WORLD ACADEMY OF ART AND SCIENCE

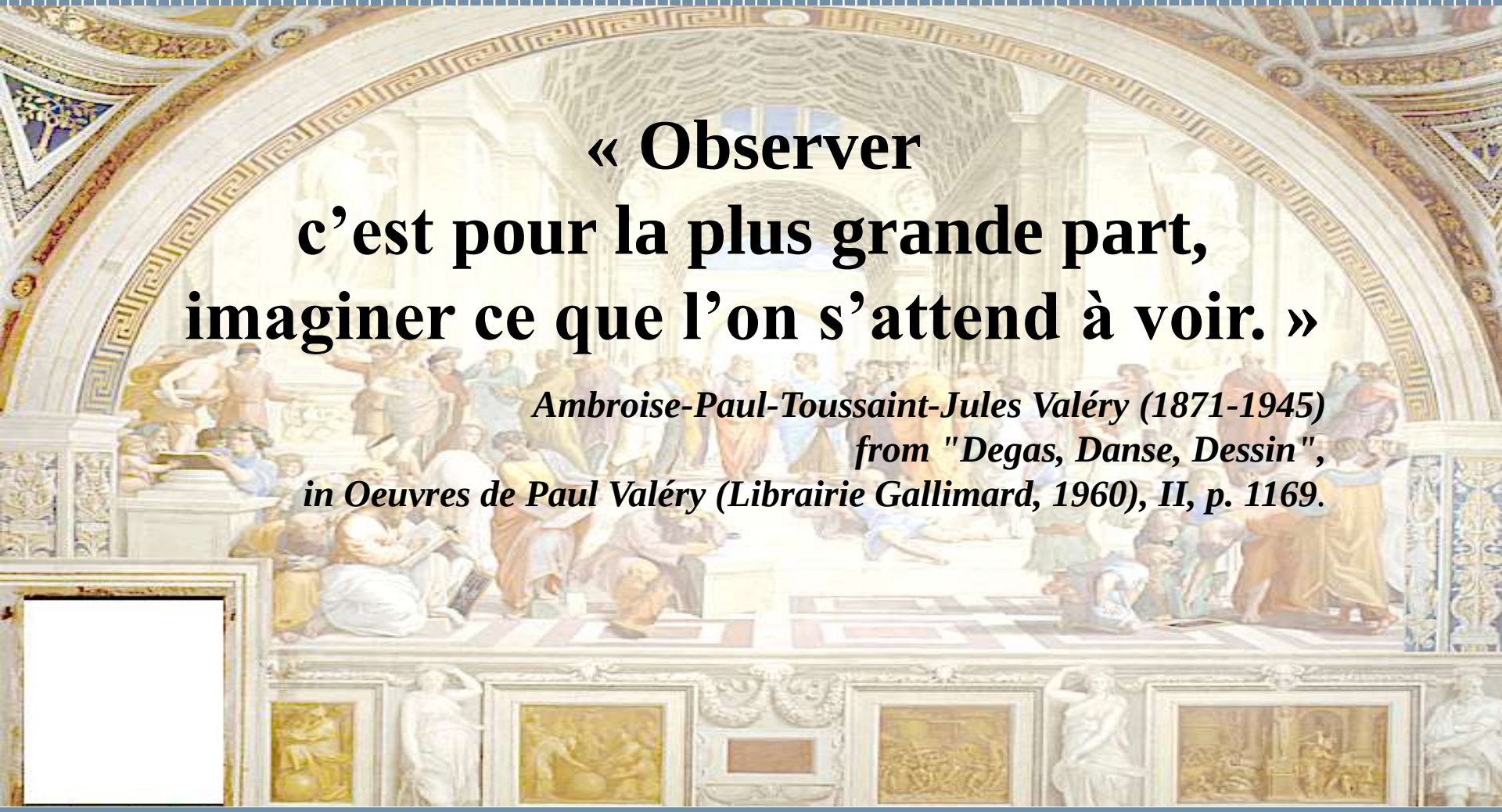
Future Capital
Financing Global Development

The World Bank Headquarters, Washington D.C. –
September 16-17, 2019

Initiating Social Transformation

Rodolfo A. Fiorini

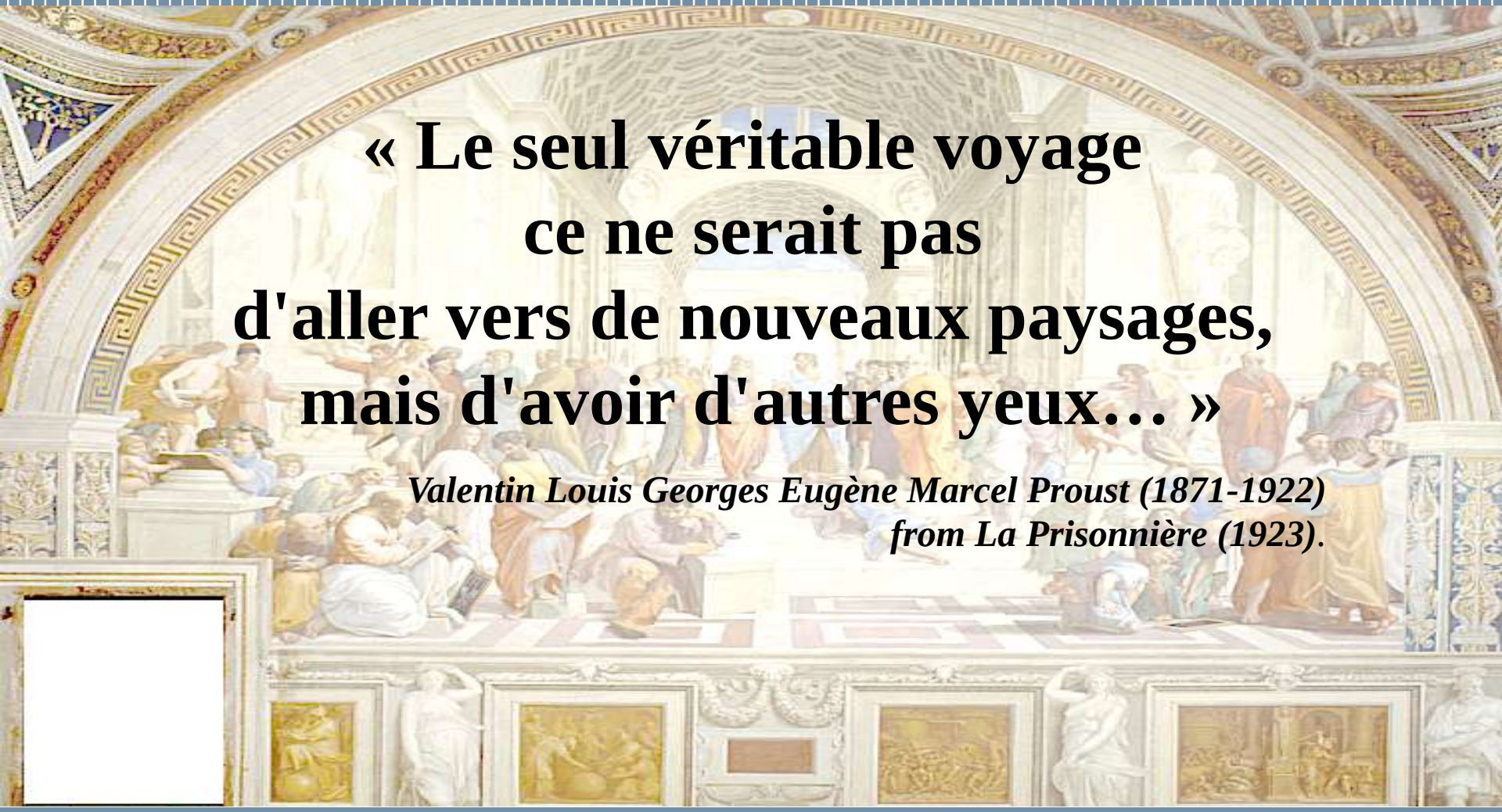
Initiating Social Transformation



« Observer
c'est pour la plus grande part,
imaginer ce que l'on s'attend à voir. »

Ambroise-Paul-Toussaint-Jules Valéry (1871-1945)
from "Degas, Danse, Dessin",
in Oeuvres de Paul Valéry (Librairie Gallimard, 1960), II, p. 1169.

