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Ethical Aspects of Research and Engineering

1. INTRODUCTION

Lecture slides for Fall Semester 2022/2023



1.1. Scope

- ◆ EEARE course is focused on ethical aspects of activities characteristic of creative engineering, i.e.:
 - research,
 - design,
 - development,
 - testing,
 - communicating,
 - documenting and reporting,
 - publishing and patenting;

rather than of activities characteristic of engineering jobs related to maintenance or business & management.
- ◆ EEARE course is focused on Western approaches of ethics.
- ◆ EEARE course is focused on the development of intellectual skills useful for consideration of ethical dilemmas related to research & development (R&D) activities rather than on presentation of any system of ethics or any code of ethics.



1.1. Scope (cont.)

- ◆ Examples of ethical dilemmas in every-day practice of R&D:
 - to do or not to do R&D work for military industry,
 - to publish or to perish,
 - to be honest or to be financed,
 - to pay for additional testing or to gain additional salary,
 - to quote a passage from one source or to compile three passages from various sources,
 - to use expensive real-world data or cheap synthetic data,
 - to be diligent or to be efficient.



1.2. Motivation

- ◆ Charles Murray in *Human Accomplishments* (2003) identified three greatest meta-inventions of humanity:
 - logic,
 - **ethics**,
 - method of scientific research.
- ◆ Philippe Nemo in *Qu'est-ce que l'Occident?* (2004) indicated five "miracles" which had contributed to the world-wide supremacy of the Latin civilisation:
 - the invention of the city-state (Gr. *polis*), science and school;
 - the invention of law, private property and of the concept of person;
 - **the Judaeo-Christian ethical revolution**;
 - the "papal" revolution of XI–XIIth centuries;
 - the development of liberal democracy.



1.3. Motivation (cont.)

- ◆ Responsibility for the future:



Paweł Flieger, "Dry branch II" (exposition Metamorfozy idei, Arsenał, Poznań 2014)

1.2. Motivation (cont.)

- ◆ The spirit of postmodernism is undermining the functioning of traditional ethical values:
 - in every-day life,
 - in production and business,
 - in science and engineering.

"Money is just money. Ethics does not apply to it. Ethics is about our relations with family and friends." (a Canadian patent attorney).
- ◆ The pathological bureaucratisation is paralysing institutions related to science and higher education:
 - from neoliberal slogan "*anything goes if it is not forbidden by law*", launched in 1990;
 - to obligatory accreditation of curricula and national framework of qualifications imposed on higher education, and "fast" science with bibliometric fetishism in 2010–2020.
- ◆ Ethical considerations are of practical importance ⇒ courses of ethics have been introduced in science and engineering curricula all over the world.



1.3. Educational objectives

- ◆ Formation-related objectives:
 - to make students sensitive to moral values related to R&D;
 - to prepare students for undertaking the responsibility for ethical quality of R&D activities;
 - to prepare students for resolving ethical dilemmas that appear in R&D practice;
 - to help students in developing individual personal ethical stance with respect to R&D issues.



1.3. Educational objectives (cont.)

- ◆ Knowledge-related objectives:
 - to extend basic knowledge concerning general ethics as a philosophical discipline;
 - to identify ethical issues related to R&D activities;
 - to introduce the methodology of resolving ethical dilemmas related to R&D activities.



1.3. Educational objectives (cont.)

- ◆ Skills-related objectives:
 - to enhance skills of critical analysis of ethical aspects of R&D activities;
 - to enhance skills of discussing and defending one's own ethical stance;
 - to encourage students to develop habits of continual reflection over ethical aspects of their every-day activities.



1.4. Lecture

- ◆ Elements of meta-ethics and general ethics:
 - the definition of basic concepts of ethics and meta-ethics;
 - the historical development of ethics;
 - the relation of ethics to other philosophical disciplines;
 - the relation of ethics to law, religion and customs;
 - the relation of ethics to psychology, sociology and other social sciences.
- ◆ Methodological background of R&D ethics:
 - the definitions of truth and their ethical consequences;
 - the crisis of truth in the postmodern culture;
 - the naïve concept of scientific method and its criticism;
 - the epistemological status of mathematical modelling and measurement.



1.4. Lecture (cont.)

- ◆ Ethical aspects of principal R&D activities:
 - the choice of a research problem or of a design object;
 - ethical aspects of the choice of an R&D methodology;
 - ethical aspects of the design and execution of experiments and tests;
 - ethical aspects of the acquisition and processing of experimental data;
 - ethical aspects of the experimentation and testing with the involvement of live organisms;
 - the evolution of R&D ethics;
 - an example of a R&D-related ethical dilemma.
- ◆ Ethical aspects of information processes:
 - the definition of an information process;
 - ethical issues related to the scientific and/or technical discussion;
 - ethical issues related to the publication of R&D results;
 - ethical issues related to the reviewing process;
 - ethical issues related to grant applications.



1.4. Lecture (cont.)

- ◆ Protection of intellectual property – legal and ethical aspects:
 - ethical issues related to legal protection of author's rights;
 - ethical issues related to patenting;
 - ethical arguments against legal protection of material rights.
- ◆ Ethical aspects of using information technologies (ITs):
 - a classification of ethical issues related to IT usage;
 - a basic approach of ethical problems related to IT usage;
 - the netiquette or internet ethics;
 - ethical dilemmas related to IT usage.
- ◆ Complementary issues:
 - ethical aspects of engineering practice;
 - codes of professional ethics.



1.5. Sources

Basic textbook

R. Z. Morawski, *Technoscientific Research: Methodological and Ethical Aspects*, Walter de Gruyter 2019.

Other sources

E. E. Anderson, A. Cornell, *100 Questions (and Answers) About Research Ethics*, Sage 2018.

The European Code of Conduct for Research Integrity, All European Academies European Science Foundation, March 2011.

J. G. D'Angelo, *Ethics in Science: Ethical Misconduct in Scientific Research*, CRC Press 2018 (2nd edition).

R. Faria, *Research Misconduct as White-Collar Crime: A Criminological Approach*, Springer 2018.

Y. Freund, *Ethical and Scientific Misconduct*, Lippincott Williams & Wilkins 2018.

S. Jargin, *Scientific Misconduct and Consequences: Report from the Former Soviet Union*, Independently Published 2018.

N. S. Kinsella, *Against Intellectual Property*, Ludwig von Mises Institute 2008.

R. MacGinn, *The Ethical Engineer: Contemporary Concepts and Cases*, Princeton University Press 2018.

F. L. Macrina, *Scientific Integrity: Text and Cases in Responsible Conduct of Research*, ASM Press, 2014 (4th edition).

M. W. Martin, R. Schinzinger, *Introduction to Engineering Ethics*, McGraw Hill 2010 (2nd edition).

A. E. Shamoo, D. B. Resnik, *Responsible Conduct of Research*, Oxford University Press 2015 (3rd edition).

C. N. Stewart, *Research Ethics for Scientists: A Companion for Students*, Blackwell 2011.

C. Whitbeck, *Ethics in Engineering Practice and Research*, Cambridge University Press 2011 (2nd edition).



1.6. Class tutorials

CT1. Art and science of ethical discourse:

BBC 2021 – Dare to repair – The fight for the right to repair (MP3)

Buerk 2021 – Is it immoral to refuse the vaccine (MP3)

Caruso 2021 – Free will = Philosophy and moral responsibility (MP3)

Singer 2022 – Consequentialism (MP3)

CT2. Ethical dilemmas related to R&D:

Ladyman 2021 – Science, pseudoscience, and snake oil (MP3)

Lauer 2019 – Case studies on research integrity (MP3)

Le Texier 2019 – Debunking the Stanford prison experiment (MP3)

Wester 2015 – Trends in research misconduct on the rise (MP3)

All the sources available via SharePoint



1.6. Class tutorials (cont.)

CT3. Ethical dilemmas related to data processing and publication:

- Astaneh 2021 – Biomedical authorship = Common misconducts & possible scenarios for disputes (PDF)
- Berger 2017 – Everything you ever wanted to know about predatory publishing but... (PDF)
- Bos 2020 – Fabrication and Cheating (PDF)
- Bos 2020 – Plagiarism (PDF)
- Tijdink 2016 – Publish & perish = Science and medical researchers under pressure (MP3)

CT4. Ethical dilemmas related to new technologies and IP protection:

- BBC 2019 – The morality of genetics (MP3)
- Fry 2021 – The power and perils of big data (MP3)
- Kinsella 2021 – Guest lecture on IP for Walter Block's Law and Economics Class (MP3)
- Kinsella 2021 – Stephan Kinsella explains intellectual property to Caleb Brown (MP3)

All the sources available via SharePoint



1.6. Class tutorials (cont.)

Guidelines

- ◆ Class tutorials are discussions animated by appointed students (called animators hereinafter) under supervision of the professor. With each topic of the discussion several sources of inspiring information are associated. The animators are expected:
 - to read (or at least carefully overview) the sources;
 - to select 1–2 problems for discussion, taking into account the following criteria:
 - the moral nature of the problem,
 - possible moral dilemma(s) underlying the problem,
 - the potential to attract interest of other students and provoke the real discussion;
 - to prepare a very short introduction to the discussion over each problem;
 - to guide the discussion;
 - to summarise the discussion.
- ◆ All the above elements are taken into account by the professor in the evaluation of the animators' performance, but special emphasis is put on the quality of discussion.



1.7. Schedule of lectures, class tutorials and tests

Subject	Hours	October				November				December			January			
		5	12	19	26	2	16	23	30	7	14	21	4	11	18	25
Lectures	20 h															
Elements of meta-ethics and general ethics	4 h	2 h	2 h													
Methodological background of R&D ethics	2 h			2 h												
Ethical aspects of principal R&D activities	4 h				2 h	2 h										
Ethical aspects of information processes	4 h						1 h	1 h	2 h							
Protection of intellectual property – legal and ethical aspects	3 h										2 h		1 h			
Ethical aspects of using information technologies (ITs)	2 h												1 h	1 h		
Complementary issues	1 h													1 h		
Class Tutorials	6 h						1 h									
Art and science of ethical discourse	1 h															
Ethical dilemmas related to R&D	2 h									2 h						
Ethical dilemmas related to data processing and publication	2 h											2 h				
Ethical dilemmas related to new technologies and IP protection	1 h													1 h		
Tests	4 h						1 h									
Test #1	1 h															
Test #1'	1 h														1 h	
Test #2	1 h													1 h		
Test #2'	1 h														1 h	

Note 1: Test #1' is fully equivalent to Test #1, and Test #2' is fully equivalent to Test #2; all the EEARE students are eligible to take all the tests.

Note 2: During the tests students are not allowed to use any other aids than their own writing tools.



1.8. Grading

Partial grading:

Test #1

up to 35 pts

Test #2

up to 45 pts

Class Tutorials

up to 20 pts (for animation and class activity)

Class Tutorials

–5 pts (for the second, third and fourth absence)

Final grading:

$0 \leq \sum \text{pts} < 50 \Rightarrow 2$

$50 \leq \sum \text{pts} < 60 \Rightarrow 3$

$60 \leq \sum \text{pts} < 70 \Rightarrow 3.5$

$70 \leq \sum \text{pts} < 80 \Rightarrow 4$

$80 \leq \sum \text{pts} < 90 \Rightarrow 4.5$

$90 \leq \sum \text{pts} \leq 100 \Rightarrow 5$



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2. ELEMENTS OF GENERAL ETHICS AND META-ETHICS

Lecture slides for Fall Semester 2022/2023



2.1. Basic concepts

- ◆ Morality (Lat. *moralis* = related to customs, from *mos* = a custom) is a social phenomenon, *viz.* a system of principles, values and judgments concerning individual-individual relationships and individual-group relationships, developed by a community to control those relationships.
- ◆ Ethics (Gr. *ethos* = a custom) is a philosophical discipline oriented on development of theories of morality. Most important classifications of ethics are the following:
 - descriptive ethics (description and explanation of moral phenomena in terms of philosophy),
 - normative ethics (philosophical analysis of moral norms and judgments);
 - general ethics (developed without indication of any specific field of application),
 - applied ethics (developed with indication of a specific field of application);
 - individual ethics (ethics of a single person),
 - social ethics (ethics of a group of persons).



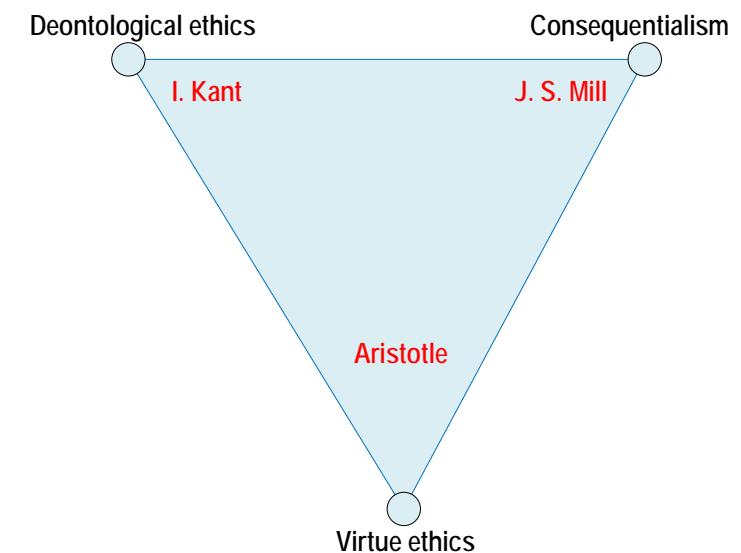
2.1. Basic concepts (cont.)

- ♦ Meta-ethics (Gr. *meta* = after, beyond) is a methodology of ethics (logical analysis of the language of ethics, the status of truth in ethics, methods of substantiation and justification of ethical norms and judgments). The following are examples of meta-ethical questions:
 - *What does it mean to say something is "good"?*
 - *How, if at all, do we know what is right and wrong?*
 - *How do moral attitudes motivate action?*
 - *Are there any objective (or absolute) values?*
 - *What is the source of our moral principles and values?*



2.1. Basic concepts (cont.)

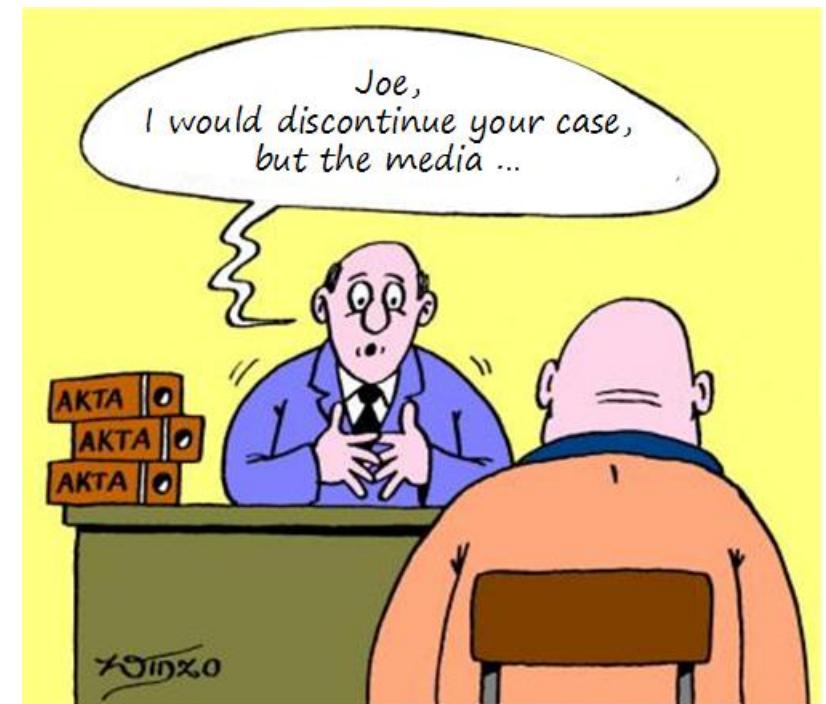
- ◆ The fundamental classification of ethical approaches, based on the criterion used for moral evaluation of actions:
 - *Virtue ethics* is emphasizing the virtues or the moral character of a person; it is focusing on what makes a good person rather than on what makes a good action.
 - *Deontological ethics* (Gr: *deon* = *obligation* or *duty*) is holding that decisions should be made solely or primarily by considering one's duties and the rights of others.
 - *Consequentialism* is holding that the consequences of a particular action form the basis for any valid moral judgment about that action; a morally right action is an action which implies good consequences.



2.1. Basic concepts (cont.)

- ◆ Ethical (moral) dilemma is a decision-making problem implied by the necessity to choose among the conflicting values if at least one of them is a moral value.

