



Education and Culture

Socrates

Erasmus

Socrates IP:

Bioethics in life sciences and environment



Ethical rules for scientists; the ethical problems of GMOs.



Evora

Sofia

What is science?

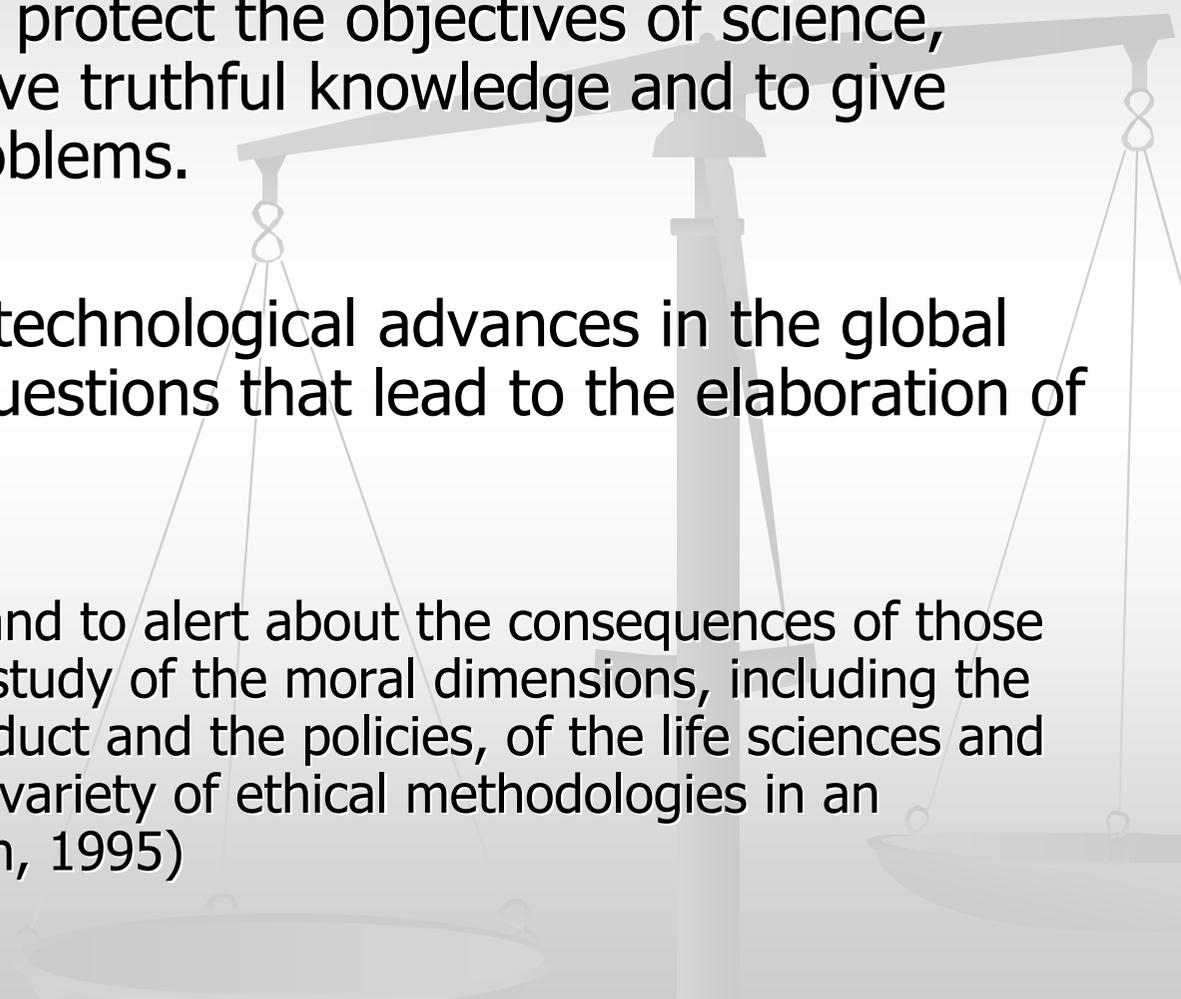
Science depends on the cooperation and coordination of different people to achieve common goals within a larger social environment (David Resnik)

Science requires cooperation and coordination of different people, such as experimentation, data analysis, writing research papers and educating future scientists

“Scientific profession” is a general expression and it can include many different scientific professions, but important similarities:

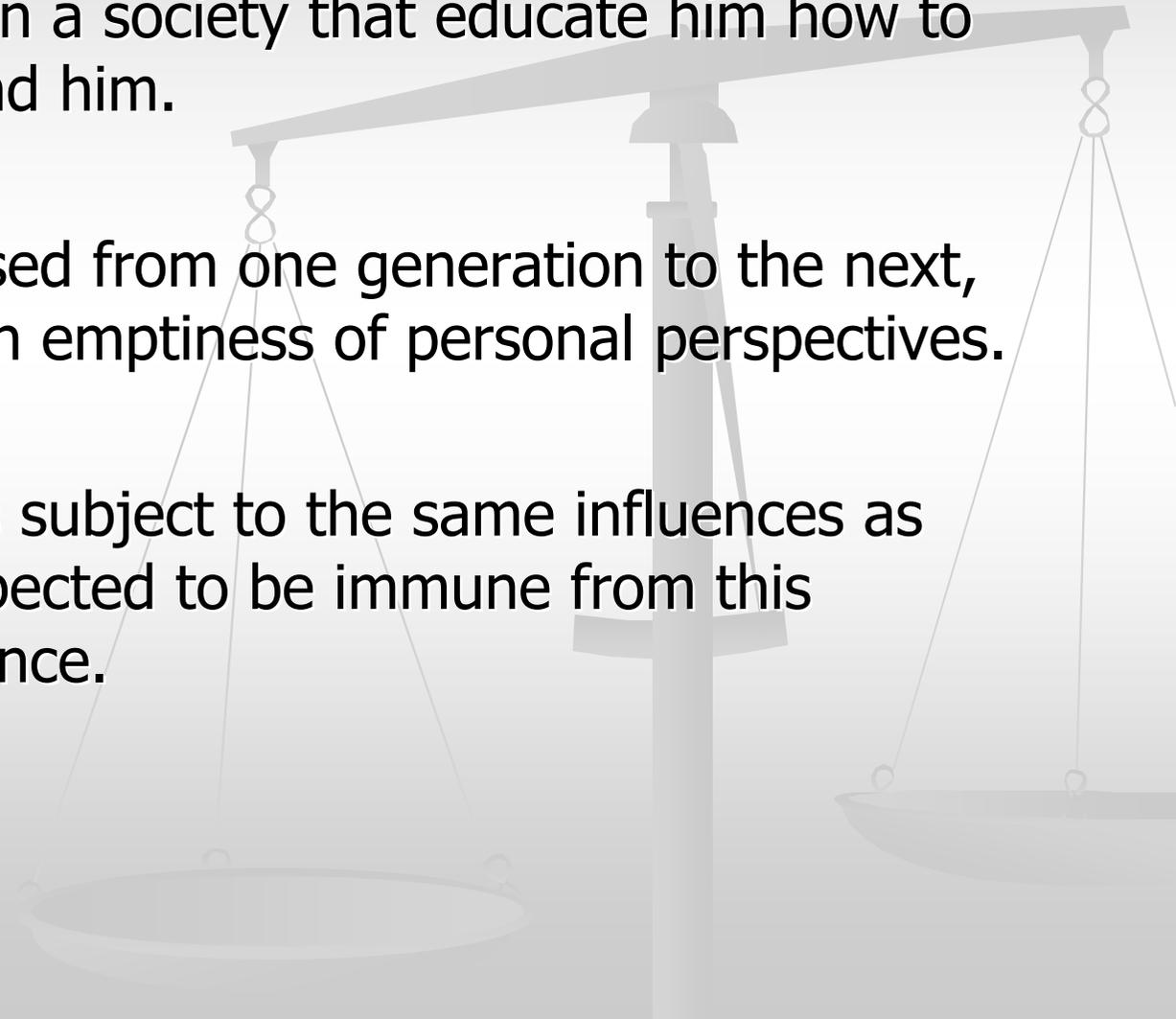
—————> **professional standards and common goals**