Initiating Social Transformation



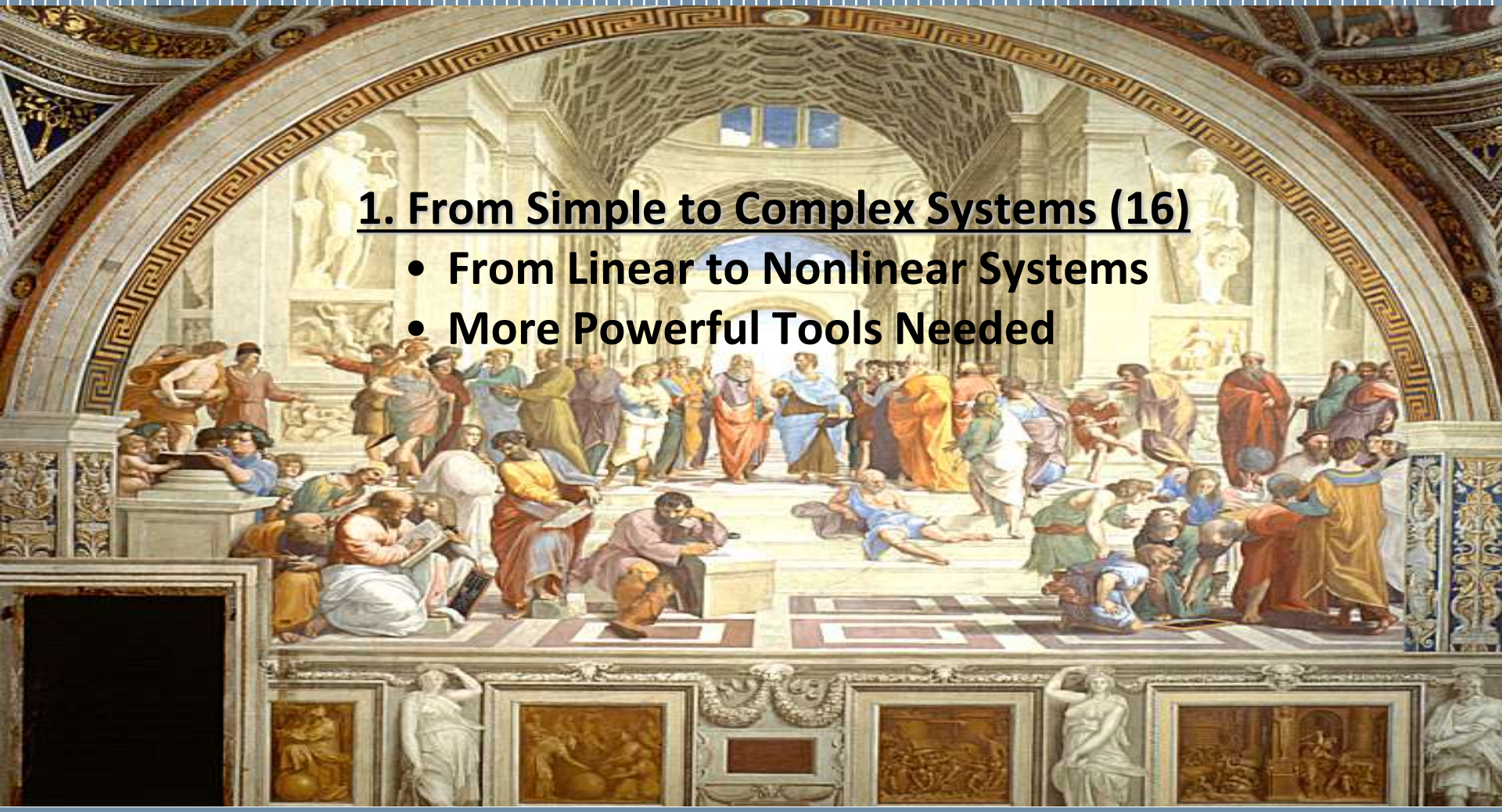
« Le seul véritable voyage
ce ne serait pas
d'aller vers de nouveaux paysages,
mais d'avoir d'autres yeux… »

Valentin Louis Georges Eugène Marcel Proust (1871-1922)
from La Prisonnière (1923).

Presentation Outline

1. From Simple to Complex Systems (16)
   - From Linear to Nonlinear Systems
   - More Powerful Tools Needed
2. Conclusion (06)
   - Continuum-Discrete Integrated Framework
   - AMS Modelling Solution by CICT

Initiating Social Transformation



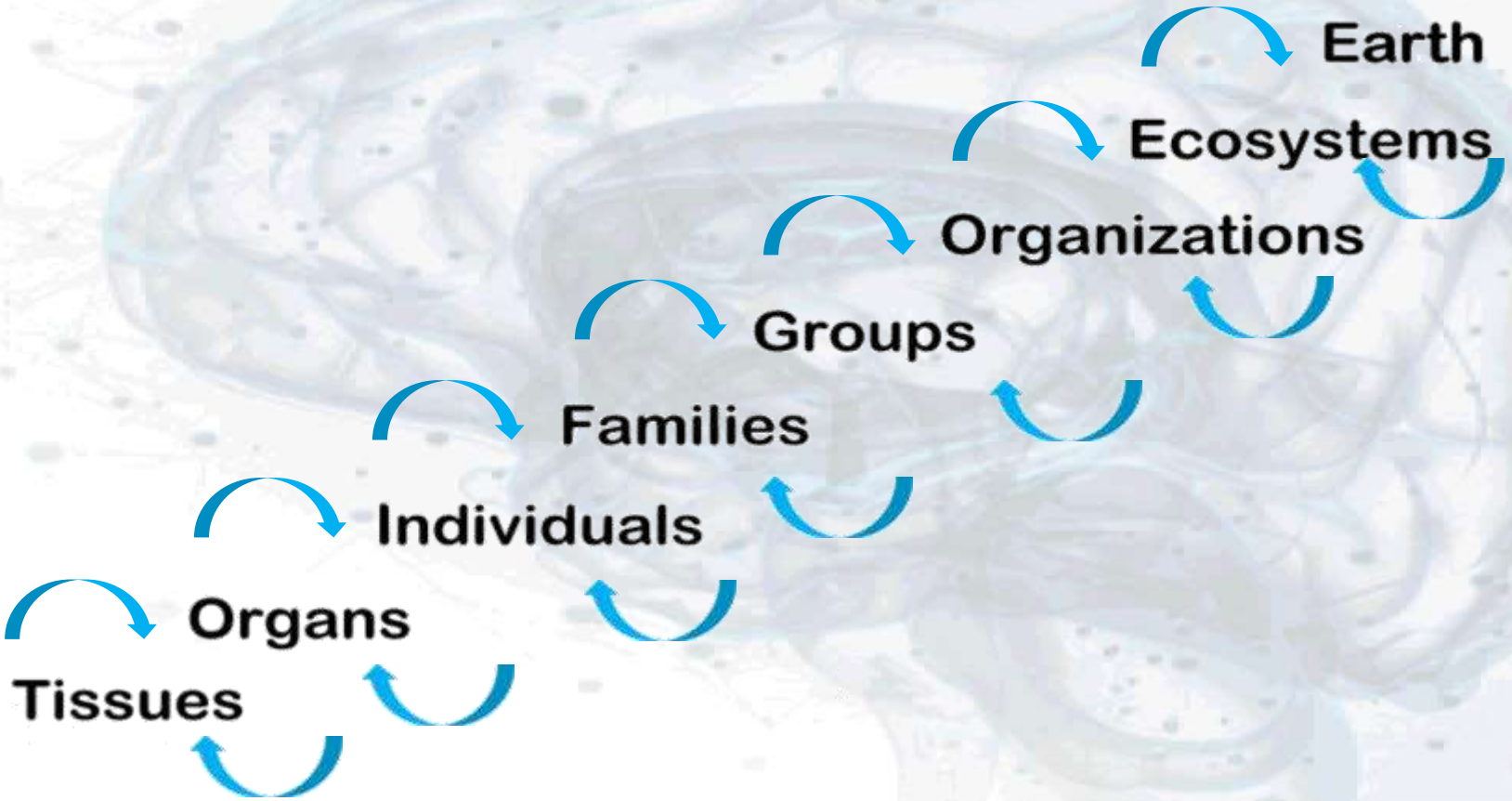
1. From Simple to Complex Systems (16)