- ◆ Examples of dilemmas:
 - trolley dilemmas,
 - transplantation dilemma,
 - terrorist-on-board dilemma.

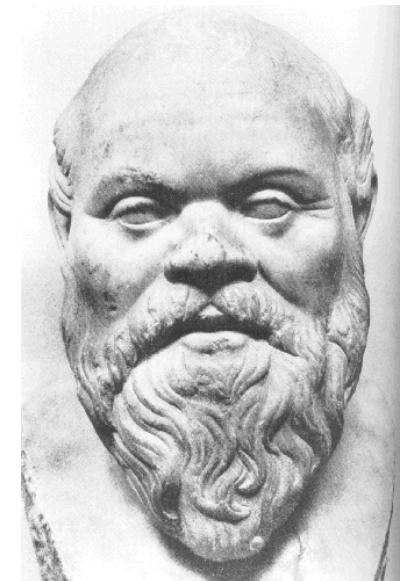


<http://www.widzo.pl.tl/Galeria/index.htm>

2.2. Western ethics in historical perspective

- ◆ The ethical intellectualism of Socrates:
 - Ethical knowledge is potentially present in every person, but not everybody is able to realise it; so, the teacher's duty is to help pupils in the process of realising it.
 - Neither profit nor happiness is the purpose of human life, but virtue (which is bringing both).
 - Knowledge is a sufficient condition of virtue.

Socrates (469–399 BC) – an ancient Greek philosopher who is widely credited for laying the foundation for Western ethics.



2.2. Western ethics in historical perspective (cont.)

- ◆ The eudemonism (eudaemonism) of Plato:
 - The highest human purpose is the state of *eudemonia*, i.e. of wellbeing (or flourishing), resulting from the contact with the idea of absolute good and beauty.
 - The soul has three motivating parts: a rational part, an emotional part, and an appetitive part.
 - Virtues related to those parts (wisdom, courage and temperance, respectively), coordinated by a super-virtue (justice), provide the equilibrium: the rational part is governing the emotional and appetitive part, thereby correctly leading all desires and actions towards *eudemonia*.

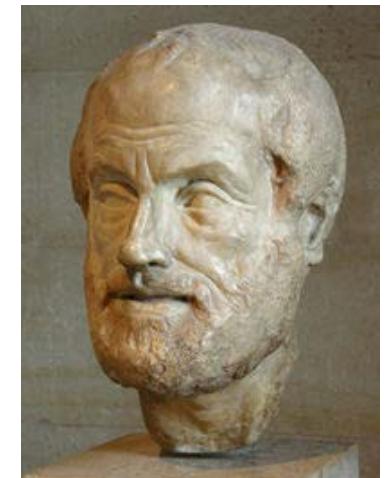
Plato (427–347 BC) – a Socrates's disciple, the founder of the Academy in Athens.



2.2. Western ethics in historical perspective (cont.)

- ◆ The eudemonism (eudaemonism) of Aristotle:
 - Eudemonia is the highest purpose of a human being.
 - Three ways are leading to eudemonia: contemplative life, practical (active) life, and responsible love (family links, man-woman love, friendship, worship of a deity).

Aristotle (384–322 BC) – a Plato's disciple, the author of the concept of ethics (*Nicomachean Ethics*).



2.2. Western ethics in historical perspective (cont.)

◆ The stoicism (the moralism of Stoics):

- Passions and desires are main causes of suffering; one may get rid of suffering only by meditation and virtue since good is rooted in the state of the soul – in wisdom and self-control.
- One may avoid emotional troubles by developing clear judgment and inner calm through diligent practice of logic, reflection, and concentration.
- One should live according to reason and virtue; where reason means not only logic, but also understanding the processes of nature.
- Unhappiness and evil are the results of ignorance; freedom follows understanding of necessity.
- An action is good if good is the intention behind it.

The school of Stoics (III BC – I AD), Athens and Rome; most prominent representatives:

- Lucius Annaeus Seneca (4 BC – 65 AD) – a Roman statesman at the Nero court;
- Marcus Aurelius (121–180 AD) – a Roman emperor.



◆ The Christian ethics:

- Moral guidelines are based on Mosaic Decalogue subordinated to the commandment of love.
- The attitude of unconditional love with respect to God is the first moral duty of a human being.
- Since a human being, as a creature following the image of God, is dotted with a particular dignity, the second duty is to love one's neighbour.
- To love one's neighbour does not mean to love abstract humankind, but specific persons (as much as oneself).



<http://mleczko.interia.pl>

The founders of Christian ethics:

- Jesus of Nazareth (0–33 AD) and Paul of Tarsus (10 BC – 67 AD), who propagated ethical principles by action;
- Augustine of Hippo (354–430 AD) and Thomas Aquinas (1225–1274 AD), who systematised and substantiated those principles in their philosophical treatises.

2.2. Western ethics in historical perspective (cont.)

The Christian theological virtues:

- faith = a virtue by which one's intellect is perfected by a supernatural light and assents firmly to the supernatural truths of Revelation, not because of intrinsic evidence, but on the sole ground of the infallible authority of God;
- hope = a virtue by which one trusts, with an unshaken confidence grounded on the God's assistance, to attain life everlasting;
- charity (love) = a virtue by which God is loved by reason of His own intrinsic goodness, and one's neighbour is loved on account of God.



2.2. Western ethics in historical perspective (cont.)

The Christian cardinal virtues:

- justice = a virtue which disposes one to respect the rights of others, to give each man his due;
- temperance = a virtue which moderates, in accordance with reason, one's desires and pleasures of the sensuous appetite;
- fortitude (**courage**) = a virtue by which one sustains dangers and difficulties (even death) and is able to pursue a good which reason dictates (despite those dangers and difficulties);
- prudence (**wisdom**) = a virtue which directs one in the choice of means most apt, under existing circumstances, for the attainment of a due end.

(the Stoic options in blue)



2.2. Western ethics in historical perspective (cont.)

Selected (110) virtues recognised in various Western cultures:

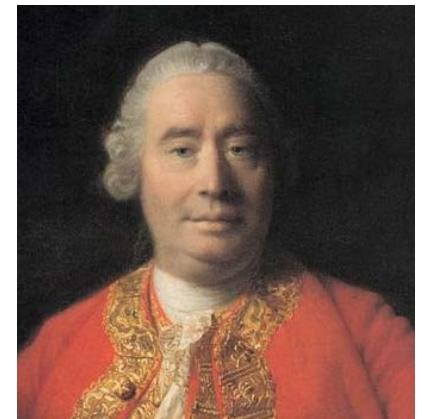
acceptance	<i>cunning</i>	<i>generosity</i>	<i>mercy</i>	<i>sacrifice</i>
<i>altruism</i>	<i>curiosity</i>	<i>happiness</i>	<i>moderation</i>	<i>self-awareness</i>
<i>appreciation</i>	<i>dependability</i>	<i>helpfulness</i>	<i>manners</i>	<i>self-discipline</i>
<i>assertiveness</i>	<i>detachment</i>	<i>honesty</i>	<i>modesty</i>	<i>self-esteem</i>
<i>autonomy</i>	<i>determination</i>	<i>honour</i>	<i>morality</i>	<i>self-reliance</i>
<i>awareness</i>	<i>diligence</i>	<i>hopefulness</i>	<i>non-violence</i>	<i>self-respect</i>
<i>balance</i>	<i>discipline</i>	<i>hospitality</i>	<i>nurturing</i>	<i>sensitivity</i>
<i>benevolence</i>	<i>empathy</i>	<i>humility</i>	<i>obedience</i>	<i>sharing</i>
<i>charity</i>	<i>endurance</i>	<i>humour</i>	<i>openness</i>	<i>sincerity</i>
<i>chastity</i>	<i>enthusiasm</i>	<i>idealism</i>	<i>optimism</i>	<i>spiritual beauty</i>
<i>cleanliness</i>	<i>excellence</i>	<i>imagination</i>	<i>patience</i>	<i>spirituality</i>
<i>commitment</i>	<i>fairness</i>	<i>impartiality</i>	<i>peacefulness</i>	<i>sympathy</i>
<i>compassion</i>	<i>faith</i>	<i>independence</i>	<i>perfection</i>	<i>tactfulness</i>
<i>confidence</i>	<i>fidelity</i>	<i>innocence</i>	<i>perseverance</i>	<i>temperance</i>
<i>consciousness</i>	<i>flexibility</i>	<i>integrity</i>	<i>piety</i>	<i>thankfulness</i>
<i>consideration</i>	<i>focus</i>	<i>intuition</i>	<i>potential</i>	<i>tolerance</i>
<i>continence</i>	<i>foresight</i>	<i>inventiveness</i>	<i>prudence</i>	<i>trustworthiness</i>
<i>cooperativeness</i>	<i>forgiveness</i>	<i>joy</i>	<i>purity</i>	<i>truth</i>
<i>courage</i>	<i>fortitude</i>	<i>justice</i>	<i>purposefulness</i>	<i>truthfulness</i>
<i>courteousness</i>	<i>freedom</i>	<i>kindness</i>	<i>respectfulness</i>	<i>understanding</i>
<i>creativity</i>	<i>free will</i>	<i>lovingness</i>	<i>responsibility</i>	<i>unselfishness</i>
<i>critical thinking</i>	<i>friendliness</i>	<i>loyalty</i>	<i>restraint</i>	<i>wisdom</i>



2.2. Western ethics in historical perspective (cont.)

- ◆ The moral sentimentalism of Hume:
 - Most frequently, we morally approve an act because it is increasing public utility.
 - We can be motivated not only by self-interest but also by our sympathy for others (understood by Hume as a principle for the communication and sharing of sentiments, what is today called *empathy*).
 - We can never make moral judgments based on reason alone: our reason deals with facts and draws conclusions from them, but it can not lead us to choose one option over the other; only our sentiments can do this.
 - Prescriptive (ethical) statements (*what ought to be*) cannot be derived from descriptive (factual) statements (*what is*) without paying attention to human sentiments.

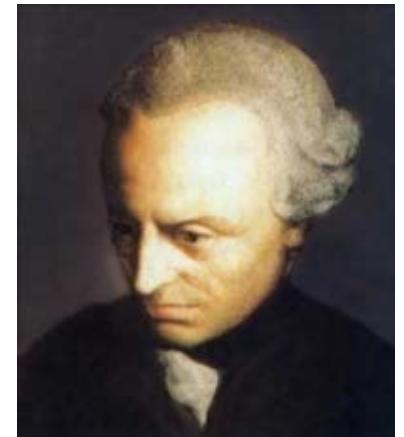
David Hume (1711–1776) – a Scottish philosopher, economist and historian who significantly influenced the development of several schools of thinking in ethics: utilitarianism, emotivism, naturalism, logical positivism.



2.2. Western ethics in historical perspective (cont.)

- ◆ The formal ethics of Kant:
 - A human act (even very positive) cannot be considered moral if it is motivated by:
 - fear of condemnation or punishment (either inflicted by God or a society);
 - desire of pleasure (hedonism), personal or social wellbeing (utilitarianism);
 - mercy or compassion.
 - It can be considered moral if, and only if, it is motivated by free disinterested will; freedom = independence of material world and submission to moral law.
 - A categorical imperative is an unconditional obligation (i.e. in force regardless of our will or desires) which is generating all other moral obligations and may be used for testing them.
 - "*Always act according to that maxim whose universality as a law you can at the same time will*".
 - "*Act with reference to every rational being (whether yourself or another) so that it is an end in itself, never a means*".

Immanuel Kant (1724–1804) – the most influential ethicist of all times, referring to ethics of Socrates and Stoics, as well as to the Christian ethics.



2.2. Western ethics in historical perspective (cont.)

- ◆ The categorical imperative vs. the golden rule of conduct:

"Hurt not others in ways that you yourself would find hurtful."

Buddhism, Udana-Varga 5:18

"Treat others as you want them to treat you. This is what the Law and the Prophets are all about."

Christianity, Bible, Mt 7:12

"Do not impose on others what you yourself do not desire."

Confucianism, Doctrine of the Mean 13.3

"This is the sum of duty: do not do to others what would cause pain if done to you."

Hinduism, Mahabharata 5:1517

"None of you [truly] believes until he wishes for his brother what he wishes for himself."

Islam, Al-Nawawi's Forty Hadiths, 13,5

"What is hateful to you, do not to your fellow man. This is the law: all the rest is commentary."

Judaism, Talmud, Shabbat 31a

"Regard your neighbour's gain as your own gain, and your neighbour's loss as your own loss."

Taoism, T'ai Shang Kan Ying P'ien



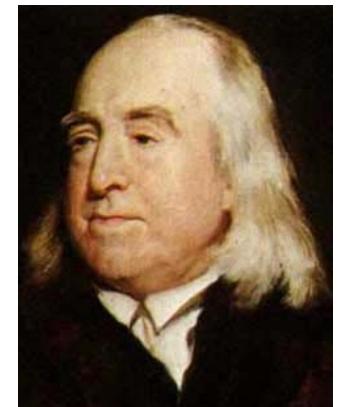
G. Tibballs (ed.): *The Mammoth Book of the Funniest Cartoons of All Time*. Carroll & Graf Pub., New York 2006, p. 186

2.2. Western ethics in historical perspective (cont.)

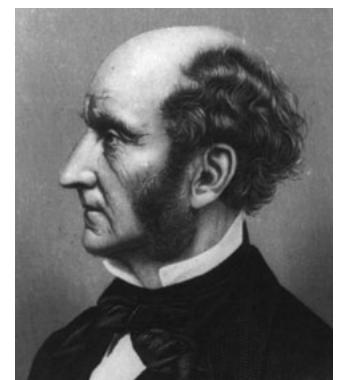
◆ The utilitarian ethics:

- The utilitarian ethics (utilitarianism) states that the moral worth of an action is solely determined by its contribution to overall utility (pleasure or happiness).
- The nature of any moral value is only instrumental: a human act is good or evil as a means for reaching a goal.

Jeremy Bentham (1748–1831) – the father of hedonistic utilitarianism stating that pleasure is the main goal of any human being: "... *nature has put man under the governance of two sovereign masters: pleasure and pain*".



John Stuart Mill (1806–1873) – the author of the utility principle: "one must always act so as to produce the greatest happiness for the greatest number of people".



2.2. Western ethics in historical perspective (cont.)

- ◆ The phenomenological ethics of value:
 - Values are objective, *i.e.* independent of a subject and, therefore, preceding its perception.
 - Values and their corresponding disvalues exist in an objective ordering of ranks:
 - values of the holy vs. disvalues of the unholy,
 - values of the mind (truth, beauty, justice) vs. disvalues of their opposites,
 - values of vitality and of the noble vs. disvalues of the ignoble,
 - values of pleasure vs. disvalues of displeasure,
 - values of utility vs. disvalues of the useless.
 - A "disorder of the heart" occurs whenever a person prefers a value of a lower rank to a higher rank, or a disvalue to a value.
 - The main task of ethics is to study the realm of values rather than to formulate moral interdictions or obligations for people.
 - Thus, human life should be guided by the experience of values rather than by ethical principles.
 - To be able to choose a higher-rank value rather than a lower-rank value, people should be free from resentments and practice the attitude of love.



The founders of the ethics of value:



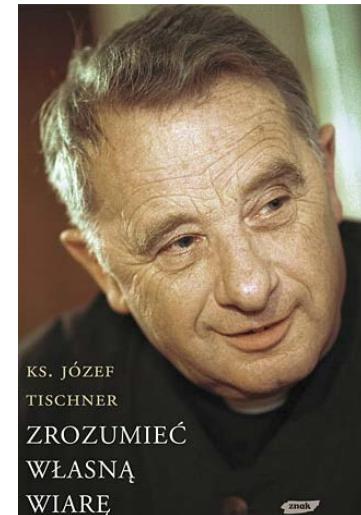
Max Scheler (1874–1928)



Dietrich von Hildebrand (1889–1977)



Nicolai Hartmann (1882–1950)

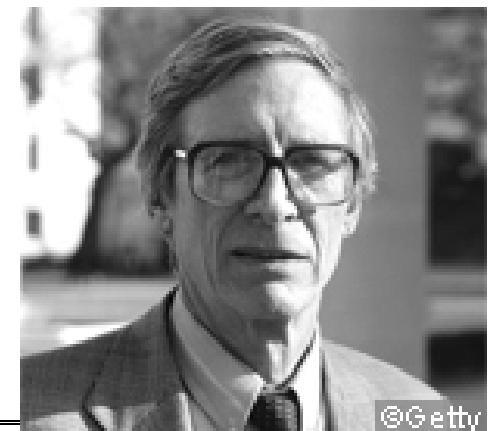


Józef Tischner (1931–2000)

2.2. Western ethics in historical perspective (cont.)

- ◆ The ethics of justice:
 - The original position = a group of persons is designing the future organisation of a society:
 - they are lacking knowledge about their future gender, race, age, intelligence, wealth, skills, education (*veil of ignorance*);
 - they have, however, a sense of justice and the capacity to design a good life plan.
 - Principles of justice derived from the original position:
 - the principle of liberty = equal basic liberties for all citizens (freedoms of conscience, association, and expression, democratic rights, personal property right);
 - the principle of fair equality of opportunities = persons with comparable talents and motivation have similar life chances; social inequalities work to the benefit of the least advantaged.

