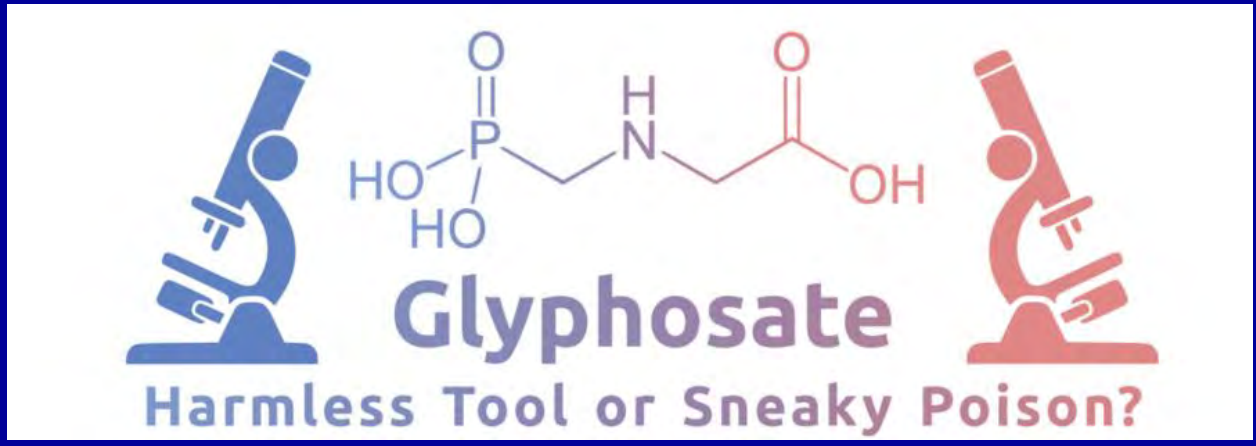

Brussels, European Parliament, 10 May 2017

Do chemists/scientists need to understand ethics?

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Leicester
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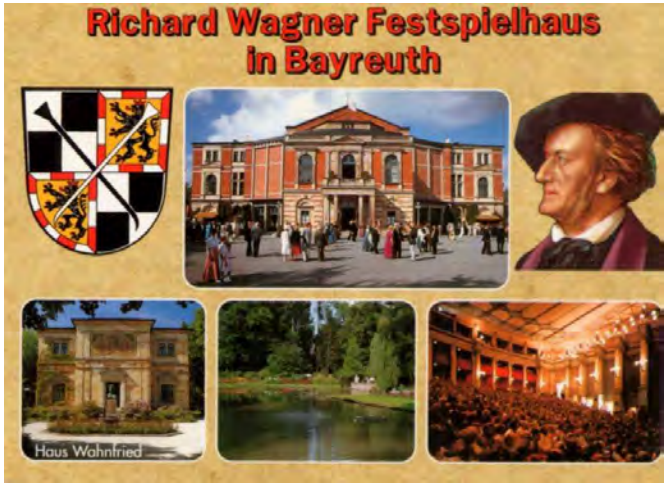
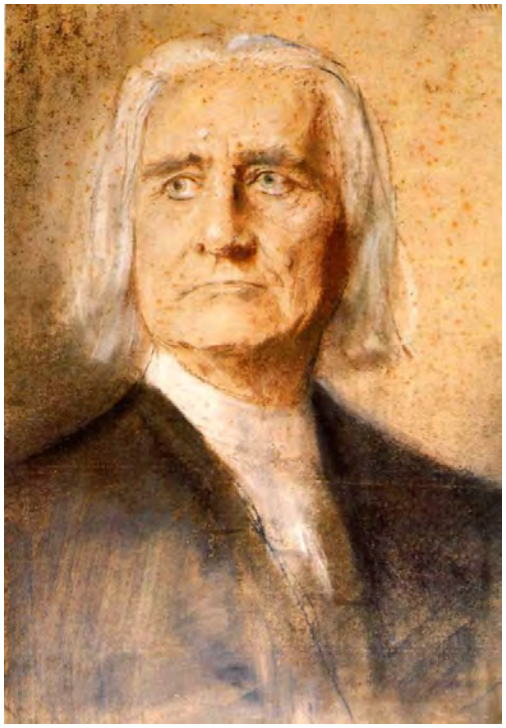