- **From Linear to Nonlinear Systems**
- **More Powerful Tools Needed**

What is an Arbitrary Complex Multiscale (ACM) System?

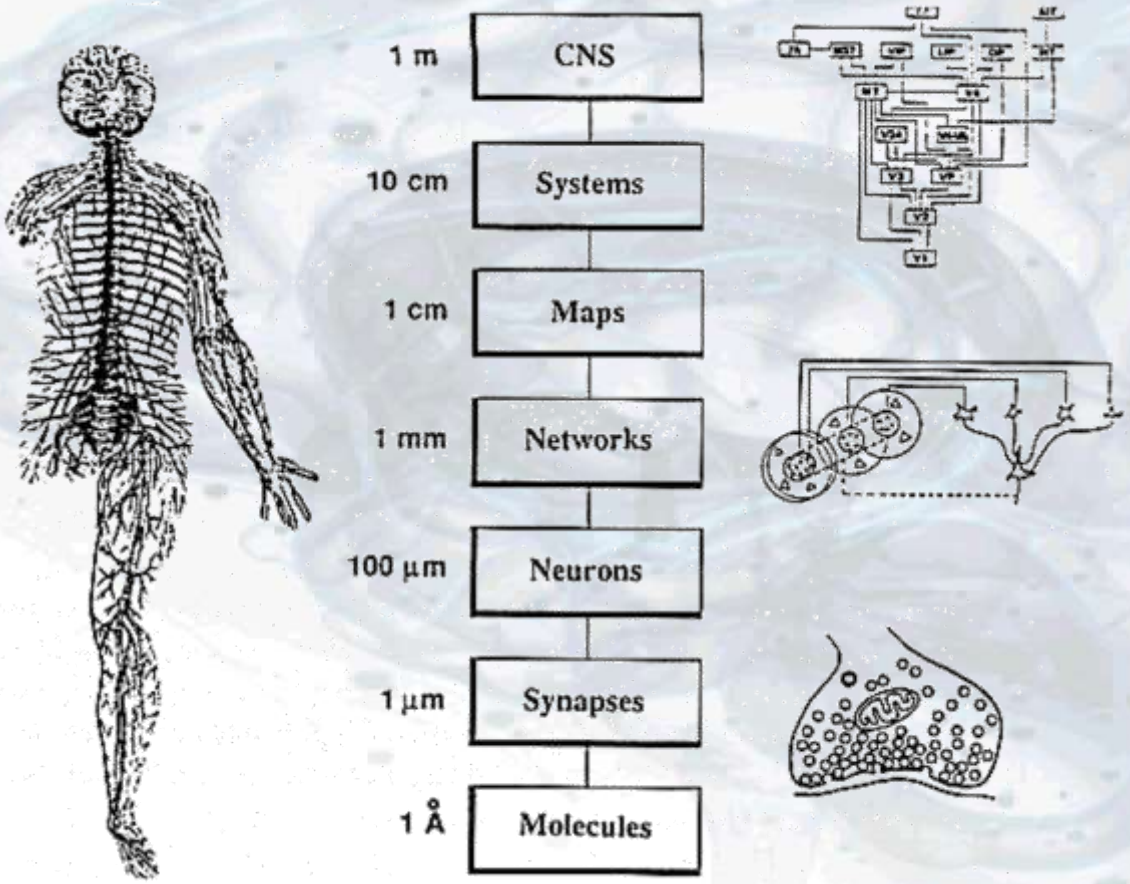
Initiating Social Transformation

Example of Arbitrary Complex Multiscale System (ACM)



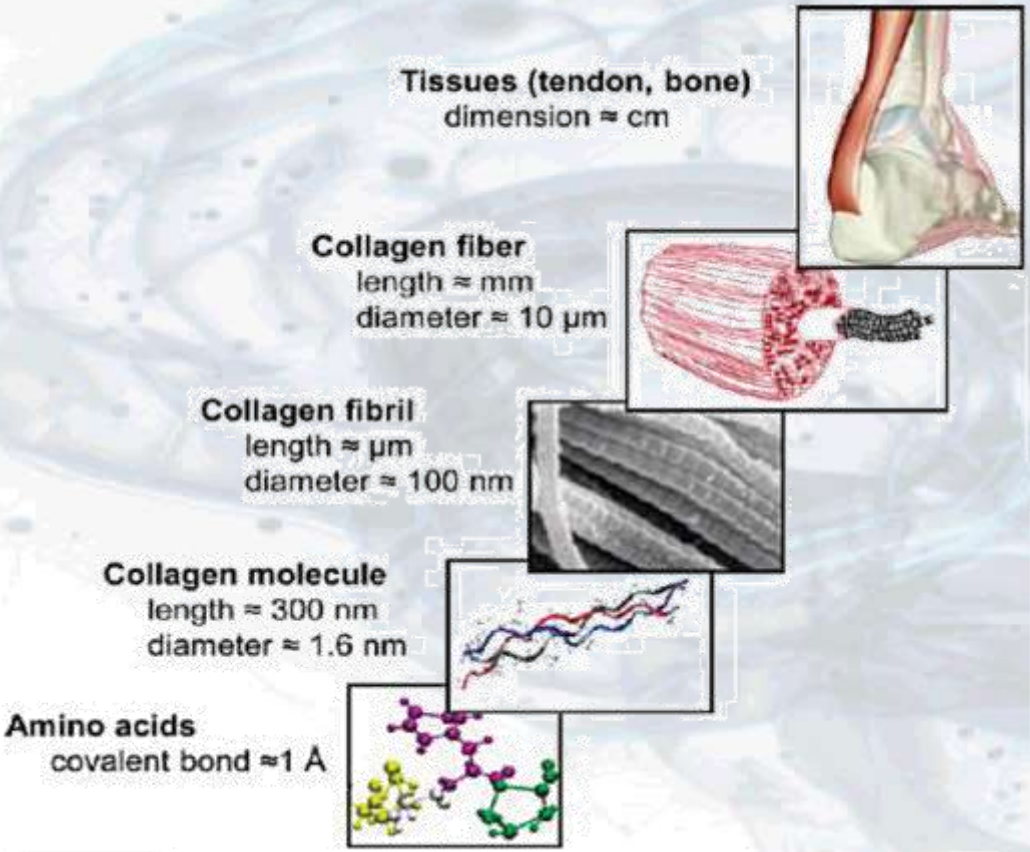
Initiating Social Transformation

Example of Arbitrary Complex Multiscale System (ACM)