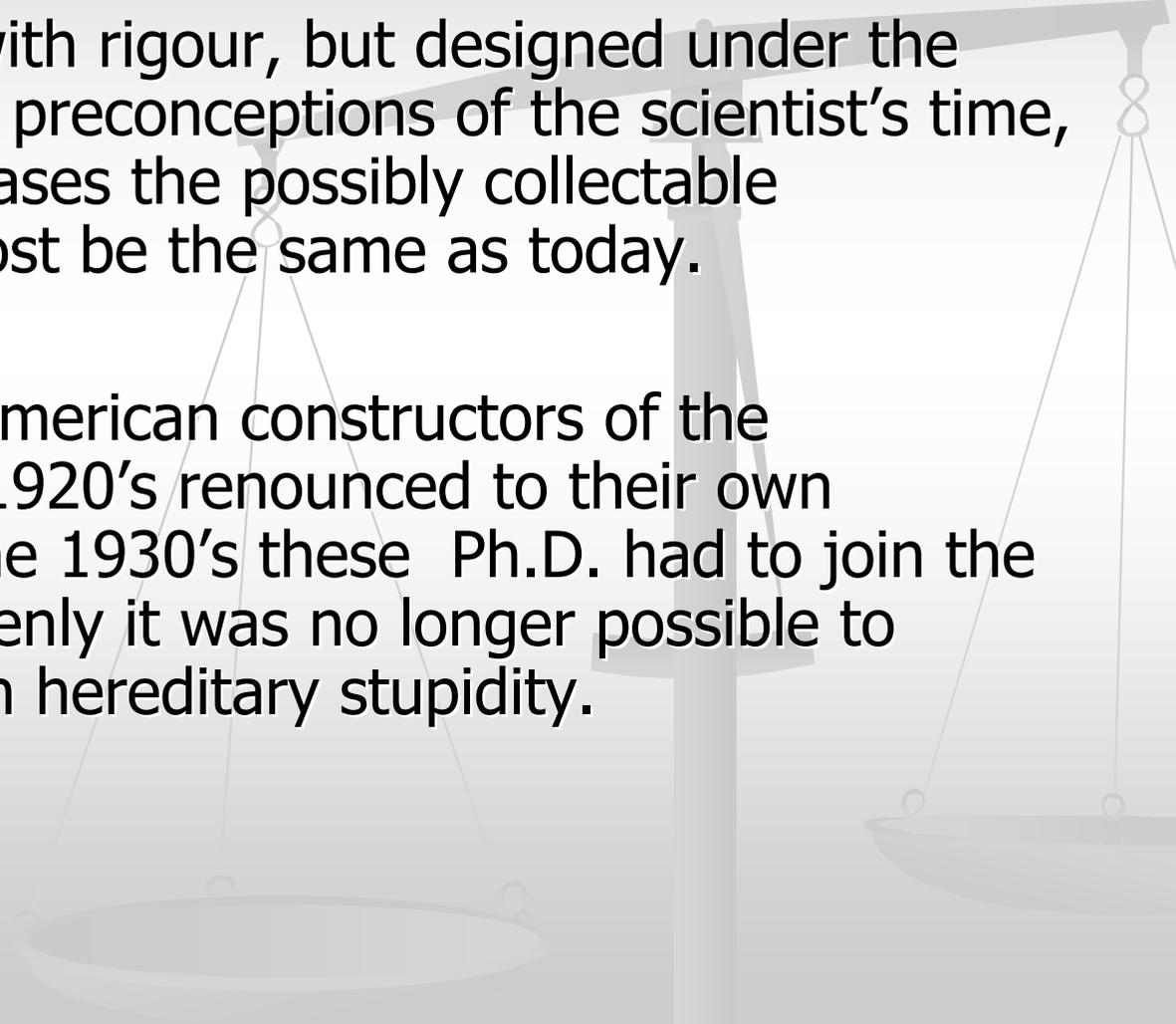
How are science and ethics related?

- Ethical standards try to protect the objectives of science, which is trying to achieve truthful knowledge and to give solution of practical problems.
 - With the scientific and technological advances in the global society appeared the questions that lead to the elaboration of ethic rules.
 - Bioethics intends to clarify and to alert about the consequences of those advances, is the systematic study of the moral dimensions, including the moral vision, decisions, conduct and the policies, of the life sciences and attention to health, using a variety of ethical methodologies in an interdisciplinary set." (Reich, 1995)
- 

The scientist as a person, citizen and a professional

- Every scientist is born in a society that educate him how to look at the world around him.
- Many opinions are passed from one generation to the next, generating in society an emptiness of personal perspectives.
- In general a scientist is subject to the same influences as everyone, but he is expected to be immune from this powerful cultural influence.