Franz Liszt

Cosima Wagner

Richard Wagner


Mark Twain
„I have been told
that Wagner's music
is better than
it sounds."
R. WAGNER

University of Bayreuth
since 1976

City of Bayreuth

Chemistry and Chemistry-based technology:
its contribution to human culture:

The first phase:

Proto-Chemistry

although unconscious Chemists/Chemistry

based upon
observation – experimentation – repetition

?

today

Holocene

Pleistocene

1 200 bC

3 000 bC

8 000

~ 25 000

800 000

2.5 Mio

Ecological Era

Petrol/Plastics Era

Iron Age

Bronze Age

Copper-Neolithic Age

Neolithic

Epipaleolithic

Paleolithic

Physico-Mechanical Processes only

Venus of Dolní Věstonice (fired loess loam)

The first inventor:

Prometheus

~ 4 kWh/kg wood

$$6\ n\ CO_2 + 5\ n\ H_2O \uparrow (C_6H_{10}O_5)_n + 6\ n\ O_2$$

The (primary) chemical process: Controlled application of energy for making new materials for the creation of objects of art.

The present phase of the Chemical Science & Technology:

Observe/analyze
to derive general, theory-based rules
in order to understand/predict how
natural materials
under controlled application of
intensely focussed energy
can be transformed to
new materials
which are better, more useful, longlasting,
sustaining/able

The philosophical basis and strength of the present scientific paradigm:

The <u>Subjective Scepticism</u>: <u>*Cogito ergo sum*</u>

The powerful foundation of Science!

René Descartes, 1596 - 1650

The typical scientific approach:

Falsification of Hypotheses:

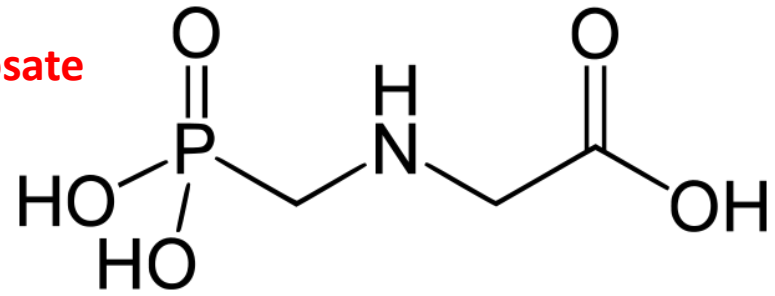
Yes or No

or rather!:

Not No or No

(until proven otherwise)

Glyphosate



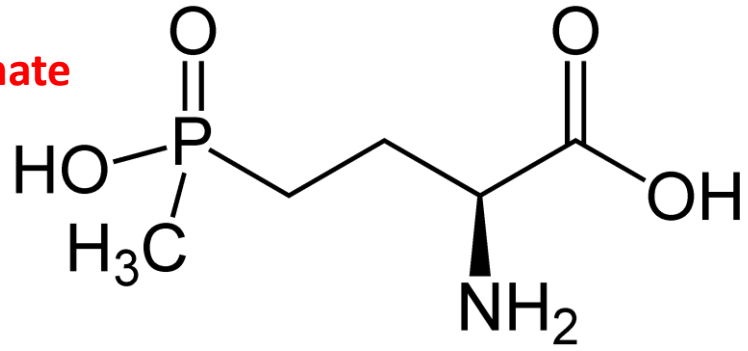
- "Roundup® might lead to excessive extracellular glutamate levels"

D. Cattani *et al.* 2014. *Toxicology* 320: 34

- "The teratogenic potential of Roundup®"