John B. Rawls (1921–2002) – an American moral and political philosopher, Professor at Harvard University, the author of *A Theory of Justice* (1971).



©Getty



2.3. The relationship of ethics to other areas of intellectual activity

- ◆ The relationship of ethics to other philosophical disciplines:
 - ontology = the study of being or existence (the study of conceptions of reality);
 - epistemology (theory of knowledge) = the study of the nature and scope of knowledge, aimed at the analysis how it relates to truth, belief, and justification;
 - logic = the study of patterns found in reasoning, setting down rules for distinguishing between valid and fallacious inference, between rational and flawed arguments;
 - aesthetics (esthetics) = the study of sensory or sensori-emotional values, sometimes called judgments of sentiment or taste;
 - philosophical anthropology = the study of human nature, unifying the understanding of human beings as creatures of their environment and creators of their own values;
 - axiology = the study of value or quality (sometimes considered to include ethics and aesthetics);
 - philosophy of religion = the study of the veracity of fundamental claims about God, particularly about the nature and existence of God;
 - jurisprudence (philosophy of law) = the study of the nature of law, of legal reasoning, legal systems and of legal institutions.



2.3. The relationship of ethics to other areas of intellectual activity (cont.)

- ◆ The relationship of ethics to law, religion and customs:
 - law = a system of regulations governing the conduct of a society, introduced and executed (by force, if necessary) by the State authorities;
 - religion = a system of beliefs and practices, shared by a number of persons, that generally involves faith in spirituality, as well as knowledge and wisdom related to understanding of human life;
 - customs = forms of conduct considered to be acceptable by a community, very slowly evolving from one generation to another, and justified by this tradition.



2.3. The relationship of ethics to other areas of intellectual activity (cont.)

- ◆ The relationship of ethics to psychology, sociology and other social sciences:
 - moral psychology,
 - sociology of morality,
 - history of morality,
 - ethnology of morality.



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Ethical Aspects of Research and Engineering

3. METHODOLOGICAL BACKGROUND OF R&D ETHICS

Lecture slides for Fall Semester 2022/2023



3.1. Introduction

- ◆ Meta-ethical assumptions:
 - Ethics is not directly applicable to science or technology, but to the human acts or actions related to their development.
 - Truth is the central value of science:
 - a scientist best serves the society when serving truth, but
 - a scientist cannot use unethical means for making people serve truth.
 - We are responsible for:
 - fully conscious, free and voluntary actions only;
 - good and bad actions if we know that they are good or bad;
 - goodness or badness of our actions from the very moment of their planning, not only after they have been accomplished;
 - future foreseeable consequences of our acts, not only for those acts themselves.

Interpretation depends on the answer to the questions: what is truth, what is freedom?



3.1. Introduction (cont.)

- ◆ The principal ethical imperative of any professional ethics is "to do one's job honestly". What does it mean in research and engineering:
 - if the principal goal of research is truth?
 - if the principal goal of engineering is effectiveness?



In communist Poland, workers stole, physicians accepted bribes, and railway workers delayed. Artists drank, writers served, public prosecutors succumbed, clerks pretended, historians counterfeited, journalists told lies, and only secret security agents honestly did their job.

Henryk Sawka (www.przyssawka.pl)



3.1. Introduction (cont.)

- ◆ The collective R&D activities, both in micro-scale and macro-scale, are based on trust:
 - the reader of a research paper must have confidence in its contents;
 - the coordinator of collective R&D efforts must have confidence in partial results of work.

The functioning of science and technology is unthinkable without trust.



Most serious infringements of R&D ethics are those against trust.



3.2. The crisis of truth and the spirit of relativism

- ◆ Truth, according to the correspondence definition = an objective property of our beliefs in virtue of which they correspond to the world.
(*"Veritas est adaequatio rei et intellectus"*, St. Thomas Aquinas).
- ◆ Truth, according to the normative definitions (i.e. definitions referring to the norms of justification of beliefs):
 - the *coherence* definition of truth (a statement is true if it is coherent with some specified set of statements),
 - the *consensus* definition of truth (a statement is true if it is generally accepted)
 - the *evidence* definition of truth (a statement is true if it is evident),
 - the *pragmatic* definition of truth (a statement is true if it is useful).



3.2. The crisis of truth and the spirit of relativism (cont.)

- ◆ The crisis of truth in every-day life and in technoscience:
 - We react with growing insensitivity, boredom and disorientation to overproduction of messages, theories, hypotheses and views.
 - We accept them often without critical analysis or reasoning because the class of statements we can personally test is shrinking.
 - We are exposed to the contradictory interpretations on the same facts, all presented as true: to avoid the pain of contradiction, we are inclined to reject the concept of truth.
 - Our civilisation, based on advanced technology, seems to be highly robust to the lack of truth
 - to the avalanche of false information circulating in the infosphere.

How truth, the central value of technoscience, may survive the global crisis of truth?



3.2. The crisis of truth and the spirit of relativism (cont.)

- ◆ The broad spectrum of views on the morality of social communication (exchange of information in the society) spans between the following extremes:

- The objectivity of science requires a community of argumentation, and argumentation may be meaningful only if some ethical principles are assumed: the respect of truth, responsibility for information, and the respect for others.

Jürgen Habermas: "Theorie des kommunikativen Handelns", Suhrkamp, Frankfurt am Main 1981

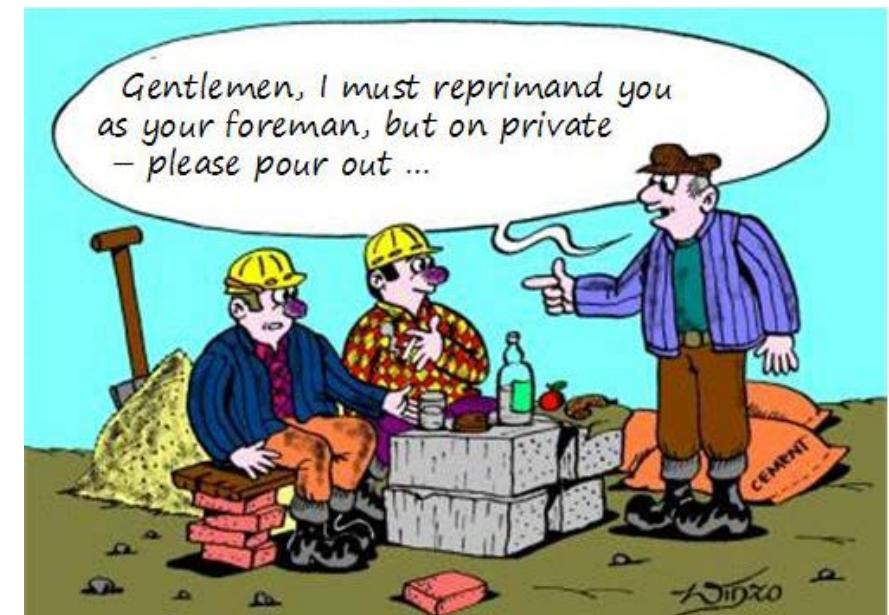
- The ability to lie is a language skill necessary in social life, especially in politics.

Simone Dietz: "Die Kunst des Lügens – Eine sprachliche Fähigkeit und ihr moralischer Wert", Rowohlt, Reinbek bei Hamburg 2003.



3.2. The crisis of truth and the spirit of relativism (cont.)

- ◆ We are persuaded to accept the relativity/uncertainty of truth, i.e. its dependence on:
 - the inquiring subject,
 - circumstances of the inquiry (time, place and "influence quantities"),
 - objectives of the inquiry,
 - paradigms, methods and tools used for the inquiry,
 - a stage of the inquiry.



<http://www.widzo.pl.tl/Galeria/index.htm>

3.3. The naïve understanding of scientific method and its critics



*Step #1:
Make an observation*



*Step #2:
Formulate a hypothesis*



*Step #3:
Make an experiment*



*Step #4:
Analyse its result*



*Step #5:
Report your findings*

3.3. The naïve understanding of scientific method and its critics (cont.)

- ◆ An objective (impartial and unbiased) researcher makes observations and measurements on the object of study.
 - The state of the researcher's mind significantly influences the "way of seeing".
 - The scope of observations and measurements (a set of aspects taken into account) is arbitrary.
- ◆ On the basis of the results of observations and measurements, the researcher formulates a hypothesis concerning the properties or behaviour of the object of study.
 - The interpretation of the results of observations and measurements is "theoretically biased" because the researcher's understanding of the situation depends on his/her theoretical background.
 - Generalisations, based on the results of observations and measurements, are uncertain because these results are uncertain, and the empirical induction is incomplete.
 - The "theoretically-biased" interpretation of the results of observations and measurements and uncertain generalisations may lead to alternative hypotheses of comparable epistemic value.
- ◆ Having transformed the hypothesis into a theory, the researcher corrects this theory any time he/she is confronted with new data which are not coherent with this theory.
 - In practice, the researcher is adding new constraints on the scope of its applicability.
 - The theory is abandoned if the set of (accumulated) constraints is drastically reducing its field of applicability.



3.3. The naïve understanding of scientific method and its critics (cont.)

- ◆ The researchers are equipped with a scientific methodology which enables them to asymptotically "catch the truth", but with uncertainty because:
the research methods for "catching the truth" are subject to significant limitations having numerous sources:
 - in epistemology (the crisis of the definition of truth),
 - in induction and abduction (the problem incompleteness and ambiguity),
 - in deduction (the problem of unresolvability and logical paradoxes),
 - in measurement (the problem of the dependence on mathematical models),
 - in mathematical modelling (the problem of the dependence on measurement).



3.3. The naïve understanding of scientific method and its critics (cont.)

- ◆ Negative follow-ups of naïve understanding of scientific method are numerous:
 - a hypocrisy stimulating distrust of the society with respect to science and dissuading researchers from observation of due-diligence rules in the research practice,
 - the incorrect use of research methods,
 - the frustration among young researchers.



"Melville's an economist. In his predictions he's been right just once in a hundred, enough to give him a considerable reputation."

G. Tibballs (ed.): *The Mammoth Book of the Funniest Cartoons of All Time*. Carroll & Graf Pub., New York 2006, p. 325

3.4. Scientific truth vs. cognitive status of mathematical modelling and measurement

- ◆ The primordiality of the concept of mathematical modelling:
 - Various meanings of the term "modelling" are linked by the notion of similarity.
 - Mathematical refinement of the idea of similarity is leading to the concept of "homomorphism".
 - Mathematical modelling of abstract objects may be defined as homomorphic mapping of their significant parts or features and relationships connecting them.
 - An extrapolation of this definition on mathematical modelling of physical objects is logically impossible, but useful as an interpretation of this notion.
- ◆ The basic assumptions underlying mathematical modelling of a physical object (phenomenon):
 - The object may be satisfactorily described in terms of its parts or features (considered to be significant) and relations among them ("system paradigm").
 - There is some time-invariant regularity in the behaviour of the object.



3.4. Scientific truth vs. cognitive status of mathematical modelling and measurement (cont.)

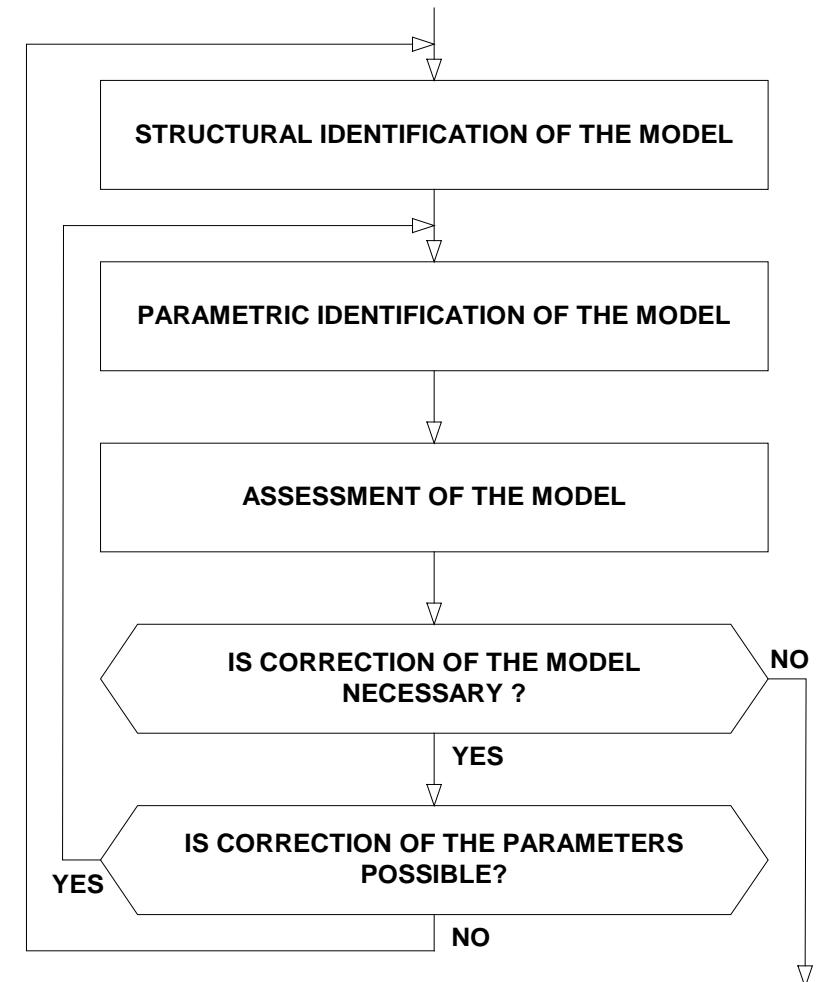
- ◆ Mathematical modelling of a physical object (phenomenon) involves:
 - The formulation of a natural-language description of the modelled object, i.e. a specification of its significant parts or features and relationships connecting them (Ludwig Wittgenstein: "... *a sentence is a model of reality as we think it*").
 - The representation of those significant features and relationships by a selected (abstract) relational system.
- ◆ A fundamental difficulty is related to the relationship of the model to physical reality:
 - The experts' views on this issue diverge and depend on their epistemological orientation.
 - There is no logical means to prove any of those views.
 - However "... *science does not attempt to explain, almost does not attempt to interpret; first of all, science is involved in creation of mathematical models*" (John von Neumann).



3.5. Mathematical modelling vs. measurement

- ◆ The iterative identification of a mathematical model:
 - The model parameters are corrected until a model satisfying the needs is obtained or further correction is impossible.
 - The model structure is corrected (enhanced) if the adaptation of the model by correction of its parameters is impossible.

Within both correction loops, a measurement-based assessment of the model is performed.



3.5. Mathematical modelling vs. measurement (cont.)

- ◆ According to the representational theory of measurement:
 - Any measurement is a mapping of a relational system of manifestations of physical quantities (empirical system) into a relational system of numbers (abstract system).
 - Any measurand (generalised quantity to be measured) is a feature of a mathematical model of a measurement object (not of the object itself).
 - A plurality of models implies a plurality of measurand definitions.



3.6. Conclusions

◆ Methodological conclusions:

- The presented conceptualisation is revealing the analogy between measurement and mathematical modelling.
- The definition of a new measurand and new method of measurement (the formulation of a linguistic model followed by the mapping of this model into a relational system of numbers) is **a particular case of structural identification**.
- An act of measurement (estimation of the value of a measurand) is **a particular case of parametric identification**.
- The cognitive status of measurement and the cognitive status of mathematical modelling are comparable.

◆ Ethical conclusions:

- Epistemological doubts, concerning measurement and mathematical modelling, do not cancel methodological requirements concerning due diligence in experimental work.
- The effectiveness of technoscientific research is characterised by the practical utility of its results: the question of truth is frequently replaced with the question of this utility.



