethics-Engineering-Mike-W-Martin/dp/0072831154

Why Professional Ethics?

Professional Ethics is a crucial part of the content of professionalism!

ACM Computing Curricula 2020

https://www.acm.org/education/curricula-recommendations

- Social context of computing
- Methods and tools of analysis of ethical argument
- Professional and ethical responsibilities
- Risks and liabilities of safety-critical systems
- Intellectual property
- Privacy and civil liberties
- Social implications of the Internet
- Computer crime
- Philosophical foundations of ethics

Association of Computer Machinery (ACM) Code of Ethics

1. General Moral Imperatives

1.1 Contribute to society and human well-being

1.2 Avoid harm to others

1.3 Be honest and trustworthy

1.4 Be fair and take action not to discriminate

1.5 Honor property rights including copyrights and patents

1.6 Give proper credit for intellectual property

1.7 Respect the privacy of others

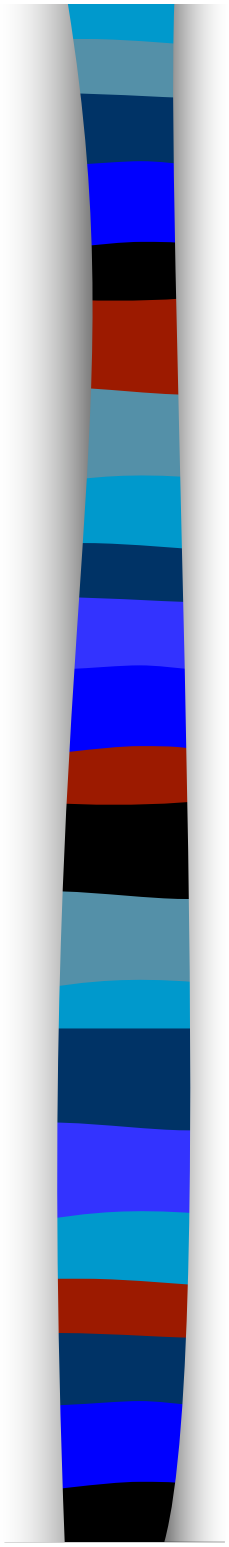
1.8 Honor Confidentiality

https://www.acm.org/code-of-ethics

IEEE (Institution of Electrical and Electronics Engineers) Code of Ethics

1. accept responsibility in making engineering decisions consistent with the safety, health and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;
2. avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
3. be honest and realistic in stating claims or estimates based on available data;
4. reject bribery in all its forms;

https://www.ieee.org/about/corporate/governance/p7-8.html



IEEE Code of Ethics

5. improve the understanding of technology, its appropriate application, and potential consequences;
6. maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
7. seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;

IEEE Code of Ethics

8. treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or national origin;
9. avoid injuring others, their property, reputation, or employment by false or malicious action;
10. assist colleagues and co-workers in their professional development and support them in following this code of ethics.

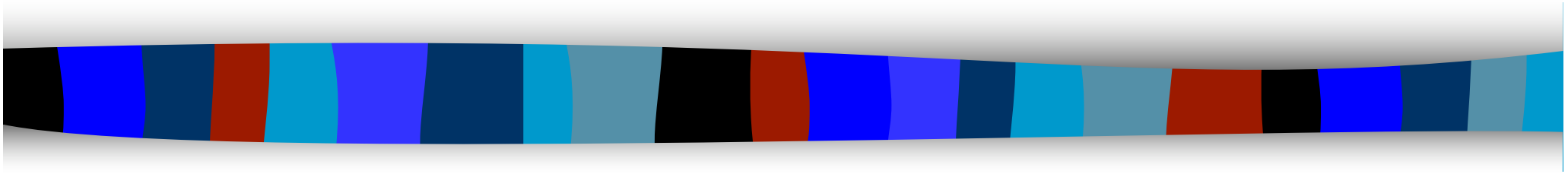
http://www.ieee.org/portal/index.jsp?pageID=corp_level1&path=about/whatis&file=code.xml&xsl=generic.xsl

