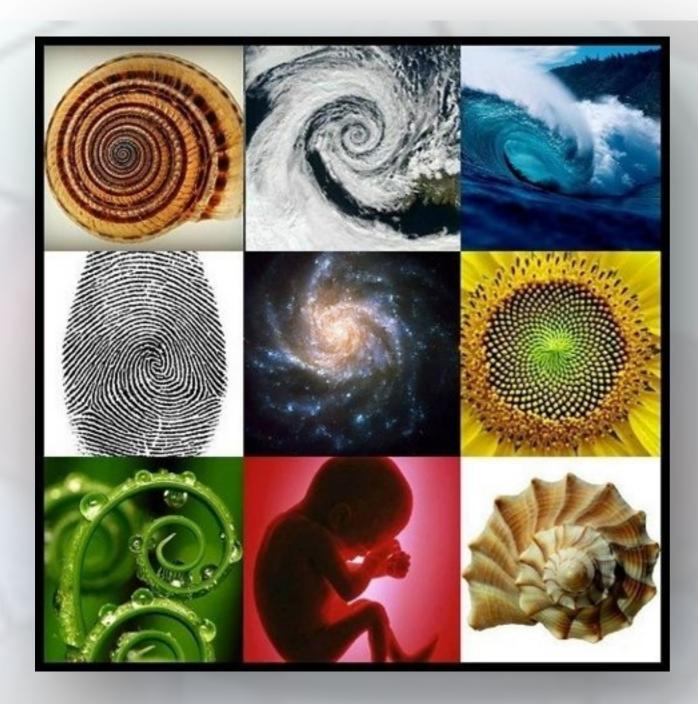


### Exercise 1



Why 'complexity'?

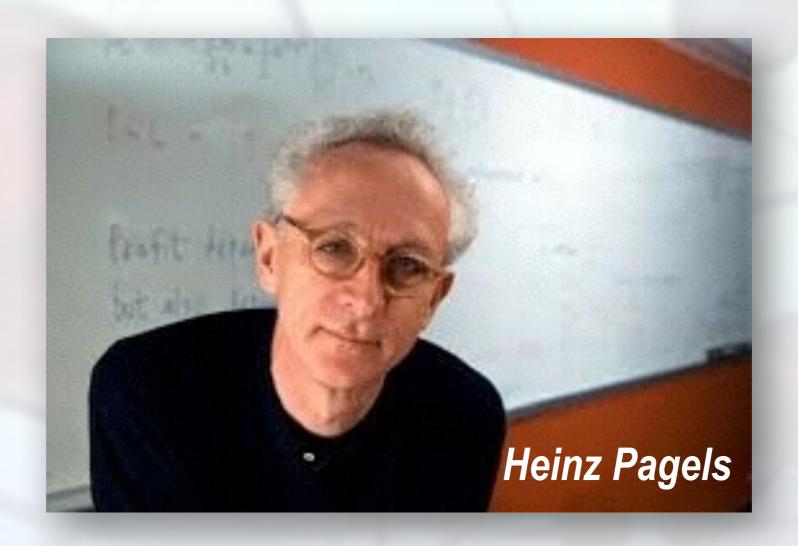
What does 'complexity' mean to you?



## "The 21st century will be the century of complexity"



"The nations and people who master the new sciences of complexity will become the economic, cultural, and political superpowers of the 21st century."





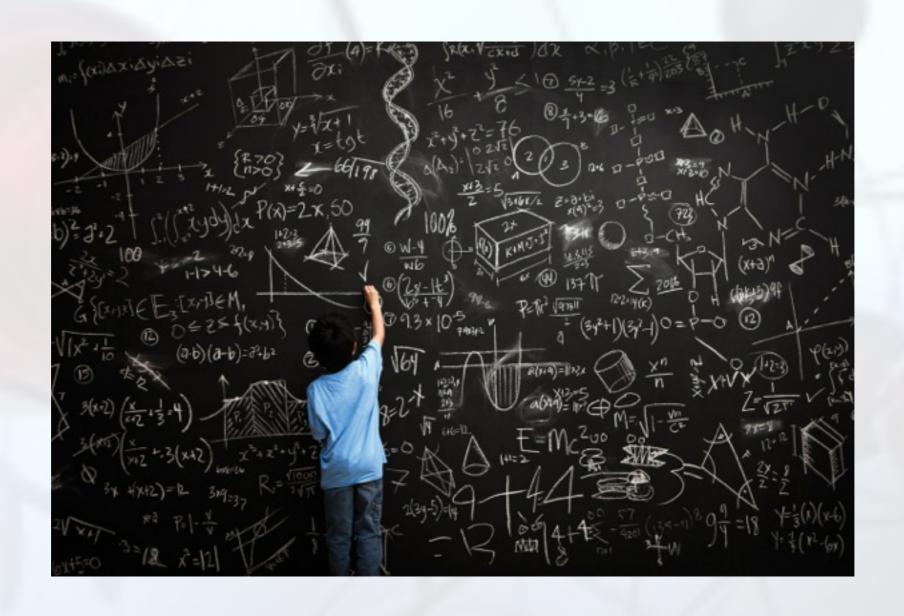
"Complexity embodies some of the hardest, most fundamental and most challenging open problems in academia. In that sense it is truly "big science". It also lies at the root of the most burning issues that we must face every day, such as climate, hunger, sustainability, energy, urbanization, water, health, security, innovation, and the impact of technology. In that sense complexity is what we have created, what we are, and what we do. The most compelling challenge for the world community is to find ways to "deal" with that complexity and therefore to exercise some element of control over our future.

Complexity as "big science" is key to meeting this challenge"





Defining a complex system is itself a complex problem, to the point that today there is no universally accepted definition of a complex system. (Italian Institute of Nuclear Physics)





### **COMPLICATED VS COMPLEX**

AIDI	TO	
	ЛСА	TED

**COMPLEX** 

**ETIMOLOGY** 

CUM PLICUM (SHEET FOLD)

CUM PLEXUM (KNOT OR WEAVE)

**APPROACH** 

**ANALYTIC** 

**SYSTEMIC** 

**SOLUTION** 

**EXPLAINING** BY STRAIGHTENING FOLDS

UNDERSTANDING THE WHOLE

**EXAMPLE** 

MECHANISM

→ CLOCK

ORGANISM

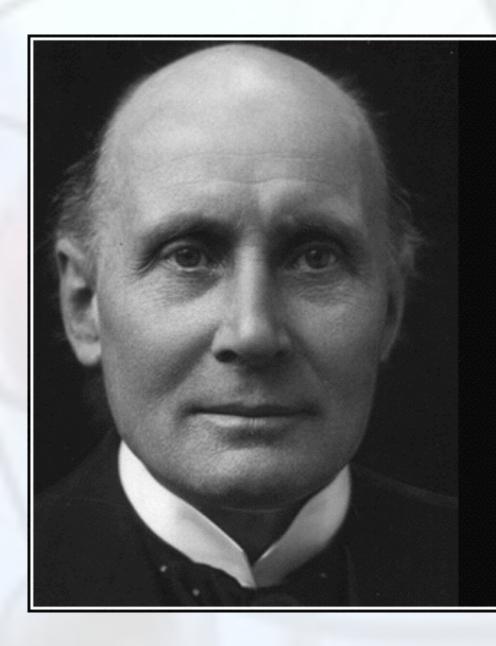
→ LIFE



## **COMPLEXITY, SEMPLICITY AND DESIGN**



### A FEW SIMPLE RULES TO ORGANIZE THE WORLD



...the only simplicity to be trusted is the simplicity to be found on the far side of complexity.

