


United Nations
Educational, Scientific and
Cultural Organization

UNESCO Chair
in Anticipatory Systems

UNIVERSITY OF TRENTO - Italy

A 1st understanding of ANTICIPATION

Roberto Poli



Anticipation Services

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Anticipation

- ▶ Widely different ideas of anticipation
- ▶ So far, **no systematic comparison** among the various proposals has ever been tried
 - ▶ We literally do not know whether the same idea has been discovered times and again or entirely different perspectives have been proposed
- ▶ Many recent papers/books
 - ▶ Appadurai, A. (2013). *The Future as Cultural Fact*
 - ▶ Seligman et al (2013). *Navigating Into the Future or Driven by the Past*
 - ▶ Tavory, I., & Eliasoph, N. (2013). *Coordinating Futures: Toward a Theory of Anticipation*
 - ▶ Gergen, K. J. (2015). *From Mirroring to World-Making: Research as Future Forming*
 - ▶ Poli, R. (2017). *Introduction to Anticipation Study*
 - ▶ Miller, R. (2018). *Transforming the Future. Anticipation in the 21st Century*
 - ▶ Poli, R. (2018). *Handbook of Anticipation*
- ▶ ▶ Etc. <http://www.projectanticipation.org>

Anticipation

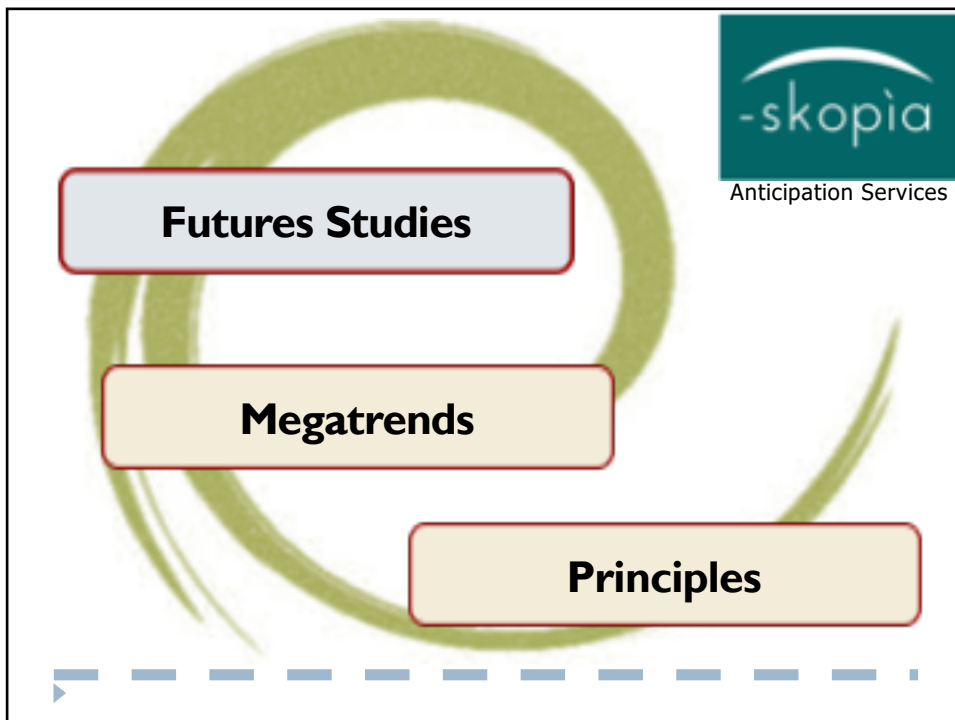
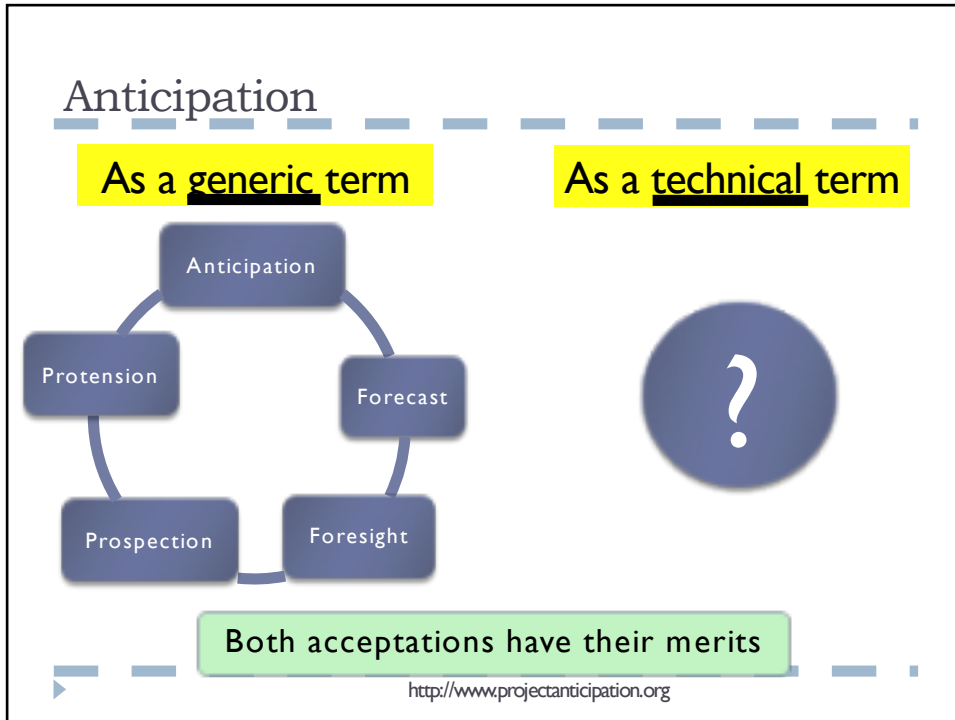
- ▶ The explicit consideration of anticipation opens **new scientific perspectives**. To mention but two apparently opposed and disconnected outcomes, anticipation both rehabilitates the Aristotelian theory of causes (including a version of the final cause) and generates an innovative understanding of complexity
- ▶ Our understanding of anticipation is still cursory, and the novelty of the perspective may conceal the difficulty implied by this otherwise refreshingly new vision
- ▶ Nonetheless, anticipation is increasingly at the heart of urgent contemporary debates, from climate change to economic crisis

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Some Questions about Anticipation

- **When** anticipation does occur in behaviour and life?
- **What** types of anticipation can be distinguished?
- **Which** properties of our environment change the pertinence of different types of anticipation?
- **Which** structures and processes are necessary for anticipatory action?
- **Which** is the behavioral impact of anticipation?
- **How** can anticipation be modeled?