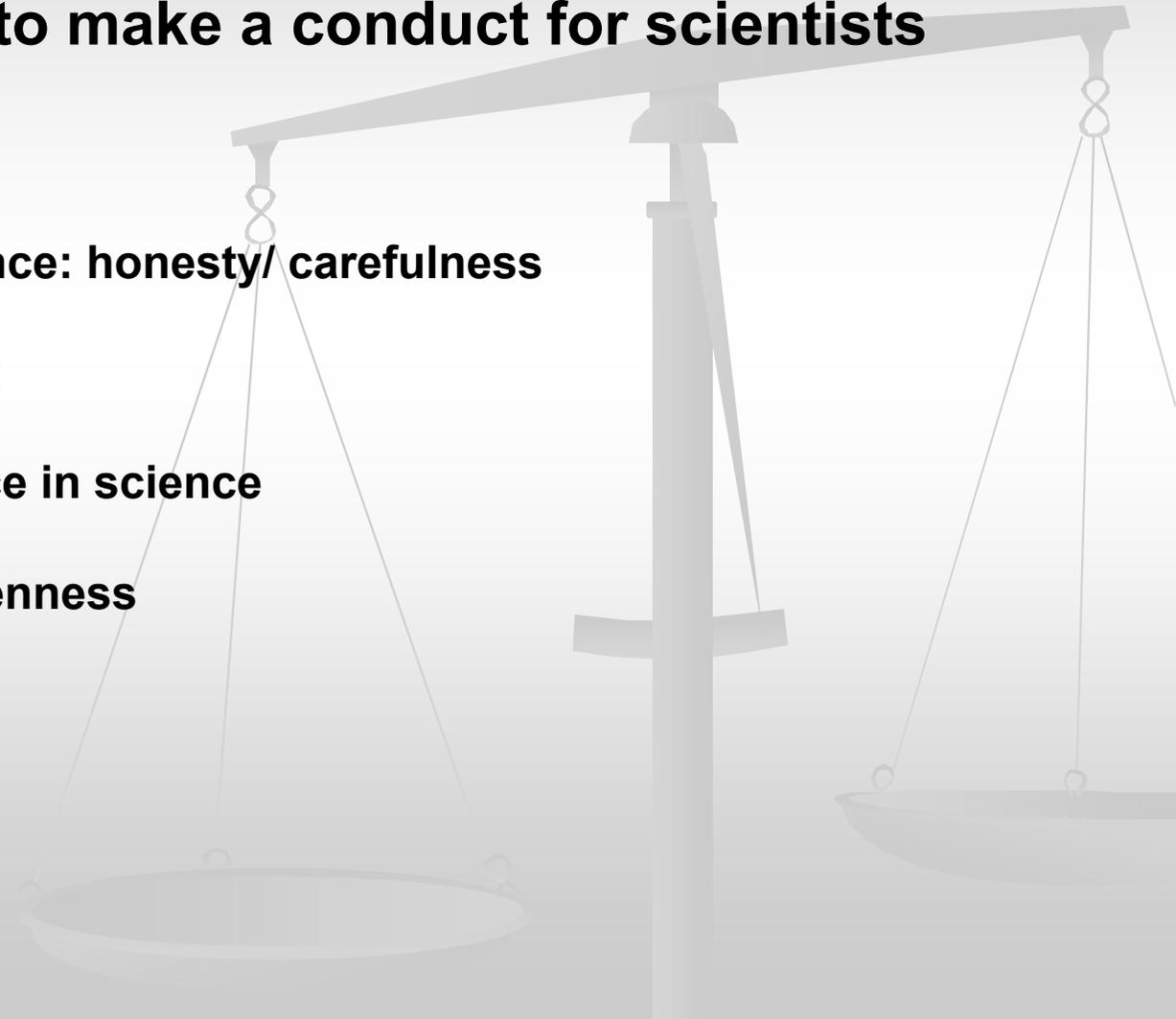


- 
- At the same time, many skills are given by the personal experience and interactions. The same for scientific discovery curiosity, intuitions and creativity.
 - Science can be made with rigour, but designed under the light of the unconscious preconceptions of the scientist's time, even though in some cases the possibly collectable information would almost be the same as today.
 - Example: Most of the american constructors of the biodeterminism in the 1920's renounced to their own conclusions, when in the 1930's these Ph.D. had to join the soup of the poor- suddenly it was no longer possible to explain poverty through hereditary stupidity.

How is it possible to make science as correct as possible?

Ethic standards created to make a conduct for scientists

- Values in science
- Misconduct in science: honesty/ carefulness
- Conflicts of interest
- Error and negligence in science
- Publication and openness

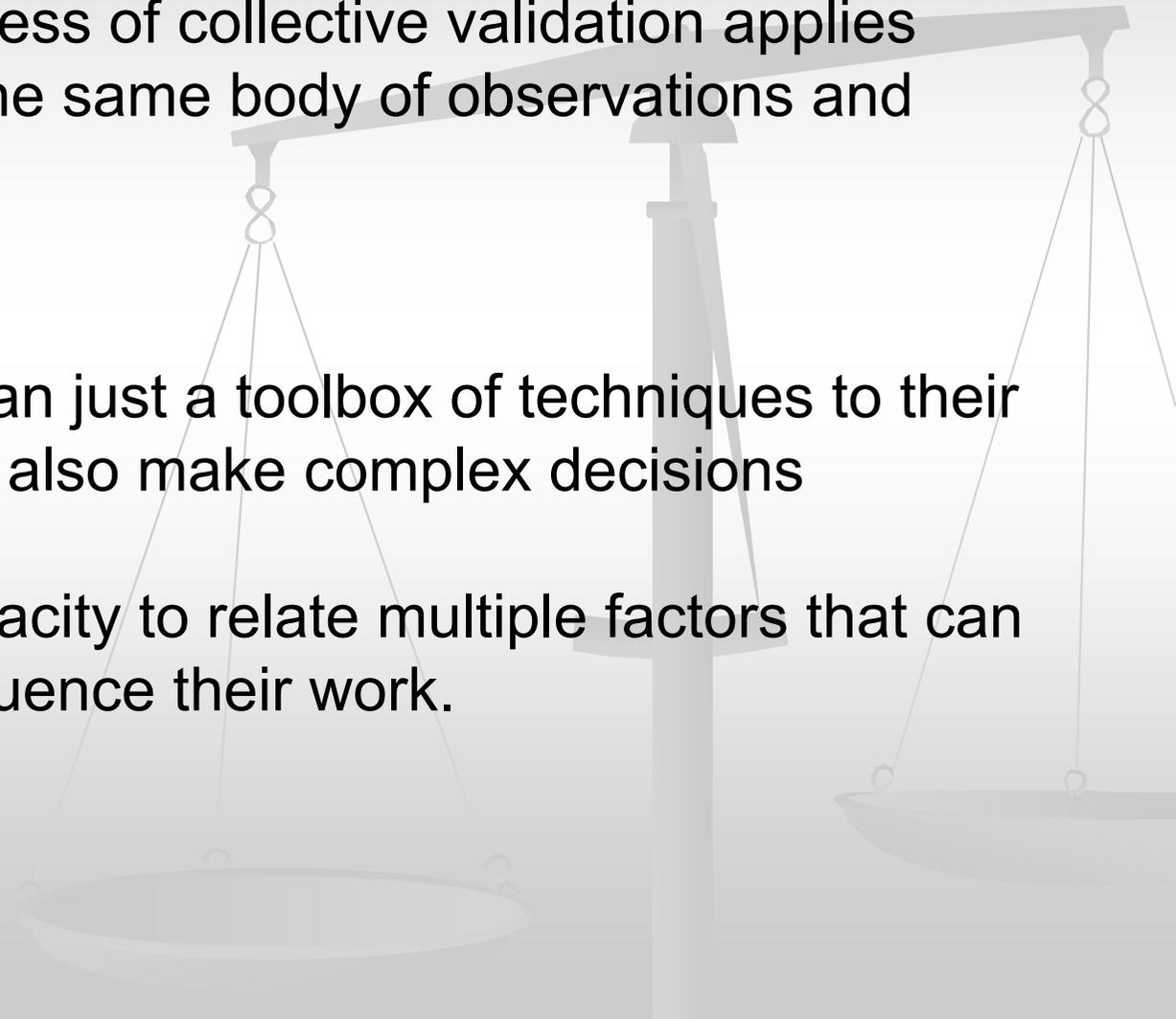


Values in science

The social mechanism control of science can help eliminate distorting effects- the process of collective validation applies different perspectives to the same body of observations and hypothesis.