Initiating Social Transformation

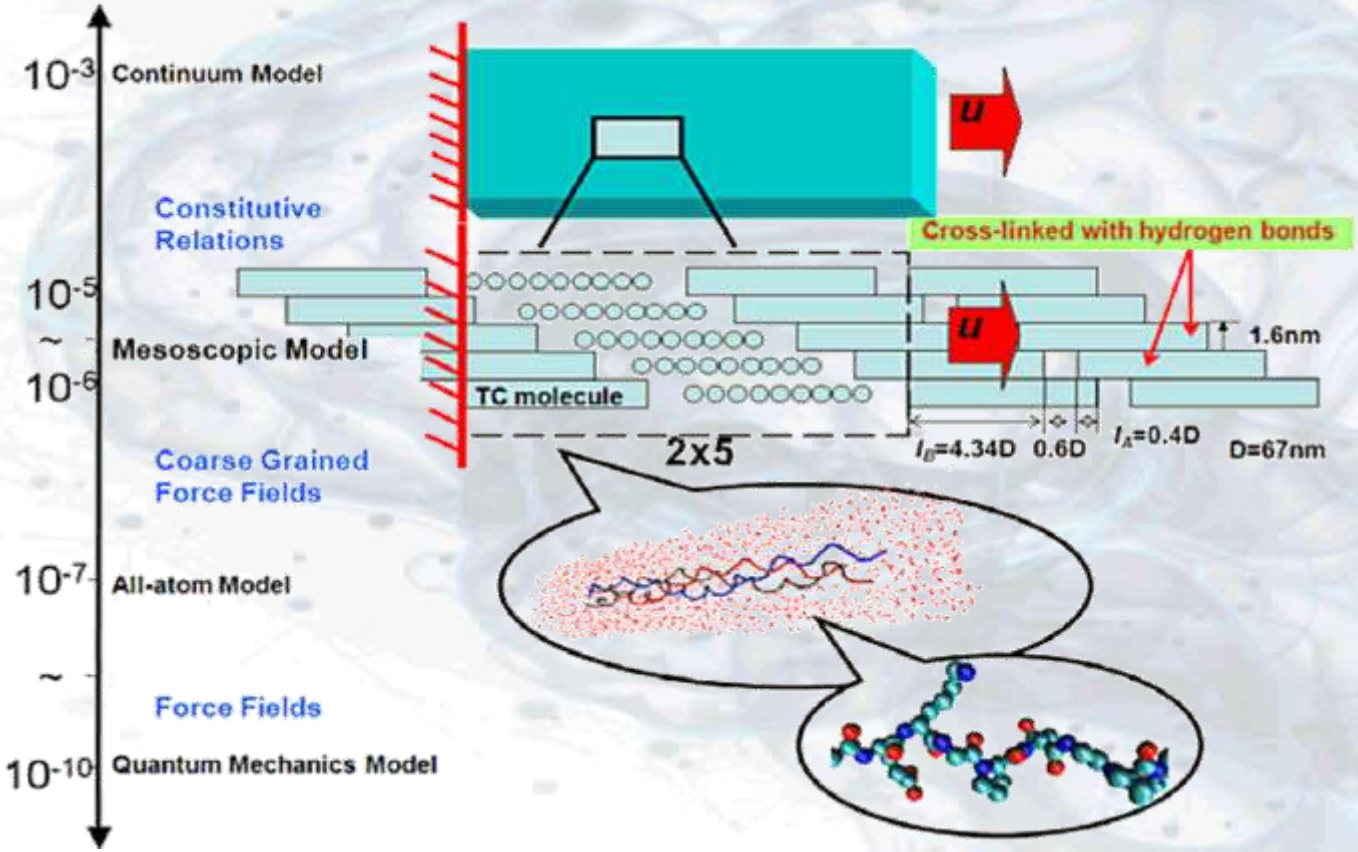
Example of Arbitrary Complex Multiscale System (ACM)



(R.A. Fiorini, 2015)

Initiating Social Transformation

Current Multiscale System Modelling



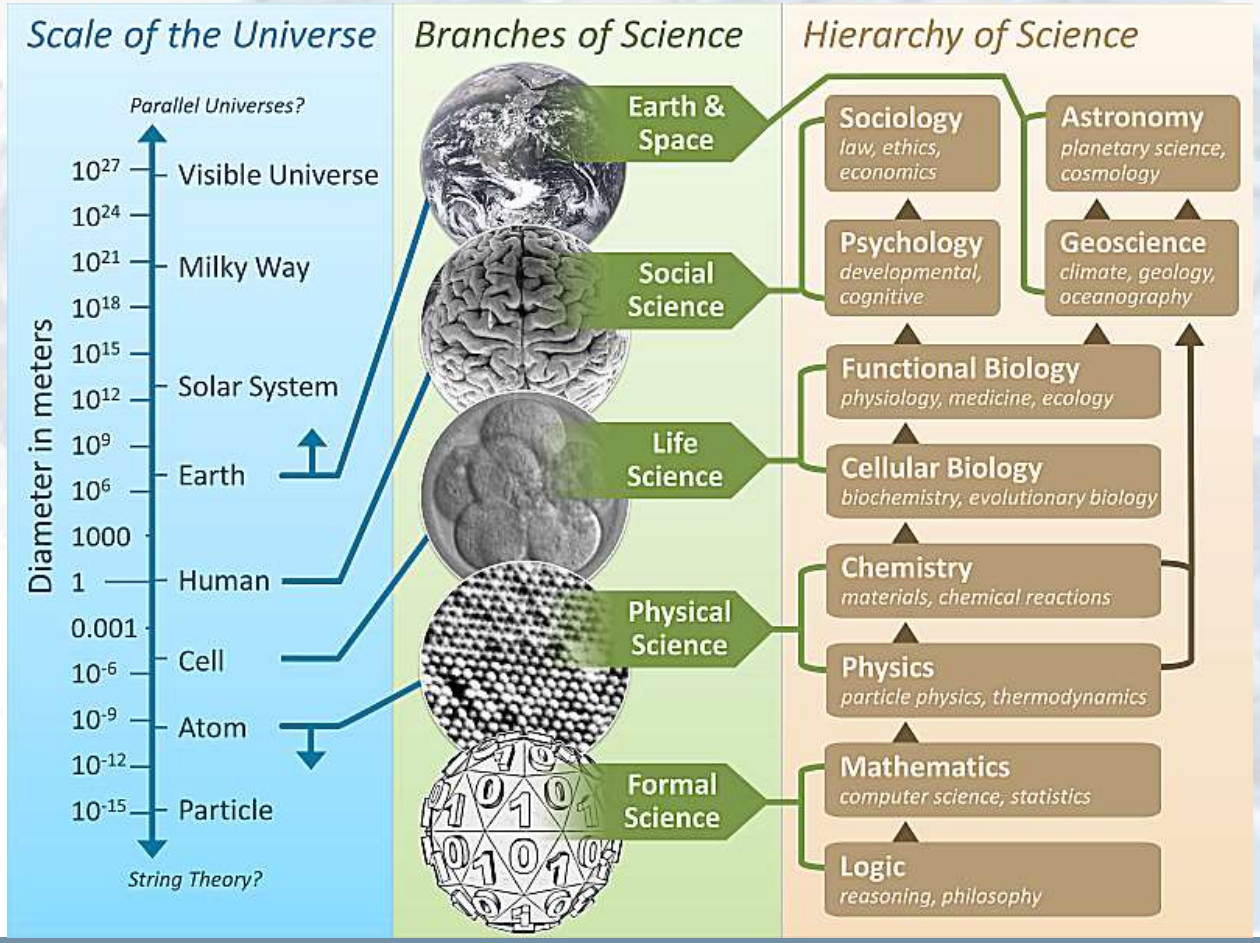
(R.A. Fiorini, 2015)