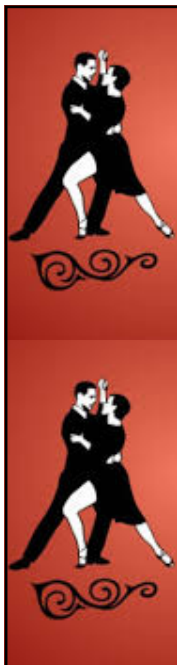
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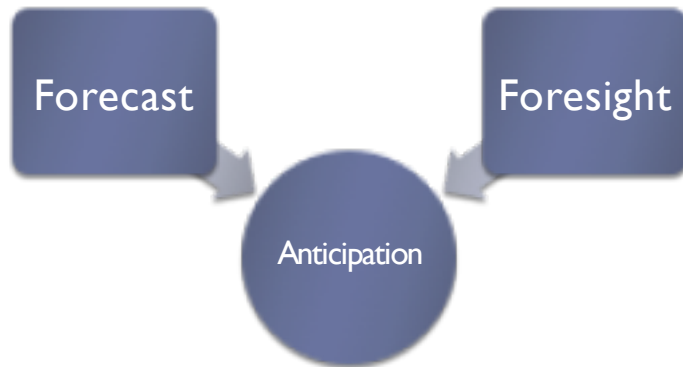


- ▶ Using the future in the present
- ▶ Generating e consuming future
- ▶ Managing ignorance
- ▶ Dancing with systems

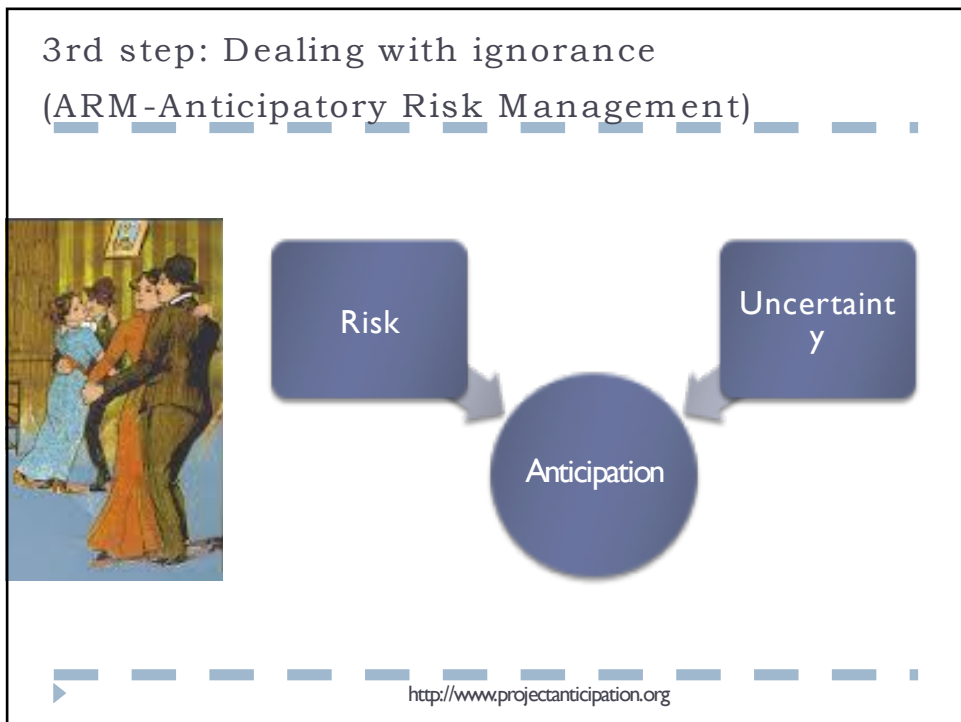
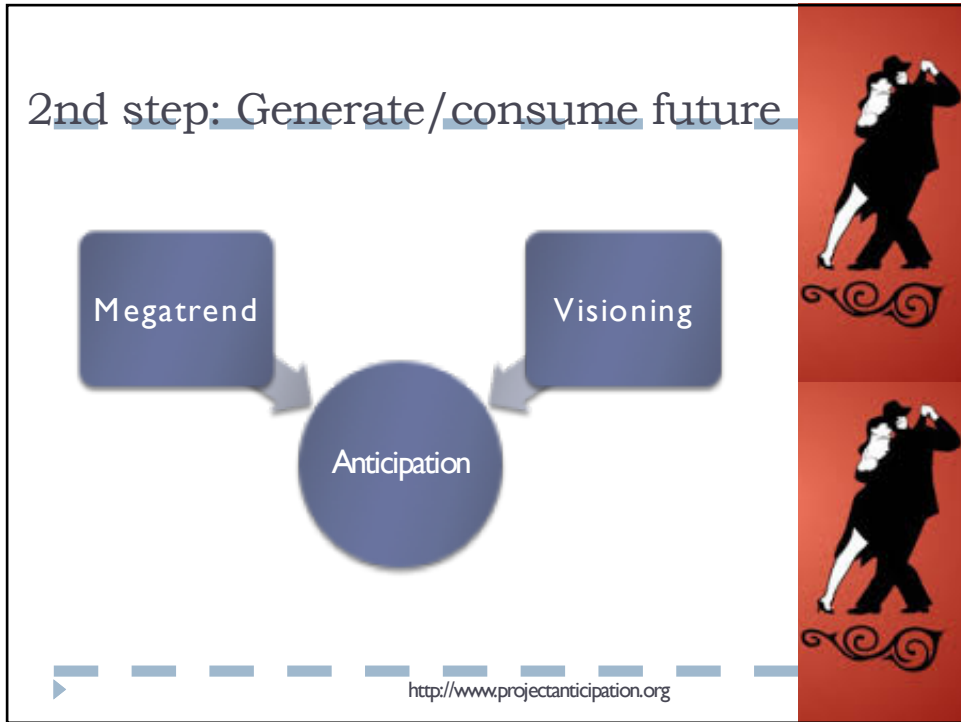
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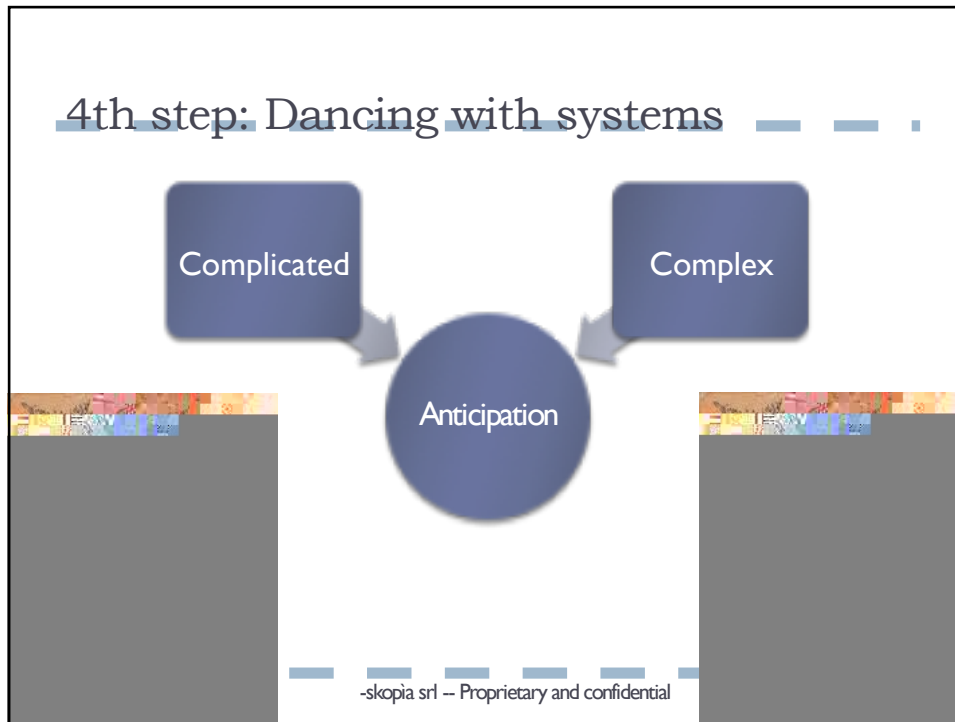