Scientists bring more than just a toolbox of techniques to their work, they must also make complex decisions

They must have the capacity to relate multiple factors that can influence their work.



Misconduct in science: honesty/ carefulness

- *Scientists should not fabricate, falsify, or misrepresent data or results. They should be objective, unbiased and truthful in all aspects of the research process* (The ethics of science, an introduction by David Resnik)

- **There are honest errors, errors caused through negligence and a third category: those that involve deception..**

.....Making up data or results (**fabrication**)

.....Changing data or results (**falsification**)

.....Using the ideas or words of another person without giving appropriate credit (plagiarism)

-

-

The line between misrepresentation of data and good methodology is sometimes ambiguous (Sergestrale, 1990)

-avoid and minimize errors in research

Error and negligence in science

Scientists can never prove conclusively that they have described some aspect of the natural or physical world with complete accuracy. In that sense all scientific results must be treated as susceptible error. (6)

-Even the most responsible scientist can make an honest mistake. When such errors are discovered, they should be **acknowledged**, preferably in the same journal in which the **mistaken** information was published.

Rarely condemned by colleagues!

On the other hand, those who don't do this are placing their reputation, the work of the colleagues and the public's confidence in science...

Publication and openness

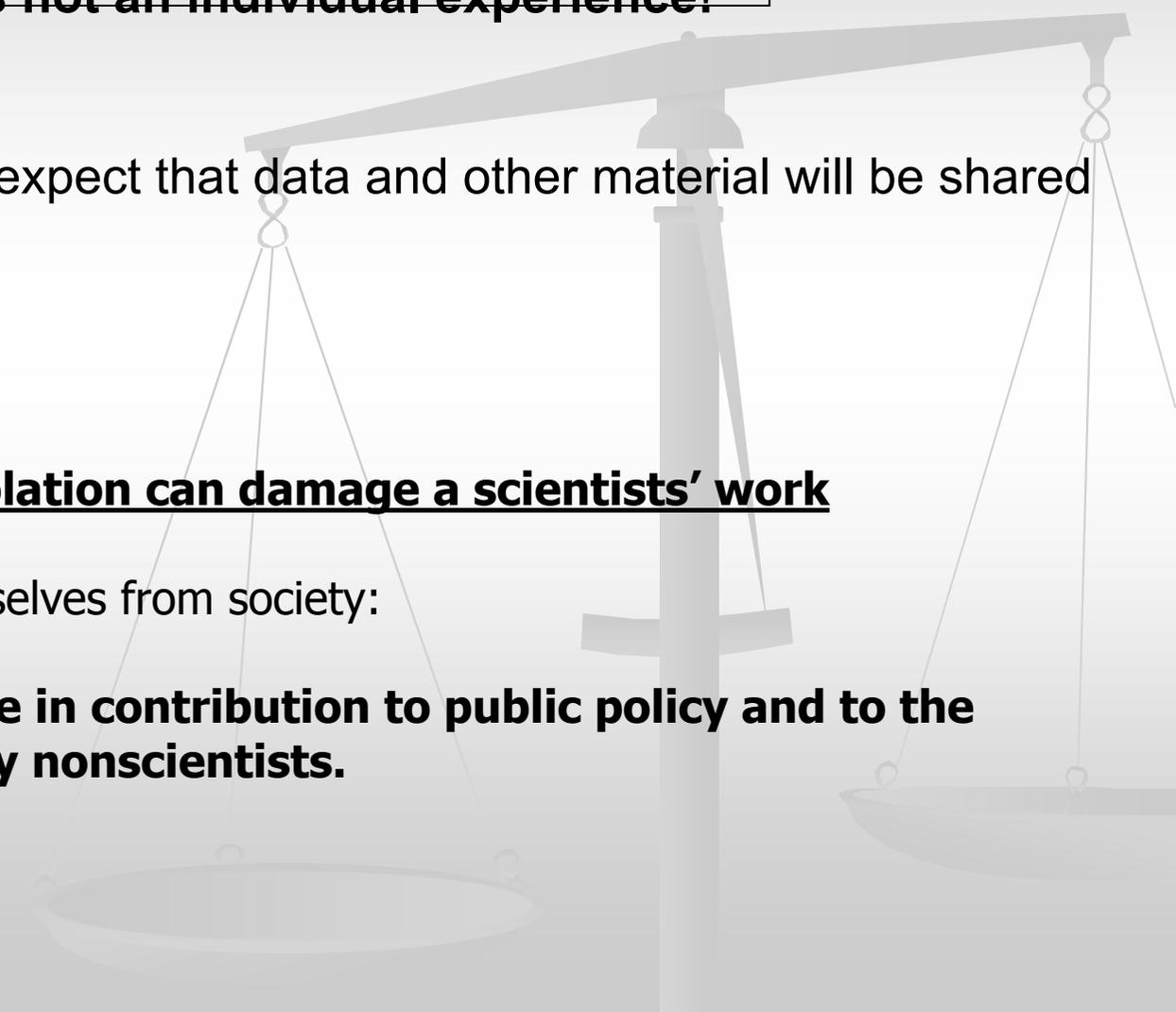
~~-Science is not an individual experience!~~

-After publication, scientists expect that data and other material will be shared

The professional isolation can damage a scientists' work

-scientists cannot isolate themselves from society:

→ **they must be active in contribution to public policy and to the understanding of science by nonscientists.**