E. Dalgrave *et al.* 2002. *Toxicol. Lett*. 142: 45

Glufosinate



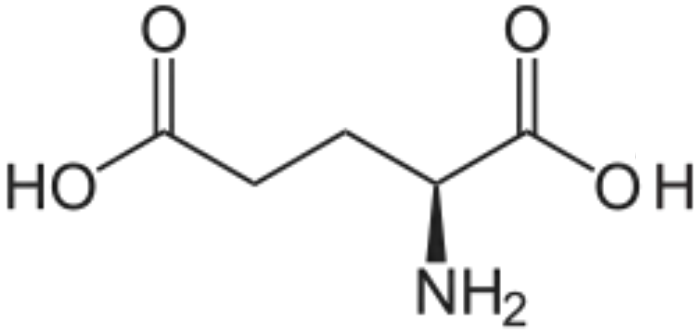
- Glutamine synthetase inhibitor: "slight increases of glutamate"

R. Hack *et al.* 1994. *Food Chem. Toxicol.* 32, 461

- "All embryos in the treated groups (10^{-5} M) exhibited specific morphological defects"

T. Watanabe & T. Iwase 1994. *Teratog., Carcinog. & Mutag.* 1996, 287

Glutamate

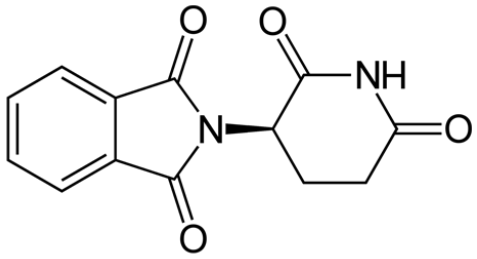


- „Glutamate acts as an intercellular signaling factor"

L. Teng *et al.* 2016. *Oncotarget 7: 49552*

T. Prickett & Y. Samuels, 2012. *Clin Cancer Res.* 18: 4240

Thalidomide



- „Spontaneous hydrolysis of thalidomide "

H. Schumacher *et al.* 1965. *Brit. J. Pharmacol.* 25: 324

Final Product: Glutamate! (≈ 50 %, 5 h, pH 7.4

Rio Grande do Sul, Brasil, March 2013

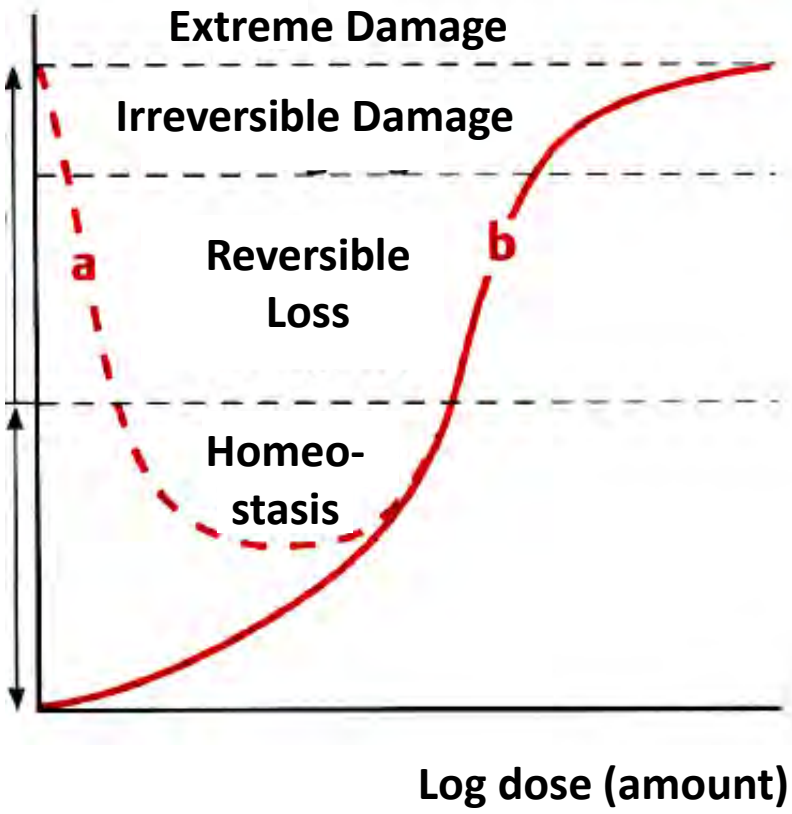
What is the problem?