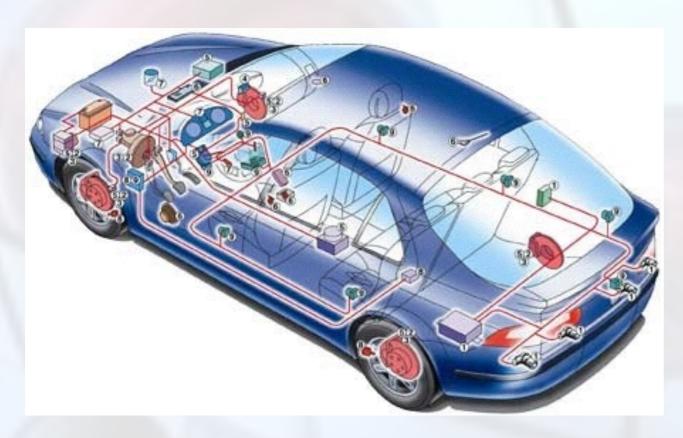
— Alfred North Whitehead —

AZ QUOTES

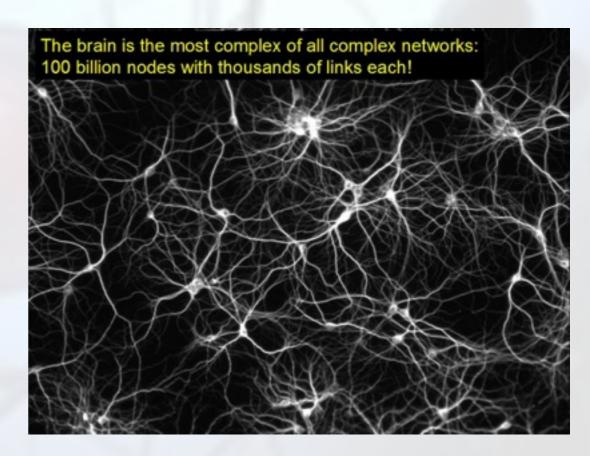


## A PARADIGM SHIFT: COMPLEX SYSTEMS UNDERGO A CONTINUOUS REORGANISATION OF ITSELF

In complicated systems: importance of components



In complex systems: the importance of relations between components change continuously





## A different way to see the world Complexity vs Reductionism

- ★ Complexity theory proposes a different way of
  - \* thinking
  - \* seeing the world
  - \* conducting scientific inquiry
- ★ Standard sciences tend to see the world as mechanicistic looking at smaller and smaller scales
  - \* In biology the investigations go from classifying organisms to functions of organisms, then organs themselves, then cells, and then organelles, right down to protein and enzymes, metabolic pathways, and DNA
- ★ This is finer and finer reductionist thinking

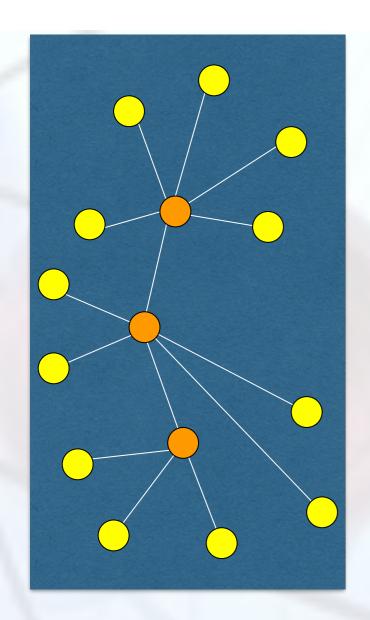


## Interaction and relationship

- ★ Complexity theory looks in the other direction
- ★ Complexity is looking at interacting elements and asking
  - \* How do things assemble themselves?
  - \* How do patterns emerge from these interacting elements?
  - \* How do these patterns unfold or evolve over time?
- ★ Complex behaviour arises from interaction
- ★ Complexity theory focuses on relationships within the whole
- ★ The distinguishing feature of complex systems is that they can create new order



### THE RELATIONSHIP CONNECTS





«You believe that because you understand "one" you must understand also "two", because one plus one makes two. But you also have to understand "plus" » (ancient proverb Sufi)



### **NODES AND RELATIONSHIPS NETWORK ACTIVATION**



In network analysis, individual elements are called "nodes". It is not only a question of considering the term "complex" as meaning a "weaving" or a fabric whose image is static and does not show the dynamics of interactions between nodes. Rather, it is about considering the complex system as a network of nodes that are in a relationship with each other and studying how its effective activation can take place.



## Interdependence

### What is Interdependence

- \* Interdependence is the mutual reliance between two or more persons or groups
- \* Dependent relationship: some members are more dependent and some are less dependent
- \* In an interdependent relationship, participants may be emotionally, economically, ecologically and/or morally reliant on and responsible to each other

### Types of Interdependence

- \* Biological interdependence between e.g. plants and animals
- \* Social Interdependence
  - Interdependence of nations e.g. international trade, defence, cultural exchange
  - Organisational interdependence
    - Pooled interdependence
    - Reciprocal interdependence



## Pooled interdependence

- Lowest form of interdependence
- Resulting in the least amount of conflict
- Departments do not directly depend or interact with one another
  - \* they draw resources from a shared source
  - every separate department contributes to an overall goal
  - \* the outputs of each department are then pooled at an organizational level
- Although the success and failure of each department do not directly affect one another
- It does affect the overall success of the company therefore indirectly affecting one another



## Reciprocal interdependence

- Highest potential for conflict
- Because it requires high levels of communication
- The output and input of activities flow in both directions between units
- The direct interaction between co-workers can create
  - \* a tight interconnection contributing to a high level of productivity
  - \* or a high level of conflict
- Managing a reciprocal interdependent work environment requires thorough and constant information sharing



### Exercise 2

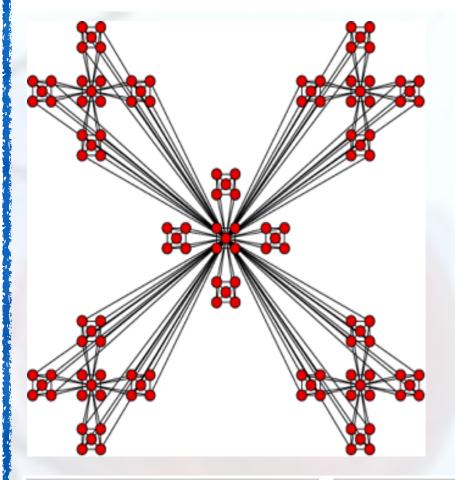
Looking at the world in general, can you identify some examples of:

- \*Social systems with intricate inter-connectivity and interdependence
- \*What were the effects of an intervention in one part of that system?

Report back one or two examples



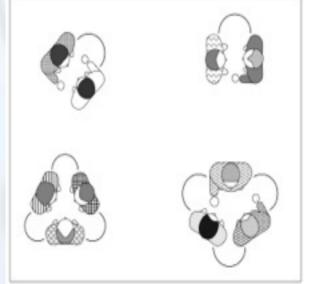
### **HUMAN AND TECHNOLOGIAL NETWORKS**

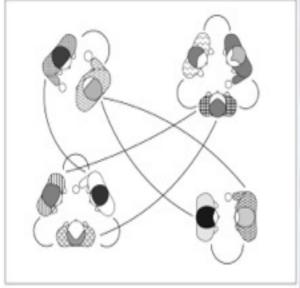


"Networks are the skeleton of complexity, the mechanisms on which the processes that make the world pulsate are articulated"

### Albert Laszlo Barabasi









# TO INQUIRE INTO THE CONNECTIVE STRUCTURES AND INTO THE DIFFERENT PROPERTIES OF THE DIFFERENT LOGICAL TYPE CLASSES

**«What is the structure that connects the crab with lobster, orchid with primula and all four with me? And me with you? And all of us with amoeba on one side and schizophrenic on the other?»** 

«The class is of a different logical type, superior to that of its members.»

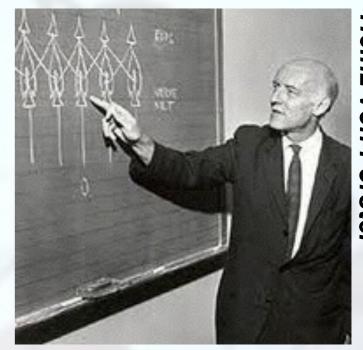




## INFORMATION DOES NOT EXIST IN ITSELF BUT IS THE WAY WE CHANGE

"There is no passing of information, because information does not exist. Information is the way you change after involvement with someone"

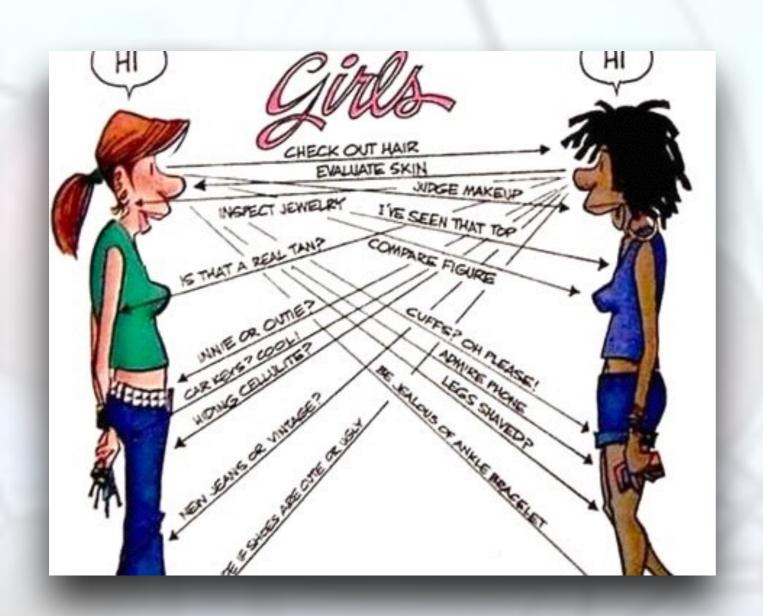




Heinz von Förster

"Thus libraries are not the equivalent of scientific knowledge, knowledge is in the mind of those who make science and those who read books taken from libraries. There is no passing of information, because information does not exist. It's in my head and I can tune with another, like in a dance, after which I know more than before. This dance is a dialogue spoken, written or read with someone. Information is the way you change after getting involved with this someone»

For example, each message has an aspect of CONTENT (the news, communication data) and one of RELATIONSHIP (the command, the way you need to consider data to understand)



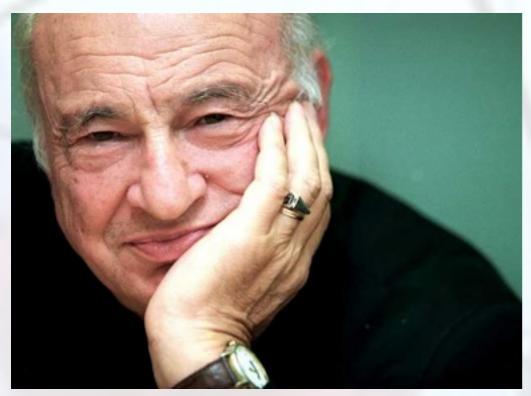
EACH PERSON COMMUNICATES
TO THE OTHER HIS OWN
PRE-CONDITIONS SYSTEM!