1st step: Using the future



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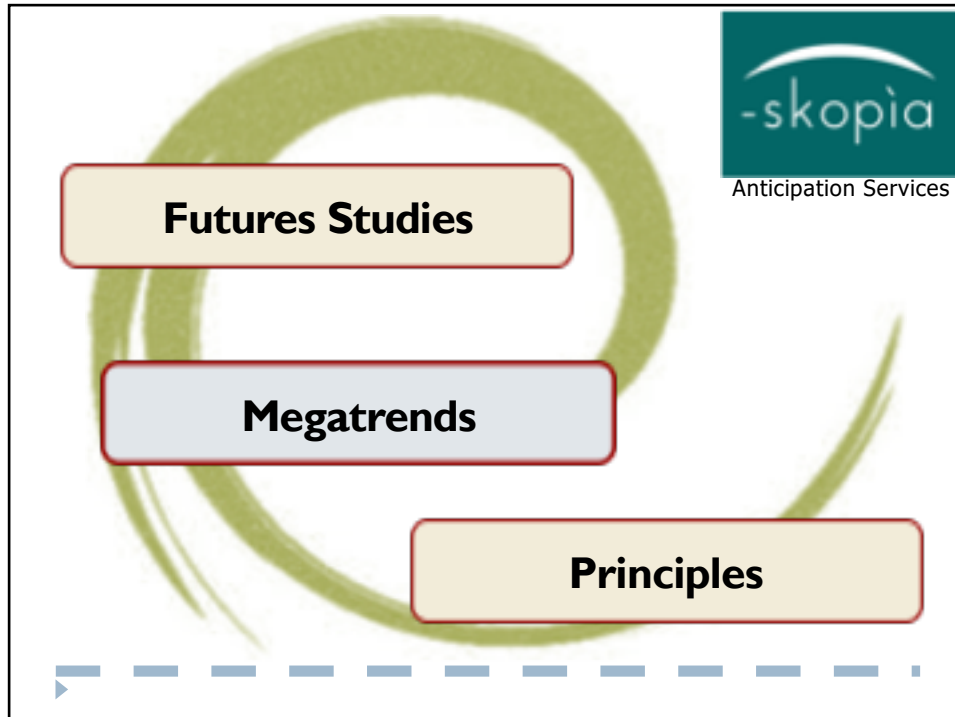




Anticipation's four strands

- ▶ **Translation** of (forecast and/or foresight) models into action (strategy)
 - ▶ (note: here is where experiential futures may lie)
- ▶ Future **generating** activity (from seeing the future as over there to the generation and consumption of futures)
- ▶ Management of **ignorance** (from distribution to impact)
- ▶ **Dancing** with systems (D. Meadows), addressing complexity
 - ▶ BECAUSE the “model and control” framework doesn’t work anymore
 - ▶ BECAUSE **most** real systems are complex – complexity is the default case (simple systems are rare; primarily didactic toys)

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2nd step A: Megatrends

- ▶ A megatrend is a set of processes ungoing since ages and promising to continue for long
- ▶ In most cases, the chance of modifying a megatrend is close to nil
 - ▶ Raising population
 - ▶ Ageing population
 - ▶ Higher need of energy
 - ▶ More food
 - ▶ Further development of cities
 - ▶ Climate changes
- ▶ ... which raises the issue of the megatrends that may eventually be modified (and for which reason)

Interaction
among
megatrends

Give me a lever ...

UN data, middle projection

Region	2017	2030	2050	2100
World	7550	8551	9772	11184

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Give me a lever ...