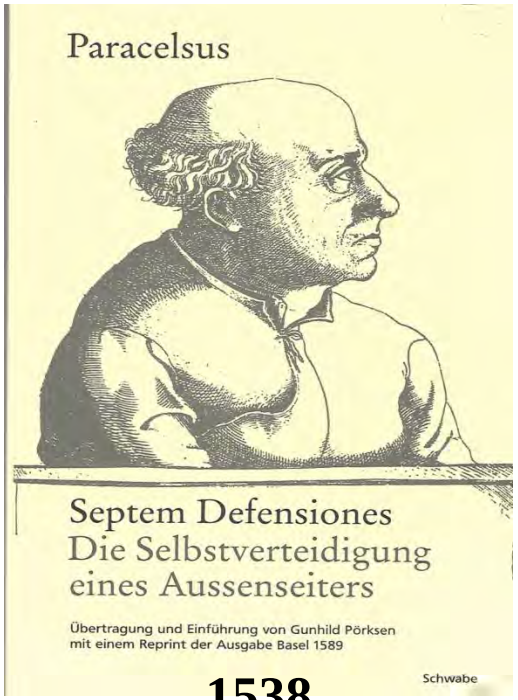
First, a quantitative one:

Global agricultural and non-agricultural use of glyphosate:

C. M. Benbrook (2016) *Environmental Sciences Europe* 28: 3

1994	2005	2014
56 300 t	402 300 t	825 800 t





1538

ein altes. Wenn jhr jedes Gifft recht wolt außlegen/ Was ist das nit Gifft ist? alle ding sind Gifft/ vnd nichts ohn Gifft/ allein die Dosis macht/ dz ein ding kein Gifft ist. Als ein Exem

Tertia Defensio

Secondly, a qualitative one:

As a result of a coldly materialistic-scientific (economic), non-empathic culture of science, insisting that science holds the whole and exact truth(s), caring little about fairness (Rawls).

The philosophical basis and strength of the present scientific (and intellectual) paradigm:

The <u>Subjective Scepticism</u>: <u>*Cogito ergo sum:*</u>

<u>I think, therefore I am</u> <u>(and the rest of the world)</u>

(Falsification of Hypotheses: **Yes or No)**

or rather:

Not-No or No

Unpreciseness in thinking creates several problems, and (wrong) beliefs, such as:

1. **that answers in science are objective:** no, they are not, they depend on the formulation of questions/ hypotheses,
2. **that there only two answers, yes or no:** mostly there are several answers of different shades and strengths.
3. **that reality is only what can be grasped scientifically:** no, there are many phenomena in nature (especially in biology; e.g. life, consciousness, etc.) which cannot be grasped within the present intellectual paradigm.

Available online at www.sciencedirect.com
SCIENCE DIRECT®
Environmental Science & Policy 7 (2004) 385–403
Environmental Science & Policy
www.elsevier.

How science makes environmental controversies worse

Daniel Sarewitz

Consortium for Science, Policy, and Outcomes, Arizona State University, P.O. Box 874401, Arizona, AZ 85287-4401, USA

Scientific uncertainty, which so often occupies a central place in environmental controversies, can be understood not as a lack of scientific understanding but as the lack of coherence among competing scientific understandings, amplified by the various political, cultural and institutional contexts within which science is carried out.