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Ethical Aspects of Research and Engineering

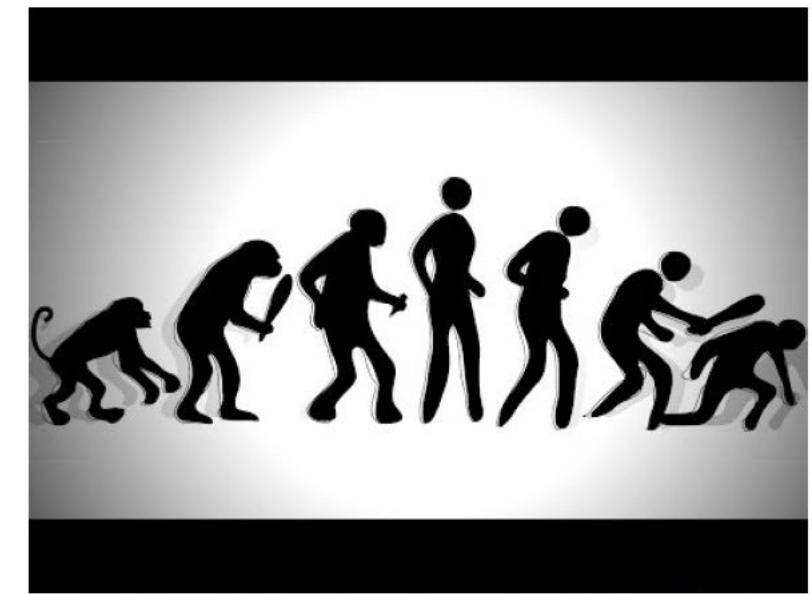
4. ETHICAL ASPECTS OF PRINCIPAL R&D ACTIVITIES

Lecture slides for Fall Semester 2022/2023



4.1. Introduction

- ◆ The increasing incidence of ethical misconduct in R&D is related to:
 - an orientation of the R&D system, integrating academic and industrial institutions, on a research result rather than on a research method, on a result directly applicable rather than on "knowledge for knowledge";
 - an exponential growth of the number of researchers in the 60s and 70s:
 - transformation of the scientist's vocation into an ordinary profession,
 - the evolution of the individual motivation for doing research (towards material values);
 - a pressure of the syndrome "*publish or perish*";
 - decline of genuine criticism in research communities;
 - "fuzzification" of the responsibility for data in large interdisciplinary R&D institutions;
 - "business spirit" permeating R&D institutions (priority for economic criteria, marketing of research results, social engineering).



<http://www.techandfacts.com/human-de-evolution/> [2015-03-010]



4.1. Introduction (cont.)

- ◆ Examples of ethical misconduct related to R&D activities:
 - Professor A is using unpublished research results, obtained by Dr. B, without proper credit to the contribution of the latter.
 - Dr. C, during 130 days of an academic year, is visiting research institutions of India, Brazil, Thailand, etc. – in order to "establish research contacts".
 - Dr. D is "marketing" his research work by presenting exaggerated conclusions, not yet confirmed by the obtained research results.
 - Dr. E, Editor-in-Chief of a research journal, is accepting a paper submitted by his colleague, despite two (out of two) negative reviews.

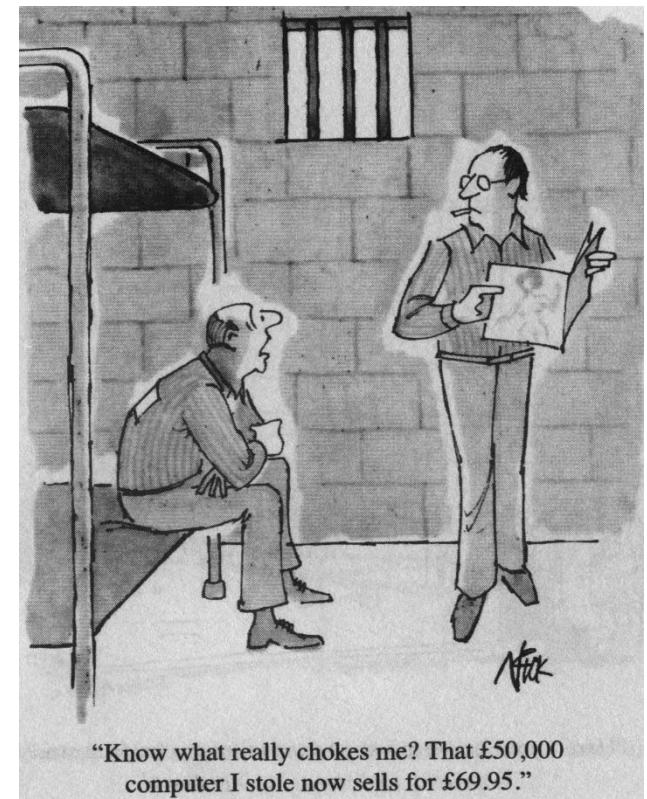


<http://www.qualityinnandsuitesoceancity.com/integrity-selling.php> [2015-03-10]

4.1. Introduction (cont.)

- ◆ Further examples of ethical misconduct related to R&D activities:
 - Engineer G is hiding the results of testing that are revealing faults in his design.
 - Institute H is studying a pharmaceutical X manufactured by the company K which is financing this research project in order to get results "supporting" the marketing of the pharmaceutical X.

... but an ethical dilemma may underlie each case.



G.Tibballs (ed.): *The Mammoth Book of the Funniest Cartoons of All Time*. Carroll & Graf Pub., New York 2006, p. 126

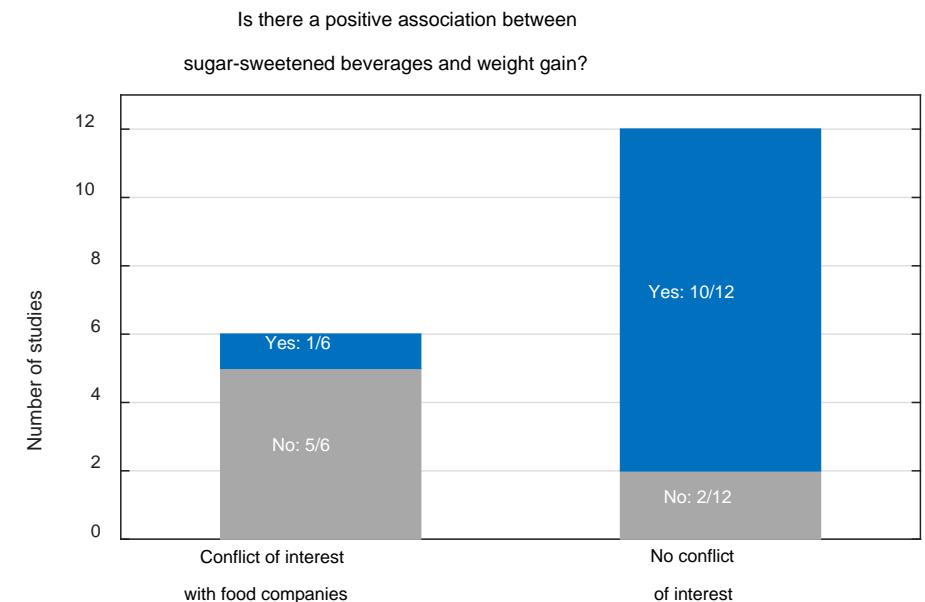
4.2. The choice of a research problem or of a design object

- ◆ The following criteria are used most frequently:
 - the significance of a research or design problem,
 - the originality of research or design objectives or methodology,
 - the probability of success,
 - the ethical value of research or design objectives,
 - the costs of research or design works.



4.2. The choice of a research problem or of a design object (cont.)

- ◆ The ethical dilemmas, related to the choice of a research problem or design object, appear if:
 - the sponsor intention is not evident (pharmacology),
 - the research/design results may imply both good and evil applications (defence vs. aggression),
 - the practical application of the research/design results is unpredictable,
 - the funds allotted for the project could be spent on more important goals.



<https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1001578>

4.2. The choice of a research problem or of a design object (cont.)

- ◆ The following patterns of unethical sponsoring of research are most frequently met in practice:
 - The sponsor, motivated by financial benefits, is going to distort research results or conclusions they imply (e.g. in pharmacology).
 - The sponsor's intention is to subordinate the research programme to some political aims (e.g. armament).



4.3. The choice of an R&D methodology

- ◆ A cycle of empirical research, *i.e.* experiment-based acquisition of knowledge, comprises:
 - the formulation of a hypothesis (Step #1);
 - the use of this hypothesis for generation of questions that can be answered by experimentation (Step #2);
 - the design and execution of experiments providing answers to those questions (Step #3);
 - the use of the results of those experiments for verification of the hypothesis (Step #4).
- ◆ Ethical constraints of researcher's freedom, in principle, apply to the Step #3 and Step #4 only: the pursuit of truth does not justify unethical experiments!



4.4. The design and execution of experiments and tests

- ◆ Experiments with the involvement of live organisms (especially, human beings) are subject to constraints implied by:
 - ethical premises,
 - legal regulations (local and international).

- ◆ There are some ethical dilemmas related to the costs of experimentation:
 - an expensive due-diligence approach vs. risky practice of "*cutting the corners*",
 - the efficiency of research vs. the economy of resources management,
 - the use of expensive real-world data vs. the use of cheap synthetic data.



Mleczko

<http://mleczko.interia.pl/>

4.4. The design and execution of experiments and tests (cont.)

- ◆ The most frequent instances of misconduct, related to the execution of experiments and tests, are implied by the lack of:
 - theoretical and methodological preparation of experiments (imitation of research rituals),
 - criticism with respect to the obtained results,
 - their verification or validation,
 - evaluation of their uncertainty.



4.5. The acquisition and processing of experimental data

- ◆ The following example is most widely discussed in the relevant literature:
 - In 1910, Robert A. Millikan (1923 Nobel-Prize winner) proposed a method for estimation of the electron charge, the method based on measurement of the velocity of oil drops falling in an electric field.
 - Since the speed of drops depended on the charge riding on it, he was able to show that the charges on the drops were multiples of the same number – the charge of the electron.
 - An examination of his laboratory notebooks revealed that he chose among his drops. However, when publishing selected results of his experiments in 1913, he wrote "*... this is not a selected group of drops but ... all of the drops experimented upon during 60 consecutive days*".
 - Was he a liar or a genius of intuition?



4.5. The acquisition and processing of experimental data (cont.)

- ◆ The most frequent ethical infringements, related to the acquisition and processing of experimental data, are the following:
 - fabrication of data,
 - falsification of data (Charles Babbage in 1830),
 - failure to estimate uncertainty of data,
 - underestimation of uncertainty of data,
 - theft of data.



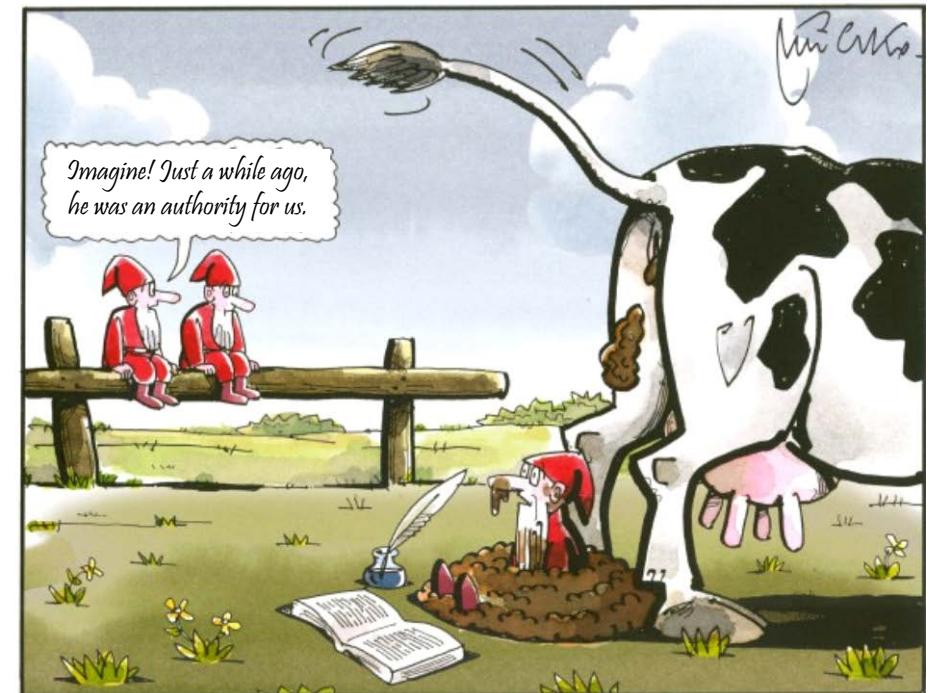
4.5. The acquisition and processing of experimental data (cont.)

- ◆ If uncertainty of experimentation is concerned, the following recommendations are usually formulated:
 - The uncertainty of the results of a quantitative experiment should be assessed and disclosed, even if this implies a disclosure of technical or medical risks.
 - The uncertainty of the results of a qualitative experiment should be characterised by providing possibly exhaustive specifications of circumstances and factors which could have influenced the course of that experiment.
 - All the experimental works should be documented, on the daily basis, in laboratory notebooks or records.
 - The criteria and procedures, used for validation of data and results of their interpretation, should conform to the standards established and accepted in a given domain of research.



4.6. The evolution of R&D ethics

- ◆ The main tendency in the evolution of the R&D ethics:
 - from the traditional ethics, based on the idea of individual authority and certain knowledge,
 - towards a new ethics, based on the idea of collective authority and uncertain knowledge.
- ("authority" = "epistemic authority" as meant by Józef M. Bocheński *"Was ist Autorität?"*, Herder, Freiburg 1974)



<http://mleczko.interia.pl>



4.6. The evolution of R&D ethics (cont.)

- ◆ The justification of the new ethics:

- The quantity of knowledge, even within a single speciality, is too vast to be mastered and controlled by a single person.
 - It is impossible to avoid all mistakes, they may appear even in the most established and verified theories.
 - Tracing mistakes is a fundamental task and duty of the researchers who should be open to them, look for them, analyse them, and learn from them.
 - Self-criticism and gratitude for external criticism is thus their moral obligation.
 - *Ergo*, the organised methods and mechanisms of criticism are a systemic necessity of science.

(Karl R. Popper in "*Auf der Suche nach einer besseren Welt*" (Piper 1987, Chapter 14)



4.6. The evolution of R&D ethics (cont.)

- ◆ Three categories of mistakes in R&D and their ethical qualification:
 - mistakes resulting from limitations of resources or other objective constraints (*honest mistakes*),
 - mistakes resulting from negligent work – haste, carelessness, inattention (*negligence errors*),
 - mistakes resulting from dishonesty (*infringements*).



4.7. An example of R&D-related ethical dilemma

- ◆ The description of the situation:
 - Dr. A, just after Ph.D. graduation, is about to choose the area of his further R&D activity.
 - He is offered, by a military R&D institute, an attractive project: "*A system for guiding missiles towards live targets*".



4.7. An example of R&D-related ethical dilemma (cont.)

◆ Pros:

- the novelty and significance of the topic;
- an open access to well-equipped R&D laboratories,
- an opportunity for mastering a technology of the future (and prospects for related career developments),
- possible defensive applications of research results,
- possible civilian applications of research result (after expiration of the secrecy clause),
- prospects for high salary and for its growth with successful accomplishments of the project,
- prospects for awards, honours, distinctions, etc.,
- ???



4.7. An example of R&D-related ethical dilemma (cont.)

- ◆ Cons:
 - possible aggressive applications of research results,
 - secrecy of research results, excluding their publication and/or patenting,
 - constraints imposed on international contacts (on research networking),
 - constraints imposed on the transfer of research results to the sphere of education,
 - possible negative reactions of the research community (ethical doubts related to the research subject, disproportional financing, etc.),
 - a risk getting addicted to an easy success,
 - ???



4.7. An example of R&D-related ethical dilemma (cont.)

- ◆ Typical rationalisations:

- "if not me, then somebody else ...",
 - "I will have control over the follow-ups of my research",
 - "if you want peace, prepare war",
 - "all peoples of the world arm themselves ",
 - "everybody in my place ...",
 - "the results will never be applied",
 - "researchers are not responsible for applications of their research results",
 - ???