Level 1 - Content Level 2 - Relationship

They are two very different logical-levels: any confusion between the two could lead to a meaningless result



## THE ECOLOGY OF ACTION Personal responsibility and unpredictable effects



Edgar Morin

"Every action increasingly escapes the will of its author to the extent that it enters the inter-retro-action game of the environment in which it intervenes"

- Networks of relationships with different degrees of connectivity:
  - \* strength of coupling the degree of connectivity between two things
  - \* epistatic interactions i.e. the fitness contribution made by one individual will depend upon related individuals



### **SOME SUGGESTIONS - 1**



#### **ABOUT NETWORK**

- •We cannot disjoin technology and human relations
- Everything tends to be connected with everything
- Each node of the network is in turn a network
- It is necessary to learn to recognize organizational patterns
- Small changes can lead to a major transformations

### **ABOUT LOGIC LEVELS**

- Each logical level has its own operating properties
- Thought must relate to the diversity of logical levels
- The context is the structure that connects the different logical levels
- The meaning of thoughts and actions is related to context



### **SOME SUGGESTIONS - 2**



#### **ABOUT INFORMATION**

- There is no objective knowledge of reality, but its coconstruction
- When B is better, A is better
- Education consists of learning to ask legitimate questions
- "Take action to increase choices for you and the others"

#### **ABOUT ACTION**

- The context is a dynamic system
- Each of us is the creator of the context
- There is no linear dependence between cause and effect
- There is no non-action
- The effects of the actions are imaginable but unpredictable



### FROM LOCAL TO GLOBAL: MORE IS DIFFERENT!

"Marx said that quantitative differences become qualitative ones, but a dialogue in Paris in the 1920's sums up even more clearly:

FITZGERALD: The rich are different from us.

**HEMINGWAY: Yes, they have more money.** 

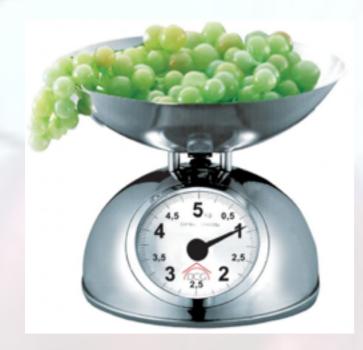
(P. W. Anderson, More is different, 1972)



At each level of complexity entirely new properties appear, and the understanding of the new behaviors requires research which I think is as fundamental in its nature as any other."

(P. W. Anderson, More is different, 1972)

### FROM QUANTITY TO QUALITY: MULTI SCALE SYSTEMS!





The passage of scale is a passage from the quantitative aspect (local or micro level) where there are many interdependent elements to the qualitative aspect (global or macro level) where a new level emerges with new qualities and new forms.



### **EMERGENCE PROCESS**



EMERGENCY
PROCESS OF A NEW
ORGANIZED SYSTEM

We observe an emerging behavior when individuals in a system think and act locally but their collective action produces a behavior that generates a new way of organizing themselves at a global level



### Exercise 3

★Can you identify examples of:

- \* Emergence
  - \* In your professional environment?
  - \* Any other context?



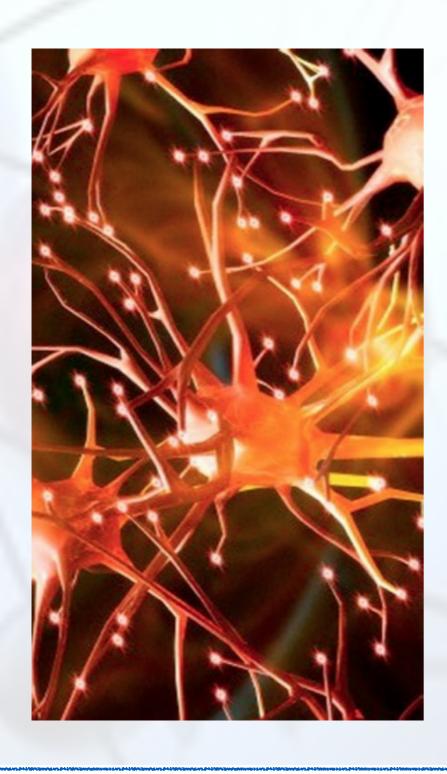
### **COLLECTIVE BEHAVIOUR**



«I study ants because I like to think about how organizations work, and in particular how simple components of organizations interact to create the behavior of the entire organization. Ants colonies are a good example of such an organization, and there are many others. One is the web, but there are also many biological systems -- brains, cells, embryos that develop» (Deborah Gordon, Ted Talk)



### DIFFERENT PROPERTIES TO DIFFERENT LEVELS



Neurons have a collective behaviour (a neuron is excited if you excite the neurons with which it has links) and are in large quantities: the analysis of the macro level is necessary to understand phenomena such as memory, intelligence, mind, memories, consciousness. It makes no sense to try to understand these phenomena by analyzing them at the micro level of the individual neuron. The information is not linked to one or more specific neurons, but is distributed among their links, i. e. in the emergence of their collective behaviour



### **GROUP BEHAVIOUR**



Stephen Strogaz

"In the relity, complex networks are the natural scenario for the most mysterious forms of group behaviour that science faces today. If ever the day comes when we understand how life emerges from a dancing of lifeless chemicals, or how consciousness is born from billions of unconscious neurons, these discoveries will surely be based on an in-depth theory of complex networks. At the moment such a theory is almost inconceivable"



### TWO WAY PROCESS - DOUBLE CAUSATION

"In an organized being, the totality exists for and thanks to the parties and the parts exist for the totality"

New constraints and New possibilities!



Stuart Kauffman

- Bottom-up (micro to macro): through interaction of individual interacting agents (downward causation)
- \* Top down (macro to micro): the emergent constrains the interacting agents in two ways (upword causation):
  - a) what actions they can enact, and this may limit their options;
  - b) at the same time it opens up new possibilities, not available to individuals on their own.



### **EMERGENCE AND MULTIPLE SCALE ANALYSIS**

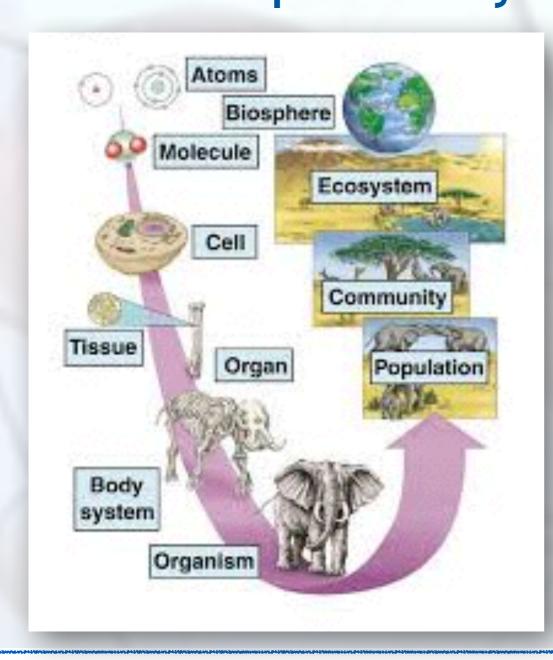


The hierarchy defines the degree of complexity: the higher the hierarchical levels that make up the system, the more complex it is.

We can analyze complex systems by levels of complexity, according to an emerging scale that configures their evolution in time and space.