Initiating Social Transformation

Current Scientific Approach

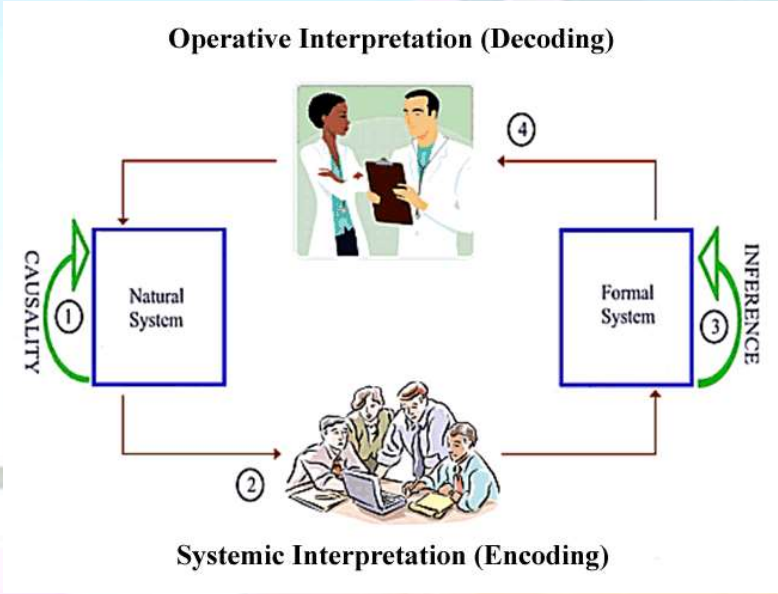
Initiating Social Transformation

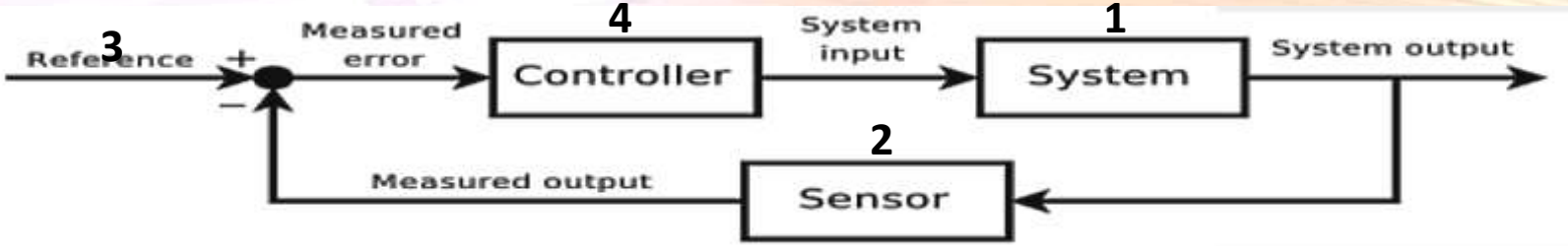
Current Scientific Approach



Initiating Social Transformation

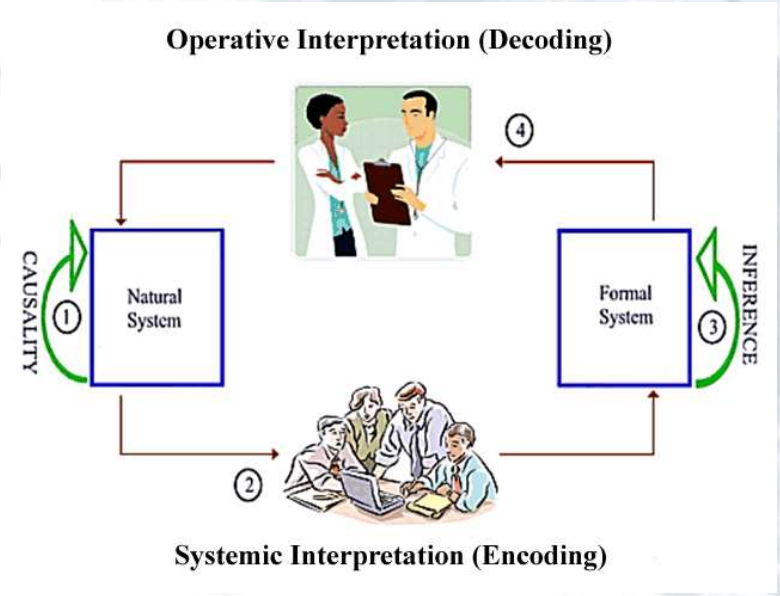
Linear Feedback Example (reduced system)

