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**Session:**  
**Limits to rationality**  
**World Academy of Art and Science**

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The paper is given in terms of PowerPoint presentation.

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Quality of life and ability to cope with threats and challenges are increased by science. «To the Age of reason we owe our prosperity, .. but also emancipation of slaves and women, the view that we are all at root the same.» (Lee Smolin, New Scientist, July 2008).

1970-now: over 70% of the public considers scientific research to be beneficial,

less than 15% considers it to be harmful.

Public trusts scientists and physicians more than most other professions: 40% of business leaders and 61% of political leaders considered dishonest.

Nevertheless, there is rampant pseudoscience, fundamentalism and superstition.

New Scientist special issue of October 8, 2005:

«After two centuries of the ascendancy, the Enlightenment project is under threat....Religious movements are sweeping the globe preaching unreason, intolerance and dogma, and challenging the idea that rational, secular inquiry is the best way to understand the world.»

Why - it makes no sense?

Knowledge-based society is the best approach to assure and maintain sustainable global society.

Knowledge-based society depends

1) on knowledge - unique resource - inexhaustible and increased by sharing and

2) on human beings, creators and depositors of knowledge.

Human intrinsic inner resources still are being underutilized.

Knowledge-based society intertwines knowledge, governance and economy. But, they have different value systems (at least on the first level). Currently the scientific method and language have been hijacked by government, politics and big business, and put in service of their values.

Al Gore «Assault on Reason» (2007) argues that propaganda and PR are major threats to reason and democracy.

### **1) Where our rationality comes from?**

#### **How reliable is our rationality?**

- Logic, rationality, thinking, doing, and truth.

Logic vs. thinking: Niels Bohr to a friend

«You do not think, you are just being logical!»

Logic and paradoxes, Logical systems beyond our logic: not all proposition have truth value, and different propositions can have truth values depending on the larger context in which the question is being asked.

Fuzzy logic: not true or false, but «certain to some extent» taken from a «certainty-uncertainty lattice».

Context driven system using data sensed from «environment» to adaptive behavior. Relation with mathematics, and self-managed networks (neural networks)

«Few of the active processes occurring in our brains ever impinge on our awareness. We *do* most of our «thinking» without being conscious of it

[H. von Helmholtz «unconscious inferences»].

Our brain (unconscious brain) is very good at taking many things into account at the same time. (*how about animals - they do equally well?*)

Conscious reasoning is an attempt to justify a decision after we made it.»(Chris Frith, *New Scientists* -NS, p.45).

Unconscious brain cannot justify most of its actions.

Enlightenment position: We should accept opinions on the basis of reason, not authority, tradition or church.

Central to this are the *beliefs*:

- that the universe is a rational system (Einstein!) accessible to the detached logical inquiry and to meaningful observations and experiments. («Meaningful» means at least reproducible, reliable and answering the formulated question.) (This is the concept of «strong rationality»: «*for a proposition to be true, it has to be proved either by logic or/and empirically*»). A weaker condition is relative rationality: «*proposition is true only within one's own frame of reference*».

- that we can understand.

## **Our brain is the result of evolution ⇒ Can we understand?**

We are aware that our senses are incomplete and often inferior to those of animals (e.g. hearing, seeing).

Instruments we built gave us a better “view”. The Universe “we see today” is very different from what it “appeared to us” a century ago.

Can ICT and artificial intelligence “improve” our brain adequately? Is our rationality “relative”, “time dependent”?

Humans often prefer beliefs and hope rather than reality.

Does it mean that there is an additional “field” besides reality?

If our brain (mind?) is the product of evolution designed to survive and to have offsprings, is it reliable to answer questions such as «Why there is something rather than nothing?»

Quantum physics has shown that «nothing» is filled, bubbling with particle-antiparticle created and annihilated. The dance of quantum particles «contributes» to the dark energy that drives the universe apart, but this «nothing» (vacuum) has more energy -  $10^{120}$  times too large - to fit (not necessarily explain) cosmological observations. Including supersymmetry (still an open question) would reduce this to  $10^{60}$ . Explanation will require a paradigmatic change.

Actually, each paradigmatic change (Th.Kuhn's language) is a discontinuity in a rational process.

M. Rees: “Are we capable of understanding the physical Universe?” (Annual Conf of AE, Liverpool Sept 2008)

Do we have the math necessary to describe it?

What do we mean when we speak of multi-verses vs. uni-verse?

Are there Universal unchanging principles - presently not confirmed.