Progressive nesting of increasingly complex systems from atoms to human societies and ecosystems. Creative possibilities at every level and combiners increase exponentially



Complex nested evolving systems (CNES)

The behaviour of CNES is not explained by a simple extrapolation of the properties of smaller systems. On the contrary, at every level of complexity entirely new properties, new constraints and new possibilities appear



### **SOME SUGGESTIONS - 3**



- Quality requires quantity and includes quantity
- The complex paradigm includes the determinist paradigm
- It is necessary to have a vision of collective dynamics
- Knowledge needs to be integrated to create a transdisciplinary culture of complexity

### SYSTEMS DEVELOPMENT

- The systems are nested inside each other giving rise to a "co-evolutionary hierarchy".
- All phenomena have a double causation
- The creativity of nature is sacred and should be looked at with amazement



# What happens when several elements interact with each other? A change!



Interaction between two or more elements can lead to three different states:

Stabilized cycle (static order)
Self-organization (dynamic order)
Chaos (disorder)



### **EMERGENCE AND CHANGE PROCESSES**

- Emergent processes and patterns arise from <u>interaction</u>
- No event can be accurately foreseen
- No additive or cumulative processes
- More than the sum of the parts

### Examples of emergent processes:

- learning, innovation, love
- new ways of organizing and new organisational schemes

Emergence needs to be taken into consideration in any change process



### **NATURE OF CHANGE PROCESSES**

- **★ Step change fundamental, radical change** 
  - \* Revolutions/uprisings
  - \* Often apparent not actual
  - \* Change takes place all the time at a micro level
- **★ Incremental change** 
  - \* Next adjacent
- ★ Both necessary and both may be happening at the same time



# TIME ARROW Previous order isn't recoverable

A chain of irreversibile events leads to chaos

Things have to happen so that two people come into contact with each other....



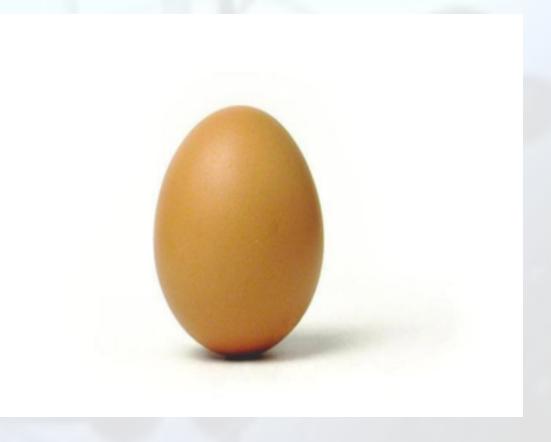




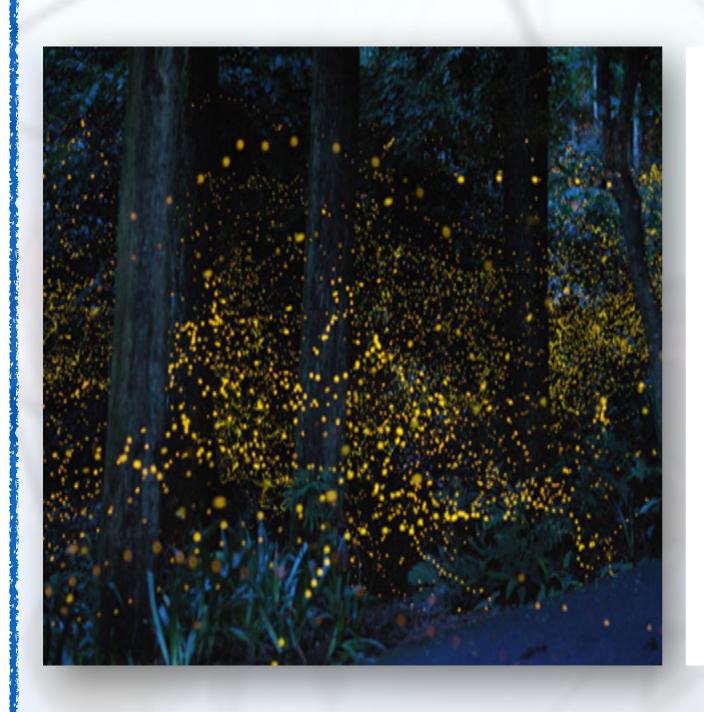
"There is a corresponding force in the universe with respect to that of entropy; the tendency towards spontaneous order"

(S. Strogatz)





### Synchronicity: spontaneous order over the time



#### synchronicity · noun

1. the experience of two or more events that are apparently causally unrelated or unlikely to occur together by chance, yet are experienced as occurring together in a meaningful manner.



# IN SOCIAL SYSTEM: WE TAKE PLEASURE IN SYNCHRONIZING



RESONANCE
IMITATION
SIMULATION
ADAPTATION
EMPATHY
COOPERATION



### **FAR-FROM EQUILIBRIUM 1**



- When an external event disturbs the behaviour of an open system significantly, so that it can no longer operate within existing limits, then it is pushed 'far-from-equilibrium'
- ★ In a social context: moving away from established norms, procedures, ways of working and relating
- ★ The system reaches a critical point when it will either explore its space of possibilities to find a different way of operating and survive or it will die
- ★ It will survive if it 'creates new order' e.g. new structures, or ways of working
- ★ The splitting into alternative solutions is called bifurcation
- ★ But, before the system settles into one solution, several alternatives were possible, and this is a rich source of innovation



### **FAR-FROM EQUILIBRIUM 2**



When a system is pushed far-from-equilibrium the following characteristics come into play to create new order:

- ★ Self-organisation
- ★ Exploration of possible solutions at the critical point
- ★ Co-evolution
- ★ Emergence of new structure
- ★ Coherence
- \* Precise behaviour can neither be predicted nor controlled
- \* Creation of new order



# PHASE TRANSITION FROM LOCAL TO GLOBAL: ACTIONS AND IMPACTS



Through many interacting elements the system moves towards a phase transition, which becomes the result of collective behaviour



# **SELF-ORGANIZATION SIMPLE RULES (3 plus 1)**



Survival property manifested only in the case of extreme danger

- \* All individuals are only aware of who is closest to them (coherence)
- Every individual has a tendency to conform (alignment)
- Everyone is attracted to each other but always tends to keep a small distance (separation)
- \* When a predator is coming in, you have to take out of the way (getaway)



# SELF-ORGANIZATION: THE ORDER EMERGES SPONTANEOUSLY FROM CHAOS



There is no need for an orchestra conductor to give time, nor do climatic conditions matter. The synchrony (for example: improvisation) is produced through a reciprocal exchange of signals, just like in the case of an orchestra that is able to stand perfectly at the time even without a conductor.



### **EMERGENCE AND HIERARCHY LEVEL**

- **★** The generativity of self-organization processes favours the emergence of new properties and allows a higher hierarchical level to manifest itself.
- ★ These properties become dominant for the overall behaviour of the system (new possibilities); the individual elements/systems that compose it are subserved to the new emerging structure (new constraints)

Spatial-temporal scheme that is not imposed from the outside but emerges spontaneously:

- \* In a situation of pressure to change
- \* From the interaction of many elementary elements
- \* From the development of the system as a function of its dynamics



### **SELF - ORGANIZATION**

- **★Is a process where global order or coordination** arises out of the local interactions between the components of an initially disordered system
- **★ It is spontaneous**
- ★It is not directed or controlled by any agent outside the system
- ★It is often triggered by random fluctuation that are amplified by positive feedback
- ★The resulting organization is decentralized or distributed
- **★** As such it is typically very robust and able to survive and self-repair substantial damage or perturbations



### Exercise 4

- ★ Can you identify examples of self-organisation?
- What role do they play in organisational transformation?
- ★ How can self-organisation and emergence be facilitated and constrained?

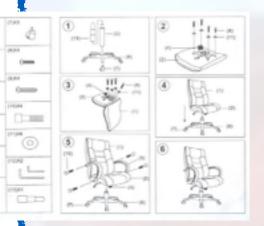


### **SCHEME - STRUCTURE - PROCESS**

3 general way to observe complex systems







SCHEME - configuration of functional relationship between the components of the organizational system that determines its essential characteristics. The SENSE (pattern/order/quality)



STRUCTURE - Physical materialization of the organizational scheme. The OBJECT (substance/material/quantity)



PROCESS - link between schema and structure. Activity necessary for the continuous materialisation of the scheme of organisation of the system. The PROJECT (is in the mind/body of designer)



# FEED BACK LOOP Connection Patterns

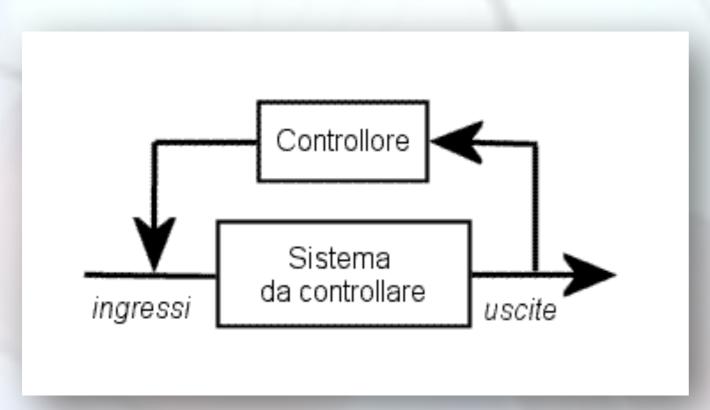
«Feedback is what makes everything work»