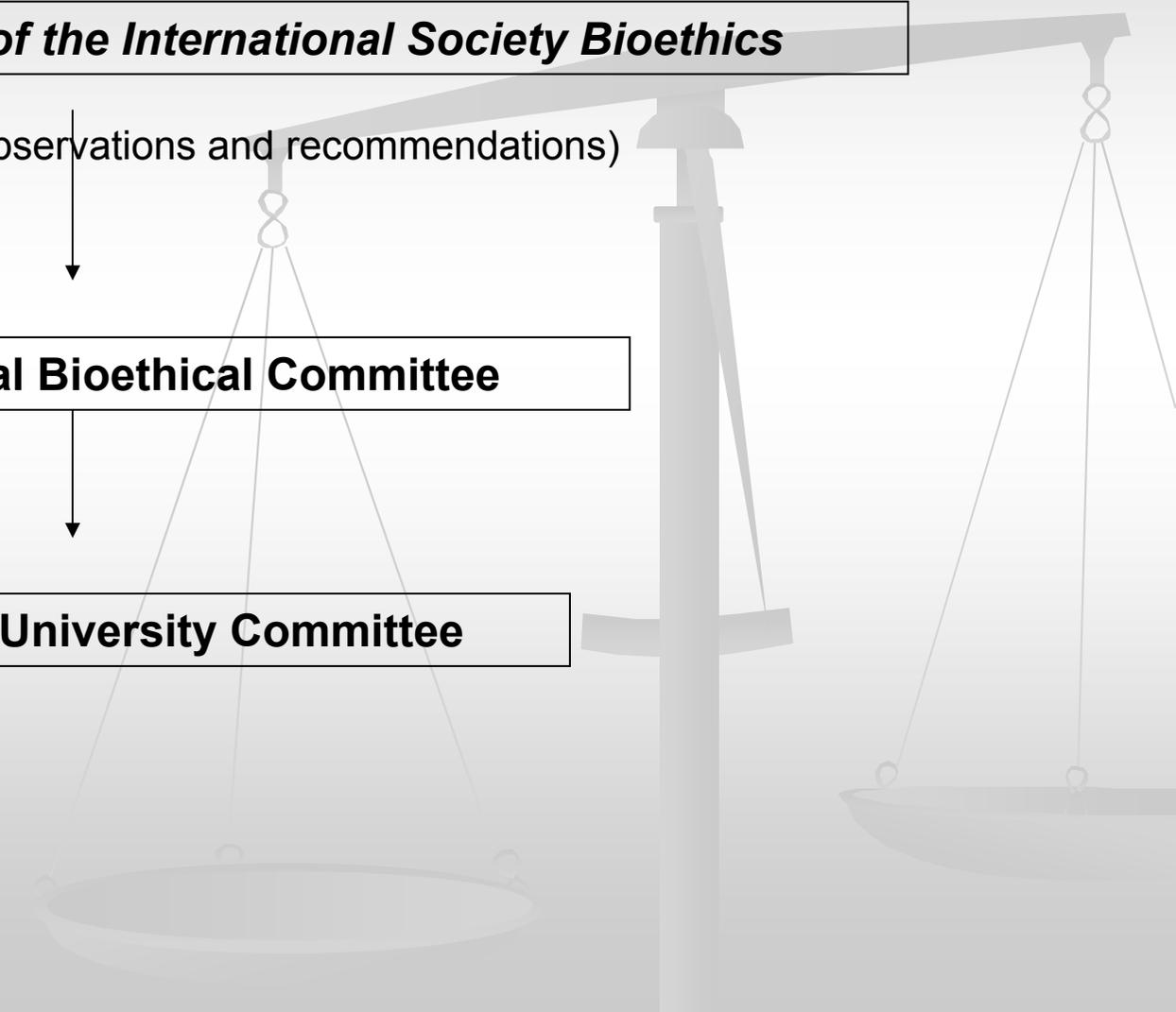
Its regulation and appliance- different dimensions

SIBI- *Scientific Committee of the International Society Bioethics*

(propose a set of observations and recommendations)

Governmental Bioethical Committee

Regional/ University Committee

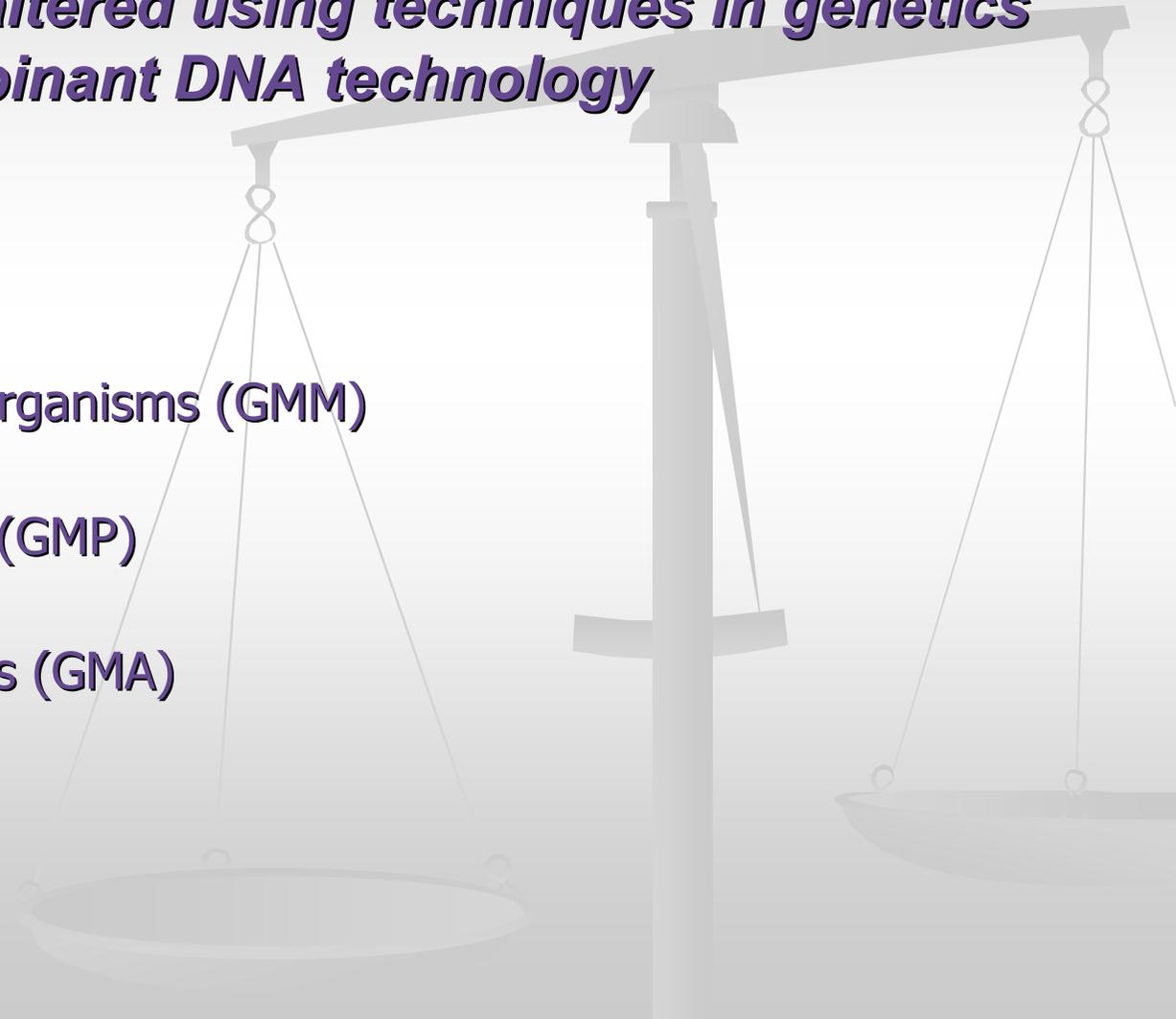


Genetically modified organisms

Genetically modified organism (GMO) is an organism whose genetic material has been altered using techniques in genetics generally known as recombinant DNA technology

Classification:

- Genetically modified microorganisms (GMM)
- Genetically modified plants (GMP)
- Genetically modified animals (GMA)