J.A. Wheeler suggested that natural laws «evolve». Does it follow that laws of logic, of rationality also evolve?

Dirac: do fundamental constants of Nature change? (no experimental evidence for change).

Relative rationality: *«proposition is true only within one's own frame of reference».*

Each frames of values/*beliefs* is of equal validity. Evaluation of other frames of reference assumes «going out of your own reference”. It appears as if the relative rationality is a contradiction in itself. Relative rationality is criticized by most religions.

«The unreasonable effectiveness of mathematics in natural sciences» - Wigner 1960: «mathematics is enormously useful bordering on the mysterious. There is no rational explanation for it.» However, we count, we measure and use basic logic and all these activities are what the universe «teaches us». Our development, including logic, mathematics and rationality are results of the evolution selecting those of our ancestors who were «consistent» with the universe.

Therefore, usefulness of mathematics (and logic) is a product of evolution. «By natural selection our mind has adapted itself to the condition of the external world .» (H. Poincare)

## **2) Can reason give answer to everything, and if it cannot, what are the limits of rationality?**

**Rationality is an unending endeavor, as science is. Science has no final truth, beauty yes, but no final truth. Science is not a dogma.**

What is the aim of rationality: to know the truth or to be able to live and to have offsprings? Are humans rational decision-makers, animals that maximize gain? Positivism (A. Comte); modern rationality (Richard Norgaard).

System cannot be understood apart from our actions (Heisenberg uncertainty principle) and our values (Norgaard)

Rationality should also apply to social systems, but are social systems in themselves rational? There is evidence that most social systems are not rational (e.g. G. Soros on functioning of the market). Can one apply rationality to an irrational system, isn't it contradiction in itself? Is it «useful» to apply rationality to an irrational system?

History is not linear, not deterministic, not predictable - each of these statements represents a different level (i.e. it can be nonlinear and still predictable).

Ponder on differences between determinism and causality!

Link between causality and time. F.M. Dostoyevsky in «Brothers Karamazovs»: «If everything on Earth were rational, nothing would happen.» vs. century earlier R. Boskovic «If everything would be fully determined, there is no need for time.»

Proof is a model of rationality. But, after a specific issue is proved - is it closed? Keith Tyson (artist) wrote «Reason excludes creativity and intuition». It excludes also freedom!? «The art has the advantage over science that its methodology can be tumbling and contradictory.» (KT, NS, p.47).

Aristotle wrote that all men by nature have a desire to know: «Sapere aude!» Where this desire comes from? Is this the same as curiosity, an inherent feature of human nature, as written by A. Toynbee. Why are we curious? Is our curiosity beneficial for our evolution? Without curiosity we will still be in Stone Age, but do we need rationality, knowledge? Are we more creative than evolution requires?



Time is one of the most difficult problems in philosophy, and it is connected with rationality. Newtonian concept of time is known to be inadequate.

Future = expected (predicted) + unexpected events.

Soedjatmoko (former rector of UNU):

«Future is ethical category, since we choose it.»

Greeks and Romans had Chronos and Kairos.

«Time is creation, or nothing» (H. Bergson)

History of science shows that science does not proceed only rationally. Rationality is just one method - not always and not necessarily the best one.

Gödel's theorem: there are truths beyond proof.

R. Penrose «Reason destroys itself» (NS, p.49)

Science teaches us self-confidence and modesty.

Scientists become arrogant, e.g. «Standard model» (SM) or «Theory of everything». This is jargon, and scientists quickly learn that the reality (truth??) is more complex:

SM → 73% (dark energy) + 23% (dark matter) + 4% (matter)

Science is an unfinished endeavor, it gives no final truth.

“End of history”, “End of faith”, “End of politics”, “End of Money”, “End of science” ???

R. Williams, archbishop of Canterbury (NS, p. 44.): «being reasonable meant being aware where you belong in the cosmos...- “singing in tune”. (My comment: *Then scientific research, except incremental research, is «unreasonable», since paradigmatic changes always transcend «singing in tune».* However, “singing in tune” is one crucially important “tool” for our evolutionary development - role of social dimension.) From 16. c. reason came to be seen as opposed to tradition and authority, ...but... we need to pause before we assume that instrumental reason will answer all the questions about how to shape a moral and humane world.»

Reason and values should be the product of evolution  $\Rightarrow$  thus, not in conflict. Enlightenment: progressive thought in the 18. c. was far in advance of the social and political realities of the time.» (*Isn't it always??*). A.C. Grayling, NS, p.42).