Region	2017	2030	2050	2100
World	7550	8551	9772	11184
Africa	1256	1704	2528	4468
Asia	4504	4947	5257	4780
Europe	742	739	716	653
Latin America and the Caribbean	646	718	780	712
Northern America	361	395	435	499
Oceania	41	48	57	72

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Lever

- ▶ 41% Africans in the I-14 cohort
- ▶ Facilitate the demographic transition



Aging

- ▶ The world's population is aging; virtually every country in the world is experiencing growth in the number of older persons in their population
- ▶ World population aged 60 or over

2015	2030	2050
901M	1400M	2092M
	+56%	+132%

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	2015	2030	2050
	901M	1400M	2092M
		+56%	+132%

▶ World population aged 80 or over

	2015	2030	2050
	125M	202M	434M
		+62%	+247%

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Italy

	2017	2030	2050	2100
Population	59360	58110	55093	47819

	2010-2015	2025-2030	2045-2050	2095-2100
Life expectancy at birth	82,3	84,7	87,2	93,1

Population	0-14	15-59	60+	80+
2015	13.7	57.7	28.6	6.8
2050	13.0	46.3	40.7	15.6
2100	13.7	46.4	39.9	17.9

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Cities

- ▶ **Cities are growing**
 - ▶ 2007 50%
 - ▶ 2015 54%
 - ▶ 2050 75%
 - ▶ From 1 million Km² (2005) to 2,5 million Km² (2050, ONU)
- ▶ **Cities and mobility**

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World City Risk 2025



- ▶ A risk assessment of over 20 catastrophe threats to the world's most important 301 cities
- ▶ These 300 city produce about 50% of the world GDP
- ▶ For **2025** they are expected to produce 75% of the world GDP
- ▶ Truly astonishing magnitude of growth
- ▶ Whatever happens them will have major consequences
 - ▶ (and whatever happens to the rest of the world will be almost irrelevant ...)

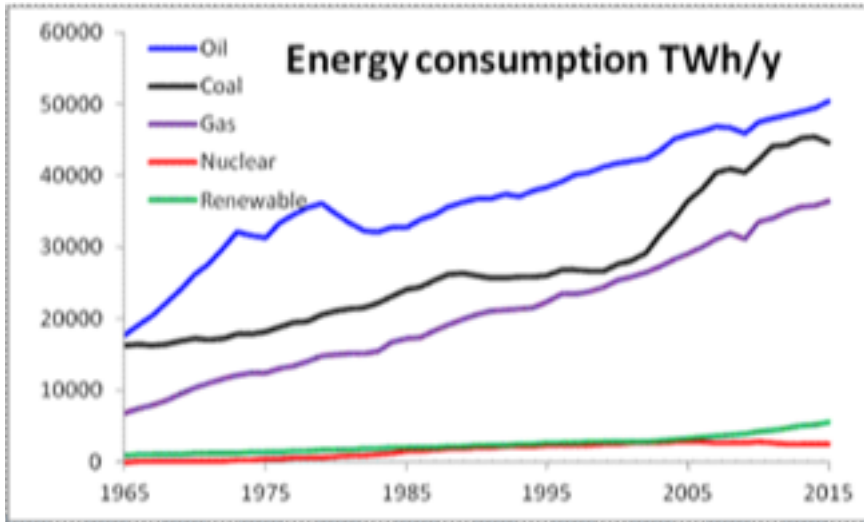


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Centre for
Risk Studies

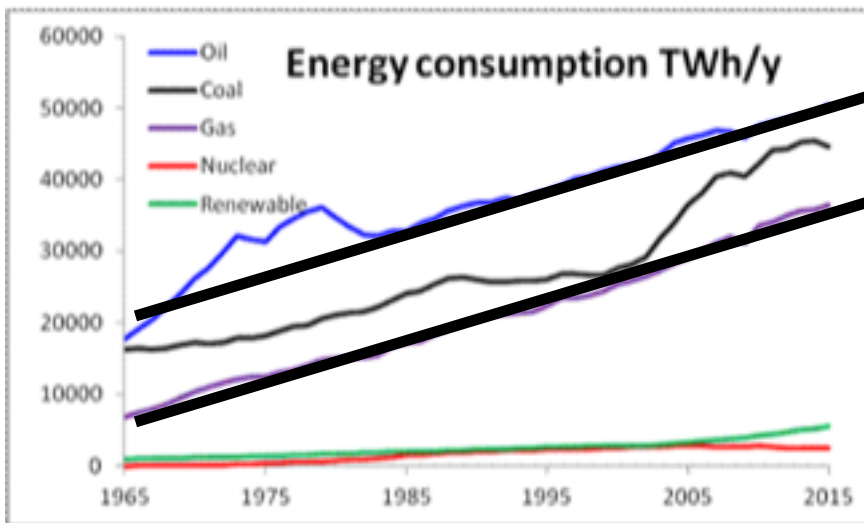
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World Energy Consumption