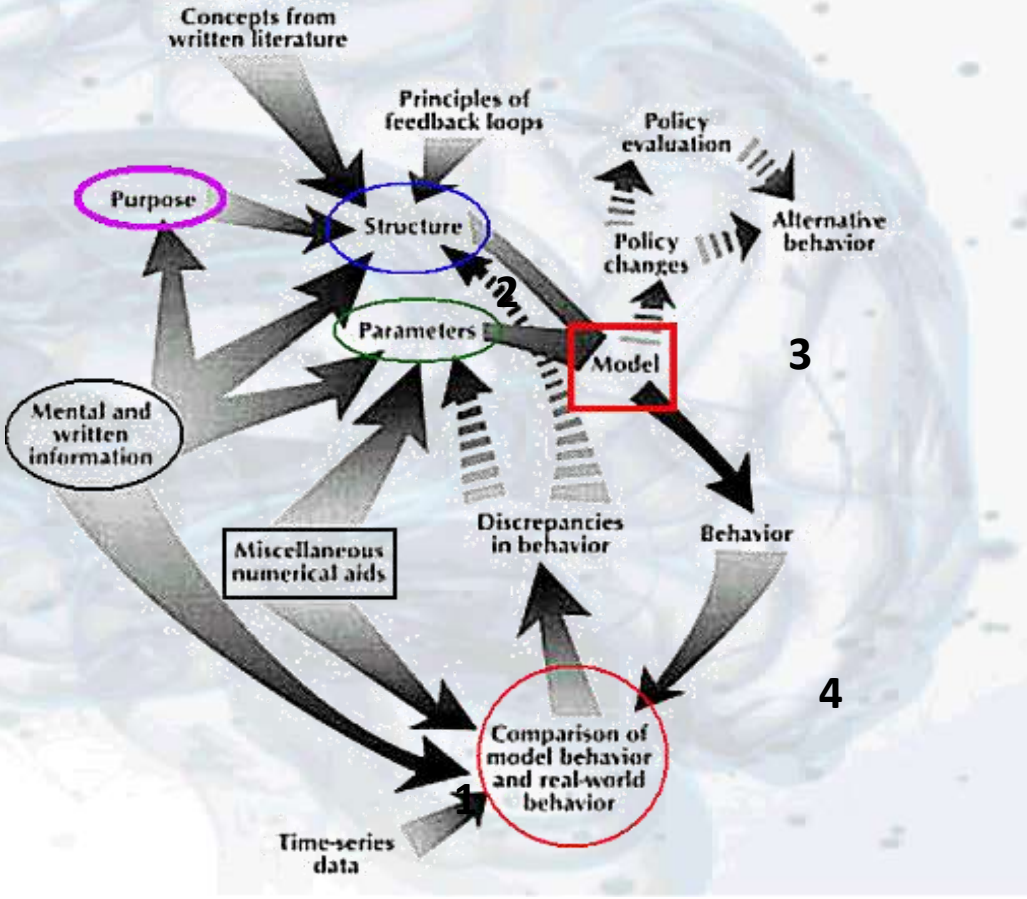




Initiating Social Transformation

Nonlinear Feedback Example (complex system)



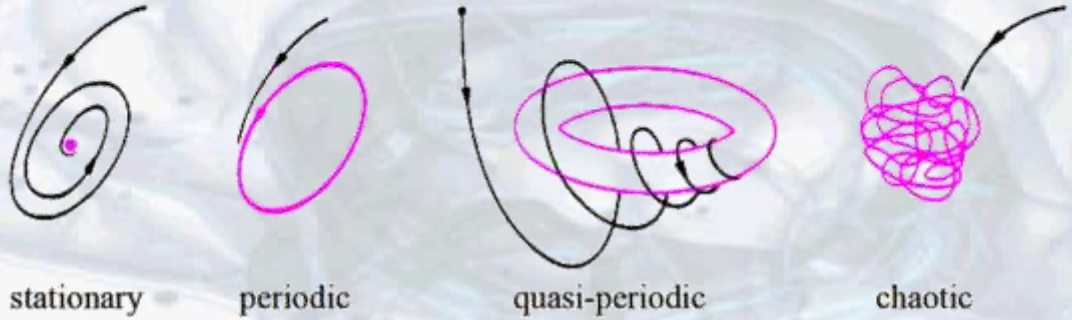


Initiating Social Transformation

Four Possible Asymptotic Regimes

Dynamical system theory in a glance

Four possible asymptotic regimes



The Lorenz's attractor [1963]

Initiating Social Transformation

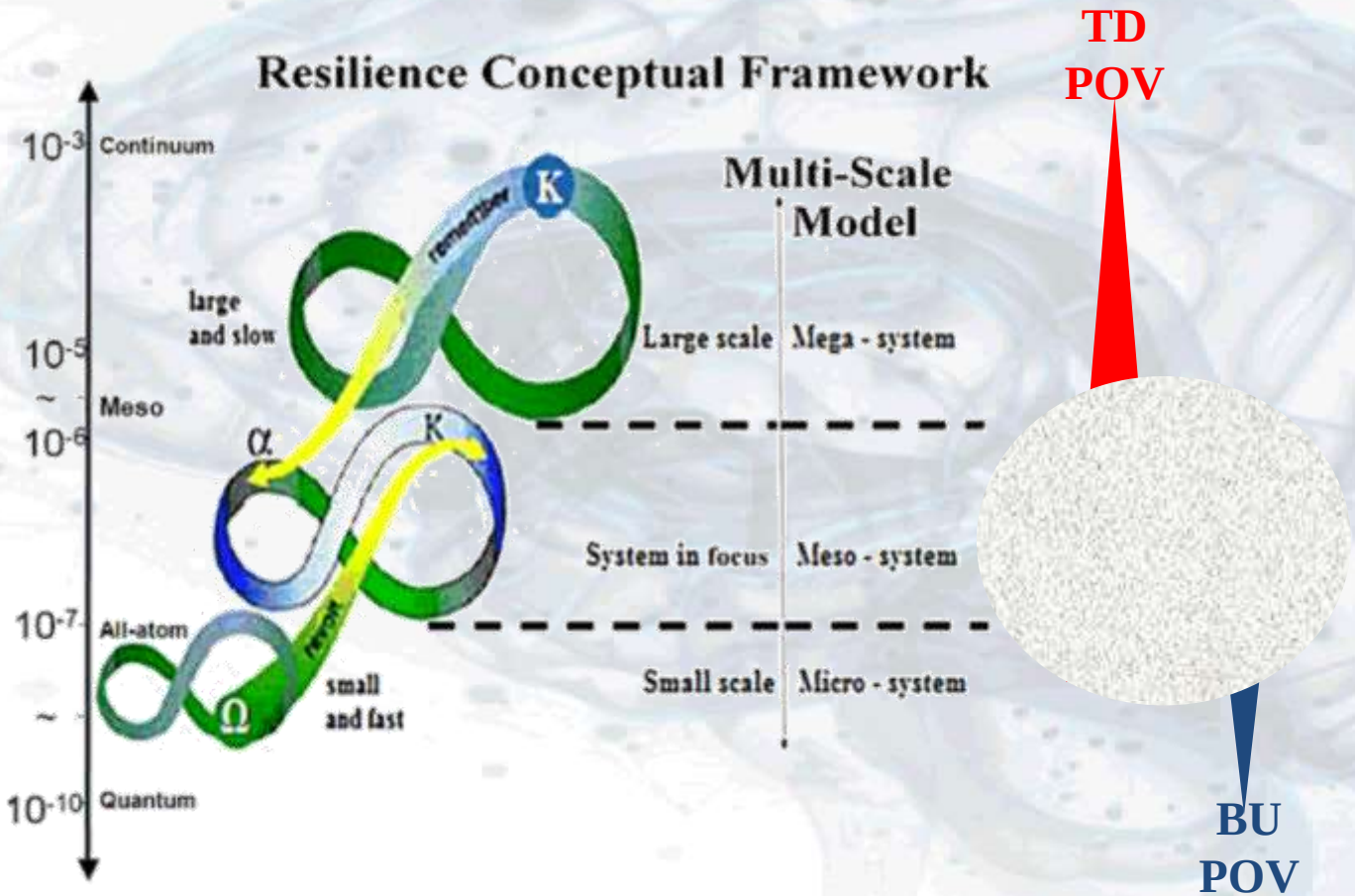
Complexity
is the impossibility of
separating a system from its context.

A living being from its environment.

An object from
its measuring instrument.