The ability of dynamic systems to take into account the results of the system to modify the characteristics of the system itself



### STABLE AND CONVERGING SYSTEMS \* SELF-REGULATING SYSTEMS NEGATIVE FEEDBACK LOOP

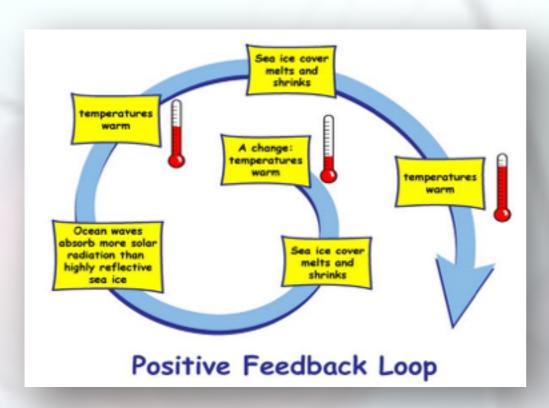


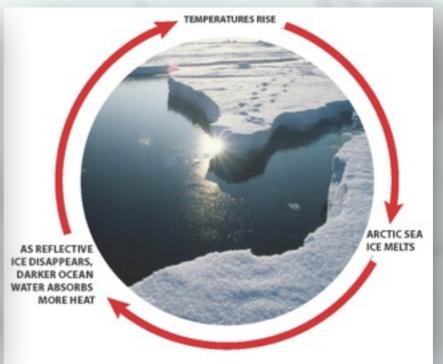


In the negative feedback loop pattern, the system results dampen the functioning of the system therefore stabilizing it.



### UNSTABLE AND DIVERGING SYSTEMS\* SELF - REINFORCEMENT SYSTEM POSITIVE FEEDBACK LOOP





**TRIGGER** 

In the positive feedback loop pattern, the results of the system amplify the functioning of the system, reinforcing it and making it unstable (banking or animal panic)



### Exercise 5

- ★Can you identify examples of:
  - Negative & positive feedback and path dependence
    - \* In your professional environment?
    - \* Any other context?



### FEED BACK LOOP

- Conventional economic theory is based on the implicit assumption of negative feedback loops in the economy, which lead to diminishing returns, which in turn lead to (predictable) equilibrium outcomes
- Negative feedback has a stabilising effect, and implies a single equilibrium point
- Based on the assumption that the right amount of correction can be applied in the most timely manner
- Both positive and negative feedback could exist at the same time or they may follow each other leading to multiple equilibria

#### **Internally**

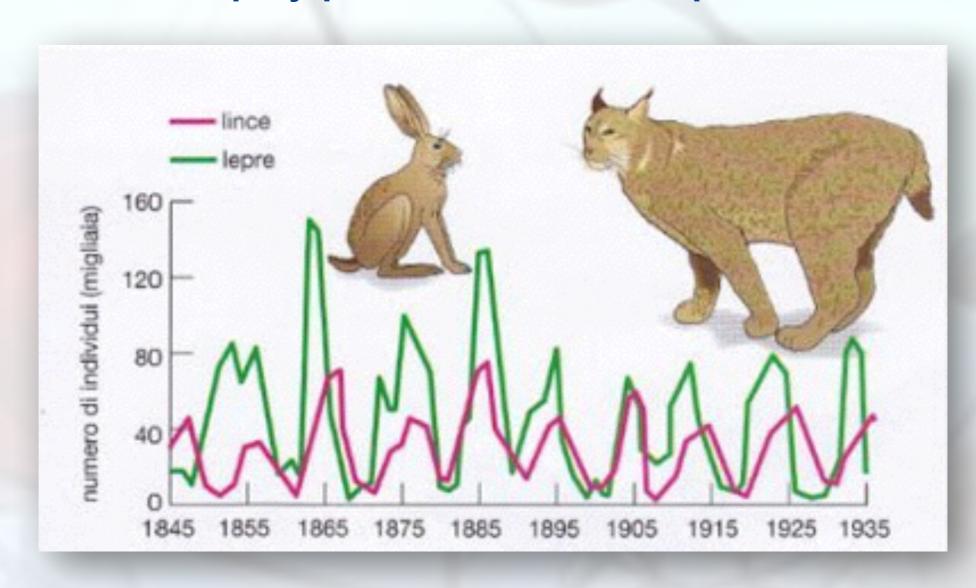
- Consider both feedback processes when initiating change
  - \* the outcome may not be precisely what was desired

#### **Externally**

- Consider both feedback effects
  - \* e.g. when external regulations/policies impact your organisation



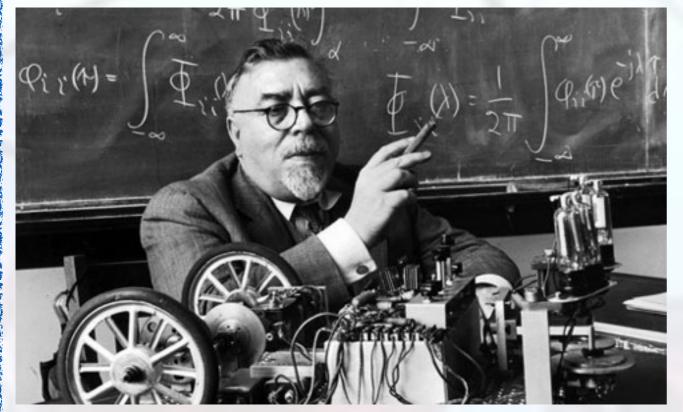
# BOND/CONSTRAINT prey-predators relationship



## CYCLIC EFFECT OF FEEDBACK EXTERNAL TO THE SYSTEM: THEY CAN SELF-REGULATE THE SYSTEMS



#### Norbert Wiener



"We are not materials that remain, but patterns that perpetuate themselves."

What makes a cell alive is not the molecules of which it is composed, but the pattern according to which they unite. Likewise, what causes a set of neurons to behave in a certain way is not the neurons themselves, but the pattern by which they unite. For scientists, this is a fundamental point: it is not the components but rather the connection scheme that gives a new property. Life, therefore, is the emerging property of a molecular scheme. Behaviour is an emerging property of a neuronal pattern. Language is an emerging property of society.

(Francisco Varela)



### THE LEARNING CIRCLE - 1



#### **EN-ACTION: A COGNITIVE PROCESS**

"To make active something that through our manipulation appears real in itself"

The world is not something that is "given" to us, but it is something we take part in by means of how we act. Cognition is an emerging phenomenon. Knowledge depends on being in a world that is inseparable from our bodies, our language, and our social history – in short, from our embodiment. Action and perception constitute unity, and the world does not exist except in this cycle, in this permanent internal/external link.



### THE LEARNING CIRCLE - 2



The en-action is the emergence of reality through its concrete manipulation. Knowledge is contextualized, concrete, embedded, lived. It is not the "abstract" knowledge, in a rarefied atmosphere, general, formal, logical, represented and planned in advance; cognition is based on the concrete activity of the whole organism: SENSE-MOTOR COUPLING



### THE LEARNING CIRCLE - 3



The world is not something that is "given" to us, but it is something we take part in by means of how we move, touch, breathe and eat.

#### PERCEPTIVELY GUIDED ACTIONS

Objects are not seen by visual extraction of characteristics, but by visual adjustment of the action

#### **EN-ACTION AND COGNITION**

- The world is inseparable from our sense-motor abilities
- Perception does not consist in the discovery of a pre-defined world, but is based on the perceptual adjustment of action
- Learning is a circuit that passes through the embodied experience



### THE ARCHITECTURE OF COMPLEXITY



1. Each complex system, regardless of its size, has a networked architecture, made up of nodes and connections and is hierarchically ordered by levels.

- 2. Each node in turn has a systemic organizational scheme: therefore it is again a network made up of nodes and connections between nodes and is hierarchically ordered by levels.
- 3. Each complex system is therefore a system made up of systems nested into systems, i. e. multiple networks nested into multiple networks according to hierarchically arranged scales by levels.
- 4. To carry out an analysis of a complex system means to analyze what are the recurring schemes to understand its evolutionary properties according to the creative circuit of double causation.