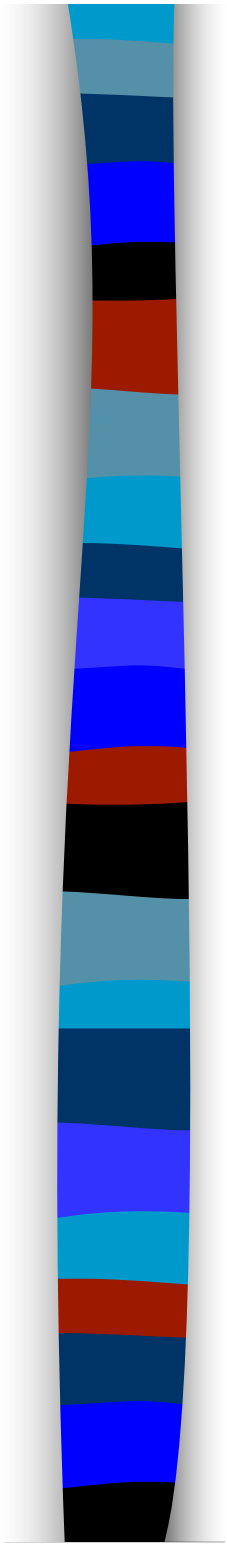
"Whistle Blowing"

"Whistle Blowing" is a matter of an individual employee finding his or her conscience unable to accept the actions of the company and telling the world about them, typically via the media.

It is always a fairly dramatic event and was even more so in the before when the typical view was that an employee owed total loyalty to the employer. Employees who blow the whistle on their employers are protected by law. If they are fired or otherwise retaliated against for whistle blowing, they can sue.

Computer-Related Risks





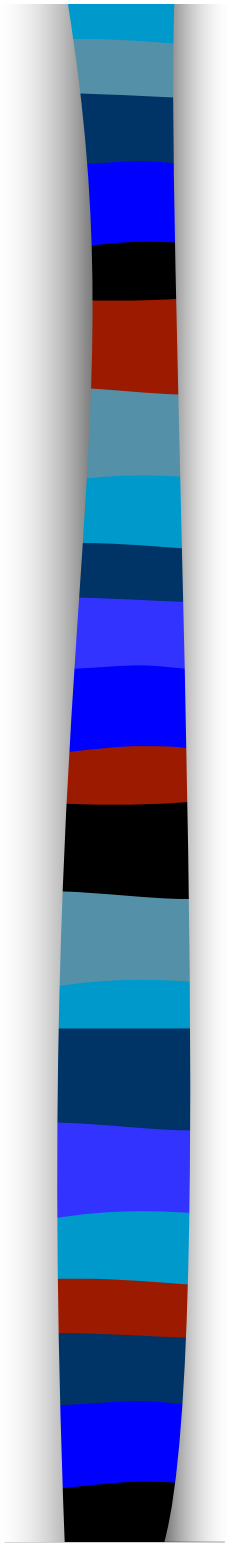
Computer-Related Risks

Problems involving:

- Reliability
- Safety
- Security
- Privacy
- Human well-being

Book: **Computer-Related Risks** by Peter Neumann (Addison-Wesley 1994; ACM Press Series)

http://legacy.eos.ncsu.edu/eos/info/computer_ethics/



RESOURCES ON COMPUTER RISKS AND COMPUTER ETHICS/DIGITAL ETHICS

Computer-Related Risks

- The Ariadne rocket, a common European space project exploded a few seconds after takeoff, due to a software error.
- The baggage-handling system of the Denver International Airport. Errors in the software that controls the system required postponement of the official opening (Oct. 1993). By June 1994 the $ 193 million system was still not functioning, but costing $ 1.1 million per day in interest and other costs. In early 1995 a manual baggage system was installed in order to open the airport.

Examples of Computer-Related Risks in Technical Systems

- Some cancer patients in the USA have received fatal radiation overdoses from the Therac-25, a computer-controlled radiation-therapy machine.

- The Sizewell B nuclear power plant in England. Some years ago it was decided to test the subsystem which is used to close down the reactor if a dangerous situation occurs. The results were not comforting: the software failed almost half of them. They were not able to find the errors in the 100 000 lines of code. Instead, they reduced the overall expectation of the plant's performance from one failure every 10,000 years to one every 1,000 years.

Historical Computer-Related Incidents with Commercial Aircraft

China Airlines Airbus A300 in Taipei (*1998*)
The Korean Air Lines B747 CFIT Accident in Guam (*1997*)
The FedEx MD11 Accident on Landing at Newark (*1997*)
The Birgen Air B757 accident near Puerto Plata (*1996*)
News on the Aeroperu B757 accident (*1996*)
The Ariane 5 Failure (*1996*)
The T-43A Accident near Dubrovnik (*1996*)
Information About the Martinair B767 EFIS-loss Incident near Boston, MA
The American Airlines B757 Accident in Cali (*1995*)
The A320 Maintenance Incident at Gatwick (*1995*)
The A330 Flight-Test Accident in Toulouse (*1994*)
The Tokyo-London A340 FMGS Problem (*1994*)
The A300 Crash in Nagoya (*1994*)
The A320 Accident in Warsaw(*1993*)
The Air Inter A320 Accident near Strasbourg(*1992*)
The Sydney A320/DC10 Incident (*1991*)
The Lauda Air B767 Accident (*1991*)
The British Midland B737-400 Kegworth Accident (*1989*)
A B747 Control Incident (*1985*)
The Eastern Airlines L1011 Common Mode Engine Failure Incident (*1983*)
A Space Shuttle Control Incident (*1981*)
The American Airlines DC10 Takeoff Accident in Chicago (*1979*)

PRECAUTIONARY PRINCIPLE (1)

When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.