Initiating Social Transformation

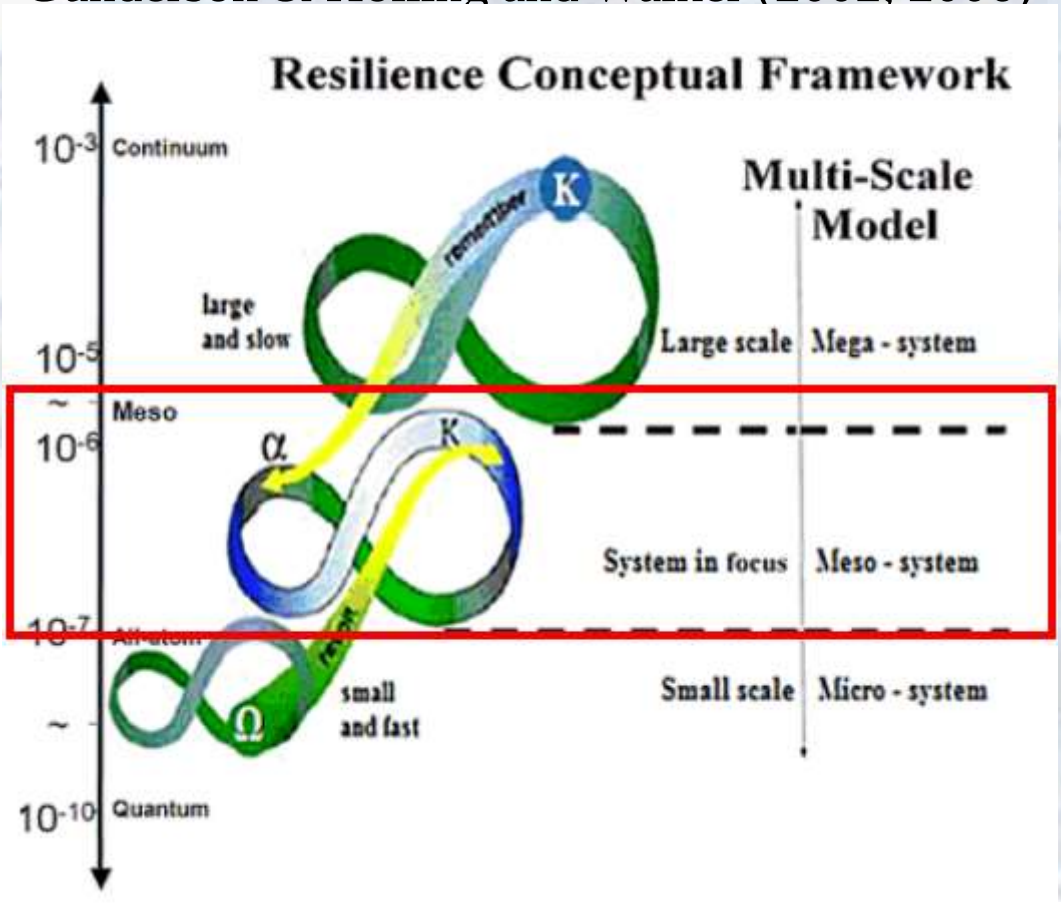
The Root of the Current Problem for ACM System Modelling



Initiating Social Transformation

System Resilience from Multi-Scale Modeling

Gunderson & Holling and Walker (2002, 2006)



Initiating Social Transformation

Current System Fragility

Attempts to optimize hierarchical systems in the traditional top-down way will be less and less effective, and cannot be done in real time **(Fiorini, 2016).**

The logical answer is to use **distributed (self-) control, i.e. bottom-up self-regulating systems. Advanced Cybernetics** (i.e. extended system theory) and **Complexity Theory** tell us that it is actually feasible to create resilient social and economic order by means of self-organization, self-regulation, and self-governance. Nevertheless, to achieve self-organization, self-regulation in a competitive arbitrary-scalable system reference framework, **we need application resilience and antifragility at system level first**.

Initiating Social Transformation

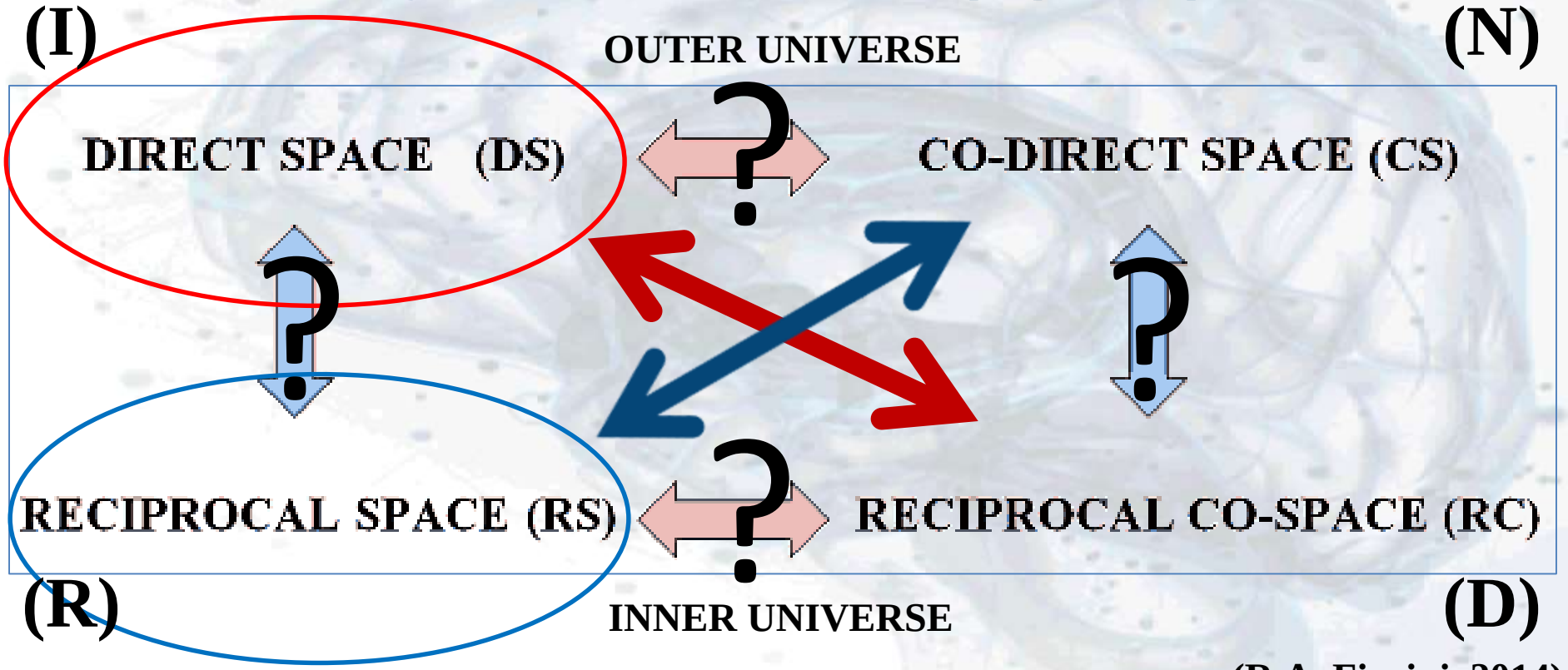
From Simple Modelling (Monoscale)

To Complex Modelling (Multiscale).

We Need More Powerful Tools!