### PATH DEPENDENCE

- Persistent positive feedback can lead to path dependence
- The specific paths that a system may follow depend on its past history
  - \* i.e. past history affects (but does not determine) future development, and there may be several possible paths or patterns that a system may follow
- This explains why the precise behaviour of a complex system may be very difficult to predict, even while keeping the system within certain bounds

#### Established by positive feedback and path dependence:

- the gauge of railway tracks
- the English language becoming established as the standard language of air navigation
- a particular screw thread, which often cannot be changed even if alternative techniques or conventions may be better
- the qwerty keyboard



### **SPACE OF NEW POSSIBILITIES**

- ★ Exploration of new options, different ways of working and relating
- ★ Essential for innovation
- ★ The search for a single optimum' strategy is neither possible nor desirable, in a changing or turbulent environment
- ★ Multiple micro-strategies + distributed strategies, power, intellectual capital

### **NEXT-ADJACENT**

- ★ When searching the space of possibilities, whether for a new product or a different way of doing things
- ★ It is not possible to explore all possibilities
- ★ It is possible to consider change one step away from what already exists



### **CO-EVOLUTION AND COMPLEXITY THINKING**

- Reciprocal influence leading to change in the behaviour of the interacting entities (individuals, organisations, industries, economies, etc.)
- Co-evolution takes place within a social ecosystem
- If influence and change are entirely in one direction: 'adaptation to' a changing environment
- Short-term adaptation may result in long-term co-evolution
- ★Seeing organisations, economies, societies, etc. as complex social systems and by understanding their characteristics Helps us to address apparently intractable problems such as organisational transformation, political conflict, major geo-political issues, climate change, etc. & to address future challenges
- **★**To effectively change organisations by co-creating enabling environments that co-evolve with their changing external environment



### Exercise 6

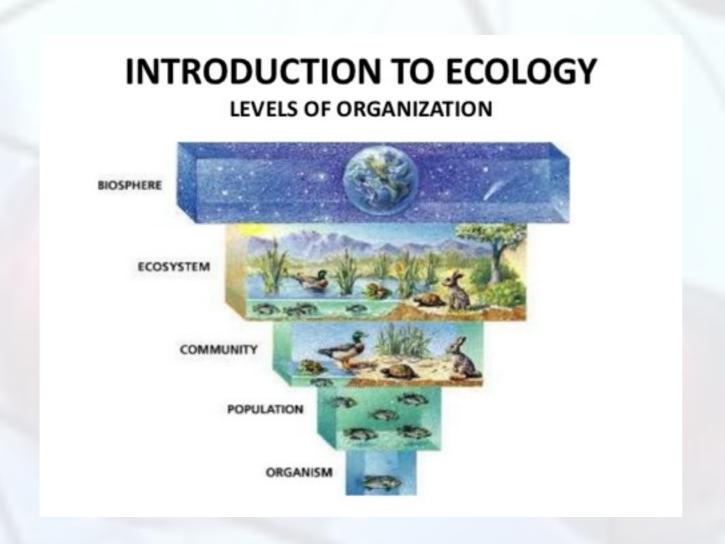
- ★ Can you identify examples of:
  - \* Co-evolution
  - \* Exploration of the space of possibilities
    - exaptation
    - the next adjacent
- ★ Which of the above facilitate change? How?

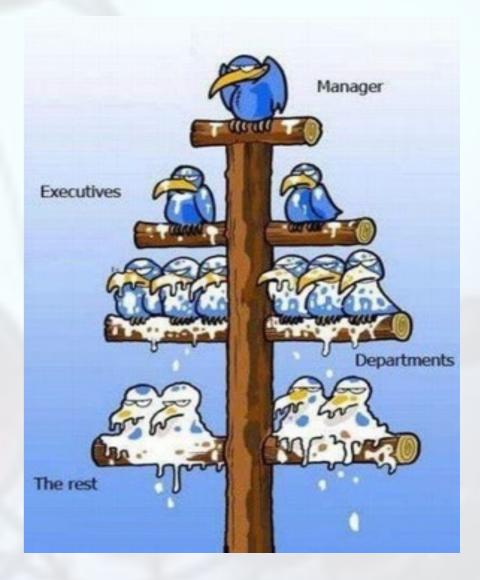


### Exercise 7

- 1. Can you identify examples from your experience, of an organisation or institution being pushed far-from-equilibrium?
- 2. What were the consequences?
- 3. What form did the 'new order' take?

### Bottom-up/Top-down?

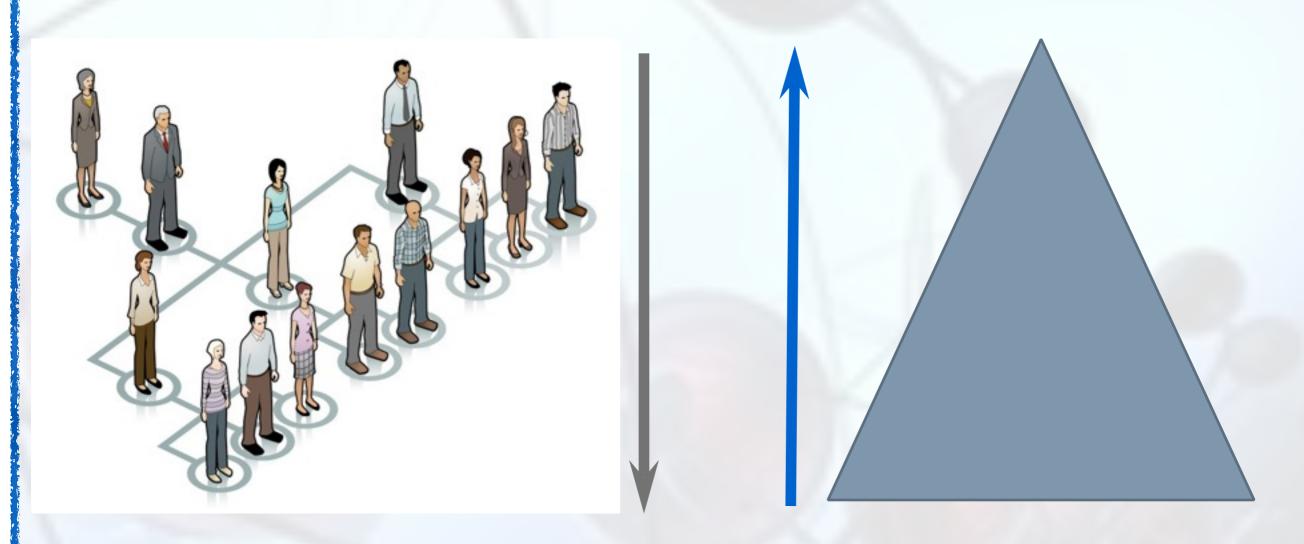




To define the organization, is it sufficient to consider the way in which the "CEO" decides the type of organization, defining its patterns and methods of action, communication and evolution over time?



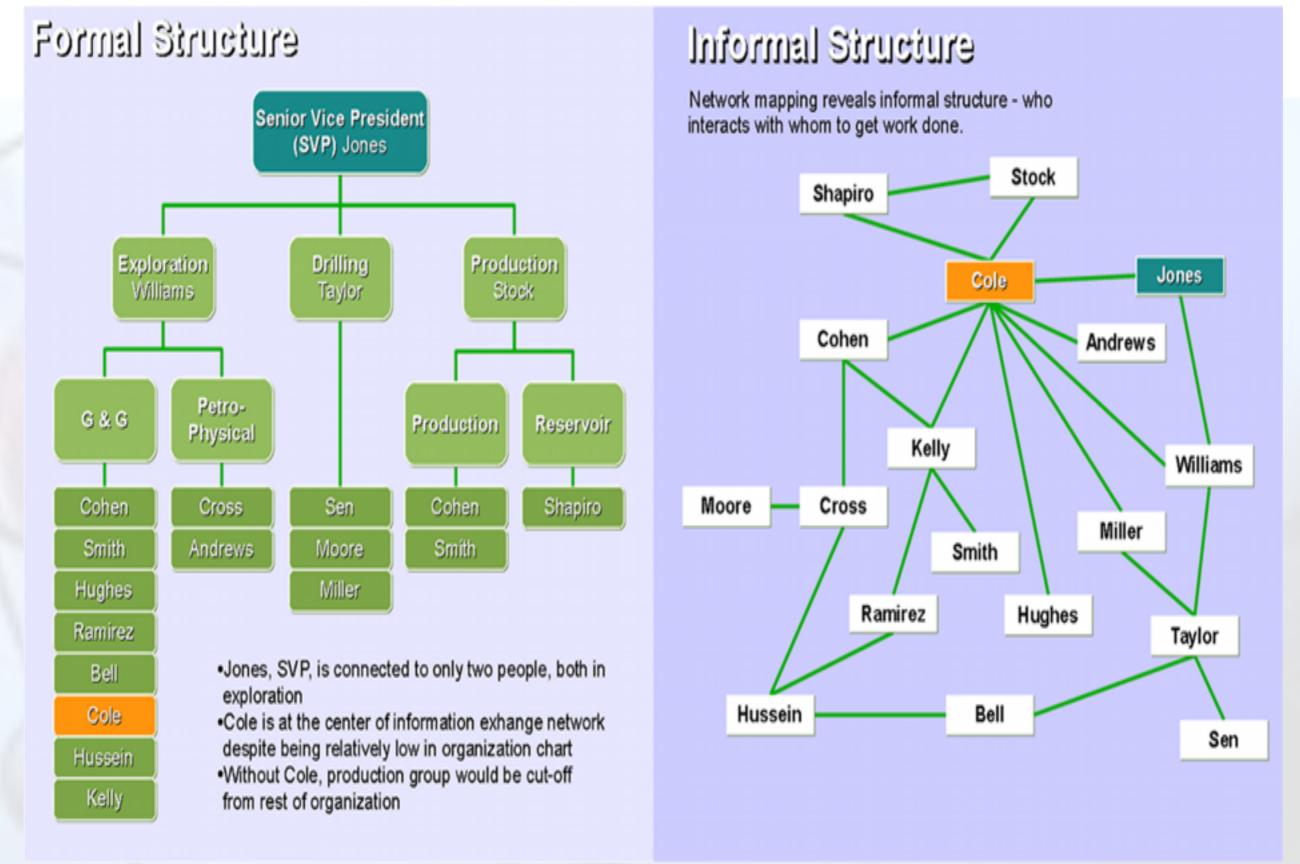
### WHAT ABOUT HIERARCHY?