ENVIRONMENTAL JUSTICE
Volume 3, Number 4, 2010

DOI: 10.1089/env.2010.0007

Environmental Justice, Participation, and the Law

Analyzing Public Participation in Risk Analysis: How the Wolves of Environmental Injustice Hide in the Sheep's Clothing of Science

Kristin Shrader-Frechette

ABSTRACT

In 1996 the U.S. National Academy of Sciences published a landmark volume, *Understanding Risk*, that mandated full public participation in environmental risk assessment, characterization, and management—particularly in environmental-justice (EJ) cases. It argued that because all types of risk decisions are laden with value judgments, experts alone ought not have control over them, and stakeholders should be part of the entire risk-decision process; that expert analysis and stakeholder deliberation should receive equal weight; and that many risk situations require special attention to EJ issues. Since this classic 1996 report, however, most risk assessors appear still to follow the old expert-dominated risk paradigm, in which the public has little or no voice. As a consequence, public participation in risk decision making has been harmed. EJ participation has especially been harmed. Why have risk decision makers not followed the 1996 mandates? Answering this question, the article shows what to do about it. It (1) argues that polluting-industry front groups have spent millions of dollars to promote risk assessment as a purely objective, scientific activity, and they have paid prominent academics, like Harvard Law Professor Cass Sunstein, to promote this technocratic view—which excludes participation of both the public and victims of environmental injustice.