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Ethical Aspects of Research and Engineering

5. ETHICAL ASPECTS OF R&D-RELATED INFORMATION PROCESSES

Lecture slides for Fall Semester 2022/2023



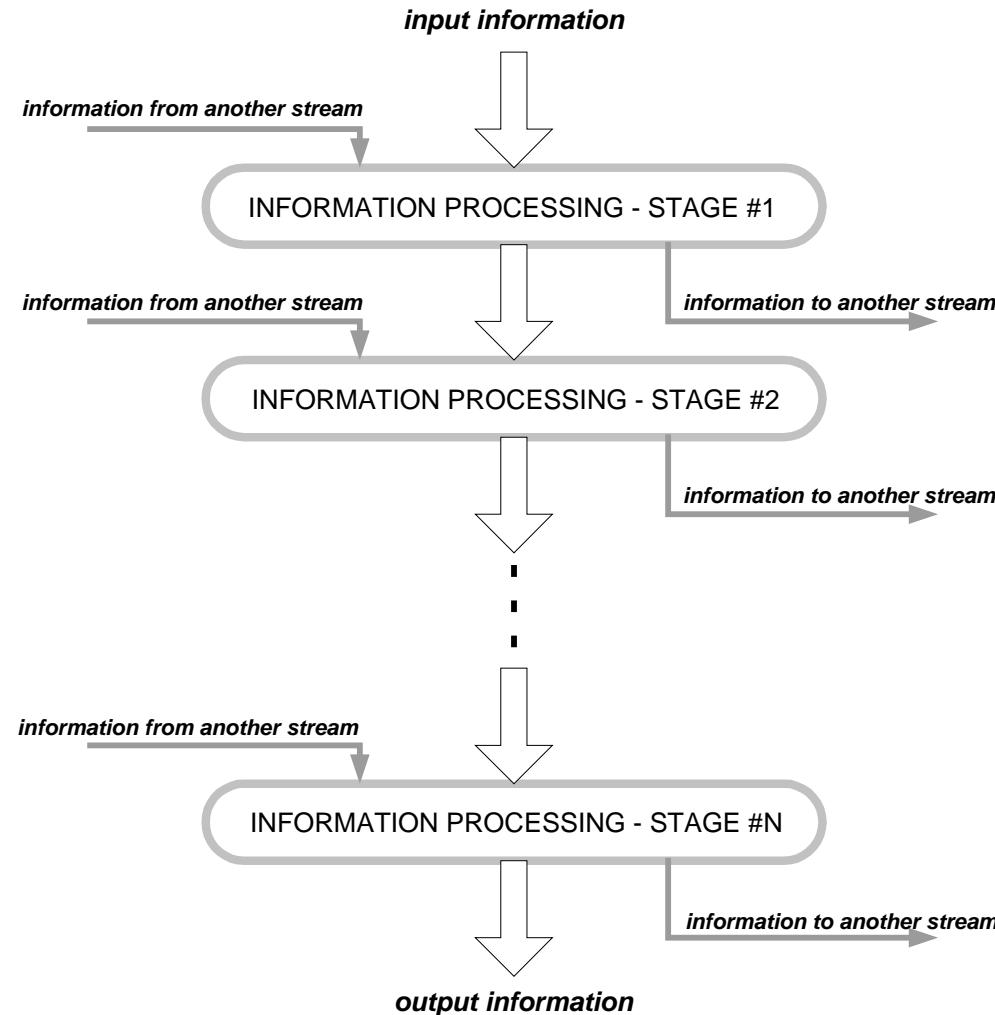
5.1. Introduction

- ◆ An information process is a sequence of operations/actions aimed at information processing.
- ◆ The information, related to R&D activities, may be structured into several streams:
 - a stream of scientific information,
 - a stream of technical information,
 - a stream of financial information,
 - a stream of logistic information,
 - a stream of formal and legal information.



5.1. Introduction (cont.)

- ◆ The structure of an information process



5.1. Introduction (cont.)

- ◆ R&D-specific ethical issues:
 - are most pronounced in the context of the first two streams of information,
 - but they should be considered with regard to the context of other information streams.
- ◆ Ethical issues, specific of R&D information processes, are related to:
 - the acquisition of the input information, e.g.:
 - a theft of information,
 - an infringement of personal goods (dignity, health, life);
 - the processing of information, e.g.:
 - fabrication or falsification of intermediate information,
 - insufficient diligence in the implementation of procedures of information processing;
 - the transfer of output information, e.g.:
 - marketing of research results during scientific conferences,
 - an "honorary" authorship of R&D publications,
 - a transfer of immature R&D results to the stage of their implementation.



5.1. Introduction (cont.)

- ◆ We are interested only in true and useful information:
 - The veracity of information is endangered by:
 - objective problems of epistemological or methodological nature;
 - subjective problems of ethical nature.
 - The utility of information is endangered by:
 - objective problems of technical nature,
 - subjective problems of ethical nature.



5.2. Ethical issues related to the scientific or technical discussion

- ◆ Discussion is an integral element of any R&D process.
- ◆ Examples of R&D-related discussion:
 - a working discussion in a R&D group,
 - a discussion during a seminar or conference (over a presentation),
 - a formal discussion during a meeting of a scientific council,
 - a discussion in a technoscientific journal.
- ◆ There are two model types of discussion:
 - a *rational discussion* which is aimed at collective resolution of a problem (by means of argumentation respecting some logical and ethical principles),
 - a *rhetoric discussion* which is aimed at defeating an opponent (by any ethical and unethical means, including eristic tricks).



5.2.1. Principles of rational discussion

- ◆ The principle of equal rights forbids a disputer:
 - to prevent the opponent from presenting and justifying his stance;
 - to use biased language for presenting and justifying his own stance;
 - to discredit the opponent by questioning his competence, credibility, or right to express opinions (on a discussed issue).

- ◆ The principle of responsibility obliges a disputer:
 - to be prepared to justify his opinion or stance;
 - to refrain from charging the opponent with the responsibility for this justification (e.g. by saying "nobody will be able to convince me that this is true ..."; "if you disagree, please prove that this is not true ...").



5.2.1. Principles of rational discussion (cont.)

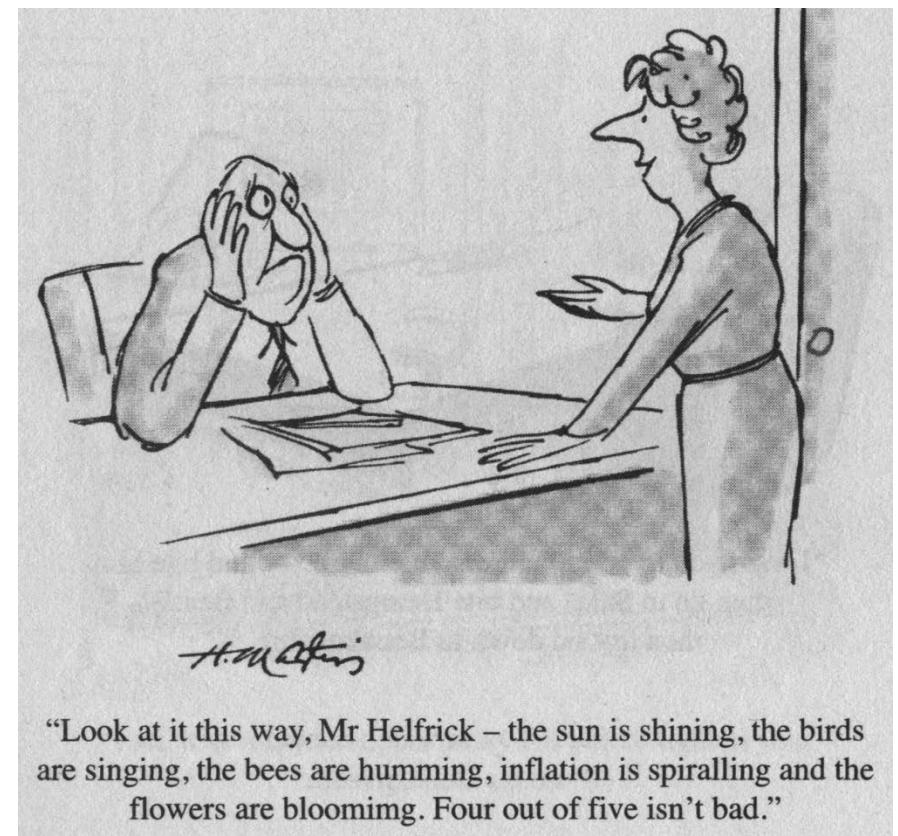
- ◆ The principle of consensus obliges the disputer:
 - to reveal all the premises of the argumentation, and to use exclusively the premises accepted by the opponent;
 - to refrain from referring (especially in a camouflaged way) to values or authorities that are not accepted by the opponent.

- ◆ The principle of honesty obliges the disputer:
 - to consider partial conclusions (agreed during the stages #1, ..., #N of a discussion) as being valid premises for the stages #N + 1, #N + 2, ...;
 - to consider only actual views of the opponent, i.e. his explicit statements and their logical consequences;
 - to refrain from distorting opponent's statements (opinions) in a way convenient for him (A: "there are situations when X holds...", B: "so, you accept that X holds ...");
 - to put forward, exclusively, arguments which are logically correct (or may become logically correct if supplemented with lacking premises);
 - to refrain from unclear or ambiguous statements, and to thoroughly interpret statements which are provoking doubts.



5.2.1. Principles of rational discussion (cont.)

- ◆ The principle of relevance obliges the disputer:
 - to defend his stance only by means of arguments which really support that stance due to logical implication, increase of probability, pertinent analogy, etc.;
 - to refrain from actions which are distracting the opponent's focus from the point of discussion, e.g. from using false implications, from providing arguments which are artificially increasing probability, from referring to doubtful analogies.



G. Tibballs (ed.): *The Mammoth Book of the Funniest Cartoons of All Time*.
Carroll & Graf Pub., New York 2006, p. 70.

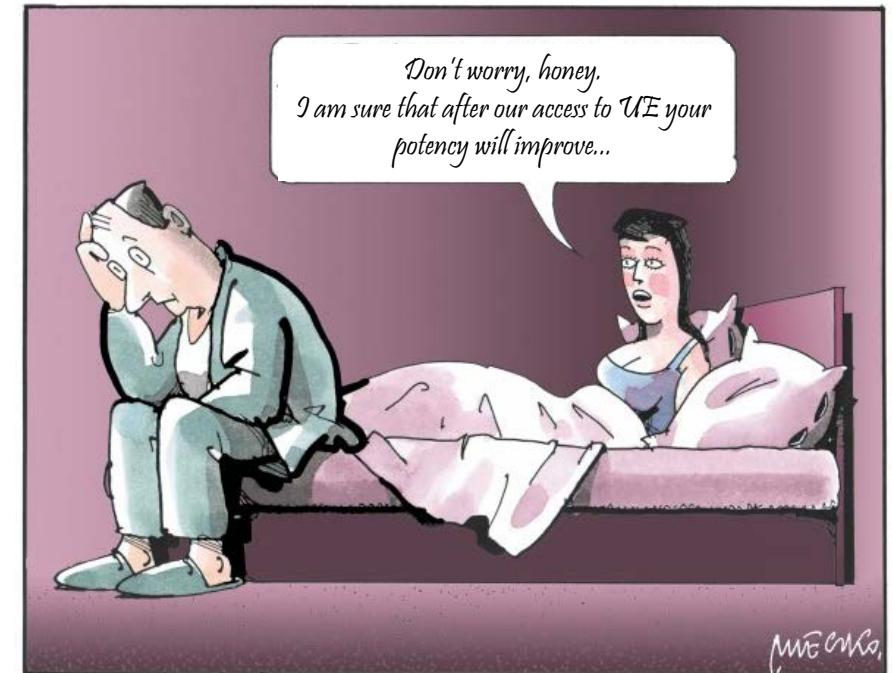
5.2.2. Fallacious arguments in research-related discussions

- ◆ An appeal to an anonymous authority, e.g.: "experts agree that...", "scientists say...".
- ◆ A false causation $A \rightarrow B$ when A and B happen in a sequence (*post hoc, ergo propter hoc*), e.g.:
 - Roman Empire fell after introduction of Christianity; so, Christianity was the cause of its fall;
 - Y lost the wallet just after a black cat had crossed his road; so, the cat is the cause of the Y's loss.
- ◆ A false causation $A \rightarrow B$ when A and B are correlated (*cum hoc, ergo propter hoc*):
 - by a common cause, e.g. the correlation of low frequency of visiting physicians (A) and longevity (B) has a common cause "good health" (paradoxically, $A \rightarrow B$ has not been proven);
 - by the inverse causation $B \rightarrow A$, e.g. the correlation of artistic activities (A) and neurosis (B) is not due to $A \rightarrow B$ but to $B \rightarrow A$.



5.2.2. Fallacious arguments in research-related discussions (cont.)

- ◆ A false causation $A \rightarrow B$ when there are other (than A) causes of B, e.g.:
 - Sasha and Grisha are travelling in the same wagon. Sasha is going from Moscow to Petersburg, Grisha – from Petersburg to Moscow. What a miracle of technology...
 - When a vegetarian person is suffering a rare illness, we are tempted to associate it with his vegetarianism; if he is reaching the age of 100 – also.



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5.2.2. Fallacious arguments in research-related discussions (cont.)

- ◆ A pretended implication (*non sequitur*), e.g.:
 - "money is guardian" (proof: money = land, land = earth, earth = mother, mother = angel, angel = guardian);
 - "Achille will never overtake a turtle" (proof: when Achille reaches the starting point of the turtle, the latter is slightly ahead, etc.).
- ◆ What logical errors are behind the following jokes?



<http://www.widzo.pl/tl/Galeria>

The Soviet expert studied the reaction of a flea to cutting its consecutive legs:

- "after cutting off the first leg, the flea skipped in reply to the command: 'skip!'"
- ...
- "after cutting off the last leg, the flea got deaf".

5.2.3. *Eristic tricks*

- ◆ Historical background:
 - the etymology: from Gr. *eristike techne* – a dispute, especially carried out in front of judges or an audience;
 - negative ethical opinions expressed by:
 - Plato and Aristotle,
 - Arthur Schopenhauer (1788-1860), *Die eristische Dialektik* (written in 1830-31, published in 1864).



5.2.3. *Eristic tricks (cont.)*

- ◆ Selected eristic tricks:
 - Refer to the opponent's statements in a possibly general way even if he/she has formulated them in a very specific way.
 - Formulate your own statements in a possibly specific way, with numerous constraining assumptions and comments.
 - Frequently use statements which are very probable *per se* or evident ("The rate of dissatisfied citizens will increase if salaries decrease while inflation and unemployment grow.").
 - By false implications and slight distortions of opponent's statements, derive conclusions which do not follow from those statements but are convenient for you.
 - Pretend objectivity and honesty by acknowledging your faults and accepting opponent's arguments in secondary issues.
 - Generate insignificant premises in order to hide conclusions you are aiming at.
 - Quickly pass from one stage of reasoning to another to prevent the opponent from keeping up and from being able to spot weaknesses of your argumentation.



5.2.3. *Eristic tricks (cont.)*

- ◆ Selected eristic tricks:
 - If the opponent has accepted a specific statement, immediately generalize it and consider as accepted by the opponent in a generalized version.
 - Knowing that even brilliant arguments are fading if repeated, provoke the opponent to repeat his best arguments.
 - Make the opponent to prove even the most evident statements, and refuse to accept veracity of his premises under any pretence.
 - When losing a point due to the opponent's time-and-energy-consuming reasoning, return to this point as frequently as possible as if it has not been sufficiently discussed.
 - Never agree even on the most evident points proven by the opponent (say "let's suppose for a moment that this is true ...") in order to demonstrate that, being motivated by a good will, you are going to tolerate his imperfect reasoning.



5.2.3. *Eristic tricks (cont.)*

- ◆ Selected eristic tricks:
 - If the opponent is asking you to formulate your objections in a more precise and specific way, escape in common generalities, e.g. by referring to human fallibility.
 - Put special emphasis on any argument that is making the opponent nervous (it is probably related to his weak point).
 - Ironically pretend incompetence, e.g. by saying "it's probably true what you are telling me, but I am unable to grasp it", in order to suggest that the opponent's statements are nonsensical.
 - Use the refutation of an argument, provided by the opponent, as a proof of the falseness of his opinion or stance.

(after K. Szymanek: *Sztuka argumentacji – słownik terminologiczny*.
Wyd. Nauk. PWN, Warszawa 2004)



5.3. Ethical issues related to the publication of R&D results

- ◆ The reader is crediting an author with trust:
 - on the veracity of the description of an R&D methodology, course and results of R&D process;
 - on the accuracy of conclusions drawn from research results.
- ◆ The authors of an R&D publication, presenting experimental results, are responsible for the procedures applied for:
 - data acquisition,
 - interpretation of those data;even if they have borrowed them from a software library.



5.3. Ethical issues related to the publication of R&D results (cont.)

- ◆ The most widespread forms of publication-related misconduct are the following:
 - fabrication or falsification of experimental results,
 - plagiarism,
 - presentation of hypotheses under guise of conclusions drawn from experimental results,
 - exaggeration of conclusions,
 - withholding publication of "inconvenient" results of research.
- ◆ There are two basic forms of plagiarism, *viz.*:
 - the presentation of information borrowed from external sources without indicating its origin,
 - the underestimation or overestimation of the collaborators' contribution to the generation of original information.