The control of a system composed of numerous interacting elements that must act in a coordinated and harmonious way

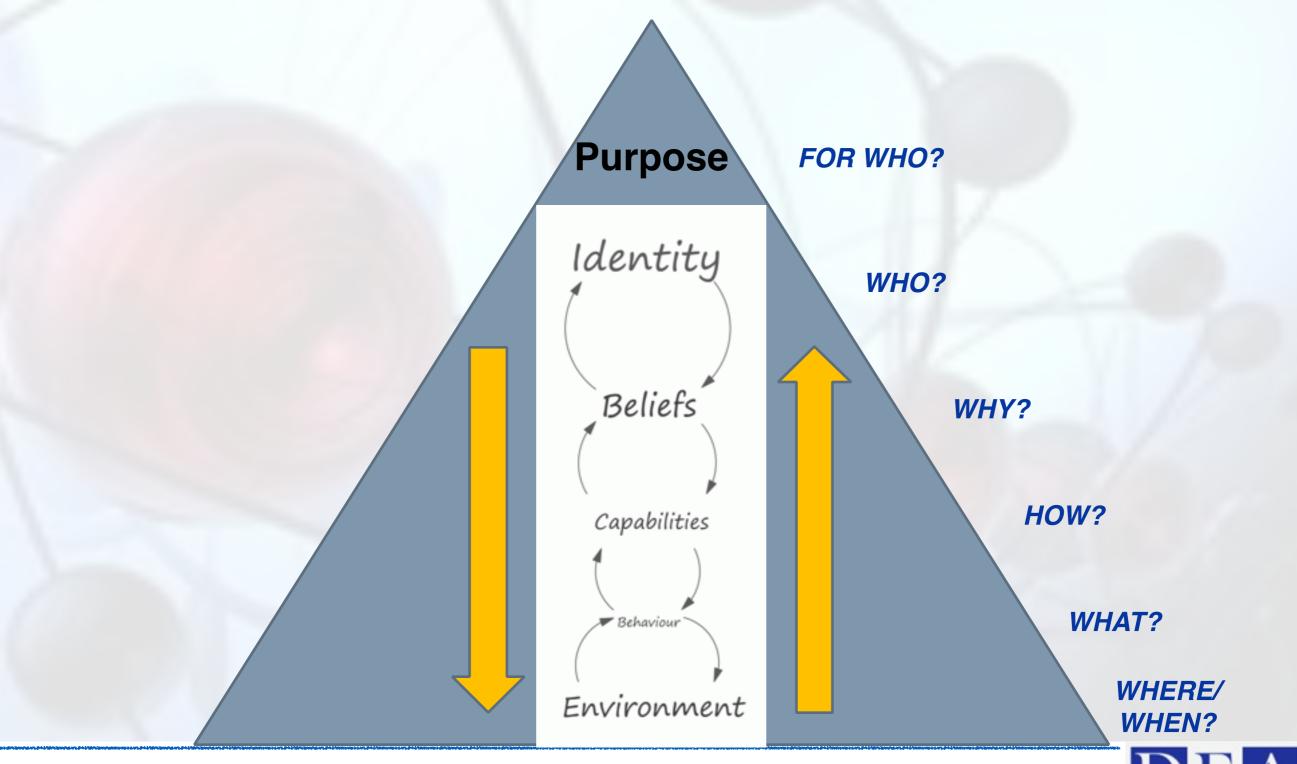
The organization is not defined top down but emerges in function of how all members of the community relate to each other.