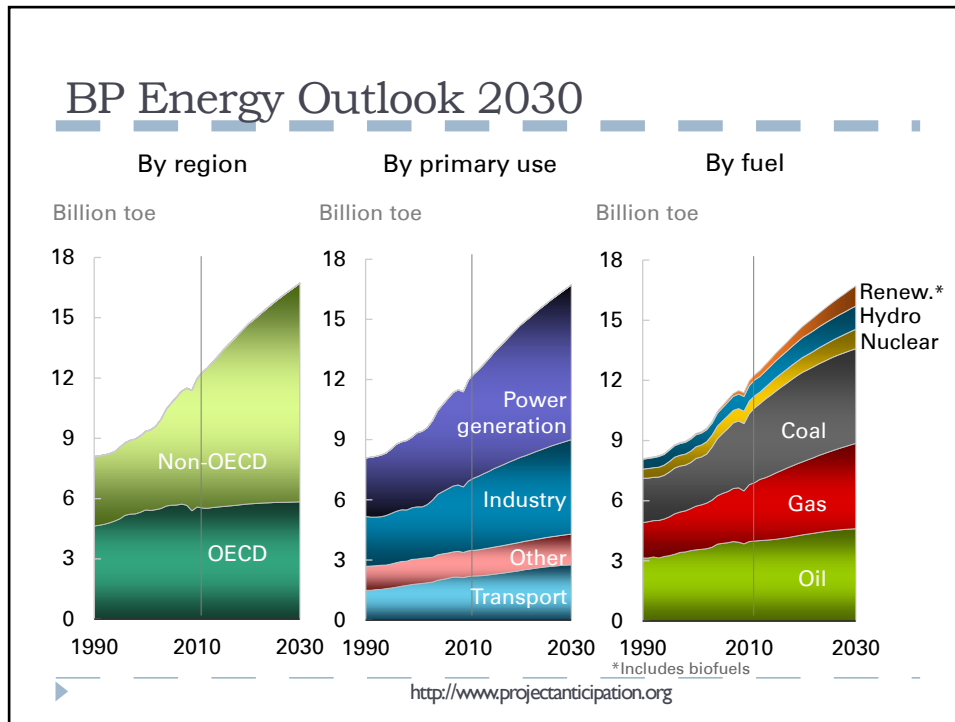


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World Energy Consumption

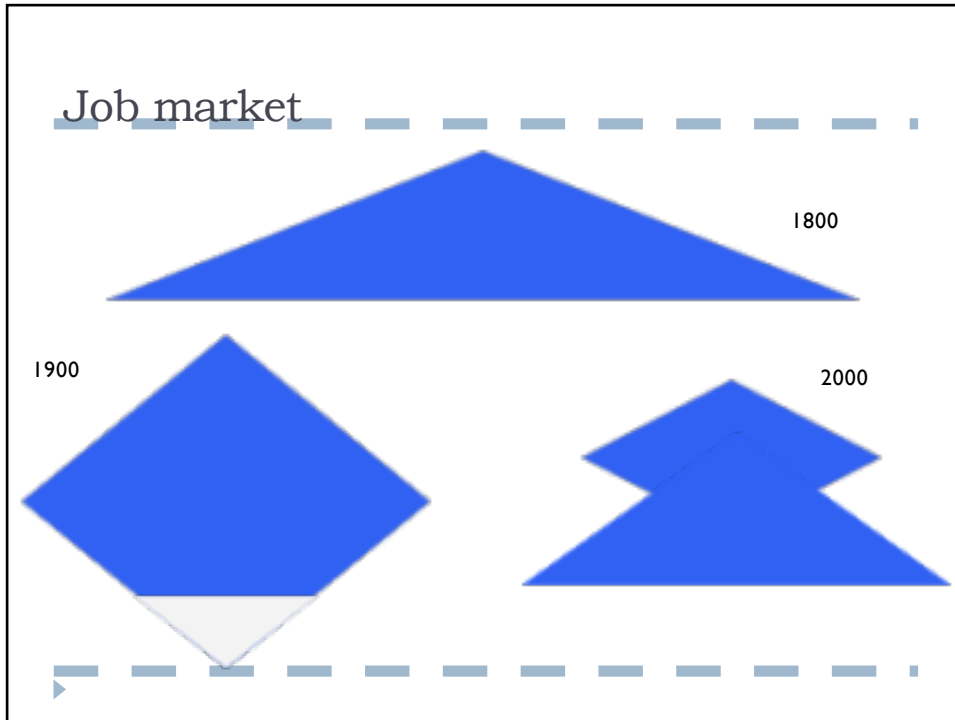


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2nd step B: Visioning

- ▶ Still undecided situations
 - ▶ Future of work
 - ▶ OBOR
- ▶ The worst mistake for a futurist is to confound megatrend and visioning



- ▶ High social differences
- ▶ No social mobility
- ▶ Democracies, as we know them, may prove unable to manage this situation

Question

How to regenerate the middle class?

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OBOR – The new silk road

- ▶ A 900 billion project
- ▶ Two routes: terrestrial route (One Belt) e maritime route (One Road)
- ▶ The commercial center of gravity of the world moves from the North Atlantic (between Europe and USA) to either the Pacific (between Asia and the USA) or OBOR (between Europe and Asia)

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Question

▶ Where exactly the belt will lie?

- ▶ Russia is intervening to make it pass "a little further north" (in its territories); but it is also gearing up for the case in which it will pass "a little further south"



Futures Studies

Megatrends

Principles



The main rule

- ▶ Avoid short-term blackmail
- ▶ The 1-2-3 year models are useless (that is, they only serve for daily management)
- ▶ Work with time windows of at least 20 years
- ▶ It's the only way to 'see' what could happen
- ▶ ... and that could give us enough time to try doing something

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The challenge

- ▶ Develop skills appropriate to the 21st century
 - ▶ FUTURES LITERACY
- ▶ Understand the concept of 'literacy'
- ▶ Why a new form of literacy?
- ▶ The challenge: to develop anticipating companies – open to the future (the real future, that of the 21st century, not the future of previous centuries)
- ▶ Understanding (and managing) changes, social acceleration, generations, ARM-Anticipatory risk management, future skills

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Principles

Working with the future cannot be done naively; it requires deep expertise

Working with, not for

Learn our methods!

Win-win outcomes!

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Living Reference Work
Continuously updated edition

Handbook of Anticipation

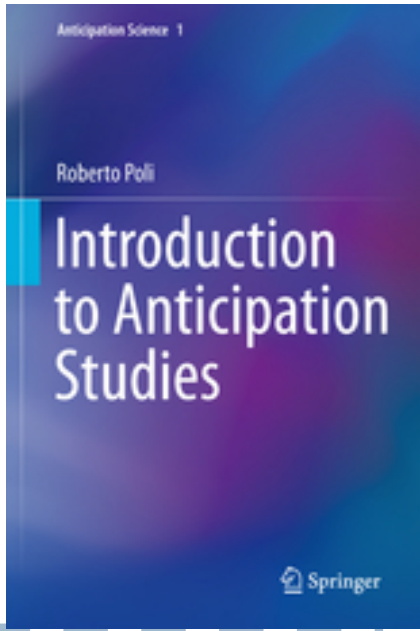
Theoretical and Applied Aspects of the Use of Future in Decision Making

Editors: Roberto Poli

ISBN: 978-3-319-31737-3 (Print) 978-3-319-31737-3 (Online)

- 1st systematic survey of anticipation across sciences, disciplines, research programs and field experiences
- About 90 chapters – 1800 pages
- Printed and online versions – the latter will be updated

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<p>Introduction Anticipation in the Natural Sciences Anticipation in the Human and Social Sciences Understanding the Future</p>	
<p>Anticipation in Philosophy Ontological Sketches Process, Cause and Emergent Time and Times</p>	
<p>Systems Complexity Impredicativity The Modeling Relation The Self-generation of Models</p>	
<p>Applying Anticipation What Next?</p>	

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You ain't seen
nothing yet

▶ Thank you!



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What Next?