*Richtlinien für Integrität in der Forschung,
ETH Zürich 2011*

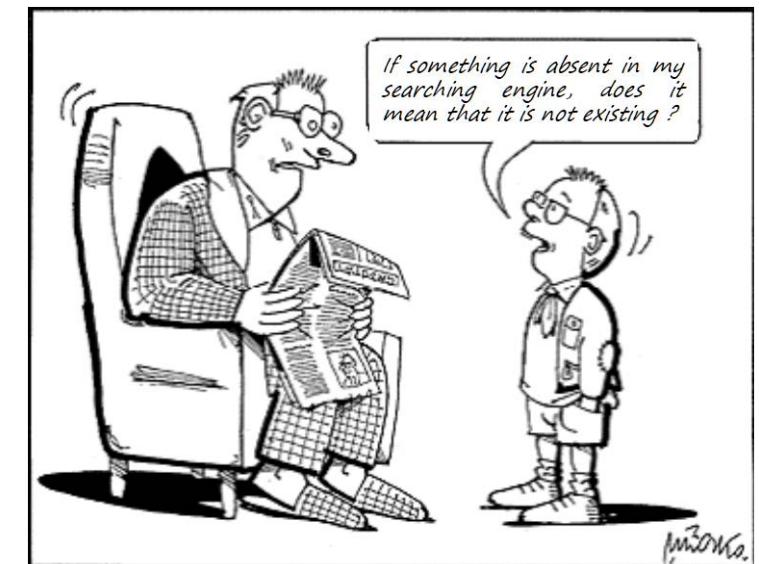
5.3. Ethical issues related to the publication of R&D results (cont.)

- ◆ The methods for crediting the collaborators' contribution to an R&D publication are the following:
 - the co-authorship,
 - a statement of acknowledgement,
 - a reference to a written document (also a document published on the internet),
 - a reference to a spoken statement (*private communication*).
- ◆ According to the highest ethical standards, the co-authorship may be attributed only to a person:
 - who has directly and significantly participated in carrying out the research work;
 - who is able to take the responsibility for all the statements in the publication.
- ◆ Special consideration is required in the following instances of co-authorship:
 - a researcher and his boss,
 - a Ph.D. student and his advisor,
 - a researcher and his sponsor,
 - a researcher and a subcontractor,
 - members of an interdisciplinary or virtual research team.



5.3. Ethical issues related to the publication of R&D results (cont.)

- ◆ The author of an R&D publication is obliged to refer to the sources containing information which:
 - have influenced the nature of that publication,
 - may facilitate the reader's understanding of the publication,
 - have been used in the research work reported in the publication,
 - are supporting the conclusions presented in the publication,
 - are contradicting the conclusions presented in the publication.
- ◆ The author of an R&D publication is obliged to make an exhaustive search of publications related to:
 - the state of the art in solving the research problem under consideration or similar problems,
 - the broader scientific or technical context of the research problem (background, justification, application).



5.3. Ethical issues related to the publication of R&D results (cont.)

- ◆ Other forms of publication-related misconduct are the following:
 - excessive redundancy, verbosity and lengthiness ([→ waste of time of editors, reviewers and readers](#)),
 - "strategic" fragmentation of published research results,
 - eristic tricks,
 - refusal to share the data with readers.



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- ◆ A euphemistic language of R&D publications is flourishing:

<i>"it is known since a long time"</i>	<i>"I have not searched the relevant literature"</i>
<i>"it is generally known"</i>	<i>"some researchers say"</i>
<i>"it is impossible to provide definitive answers to those questions, but ..."</i>	<i>"experiments failed, but I hope to be able to publish their results"</i>
<i>"three objects have been selected for experimentation"</i>	<i>"experiments with other objects of the same class failed "</i>
<i>"typical results are presented in the table"</i>	<i>"the best results obtained are presented in the table"</i>
<i>"for the time being, no theory has been developed that would provide an interpretation of the presented results"</i>	<i>"I have no idea how to approach this issue"</i>



5.3. Ethical issues related to the publication of R&D results (cont.)

- ◆ There are some circumstances driving publication-related misconduct:
 - the rules of R&D financing and researchers' promotion (the syndrome "*publish or perish*"),
 - the ignorance concerning research methodology,
 - the ignorance concerning ethical aspects of publication activities,
 - a general decline of linguistic culture in the society.



5.3. Ethical issues related to the publication of R&D results (cont.)

- ◆ The most frequently asked questions (FAQs) are the following:
 - *What should be the order of the authors?*
 - *Is an author obliged to acknowledge the sponsor of research reported in a paper?*
 - *Is it acceptable to publish the same paper in two journals?*
 - *Is it acceptable to submit the same manuscript to two journal?*
 - *Is it acceptable to publish a conference paper, suitably extended and updated, in a journal?*
 - *Is it acceptable to quote without referring to the source of quotation?*
 - *Is it acceptable to quote passages of authors' own publication without referring to their source?*
 - *Is it acceptable to copy pictures from the internet?*



5.4. Ethical issues related to the reviewing process

- ◆ Reviewing is the key method for intersubjective verification of R&D results; it is applied to:
 - publications (papers, books), degree projects and theses (B.Sc., M.Sc., Ph.D. and D.Sc.),
 - applications concerning research grants, employment, promotion, awards, etc.
- What is the probability that two independent experts are wrong if any of them individually is wrong with the probability 0.2?*
- ◆ A reviewer is responsible:
 - directly – for the quality of an opinion, not for the decision taken on the basis of this opinion;
 - indirectly – for the quality of publications, degrees, etc.; thus, for the socioeconomic impact of R&D.



5.4. Ethical issues related to the reviewing process (cont.)

- ◆ A reviewer, like a judge, should be:
 - competent,
 - independent and impartial,
 - just and honest.



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5.4. Ethical issues related to the reviewing process (cont.)

- ◆ An expert should not accept the role of a reviewer if he/she:
 - is lacking sufficient expert knowledge and experience in the subject concerned,
 - is related to the research subject or researcher concerned in a way that may engender a conflict of interest,
 - is lacking time or tools of reviewing.
- ◆ An expert should not decline the role of a reviewer if he/she:
 - has rare qualifications in the subject concerned,
 - may suspect an instance of possible misconduct related to the object of review.
- ◆ The most widespread forms of misconduct, related to reviewing, are the following:
 - plagiarism of concepts, ideas, solutions, etc.,
 - unjust or unjustified or non-informative opinions.



5.5. Ethical issues related to research grant applications

- ◆ The most widespread forms of misconduct, related to research grant applications, are the following:
 - fabrication or falsification of substance-related and/or formal data,
 - unjustified promises,
 - linguistic manipulations aimed at "catching the train".
- ◆ The unhealthy competition in the domain of R&D implies:
 - disappearance of readiness to share information
 - disappearance of real discussion
 - social losses caused by switching off the basic mechanism of R&D effectiveness
- ◆ The fundamental ethical dilemma is "to be honest or to be financed".



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Ethical Aspects of Research and Engineering

6. PROTECTION OF INTELLECTUAL PROPERTY – LEGAL AND ETHICAL ASPECTS

Lecture slides for Fall Semester 2022/2023



6.1. Introductory information on intellectual property and its protection

- ◆ Intellectual property (IP) is a plurality of rights concerning products of human minds, i.e. of intellectual activity in the fields of industry, science, literature and other arts.
- ◆ There are four main types of intellectual property (IP):
 - copyright for material (literary and artistic material, music, films, sound recordings and broadcasts, including software and multimedia);
 - patents for inventions (new and improved products and processes that are capable of industrial application);
 - trademarks for brand identity (of goods and services allowing distinctions to be made between different traders);
 - designs for product appearance (resulting from the lines, contours, colours, shapes, textures or materials of the product itself or its ornamentation).



6.1. Introductory information on intellectual property and its protection (cont.)

- ◆ IP allows people to own the products of their intellectual creativity and innovation in the same way as they own physical property.
- ◆ IP-related legal regulations vary widely from country to country, but there are inter-governmental attempts to harmonise them through international treaties, such as the 1994 World Trade Organization (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights.



6.2. Legal protection of author's rights

The legal basis in Poland: *Act on copyright and related rights* of February 4, 1994

(*Ustawa z 4 lutego 1994 r. o prawie autorskim i prawach pokrewnych, Dz.U. z 1994 r., nr 24, poz. 83, z późniejszymi zmianami*)

6.2.1. The definition and scope of copyright

- ◆ Copyright applies to a wide range of creative, intellectual, or artistic forms or "works":
 - short stories, poems, theses, plays, and other literary works;
 - movies, choreographic works (dances, ballets, ...), musical compositions, audio recordings;
 - paintings, drawings, sculptures, photographs;
 - software;
 - radio and television broadcasts;
 - live and other performances.
- ◆ Copyright covers only the "form of material expression", i.e.:
 - the form or manner in which ideas or information are manifested;
 - not the ideas, concepts, facts, styles, or techniques which may be embodied in or represented by the "work".



6.2. Legal protection of author's rights (cont.)

6.2.2. *The moral author's rights (personal rights)*

- ◆ Moral author's rights include:
 - a non-transferable author's right to associate his/her name with his/her "work";
 - a right to keep this "work" in an unchanged form.
- ◆ Moral author's rights, as a rule, do not provoke any ethical controversies.



6.2. Legal protection of author's rights (cont.)

6.2.3. *The material author's rights (property rights)*

- ◆ Copyright is a set of exclusive, but transferable, rights regulating the use of a particular expression of an idea or information:
 - The use or disposition of a "work" is restricted to the copyright holder.
 - The copyrights are, in principle, extended on the life span of the author and the period of 70 years after his/her death (90 years in USA).
- ◆ Material author's rights have been recently a subject of hot ethical debates.



6.2. Legal protection of author's rights (cont.)

- ◆ Some categories of "works" cannot be protected by copyright, *viz.*:
 - ideas and concepts, unless they are expressed in an original form;
 - normative and official acts;
 - published patent descriptions;
 - simple press messages;
 - research project titles and plans, scientific facts and theories;
 - commonly known artistic and architectural forms;
 - elements of "works", lacking originality, such as statistical tables, standard drawings or indices.



6.2. Legal protection of author's rights (cont.)

- ◆ Without the author's consent, one may (free of charge):
 - use a single copy of a "work" distributed in accordance with the copyright law,
 - make available this copy to one's relatives or friends,
 - quote (referring to the source) fragments of "works" (or even entire small-volume "works") for the purpose of critical analysis or education.



6.2. Legal protection of author's rights (cont.)

- ◆ There are three undisputable reason of copyright existence, *viz.* the protection of:
 - the authors' income generated by the distribution of their "works",
 - the editors' income generated by the distribution and promotion of "works",
 - the States' income from the taxes the authors' and editors' activity is subject to.



6.3. Legal protection of inventor's rights

The legal basis in Poland: *Act on industrial property* of July 30, 2000

(*Ustawa z dnia 30 czerwca 2000 r. "Prawo własności przemysłowej", Dz.U. 2003, nr 119, poz. 1117, z późniejszymi zmianami*)

6.3.1. *The definition and scope of patenting*

- ◆ A patent (from Lat. *patere* = "to lay open", i.e. to make available for public inspection) is a set of exclusive rights granted by the State authorities to a patentee for a fixed period of time in exchange for the public disclosure of certain details of a device, method, process or composition of matter which is new, inventive, and useful or industrially applicable.
- ◆ Modern patents include a set of claims being the basis for determining the scope of exclusive rights.



6.3. Legal protection of inventor's rights (cont.)

- ◆ The exclusive right granted to a patentee in most countries is the right to prevent or exclude others from making, using, selling, offering to sell or importing the claimed invention.
- ◆ The rights given to the patentee do not include the right to make, use, or sell the invention themselves. An example:
 - An inventor may patent an improvement to a particular type of laser.
 - That inventor may be unable to sell the new design without a licence from the owner of an earlier patent covering lasers of that type.



6.3. Legal protection of inventor's rights (cont.)

- ◆ A patentee cannot block the use of his invention in the following situations:
 - if an important State interest is involved (obligatory compensation follows),
 - if it is necessary for research purposes,
 - if it is necessary for making a pharmaceutical in a pharmacy on the basis of a prescription,
 - if it has been used by somebody before its patenting.



6.3. Legal protection of inventor's rights (cont.)

- ◆ The following "inventions" cannot be patented:
 - scientific discoveries and theories,
 - creations of esthetical value only,
 - plans, principles and methods of intellectual activities,
 - plans, principles and methods of business activities,
 - inventions that cannot work according to commonly accepted scientific knowledge (e.g. *perpetuum mobile*),
 - mathematical methods and software,
 - inventions whose practical implementation is unethical or could endanger public order (people cloning, modification of the genetic identity of a human embryo,...).



6.3. Legal protection of inventor's rights (cont.)

6.3.2. *The justification of the patent system*

- ◆ Patents provide incentives for economically efficient R&D; without patents:
 - Corporations would be much more conservative about the R&D spending.
 - Consequently, the total R&D spending would be significantly smaller, and the technological progress would be slower.
- ◆ Patents facilitate and encourage disclosure of innovations for the common good:
 - Awarding patents makes the details of a new technology available for further improvement by other inventors.
 - After the patent expires (20 years), that technology may be freely used by anybody.
- ◆ In industries with low reverse-engineering costs (e.g. computer processors, software, pharmaceuticals):
 - The cost of commercialisation is significantly higher than the initial conception cost.
 - Without patent protection, companies would avoid the production investment.



6.3. Legal protection of inventor's rights (cont.)

6.3.3. *The international patenting procedure*

- ◆ A potential patentee submits a patent application including:
 - an introduction explaining theoretical fundamentals and practical significance of the invention,
 - a precise definition of the invention,
 - at least one claim.
- ◆ The application is subject to formal and substance-related evaluation during 6-18 months; if the outcome of this preliminary evaluation is positive, it is published.
- ◆ During 6 months after publication, anybody may submit objections indicating that the invention is not new (already patented) or cannot work.
- ◆ After those 6 months, the application is examined by experts from the patent office; if the outcome of this examination is positive, then the patent is issued and distributed around the world.

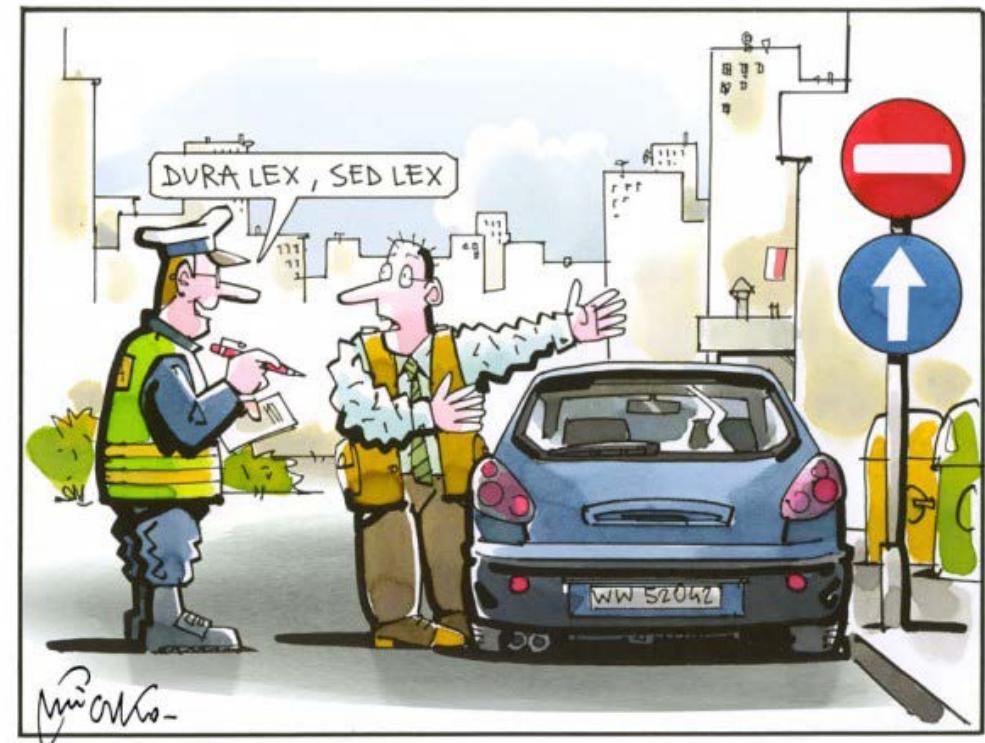


6.4. Ethical argumentation against legal protection of material rights

Warning

The awareness of ethical arguments against legal protection of material rights:

- does not exempt us from obligation to observe the law;
- however, it implies an ethical dilemma when confronted with the awareness of ethical value of legal order.