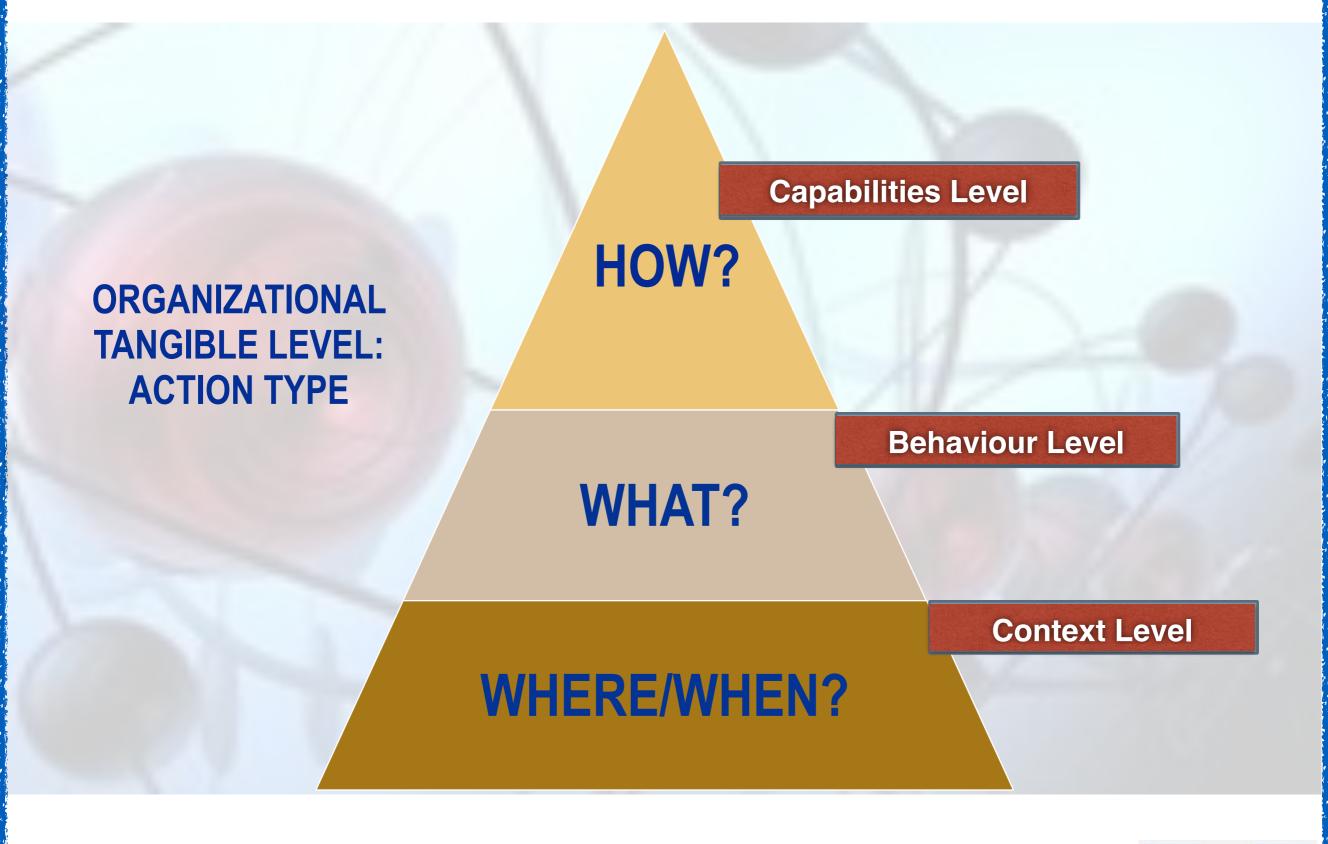


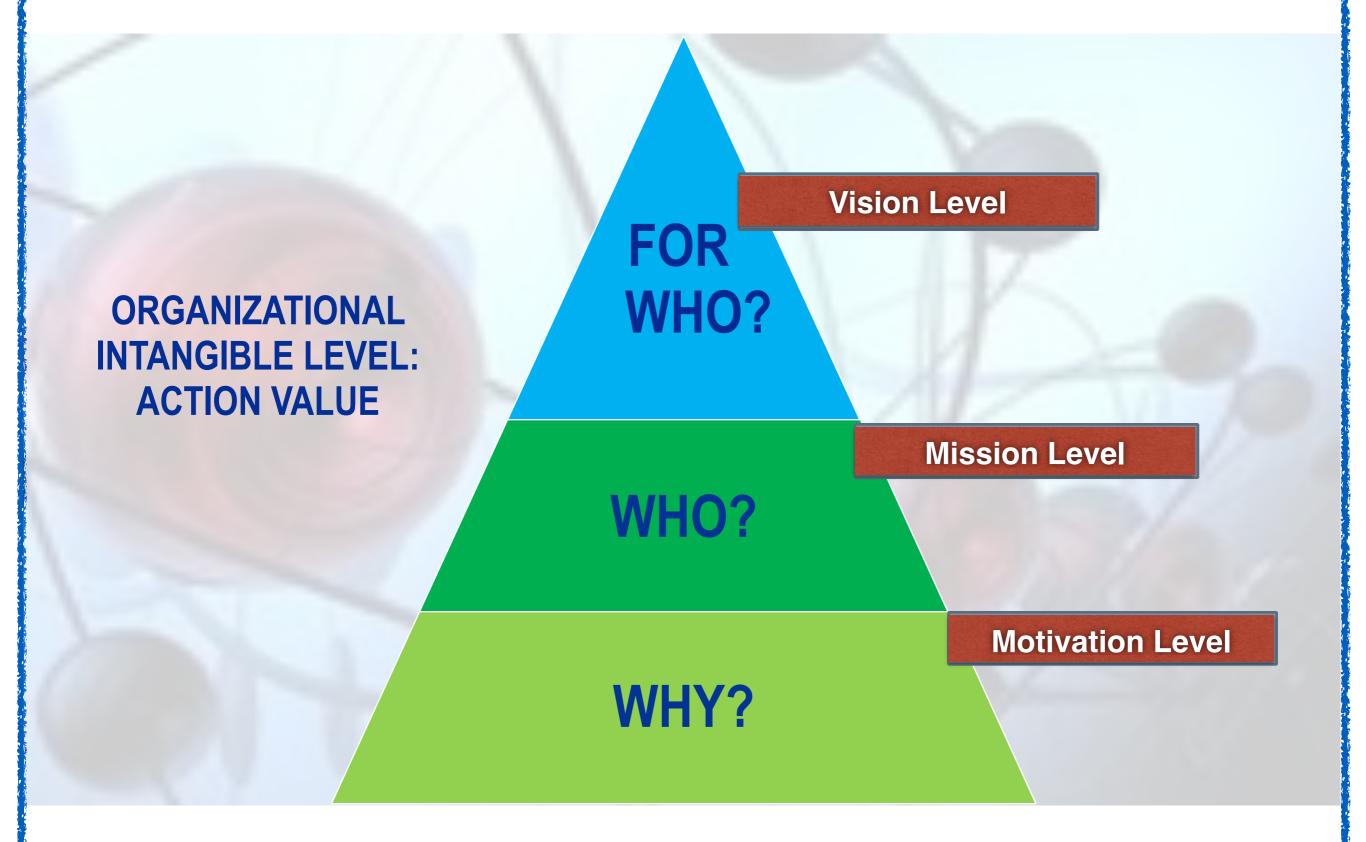
### SIX QUESTIONS, ONE FOR EACH LEVEL



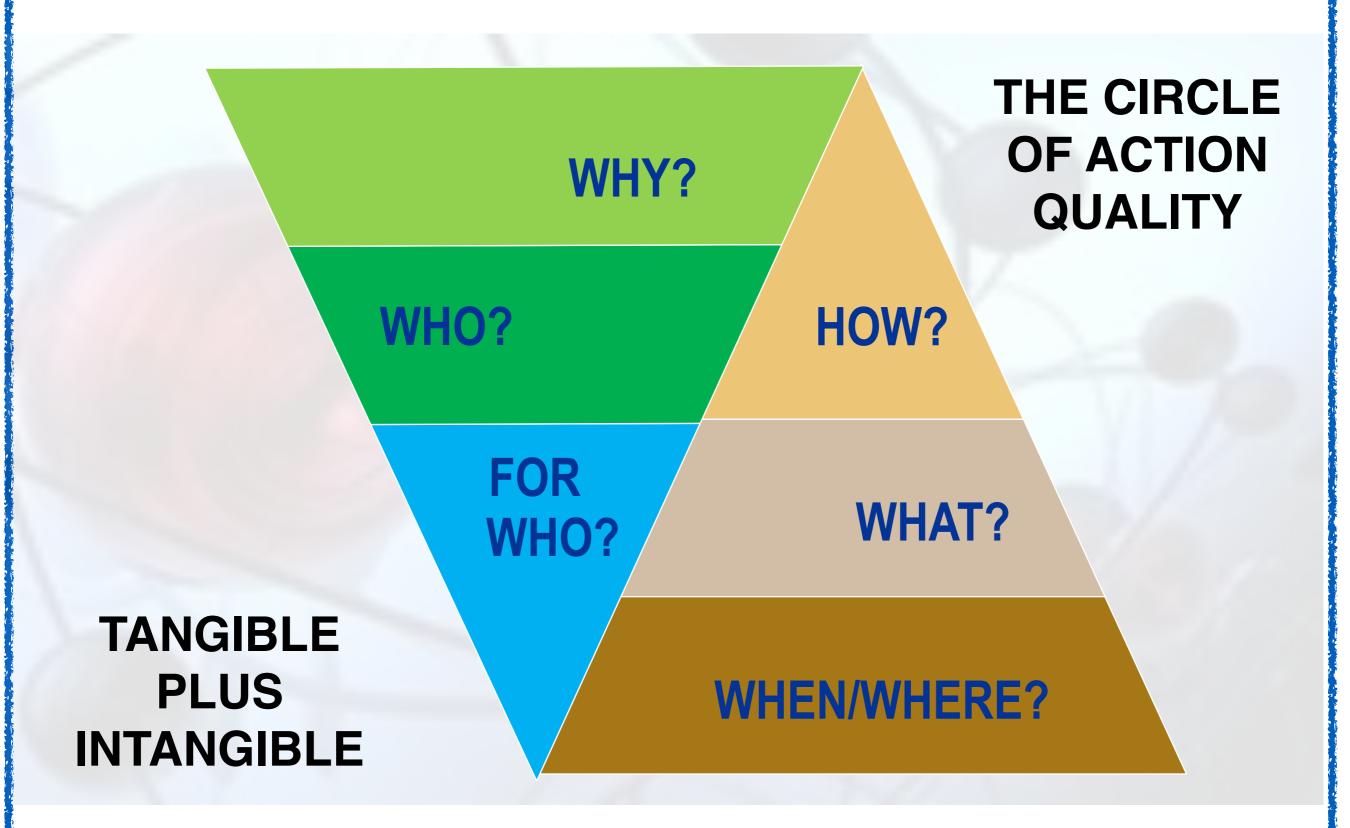
Dario Simoncini





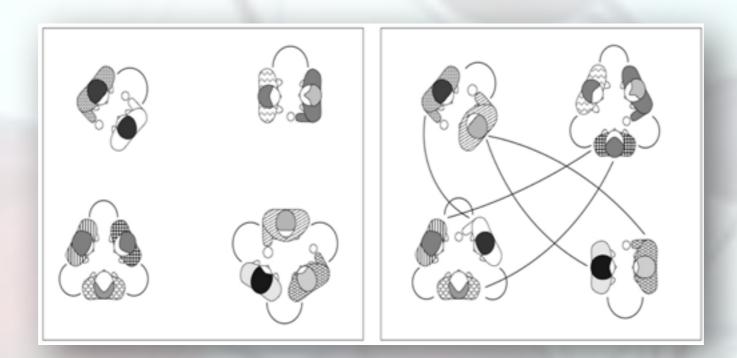








#### **SELF-ORGANIZATION IN HR**



- ★ Forming unexpected and unplanned groups often as a response to a specific problem or issue
- ★ Spontaneous 'coming together'
- ★ Not directed or designed by someone outside the group
- ★ The group decides what needs to be done, how, when ...
- ★ Can be a source of innovation



### TEAM - Command and Control Vs Self-Organization

- Part of formal structure
- Formal, temporary or permanent
- Not spontaneously formed
- Indirectly controlled or steered by senior management
- Managers decide 'who' and 'what'
- Replace the hierarchy
- Empowered by senior management
- Strongly shared culture
- Order achieved via recognized processes and behaviours influenced by procedures and roles

- Not part of formal structure
- Informal and temporary
- Spontaneously formed
- Boundaries influenced, but not determined, by senior management
- Team members decide 'who' and 'what'
- Often in conflict with or constrained by the hierarchy
- Empowered by team's members
- Strong sense of shared purpose
- Inherent order emerges