Gene engineering

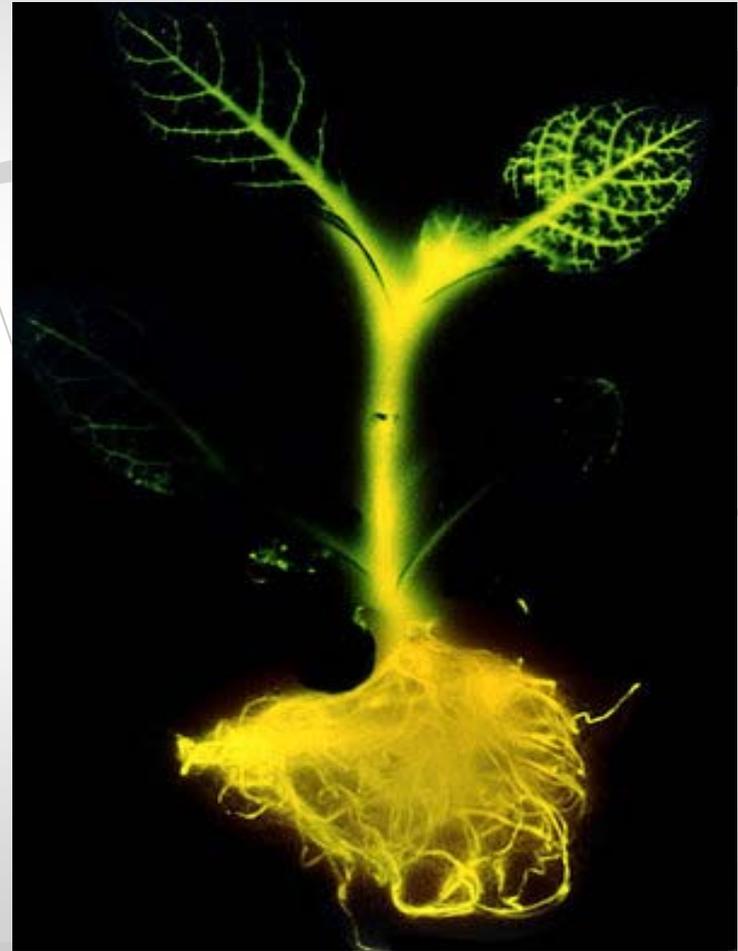
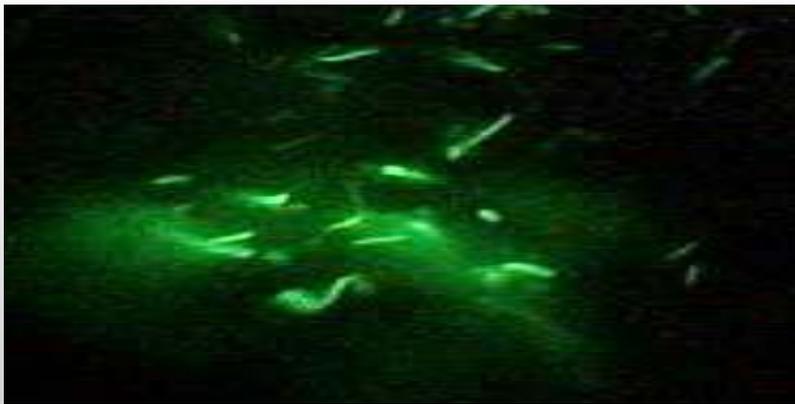
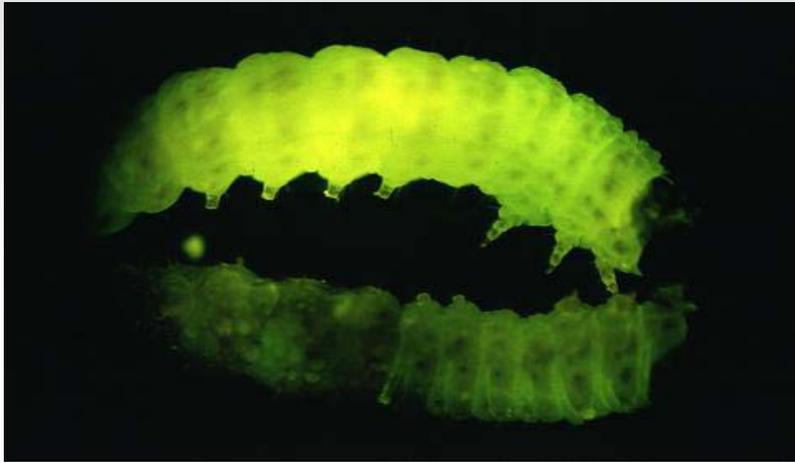
- Basic steps of creating GMOs
- Gene location and isolation

Cell-based cloning strategy

- Cloning DNA
- Gene transfer into the host cell
 - Direct DNA transfer
 - Transfection
 - Transduction