<http://mleczko.interia.pl>

6.4. Ethical argumentation against legal protection of material rights (cont.)

Two key arguments against legal protection of material rights:

- ♦ Ideas (concepts, discoveries, inventions, recipes, computer programs, artworks, etc.) should not be protected in the same way as material objects due to the following fundamental differences:

MATERIAL PROPERTY	INTELLECTUAL PROPERTY
Material property refers to rare goods which directly relate to specific activities of people who can control them.	Intellectual property refers to goods which may be multiplied unlimitedly.
The creator of a material object is getting to be its owner, but its property rights do not apply to other objects of the same kind (created by other people).	The creator of an immaterial object is getting to be the owner of all its copies (is claiming, in fact, the right to the objects owned by other people).
Theft of material objects is well defined.	Theft of immaterial objects is ill defined.
The existence of material property does not need any intervention of State (even its existence).	Intellectual property cannot sustain without advanced intervention of State.
The period of legal protection is the same always and everywhere.	The period of protection is arbitrarily defined by the legislator.



6.4. Ethical argumentation against legal protection of material rights (cont.)

- ◆ There is a theoretical possibility to generate all the ideas by means of a supercomputer:
 - So, the author of an idea is its discoverer rather than creator.
 - So, the ideas are the properties of the Universe rather than of their authors (like a newly discovered star is not becoming a property of its discoverer).
 - So, an author of a new idea cannot guarantee that nobody has discovered it earlier.



6.5. Critical analysis of arguments supporting legal protection of material rights

- ◆ Patents have been used to promote innovation, but:
 - AT&T collected patents (from 1875) in order to ensure its monopoly on telephones; it slowed down the introduction of radio and cellular telephony.
 - General Electric used control of patents to retard the introduction of fluorescent lights, which were a threat to its market of incandescent lights.
 - Patents, covering all transgenic forms of an entire species (e.g. soybeans, cotton), blocked research carried out by non-patent holders (genetic sequences can be patented in USA, even if they are found "in nature," provided some artificial means are involved in isolating them).
 - Patents covering genetic materials made some Third-World peoples pay for the use of seeds and other genetic materials that have been freely available to them for centuries.
- ◆ IP protection is necessary to promote the generation of more ideas, but:
 - There is a contradiction in promoting the development of ideas by reducing the freedom of using them.
 - There is no reason why a marketplace of ideas has to be a marketplace of owned ideas.



6.5. Critical analysis of arguments supporting legal protection of material rights (cont.)

- ◆ Financial returns from IP provide an incentive for individuals to create, but:
 - Today, most creators do not gain much benefit from IP since ideas worth being protected are usually copyrighted or patented by the organisation, not by its employees.
 - IP protection is an attempt to create an artificial scarcity in order to give rewards to a few at the expense of the many.
- ◆ Copyright provides protection against plagiarism, but:
 - Copyright provides no protection against plagiarism of ideas.
 - Copyright provides no protection against "institutional" plagiarism.
- ◆ Private property is a means for promoting privacy and a means for personal autonomy, but:
 - Privacy is protected by not revealing information, not by owning it.
 - Trade secrets cannot be defended on the grounds of privacy because corporations are not individuals.
 - Copyrights and patents are not necessary for protecting personal autonomy.



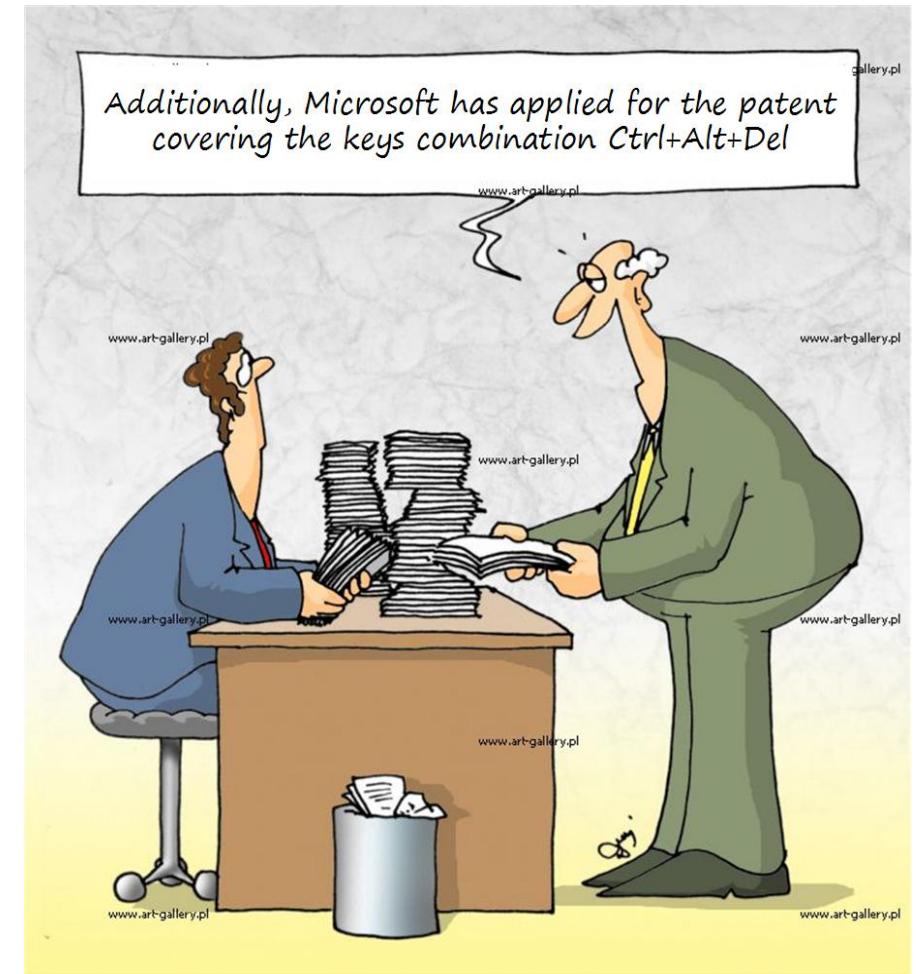
6.5. Critical analysis arguments supporting legal protection of material rights (cont.)

- ◆ People are entitled to the results of their labour, but:
 - Not all the value of intellectual products is due to labour.
 - Intellectual products are social products; their value is rarely due to the work of a single person or a small group of persons.
- ◆ People deserve property rights because of their labour, but:
 - A just reward for the labour should not be proportionate to the market value of its results, but to the person's effort and the risk taken.
 - This is because the value of intellectual work is affected by things beyond control of the worker, such as luck and talent.
- ◆ People have a right to possess and personally use objects they develop, but:
 - This does not mean that they should have a right to prevent others from using the invention.
 - This does not mean that those objects deserve market value.



6.6. Ethical analysis of the patent system

- ◆ A patent confers a "negative right" upon patent owners, permitting them to exclude competitors from using or exploiting their inventions, even if the competitors develop the same invention independently.
- ◆ A patent granted to a monopoly may stifle competition and result in higher prices, lower quality, and shortages on the market.
- ◆ IP rights may become so widely fragmented that, effectively, no one can take advantage of them (without special agreements among the owners of all of the fragments).
- ◆ Software patents (USA) inhibit rather than promote innovation.



<http://www.art-gallery.pl>

6.7. Supplementary issues

- ◆ Legal strategies against IP include civil disobedience and the promotion of non-owned information, e.g.:
 - public domain software (computer software made available free of charge – "freeware");
 - shareright ("You may reproduce this material if your recipients may also reproduce it").
- ◆ More arguments against IP protection:
 - B. Martin: "Against intellectual property", *Philosophy and Social Action*, Vol. 21, No. 3, July-September 1995, pp. 7-22 (also <http://www.uow.edu.au/arts/sts/bmartin/pubs/95psa.html>)
 - N. S. Kinsella, *Against intellectual property*, Ludwig von Mises Institute, Auburn (USA) 2008 (first published in 2001).



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Ethical Aspects of Research and Engineering

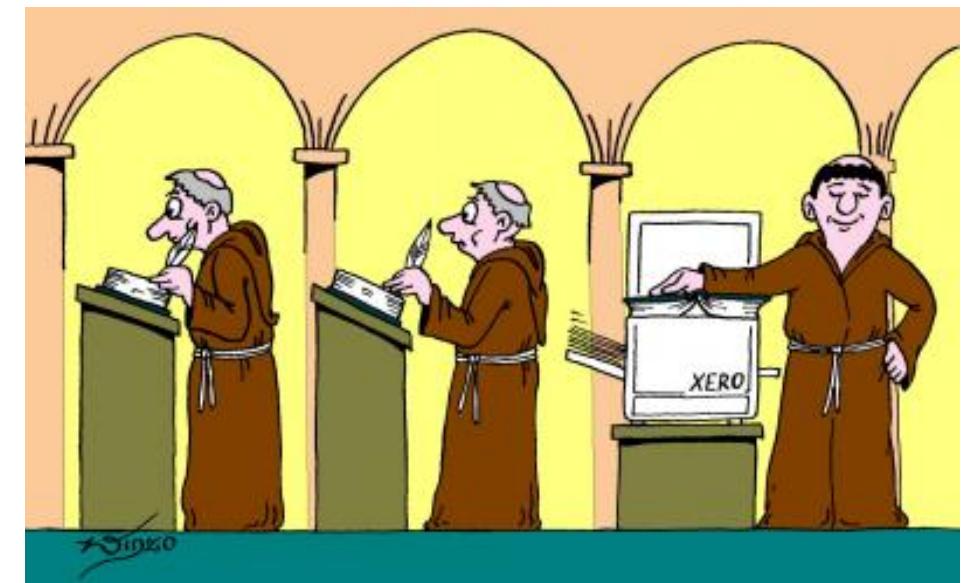
7. ETHICAL ISSUES IMPLIED BY INFORMATION TECHNOLOGIES

Lecture slides for Fall Semester 2022/2023



7.1. Introduction

- ◆ Information technology (IT) is an indispensable tool of R&D activities. In particular:
 - Computers and computer networks are tools for processing technical and scientific information, computation, control of experiments, processing of its results and editing reports and publications.
 - Telecommunication systems and networks are tools for exchanging technical and scientific information, as well as for organising R&D processes, virtual conferences and experiments.



<http://www.widzo.pl.tl/Galeria>

7.2. Three classes of ethical issues related to IT usage

- ◆ Issues of computer ethics:
 - protection of data privacy,
 - protection of intellectual property,
 - equitable access to information,
 - security and reliability of operations performed on information.

- ◆ Issues of infosphere ethics:
 - redefinition of infosphere;
 - ethical requirements concerning "ecological" management of infosphere.



- ◆ Issues of non-technical ethics:
 - the IT-implied evolution of the social context of extra-technical ethical issues;
 - the growth of the objective scope and subjective perception of anonymity of operations performed on information;
 - fuzzification of the responsibility for unethical operations performed on information.

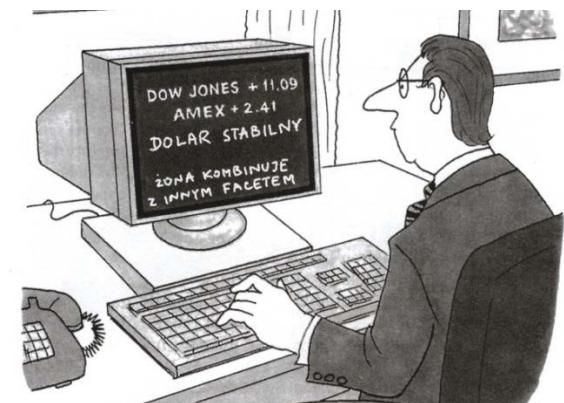
→ *Social Engineering*



I am very sorry, Mr. Abbot is not in the office at the moment



In the internet, nobody knows that you are a dog.



... dollar is stable, your wife is cheating on you

R. Mankoff (red.): *The New Yorker cartoons – Nowe technologie*.
Wyd. Historia i Sztuka, Poznań 2005.

7.3. Two basic approaches of ethical problems related to IT usage

- ◆ The technocratic approach:
 - IT tools are means for solving problems which could not be solved without their use.
 - The main objectives of ethics are the following:
 - the analysis of the IT impact on the society in terms of the adequate ethical theories;
 - the identification of IT-implied ethical problems, such as injustice or personal goods infringement;
 - the proposition of the rules of ethical conduct, which could minimise the risk of occurrence of such problems.



7.3. Two basic approaches of ethical problems related to IT usage (cont.)

- ◆ The phenomenological approach:
 - IT tools are means for solving problems which could not be solved by the society without their use.
 - IT is formed by the society and is forming the society.
 - The main objectives of ethics are the following:
 - revealing attitudes and intentions which contribute to the development of IT;
 - revealing assumptions, values and interests underlying the development/application of IT;
 - opening IT "black boxes" for ethical analysis;
 - formulation and analysis of the ethical problems in technological and social contexts.



7.4. Netiquette or internet ethics

◆ Internet applications:

- professional activities (including R&D),
- business and commercial activities,
- education,
- social life,
- administrative and banking operations,
- booking places in restaurants, hotels, etc.,
- buying railway, bus or airline tickets,
- buying tickets for theatres and cinemas,
- buying books, CDs etc.,
- counselling,
- ...



**I cannot believe that you know something
what is not available in Internet**

R. Mankoff (red.): *The New Yorker cartoons – Nowe technologie*. Wyd. Historia i Sztuka, Poznań 2005, p. 5

7.4. Netiquette or internet ethics (cont.)

- ◆ Netiquette = a set of rules for using internet, including elements of etiquette, ethics and law.
G. Kubas: Netykieta – kodeks etyczny czy prawo Internetu? Praca magisterska pod kierunkiem prof. dr. hab. R. Markiewicza, Instytut Informacji Naukowej i Bibliotekoznawstwa UJ, Kraków 2004.
- ◆ The fundamental ethical rule: each user is responsible for his/her operations made in the internet (whose functioning is based on mutual trust – like functioning of science).

Examples of misconduct:

- placing illegal information;
- distribution of messages which may damage the results of other persons' work;
- distribution of so-called "chain letters";
- using an indecent vocabulary in distributed messages.



7.4. Netiquette or internet ethics (cont.)

- ◆ Examples of general netiquette recommendations:
 - Verify terms and conditions concerning the service delivered by a provider of internet accounts.
 - Observe the legal copyright regulations when copying materials from the internet.
 - Pay for a program copied from the internet (if it is not free of charge); abstain from copying if in doubt.



7.4. Netiquette or internet ethics (cont.)

- ◆ Examples of netiquette recommendations concerning e-mail messages:
 - Don't use an academic network for commercial purposes.
 - Send short and substance-focused messages, following the rule "one message – one issue".
 - Be cautious when writing about third parties.
 - When quoting, always provide the source of information.
 - When quoting, cut out all the text which is not directly related to the subject.
 - When forwarding a received message, do not change its contents.
 - Provide your complete personal data at the bottom of each message.
 - Do not use the distribution list for distributing a private message without consent of its author.
 - If you want to forward a private message, ask for its author's consent.



7.4. Netiquette or internet ethics (cont.)

- ◆ Examples of netiquette recommendations concerning the management of the user's catalogue (UC) located on the server:
 - Keep the volume of your UC at minimum by systematically verifying e-mails and copying e-mail messages from the server to your computer.
 - Systematically and frequently check your computer with an appropriate anti-virus program to avoid infection of your UC.
 - Do not store private information in your UC because it may be accessible for other persons (e.g. administrators).



7.5. Desirable characteristics of information service

- ◆ A message should be:
 - credible (true);
 - honest (full, clear and accurate);
 - objective (impartial, independent, facts-oriented, distance-keeping);
 - orientated on supporting the rights and goods of a person;
 - orientated on supporting the rights and goods of a society (in particular, law and order);
 - aesthetic (by beauty symbolising ethical values).



7.5. Desirable characteristics of information service (cont.)

- ◆ The right to inform and the right to be informed are defined in:
 - *Universal Declaration of Human Rights*, adopted by the United Nations in 1948;
 - *International Covenant on Civil and Political Rights*, adopted by the United Nations in 1966 and introduced in 1976.