- ▶ CITIES 1: ENGAGE – NW ∞ LAB
- ▶ CITIES 2: COMPLEXITY – Cities and the failure of large engineering projects
- ▶ BIASES: Cognitive and social biases
- ▶ EDUCATION: Future-Labs in the classroom

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Cities



NATIONS UNIES



Mairie de Libreville

NEW WORLD LABORATORIES (NW ∞ LABs)

Young People envision their cities for 2050

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New World Laboratories

- ▶ A worldwide visionary project starting from Africa
- ▶ Some questions
 - ▶ Are we able to think, feel and sense beyond our limitations – beyond the separation and fragmentation of reality?
 - ▶ Are we able to imagine and make space for the next steps in human evolution?
 - ▶ Are we able to innovate ways of collectively envisioning a new world?
 - ▶ Can we express leadership and responsibility from a “We” instead of a “I” perspective?
 - ▶ Are we able to gather change-makers in all continents to co-create and manifest “PolEthics” (instead of Pol”l”tics) in all aspects of society?
 - ▶ How could we engage local communities, interconnected at the global scale, in such a deep transition?

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NW ∞ LAB Concept

- ▶ A collective intelligence process/experience for New Leaders
- ▶ New Leaders profile: Young - Decision makers, Spiritual leaders, Artists, NGOs Leaders, Activists, Scientists, Inventors, Educators, Athletes, Therapists, Designers, Visionaries, ...
- ▶ NW ∞ LABs are spaces of sharing where each participant is expected to bring and share their inventions, technologies, artistic creations, DNA, ... and inspiring movies, songs, books, music, poems, games, dances, theatre plays, quotes, ...
- ▶ NW ∞ LABs Rules of the game: no speeches, no predefined schedule, no ‘I’.
- ▶ NW ∞ LABs will be proposed to different networks of local communities around the world, such as City networks: Creative Cities, Transition Towns, Educational Cities, World Heritage Cities, Cultural Capitals, Book Capitals, Coalition of Cities against the racism...


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NW ∞ LAB

- ▶ The **first New World Laboratory** will be co-created in Gabon, at the initiative of the United Nations and the Libreville City Hall, at a gathering of New World Leaders **in October 2018**
- ▶ About 30 young people, between 18 and 35 years, coming from the 5 continents, will get together for 5 days to define the concept of New World Laboratories

If you are interested or know cities and young people willing to run a NW-Lab, drop a line to Vincenzo Fazzino: E.Fazzino@unesco.org


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Cities and the failure of large engineering projects

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Large engineering projects

- ▶ Many large engineering projects follow the paradigm established by the Manhattan project and the Space program (Bar-Yam 2003)
- ▶ General assumptions:
 - ▶ Clear understanding of the basic principles that govern the system
 - ▶ Goal and specifications of the project clearly understood
 - ▶ Managers know what needs to be done
- ▶ However, despite the enormous investments that are made, many projects end up as failed and abandoned
 - ▶ London Ambulance Service Computer Aided Dispatch System
 - ▶ Hotel reservations and flights - Hilton, Marriott, Budget, American Airlines
 - ▶ Etc etc

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Overview (Bar-Yam, Cohen)

- ▶ Over 50% of the projects are 'challenged'
 - ▶ over budget typically by a factor of two
 - ▶ over schedule by a factor of two
 - ▶ did not meet about two thirds of the original specifications
- ▶ 30% of the projects are 'impaired' – that is they are abandoned
- ▶ Under 20% of the projects are on-time, on-budget and on-function

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Question

Is there any **systematic reason** behind the high percentage of failures and the remarkable percentage of challenged projects?

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Inherent vs superficial complexity

- ▶ The complexity of the Manhattan and Space Projects was **superficial** because the tasks that they were striving to achieve were relatively simple
- ▶ The complexity of most contemporary engineering projects is **inherent**
 - ▶ Multiple feedback loops: changes in one part may have effects on other parts of the system
 - ▶ Emergent collective behaviors: unanticipated effects that lead to failures of the system
 - ▶ (etc)
- ▶ Inherent complexity = complexity proper
- ▶ Superficial complexity = complicatedness

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Techniques

- ▶ A bunch of techniques have been developed to address the complexity of these projects, such as
 - ▶ modularity
 - ▶ abstraction
 - ▶ hierarchy
 - ▶ layering
- ▶ These methods are useful, but at some degree of interdependence they become ineffective

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Techniques

- ▶ **Modularity = separate a large system into parts that can be individually designed and modified**
 - ▶ Modularity incorrectly assumes that a complex system behavior can be reduced to the sum of its parts
 - ▶ As systems become more complex the design of interfaces between parts occupies increasing attention and eventually the process breaks down
- ▶ **Abstraction simplifies the description or specification of the system**
 - ▶ However abstraction assumes that the details to be provided to one part of the system (module) can be designed independently of details in other parts
- ▶ **Modularity and abstraction are generalized by various forms of hierarchical and layered specification, whether through the structure of the system, or through the attributes of parts of a system (e.g. in object oriented programming)**
- ▶ **These two approaches either incorrectly portray performance or behavioral relationships between the system parts or assume details can be provided at a later stage**

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Why aren't these enough?

- ▶ The simple-too-simple answer: these techniques are hard to get right
- ▶ A better answer: the effect of interdependence of parts and functional complexity of the parts and the whole system should be addressed
- ▶ Two theorems
 - ▶ Law of Requisite Variety – the complexity of the engineered system must be related to the complexity of its task
 - ▶ Openness of Functional Interaction – for all practical purposes adequate functional testing of complex engineered systems is impossible (Bar-Yam, Rosen)

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What can be done?