Sustainability

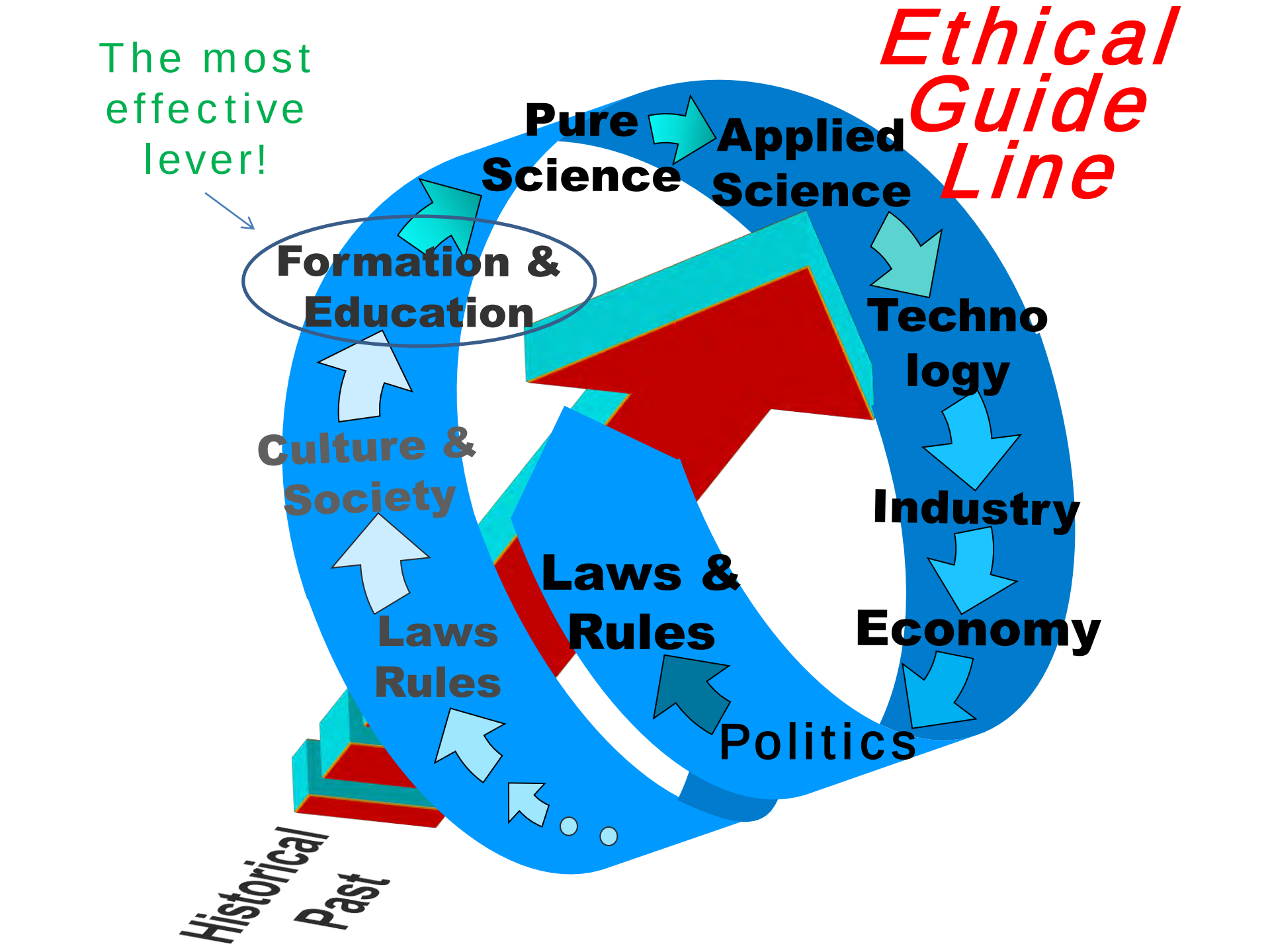
is equivalent to integration of

ETHICS **and** **SCIENCE**

The way to a good life
(non-moralistic, non-asketic)
for me, for us, for them,
for future generations.

The instrument for
ensuring material
freedom and wealth
for realization of culture.

We are all victims and actors
at the same time,
being subjects and objects of the
ecology of nature (our planet)


The most effective lever!
Ethical Guide Line
Pure Science
Applied Science
Techno logy
Industry
Economy
Politics
Laws & Rules
Laws Rules
Culture & Society
Formation & Education
Historical Past

What is needed?

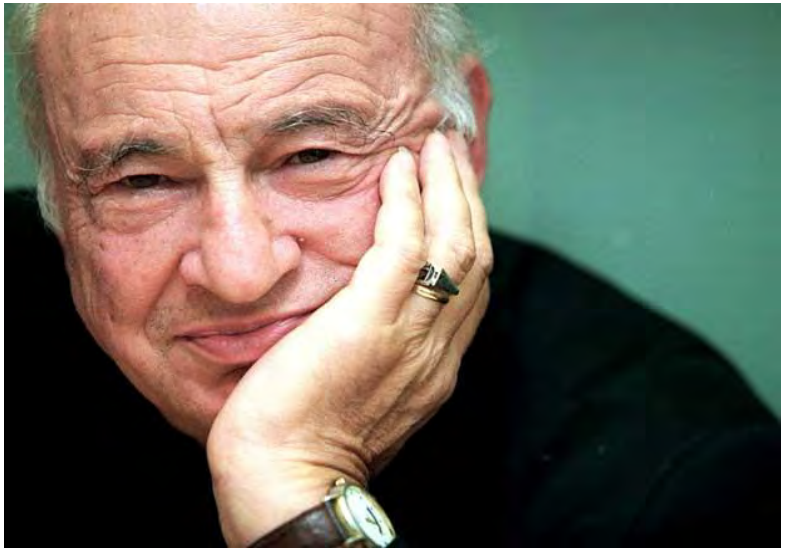
Teaching Chemistry (and Science in general) in two ways:

1) training the intellectual capability of mastering it technically (brain)