7.5. Desirable characteristics of information service (cont.)

- ◆ Those rights are subject to some constraints implied by the right for privacy (also defined in *Universal Declaration of Human Rights*). It is prohibited:
 - to interfere in somebody's private life,
 - to infringe somebody's physical or intellectual or mental integrity and liberty,
 - to assail on somebody's honour or reputation,
 - to harmfully interpret somebody's words or acts,
 - to disclose embarrassing facts from somebody's personal life,
 - to abuse somebody's name or identity or image (representation),
 - to spy or control or persecute somebody,
 - to intercept somebody's correspondence,
 - to use tricks aimed at getting somebody's opinion or statement,
 - to disclose information obtained during professional activities.

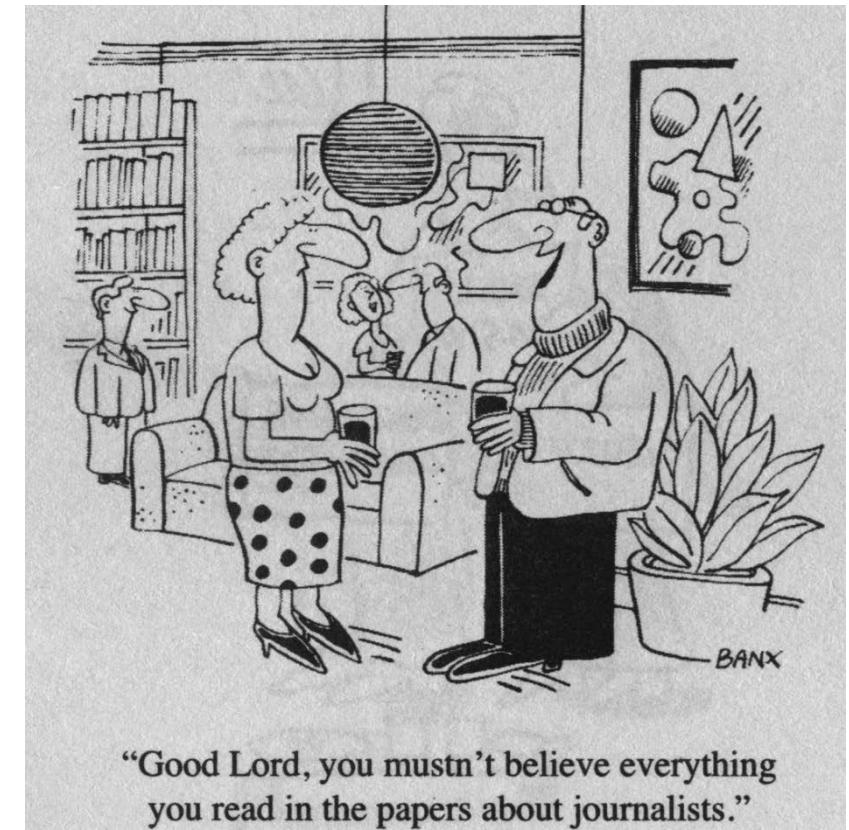


7.5. Desirable characteristics of information service (cont.)

- ◆ The most serious infringement against information ethics is disinformation (manipulation), i.e. intentional distortion of information aimed at getting influence on thinking and decisions of its recipients – frequently, at acting against truth and freedom.

It consists in providing messages which are:

- not true,
- unimportant (thus blocking a space for important and significant messages),
- important under disguise of unimportant,
- too deeply preprocessed,
- ambiguous,
- redundant (thus producing noise).



G. Tibballs (ed.): *The Mammoth Book of the Funniest Cartoons of All Time*. Carroll & Graf Pub., New York 2006, p. 318



7.6. Ethical dilemmas related to the IT usage

- ◆ Individual vs. common good ...
- ◆ Short-term vs. long-term benefits ...



*I have just realized, Howard, that everything here
is more sophisticated than we are...*

R. Mankoff (red.): *The New Yorker cartoons – Nowe technologie.*
Wyd. Historia i Sztuka, Poznań 2005, p. 92



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Ethical Aspects of Research and Engineering

8. SUPPLEMENTARY ISSUES

Lecture slides for Fall Semester 2022/2023



8.1. Elements of engineering ethics

- ◆ General characteristics:
 - Technical sciences serve engineering – engineering provides indispensable tools for R&D in technology.
 - Engineering ethics is more mature as a topic of study than R&D ethics, because:
 - engineers – in contrast to researchers – receive immediate and independent feedback on the performance or failure of technical objects they create;
 - engineering activities have a direct impact on the quality of individual and social life.
 - Engineering ethics is following the same imperative as medicine: "*Primum non nocere*" (Hippocrates).
 - In contrast to research, practising beyond one's competence in engineering is recognised to be irresponsible since grave harm to others may result from incompetent practice.



8.1. Elements of engineering ethics

- ◆ Ethical dilemmas implied by cost vs. risk considerations:
 - The main source of difficulties is due to the unpredictability of some consequences of engineering activities, related to the complexity, dynamics and intransparency of technical systems.
 - The ethical reflection must take into account the risks implied by that unpredictability.
Example: nanocomputers or nanomachines (molecular assemblers/disassemblers which are able to build, repair, or tear down any physical or biological objects) may be applied not only:
 - in manufacturing (for precision manufacturing, material reuse, miniaturisation),
 - in medicine (for pharmaceutical creation, disease treatment, nanomachine-assisted surgery),
 - in environment protection (for toxin cleanup, recycling, resource consumption reduction).
but also for the development of new weapons of mass destruction or for electronic surveillance.
 - The risks implied by the unpredictability of engineering activities may be mitigated by:
 - increasing knowledge about technical objects and methods of their maintenance,
 - increasing functional redundancy and redundancy of protections,
 - enhancing the testing procedures of new products and improving quality management,
 - slowing down the progress.

But all those actions are expensive ...



8.1. Elements of engineering ethics (cont.)

- ◆ Ethical dilemmas implied by morally doubtful business practices:
 - savings made on testing of prototypes;
 - fabrication of technical data for marketing purposes;
 - implementation of technically inferior solutions motivated by gain prospects

Example: the practice of so-called planned obsolescence:

- Phoebus Cartel (Osram, Philips, Tungsram, Associated Electrical Industries, Compagnie des Lampes, International, General Electric, and the GE Overseas Group) imposed companies to limit the life time of lightbulbs to 1500 hours (1924–1939);
- Apple Co. manufactured iPods with a battery designed for exactly 18-month operation, and refused to replace it (2002–2004);
- Numerous manufacturers of printers provide them with chips that disable printing after a predefined number of copies.

(cf. "The Light Bulb Conspiracy", 2010 at <http://www.youtube.com/watch?v=Qtj6EfzcfzM>)



8.1. Elements of engineering ethics (cont.)

- ◆ Examples of engineering-specific misconduct:
 - plagiarism of technical solutions (including "reverse engineering");
 - pushing technical solutions, despite their inferiority, for the sake of personal benefits;
 - falsification of technical documentation or of the results of testing.
- ◆ The most important causes of misconduct:
 - the unavoidable presence of economic factors in engineering activities (design, implementation and maintenance of technical objects);
 - an inevitable implication of engineering in marketing under strong economic competition;
 - the pressure of management, customers, owners and shareholders aimed at continual increase of economic effectiveness;
 - the decline of traditional ethical standards, implied by the fuzzification of the boundaries between traditional engineering branches.



8.2. Codes of professional ethics

- ◆ Throughout most of its recent history, science was constrained only by the limits of imagination and creativity of researchers; recently, this situation has changed dramatically:
 - the science has become a mass and bureaucratic institution;
 - the institutionalised science entered into a symbiosis with business and industry;
 - the intellectual competition has been replaced by a struggle for limited resources (posts, funds, infrastructure).
- ◆ There are two remedies applied for counteracting the degradation of ethical standards in scientific and/or engineering milieus, implied by this change:
 - courses of professional ethics, introduced in the academic curricula;
 - codes of professional ethics, promulgated by academic institutions and professional associations.



8.2. Codes of professional ethics (cont.)

◆ Examples of codes of professional ethics:

- *Etyka w nauce*, opracowanie Komitetu Etyki w Nauce PAN, Warszawa 1994
<http://www.jwojtyna.wsp.czest.pl/ethics.html>
- *Rzetelność w badaniach naukowych oraz poszanowanie własności intelektualnej*, Ministerstwo Nauki i Szkolnictwa Wyższego, Warszawa 2012
<https://www.bip.pw.edu.pl/var/pw/storage/original/application/de99e93f657288ab003e115cfdcc869f.pdf>
- *Code of Ethics for Engineers*, National Society of Professional Engineers, USA, January 2003
<http://onlineethics.org/codes/NSPCode.html>
- *IEEE Code of Ethics*, Institute of Electrical and Electronics Engineers, USA, August 1990
http://www.ieeeusa.org/DOCUMENTS/CAREER_CAREER_LIBRARY/ethics.html
- *Code of Ethics*, American Institute of Chemical Engineers, USA, January 2003
[http://www.aiche.org/about/ethicscode.htm \(as of February 2004\)](http://www.aiche.org/about/ethicscode.htm)
- *Ethical Guidelines for Statistical Practice*, American Statistical Association, USA, August 1999
<http://www.amstat.org/profession/ethicalstatistics.html>
- *Code of Ethics*, Information Processing Society of Japan, May 1996
<http://www.onlineethics.org/codes/jpn-code.html>
- *Código de Etica del Profesional de Sistemas* (by F. J. Mariscal-Flores et al.), México, 2001
<http://www.onlineethics.org/spanish/copicode2.html#I>



8.2. Codes of professional ethics (cont.)

- ◆ The multiplication of codes is resulting from the lack of understanding of the fundamental difference between ethics and law:
 - Legal regulations are imposed and implemented (executed) by political authority; they apply to strictly predefined issues, not necessarily concerning morality; they must be codified.
 - Ethics provides a set of moral standards freely accepted by a person or a social group:
 - it is a product of free, individual or collective, reflection over the dialectics of good and evil aspects of human relations;
 - it applies to both recurrent and completely new situations that are not morally neutral.



8.2. Codes of professional ethics (cont.)

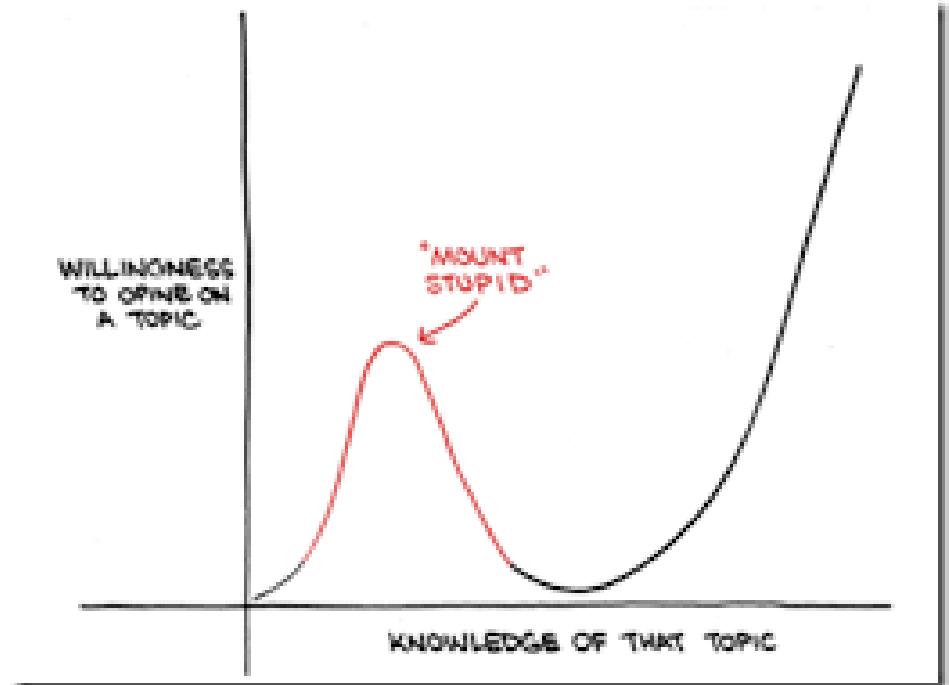
- ◆ Most frequently, a typical code of professional ethics:
 - is a collection of "pious wishes" or trivial declarations or law-imitating regulations;
 - cannot compensate for the lack of pragmatic procedures if the violation of the functional rules of an institution is under investigation;
 - can be used as an excuse for avoiding moral considerations.
- ◆ Quite frequently, codes of professional ethics are introduced in order to avoid outside regulation of a profession.



8.3. Farewell advice

"Stop judging and you will not be judged.
Stop condemning and you will not be condemned.
Forgive and you will be forgiven."

(Bible, Luke 6, 37)



8.3. Farewell advice



T. Leśniak & R. Skarżycki, <http://bi.gazeta.pl/im/05/fe/15/z23062533V,Komiks-z-cyklu--Polska-mistrzem-Polski-.jpg>

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Ethical Aspects of Research and Engineering

APPENDIX: EXEMPLARY TESTS

Slides for Fall Semester 2022/2023



A.1. Definition of tests

- ◆ Test #1 covers the material of chapters 1–4.
- ◆ Test #2 covers the material of chapters 4–8.



A.2. Example of Test #1

Problem #1 (8 pts): Locate in time, with the uncertainty of a century, the lives of the following ethicists: Socrates, Thomas Aquinas, Immanuel Kant, Max Scheler. Provide the names and one-sentence definitions of ethical systems they developed.

Problem #2 (6 pts): Provide one-sentence definitions for the following concepts: morality, meta-ethics, moral virtue, ethical dilemma.

Problem #3 (3 pts): Indicate three essential features differentiating ethics and law.

Problem #4 (6 pts): Provide an example of mathematical modelling of a simple technical object (selected in your domain of study), and explain how its parameters may be determined.

Problem #5 (6 pts): Explain what is wrong, from ethical point of view, in using marketing techniques for promoting own research findings.

Problem #6 (6 pts): Enumerate six criteria most frequently used for choosing a research problem.



A.3. Example of Test #1

Problem #1 (8 pts): Locate in time, with the uncertainty of a century, the lives of the following ethicists: Plato, Marc Aurelius, David Hume, John S. Mill. Provide the names and one-sentence definitions of ethical systems they developed.

Problem #2 (6 pts): Provide one-sentence definition of virtue in general, and one-sentence definitions of the following specific virtues: charity, empathy, purity, truthfulness, wisdom.

Problem #3 (3 pts): Indicate essential features differentiating ethics and religion.

Problem #4 (8 pts): Enumerate basic assumptions of the so-called naïve understanding of scientific method.

Problem #5 (6 pts): Explain what is wrong, from ethical point of view, in doing research without knowing general and specific principles of research methodology.

Problem #6 (4 pts): Explain the difference between "negligence errors" and "honest errors" (committed by researchers). Illustrate each class of errors with an example.



A.4. Example of Test #2

Problem #1 (8 pts): Provide a one-sentence explanation for each of the following principles of rational discussion: the principle of relevance and the principle of responsibility.

Problem #2 (8 pts): Provide the definition of the fallacious argument called *post hoc, ergo propter hoc*. Illustrate it with an example (other than given in the lecture notes).

Problem #3 (8 pts): Explain what is wrong, from ethical point of view, with:

- the presentation of hypotheses under disguise of conclusions drawn from experimental results (in a publication or research report);
- the exaggeration of conclusions drawn from experimental results (in a publication or research report);
- being late for a lecture or seminar.

Problem #4 (5 pts): Provide the definition and two examples of the institutional plagiarism.

Problem #5 (4 pts): Enumerate main types of intellectual property.

Problem #6 (6 pts): Enumerate main 6 categories of "works" which cannot be protected by copyright.

Problem #7 (6 pts): Enumerate basic requirements to be met by an invention to be patentable.



A.5. Example of Test #2

Problem #1 (8 pts): Provide a one-sentence explanation for each of the following principles of rational discussion: the principle of equal rights and the principle of consensus.

Problem #2 (8 pts): Provide the definition of the fallacious argument called *cum hoc, ergo propter hoc*. Illustrate it with an example (other than given in the lecture notes).

Problem #3 (6 pts): Explain what is wrong, from ethical point of view, with:

- publication of underestimated indicators of measurement uncertainty of experimental results;
- excessive fragmentation of research results aimed at increasing the number of publications;
- using a cell phone during a lecture or seminar.

Problem #4 (9 pts): Provide the explanations of the following infringements: falsification of measurement data, plagiarism, and theft of data. Illustrate each of them with an example.

Problem #5 (4 pts): Enumerate main types of intellectual property.

Problem #6 (6 pts): Enumerate conditions under which a patent may be used without its author's consent (license).

Problem #7 (4 pts): Present and justify a serious ethical argument against existing systems for patenting inventions.