- ▶ Whenever possible, limit the complexity of objectives
- ▶ Otherwise, use an evolutionary process
 - ▶ When simplification does not work because the function required is intrinsically complex
 - ▶ Try in a systematic manner many alternative solutions
 - ▶ Create an environment in which a process of innovation and creative change takes place
 - ▶ Involve multiple small teams in design and implementation of changes. Note that this is the opposite of standardization
 - ▶ Conduct your testing 'in the field' – learn effective solutions through direct feedback from the environment
 - ▶ Exploit a context designed for redundancy and robustness so that the implementation of alternatives can be done in parallel and effective improvements can be combined

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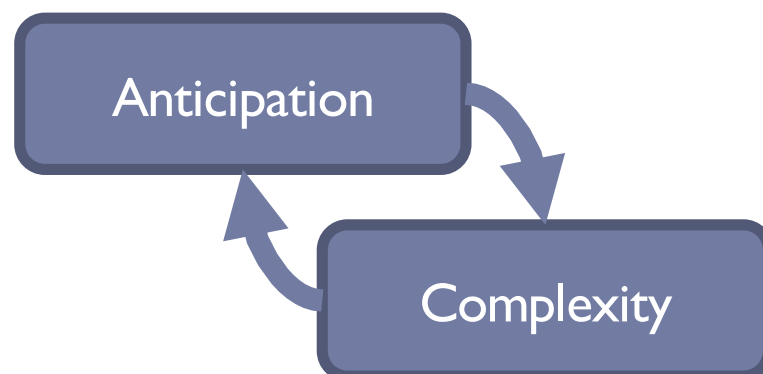
On a more sophisticated level

- ▶ Establish module boundaries and encapsulation methods so that interdependence between modules is simpler than dependence within modules
- ▶ Since comprehensive advance planning is often not possible, design the system to be effective in an adaptive process
- ▶ Since selection and competition after some time generally gives rise to a single dominant type that inhibits innovation, promote change and destabilize uniform solutions to problems (when appropriate)
- ▶ Balance between adoption of improved solutions and inhibiting propagation in order to allow sufficient time for testing (If adoption is too rapid, a solution that appears effective over the short term may come to dominate before it is tested in circumstances that are rare but important, leading to major failures when these circumstances arise; if adoption is too slow, the system cannot effectively evolve, giving rise to an inhibition of change)

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The main issue

- ▶ Interaction between complexity and anticipation
 - ▶ Anticipatory systems are inherently complex
- ▶ I have addressed only complexity-related aspects, leaving anticipation-related aspects for another occasion



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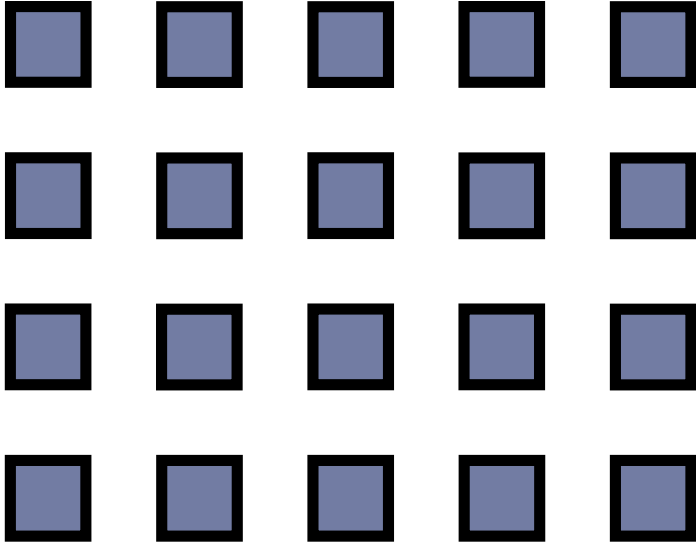
Biases, biases, biases

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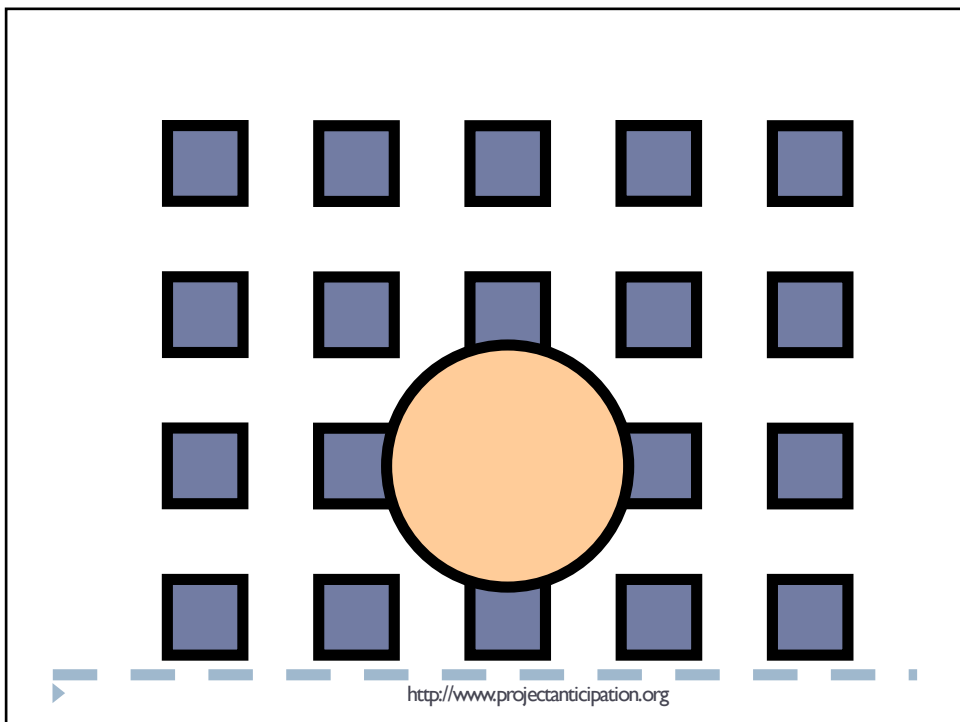
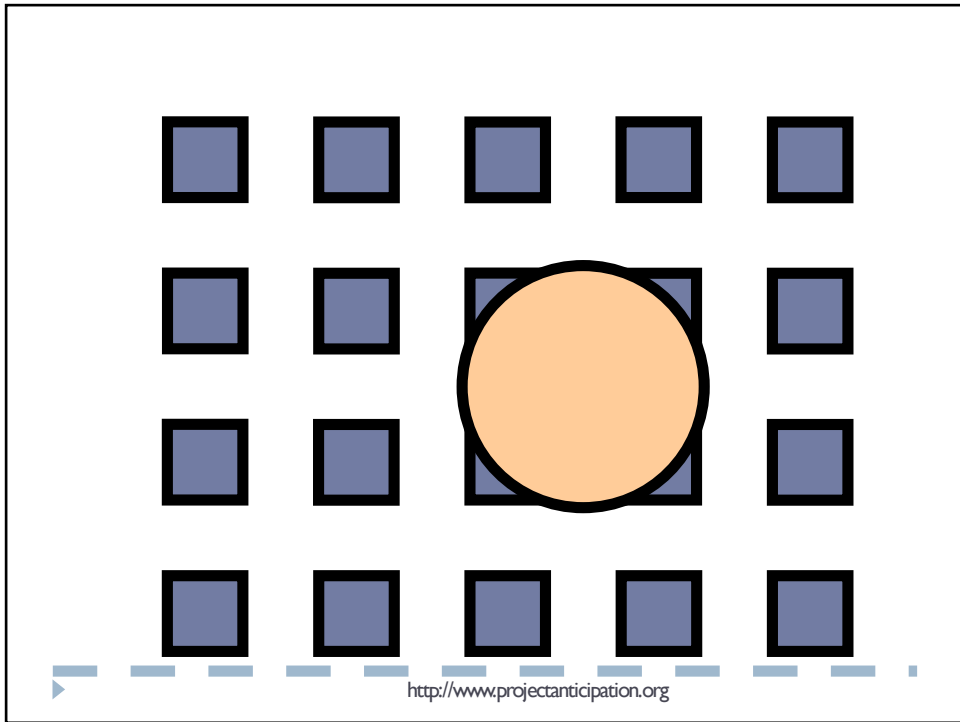