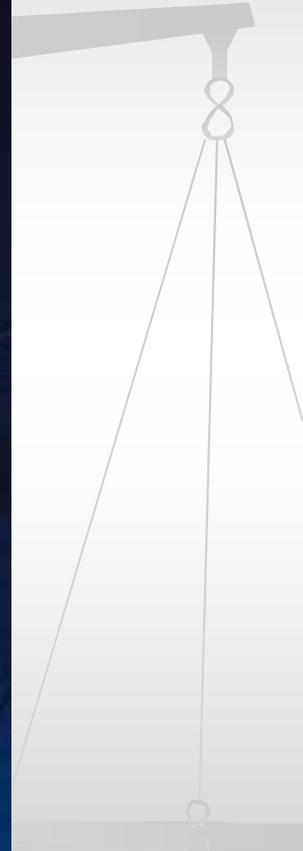
PCR

GMOs created by using transfer of GFP gene from jellyfish



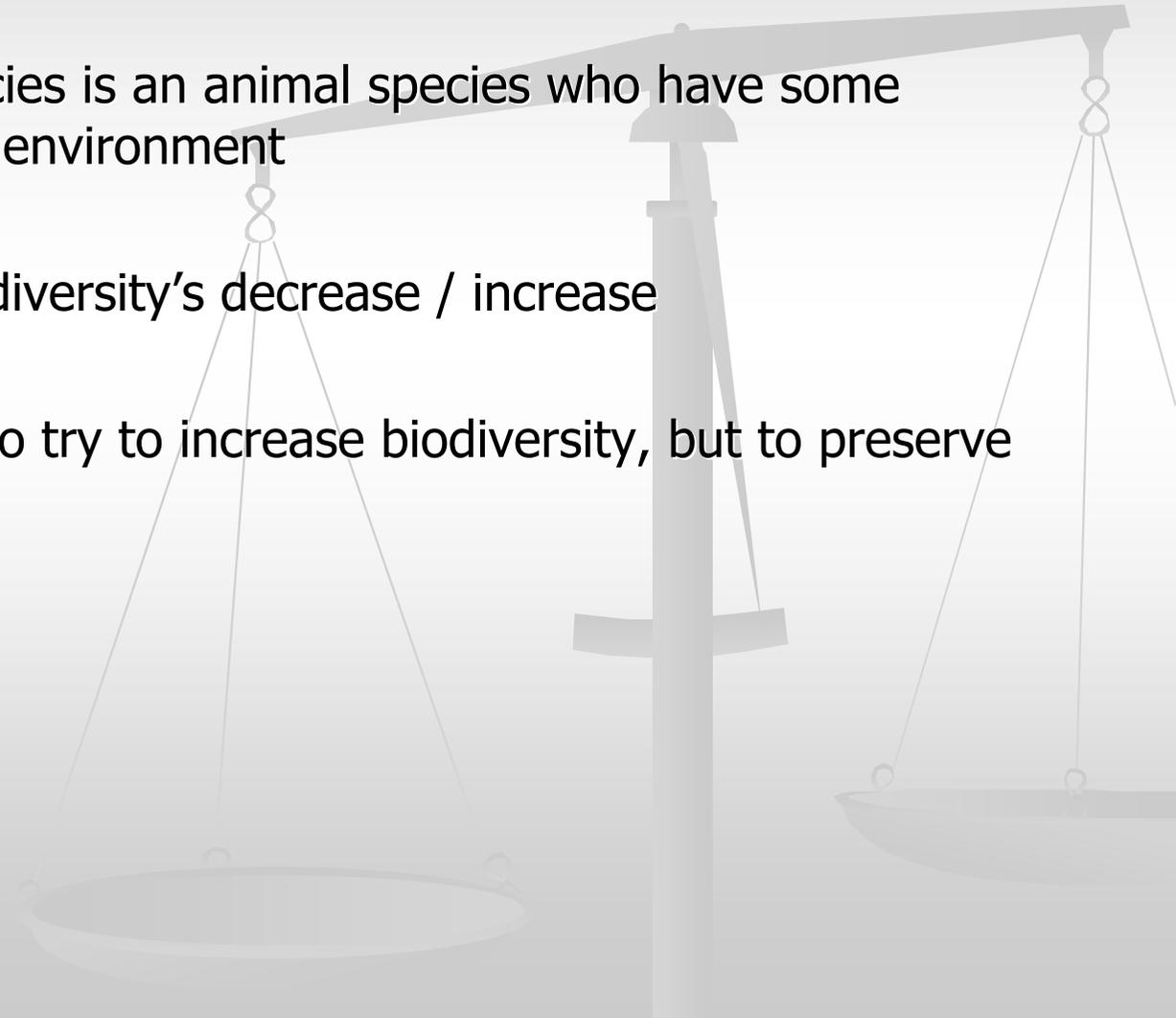
Benefits	Controversies
<p>Crops:</p> <ol style="list-style-type: none"> 1) Enhanced taste and quality; 2) Reduced maturation time; 3) Increased nutrients, yields, and stress tolerance 4) Improved resistance to disease, pests, and herbicides 5) New products and growing techniques 	<p>Safety</p> <ol style="list-style-type: none"> 1) Potential human health impact: allergens, transfer of antibiotic resistance markers, unknown effects Potential environmental impact: unintended transfer of transgenes through cross-pollination, unknown effects on other organisms (e.g., soil microbes), and loss of flora and fauna biodiversity
<p>Animals</p> <ol style="list-style-type: none"> 1) Increased resistance, productivity, hardiness, and feed efficiency 2) Better yields of meat, eggs, and milk 3) Improved animal health and diagnostic methods 	<p>Access and Intellectual Property</p> <ol style="list-style-type: none"> 1) Domination of world food production by a few companies 2) Increasing dependence on industrialized nations by developing countries 3) Biopiracy—foreign exploitation of natural resources
<p>Environment</p> <ol style="list-style-type: none"> 1) “Friendly” bioherbicides and bioinsecticides 2) Conservation of soil, water, and energy 3) Bioprocessing for forestry products 4) Better natural waste management 5) More efficient processing 	<p>Ethics</p> <ol style="list-style-type: none"> 1) Violation of natural organisms’ intrinsic values 2) Tampering with nature by mixing genes among species 3) Objections to consuming animal genes in plants and vice versa 4) Stress for animal
<p>Society</p> <ol style="list-style-type: none"> 1) Increased food security for growing populations 	<p>Labeling</p> <ol style="list-style-type: none"> 1) Not mandatory in some countries (e.g., United States) 2) Mixing GM crops with non-GM confounds labeling attempts
	<p>Society</p> <ol style="list-style-type: none"> 1) New advances may be skewed to interests of rich countries

Ethical problems



Ethical problems of biodiversity

- Darwinism: the human species is an animal species who have some responsibilities towards the environment
- Production of GMOs - a biodiversity's decrease / increase
- The first thing to do is not to try to increase biodiversity, but to preserve the one we are having now



Transgenic animals

- Peter Singer: animals are equal to humans as they have the ability to feel pain and pleasure
- Christians, Jews, and Muslims: our innate value comes from the value God places on us
- Monists: there is only “one substance” in the world.
- Animism: everything in nature (animals, plants, minerals etc) is animated
- Hinduism: all components of universe have a divine nature

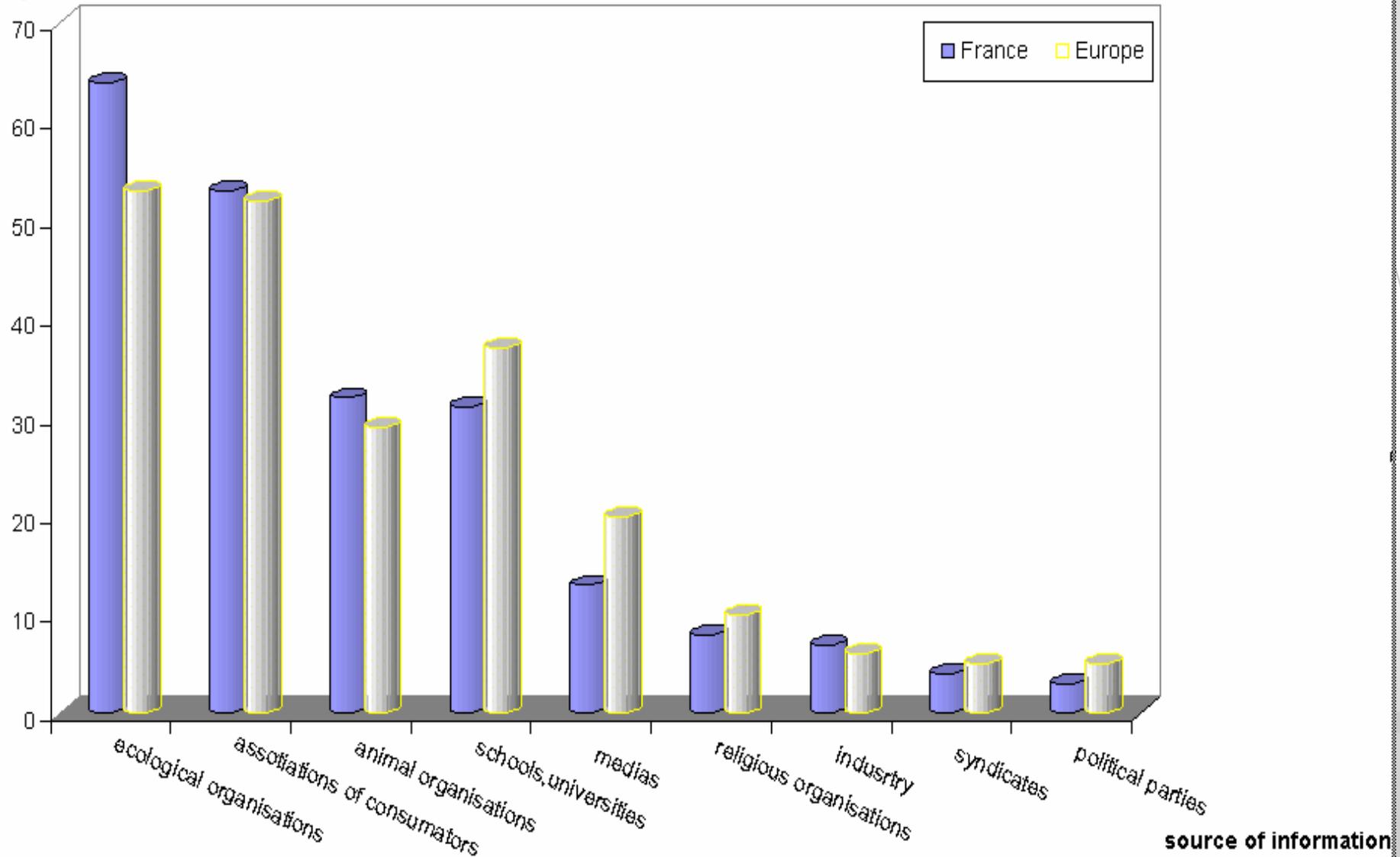
Can we say that animals have the same rights as people do?