Rationality, ideology, faith, irrationality, chaotic irrationality (what else?), intuition.

Human actions are associated and stimulated by any of these, by tacit knowledge (M. Polanyi) and by reflexes.

Explaining religiosity (project EXREL) (leading theory: religiosity exist because of the functioning of the human cognitive architecture.

Is reason another faith? (M. Midgley, NS p.50)

Should we know all we can? Should we do all we can?

Eugenics (F. Galton)

Inherent in human nature is to ask all, any questions.

John Donne warned centuries ago «He that seeks proffe for every mystery of Religion shall meet with much darkness.»

Science (rationality) and religion can interact according to Ian Barbour in four ways to be:

1) in conflict, 2) in dialogue, 3) independent, 4) to integrate.

S.J. Gould argued for non-overlapping magisteria (NOMA), i.e. independence and dialogue.

John Paul II favored integration with dialogue (“Religion and science are two wings of a human spirit”).

Rationality and common sense.

Theory of relativity and quantum physics taught us the limits of common sense.

Is common sense that segment of rationality that is caused by evolution? Do we have another segment of rationality? Where it came from? Can we ask the unthinkable? (In 3rd generation warfare plans are prepared for unthinkable attacks.)

### **3) Rationality (and science) has been, is and will be misused and abused – what are the safeguards?**

Is a blind *faith* in reason dangerous? «The most destructive and dangerous of all religions is the newfound faith in the power of reason and the perfectibility of man.» F.M. Dostoyevsky in «Notes from Underground» and in «Crime and Punishment». The great inquisitor («Brothers Karamazov»): three forces capable of enslaving us are miracle, mystery and authority.

Is science, is rationality guilty of creating a perception that it is in command of all of these three: miracle - great achievements of our science-generated technology, mystery (dark energy) and authority (only rationality!).

History of scientific research deserves the word «progress». It is not straight, it is full of mistakes, wrong turns. Intuition, discrete leaps of faith, but also of unjustified beliefs and of prejudices are common (Einstein's "prejudices": to reject the probabilistic interpretation of quantum physics, and cosmological constant.)

Significant progress is made when instead of asking general questions specific «small» questions were asked, leading to specialization and to scientific disciplines, reinforced by economic development, notably Industrial revolution ⇒ Taylorian subspecializations. This led to a definition of an «expert as a person knowing more and more about less and less and finally knowing everything about nothing.»

Malignant version: meeting of CEO and generals: “I have a group of very intelligent expert who do not think”

Expert limiting themselves to their narrow expertise and leave decision-making to ?? However, can expert at their current level of edu act beyond their narrow domain?

Everybody has a duty to be concerned and should (?) interfere.

Rationality involves language and communication. Meaning of words change in time and in context.

Culture do interact, merge, divide and modify.

Pythagora → “city of the wise”, Plato: philosopher-king  
V.I. Vernadsky (1863-1945) and P. Teilhard de Chardin (1881-1955): “collective consciousness – noosphere”

Noocracy = rule of the wise.

Cf.:

- rational decision-making
- noosphere
- knowledge-based society

To act, or not to act - this is the question now!  
Climate change now, and tobacco decades ago.  
No scientific conclusion is a dogma, and can and will be improved. This was abused by the tobacco industry and it is now abused by politicians and oil business.  
The opposite position: do as soon as you can did lead to the use of x-ray machine in shoe shops and to overuse of x-rays in dentistry.  
Humans desire certainty and they conceive uncertainty as insecurity and vulnerability.  
We exist because of quantum physics which is based on uncertainty. In the enormous potentialities of the world is our existence and future.

In the enormous potentialities of the world is our freedom based, our freedom ↔ uncertainty.

Many problems:

- manipulation of our opinions - fishermen of human souls.
- suppression of doubt and enforcement of strict obedience.
- perception that all rational inquiries serve hidden interest.

Are human beings responsible and guilty if they persevere in business-as-usual and/or do nothing?

Breaking the causality chain: rain-dance, but also chemistry (we do know the basic laws)

**B. Pascal: «We think not only by our brain, but also by our heart. »**

**“Humankind cannot live by rational thoughts alone” (Editorial, NS, 10 Nov 2007).**

Human beings are rational beings and have free will. By birth we have rights - human rights. Through our rationality and free will we have responsibilities. Not acting when we should is irresponsible, and we are responsible for our actions. Rationality helps us to decide when to act and to minimize possible errors.