In this context the proponent of an activity, rather than the public, should bear the burden of proof.

PRECAUTIONARY PRINCIPLE (2)

People have a duty to take anticipatory action to prevent harm.

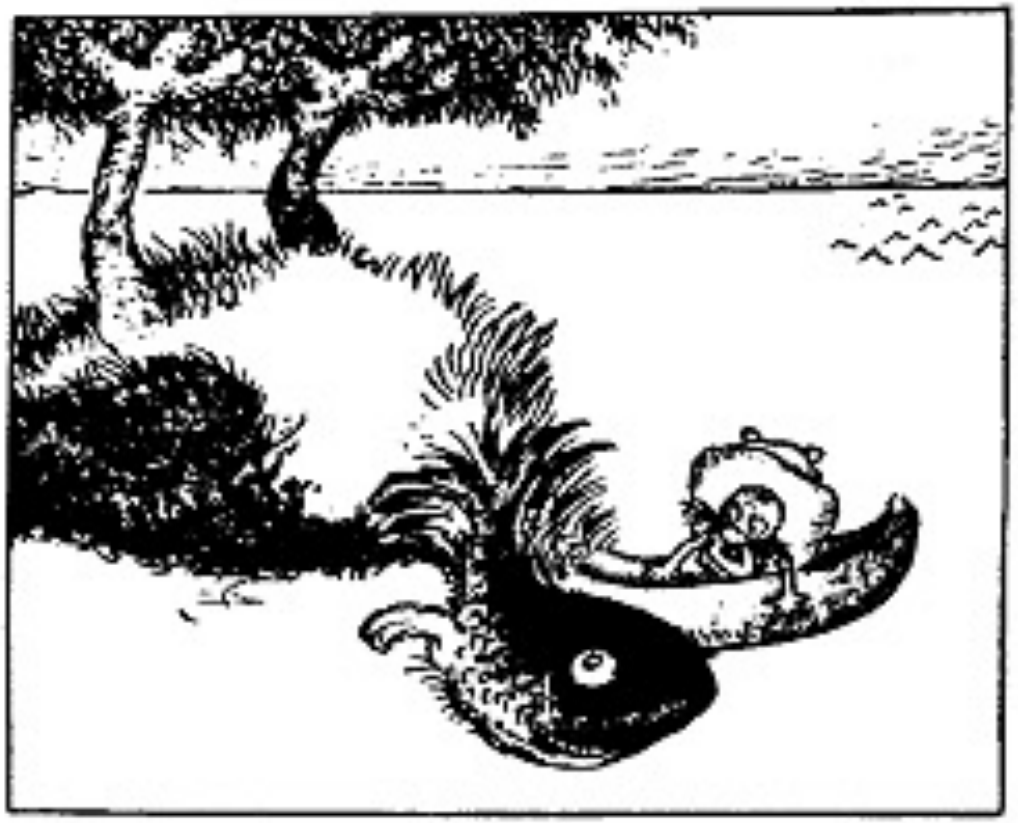
The burden of proof of harmlessness of a new technology, process, activity, or chemical lies with the proponents, not with the general public.

PRECAUTIONARY PRINCIPLE (3)

Before using a new technology, process, or chemical, or starting a new activity, people have an obligation to examine "a full range of alternatives" including the alternative of doing nothing.

Decisions applying the precautionary principle must be open, informed, and democratic and must include affected parties.

DIFFERENT PERSPECTIVES



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  - ETHICS AND COMPUTING, Living Responsibly in a Computerized World, Kevin W. Bowyer Editor, IEEE Press 2000
  - ETHICS IN ENGINEERING, Mike Martin, Roland Schinzinger, McGraw Hill, 1997
  - http://ethics.acusd.edu/socialethics/
- Additional resources:
  - http://www.ethics.ubc.ca/resources/professional/ Professional Ethics Resources
  - http://www.phil.gu.se/munthe/ethicsLinks Internet-sites dealing with ethics
  - http://www.engr.csulb.edu/~jewett/social/ Social Issues of Computing
  - http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/WorldCodes.html Codes of Conduct/Practice/Ethics from Around the World

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