and

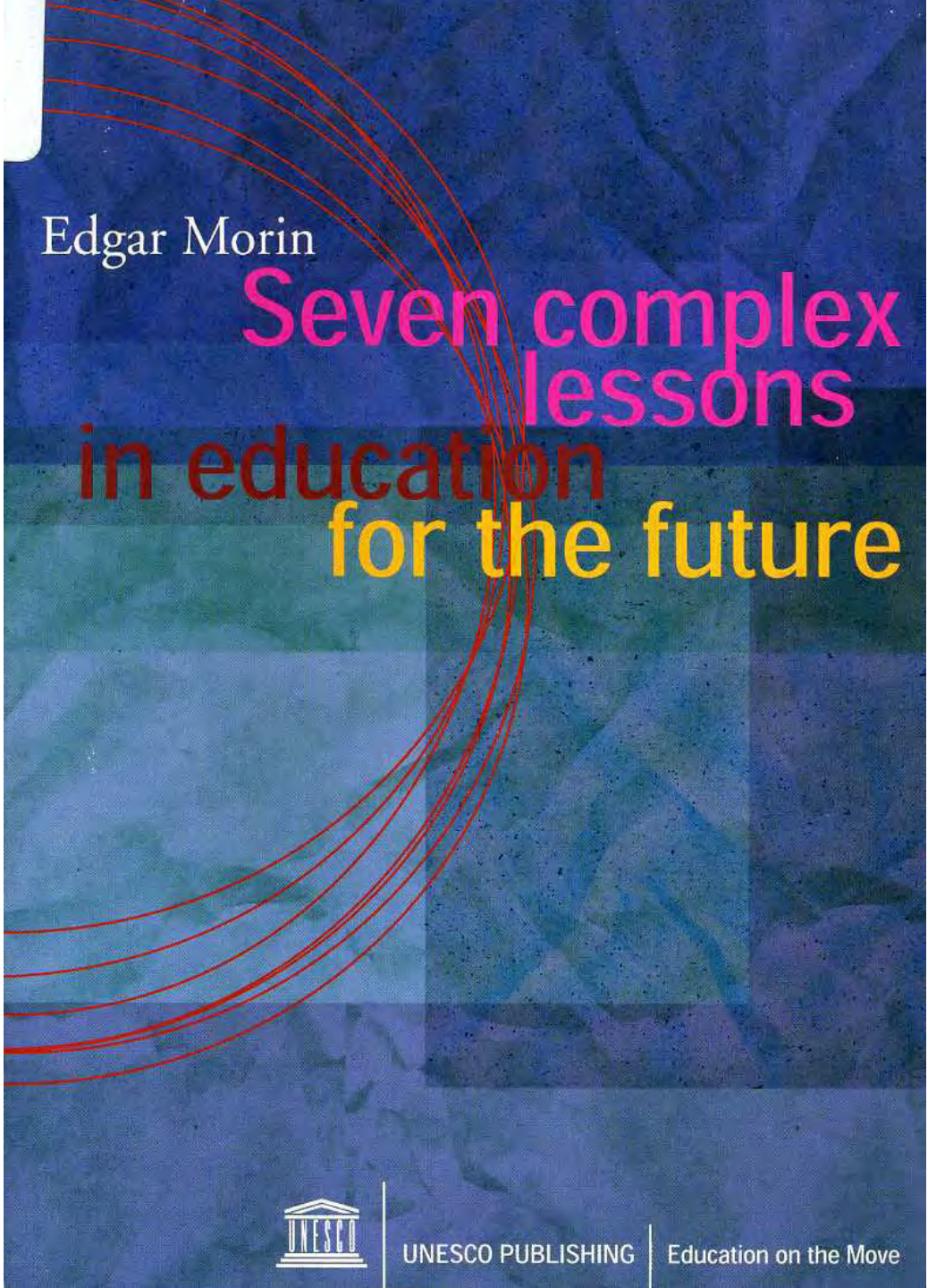
2) Fostering the empathic ability to understand its limits (heart).

Education in (Applied) Science Ethics



1. Detecting error and illusion
2. Principles of pertinent knowledge
3. Teaching the human condition
4. Earth identity
5. Confronting uncertainties
6. Understanding each other
7. Ethics for the human genre

Ethics, in its foundations, is a matter of education to respect and empathy, not predominantly a matter of the intellect!



Conclusion

1) A new paradigm in science teaching to be developed, integrating scientific-intellectual-analytical and philosophical-ethical, spiritual aspects;
2) A higher level with strong emphasis on international and interdisciplinary cooperation needs to be achieved.

How in Practice?

(Examples)

1) (Re)-Writing Science&EthicsText-Books,
2) Personal-Individual Partnerships between students/scientists from various disciplines and stages of industrial development.

Thank you!

Questions ?
Comments ?