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Why is this important?

- ▶ The opposition between “seeing” and “knowing”
- ▶ All mental models are biased
 - ▶ Challenging/changing mental models requires dedicated interventions
 - ▶ One of the deep roots of prejudice
 - ▶ I know I should be vegetarian, but that steak looks so tasty ...
 - ▶ The more we are deeply focused on a task, the less we see of our environment
- ▶ Know our own mental models (including their biases and prejudices) and find ways to change them
- ▶ Sometimes, the solution to our problems requires that we learn to see/know things differently
- ▶ Our “inherited” models (including biases and prejudices) are all derived from the past – even if they have proven so far successful, this does not imply that they will be successful in the future as well, in situations very different from those we are accustomed to

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Anticipation

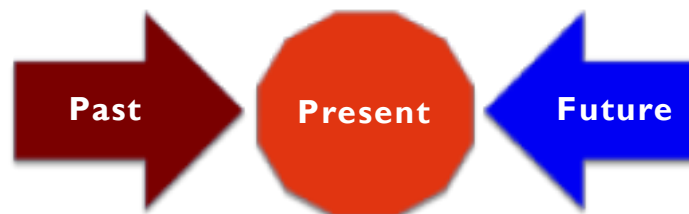
- ▶ Anticipation forces a re-evaluation of the very idea of science
- ▶ The underlying idea is to use the future to reshape the human and social sciences
- ▶ As a matter of fact all human and social sciences have accepted, to varying extents, what is possibly Newton’s most important *implicit* assumption, what Rosen called the Zeroth Commandment:
 - ▶ “Thou shalt not allow the future to affect the present” (Rosen 1991, 49)
- ▶ The Zeroth Commandment implies that all information comes from the past and no information comes from the future
- ▶ The idea that at least some information may derive from the future is the source of the theory of anticipatory systems

Future information

- ▶ At a first sight, the expression “information that is coming from the future” appears implausible, unless one reads the expression “coming from the future” as concerning information conveyed by a **model** of the system
- ▶ “Model” here is a **shorthand** for a variety of situations including “theory”, “idea”, “guess”, “belief”, “hope” and “fear”
- ▶ All them convey information on the future
- ▶ Models can be explicit or implicit
 - ▶ Theories and ideas are usually explicit
 - ▶ Beliefs, hopes and fears are either explicit or implicit

Two perspectives

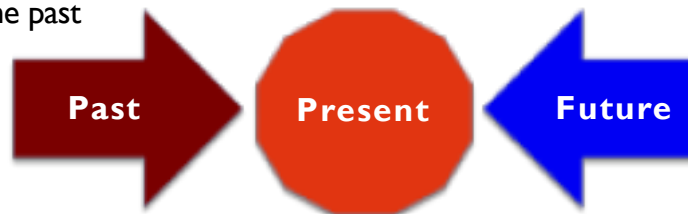
- ▶ The traditional saying: **use the past to understand the present** (*historia magistra vitae*)
- ▶ The new vision: **use the future to understand the present** (= anticipation)



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Caveat!

- ▶ These two perspective aren't orthogonal – one can, and should, use both
- ▶ To make sense, the present can't be seen as an extensionless boundary between the past and the future (thick against thin present)
- ▶ Similarly, the future should be seen as a force, on a par with the past



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Problem

The Zeroth Comandment
 “Thou shalt not allow the future
 to affect the present”

- ▶ By giving full scientific legitimacy to the future, a remarkably new vision of science arises – including a fully scientific (i.e., not allusive, metaphorical or mystical) treatment of ‘final’ causation (= anticipation)
- ▶ Here I will follow a pretty prudential/conservative route – even so, you will see that many surprises are in store

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The main question

- ▶ Why do we study the future? – to take better decisions today
 - ▶ Not only: use the past to understand the present, but also: use the future to understand the present
 - ▶ The present – where the forces of the past and future meet
 - ▶ Thick against thin understanding of the present
- ▶ If we are blind to the future, we fail to understand the present
- ▶ And we fail to see that the present is already future-bound
 - ▶ No action can be performed without a future component – even as simple an action as to go out to buy some bread involves the future
 - ▶ Similarly, no decision, no project, no plan can be devised without involving some stretch of the future (here and now, in the present)
 - ▶ “... via intentional agency, the present is always futurized, i.e., the future is always present in the moment of action” (Patomaki 2011)


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However

Why the future is so easily discounted?

- ▶ There are many reasons for discounting the future. One is: “The End of History Illusion” (*Science*, 4 Jan 2013, vol. 339, pp. 96-98)
- ▶ Extensive survey (19,000 people, aged 18-68)
- ▶ “Young people, middle-aged people, and older people all believed they had changed a lot in the past but would change relatively little in the future.”
- ▶ “People, it seems, regard the present as a watershed moment at which they have finally become the person they will be for the rest of their lives.”
 - ▶ 10 years ago I was very different from the person I am now – At the end of the next 10 years I will be the same person I am now
- ▶ The illusion leads “people to overpay for future opportunities to indulge their current preferences.”

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Fut-Labs in the classroom

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