***Do we have the right to create animals
whose life is fully dependant on our knowledge
and skills even when we are not aware of our abilities?***



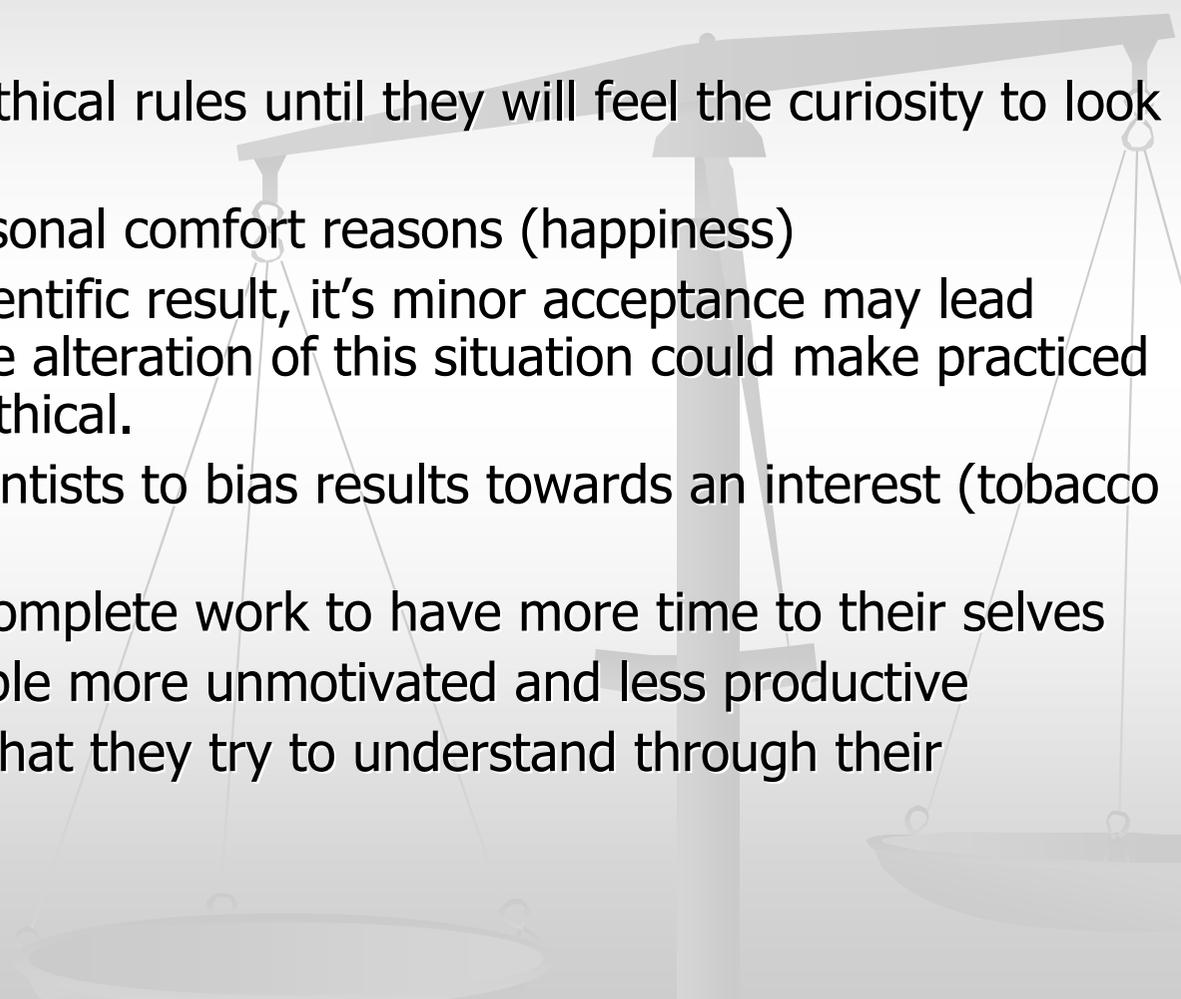
Information is the basis for education

reliability (%)



Back to reality

Report of the group debate about what is causing bad science to still occur

- Scientists will not access the ethical rules until they will feel the curiosity to look for them
 - Scientists forge results for personal comfort reasons (happiness)
 - Since a negative result is a scientific result, it's minor acceptance may lead researchers to avoid them. The alteration of this situation could make practiced science more innovative and ethical.
 - Money interests can make scientists to bias results towards an interest (tobacco companies, etc.)
 - Scientist abdicate on a more complete work to have more time to their selves
 - Lacking conditions makes people more unmotivated and less productive
 - Nowadays scientists still see what they try to understand through their societies' eyes
- 

References:

- On being a scientist, committee on science, engineering and public policy. National Academy Press.
- Tor Lezmore, "Debating ethics and public policy: the Nuffield Council on Bioethics"
- Published online: 30 October 2002
- René von Schomberg , From the Ethics of Technology
- towards an Ethics of Knowledge Policy
- & Knowledge Assessment
- A working document from the European Commission Services, January 2007, *
- James Watson, Tania Baker, Stephen Bell, Molecular Biology of the Gene (International Edition) - 5th Edition, 2004
- Harvey Lodish, Arnold Berk, Paul Matsudaira, Molecular Cell Biology 5th Edition, 2003
- Griffiths, Anthony J.F.; Miller, Jeffrey H.; Suzuki, David T., Introduction to Genetic Analysis. 7th ed., 1999
- Christian Smith, Moral, Believing Animals: Human Culture and Personhood , Oxford University Press, 2003

***Thank you for your
attention!***