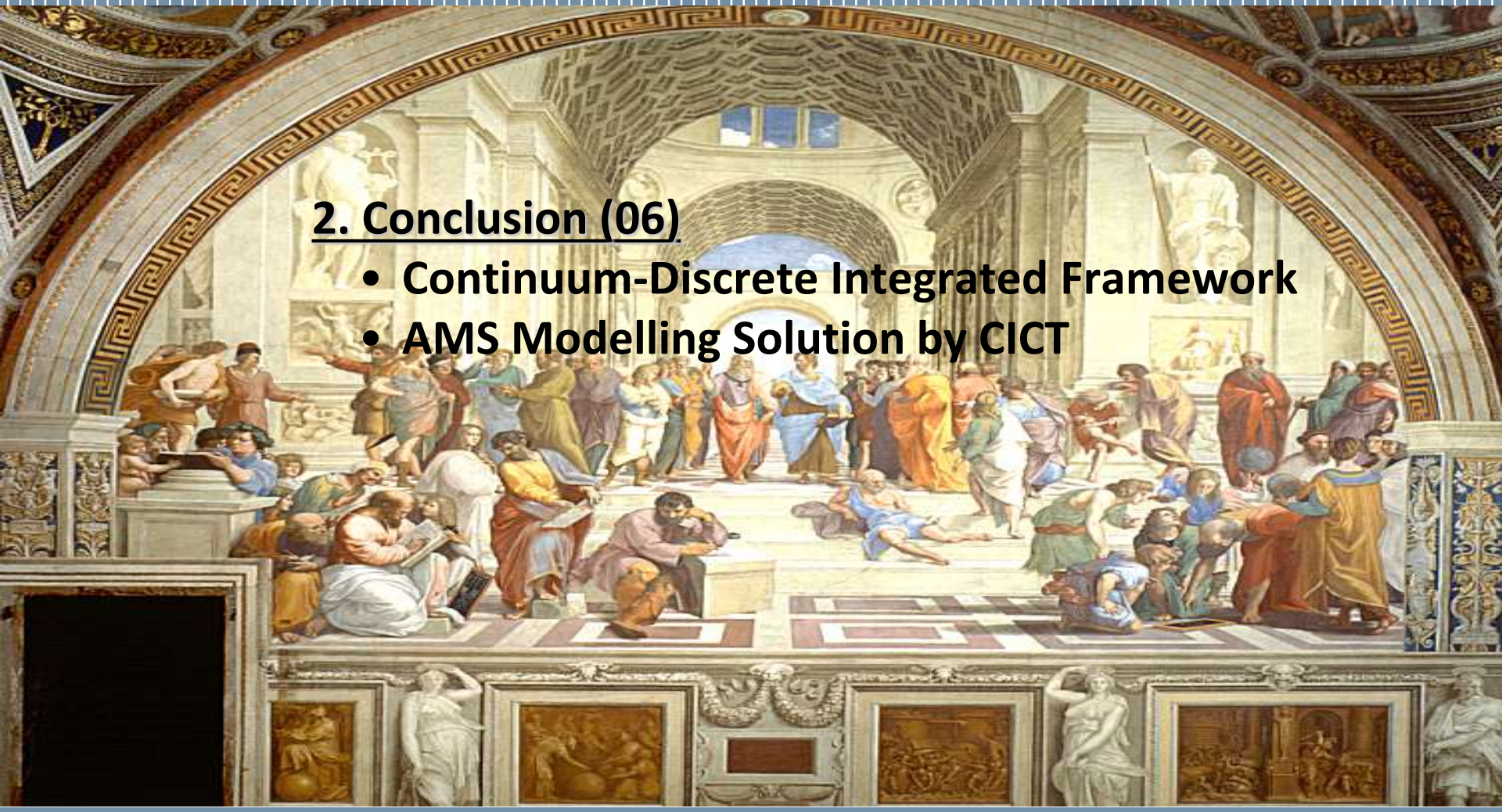
Initiating Social Transformation

INNER vs. OUTER UNIVERSE (IOU) Mapping By KLEIN Four-Group (CICT)



(R.A. Fiorini, 2014)

Initiating Social Transformation

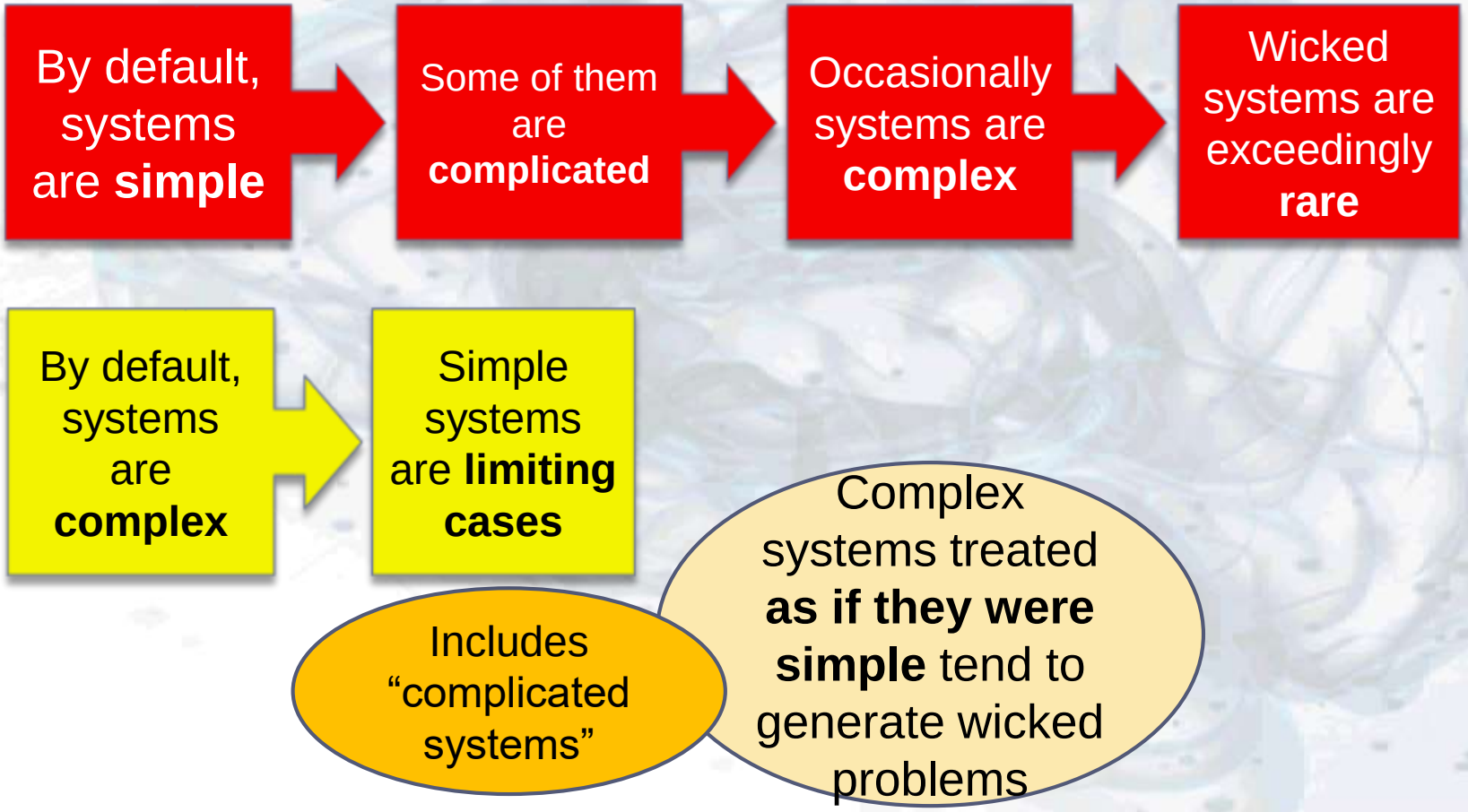


2. Conclusion (06)

- Continuum-Discrete Integrated Framework
- AMS Modelling Solution by CICT

Initiating Social Transformation

The Two Modelling Understandings



Initiating Social Transformation

Half-Plane Space vs. OECS Space

Two Irreducible Complementary Operative Spaces

Half-Plane Space

- Inert matter best operational representation compromise.
- A Representation Space endowed with full Flexibility (mapping complexity to simplicity to give space to Imagination).
- Simplified system dynamics framework (Newtonian Approach).
- To model any geometrical space and monitor system dynamics behavior only.
- A Spectator can become a system innatural perturbation.

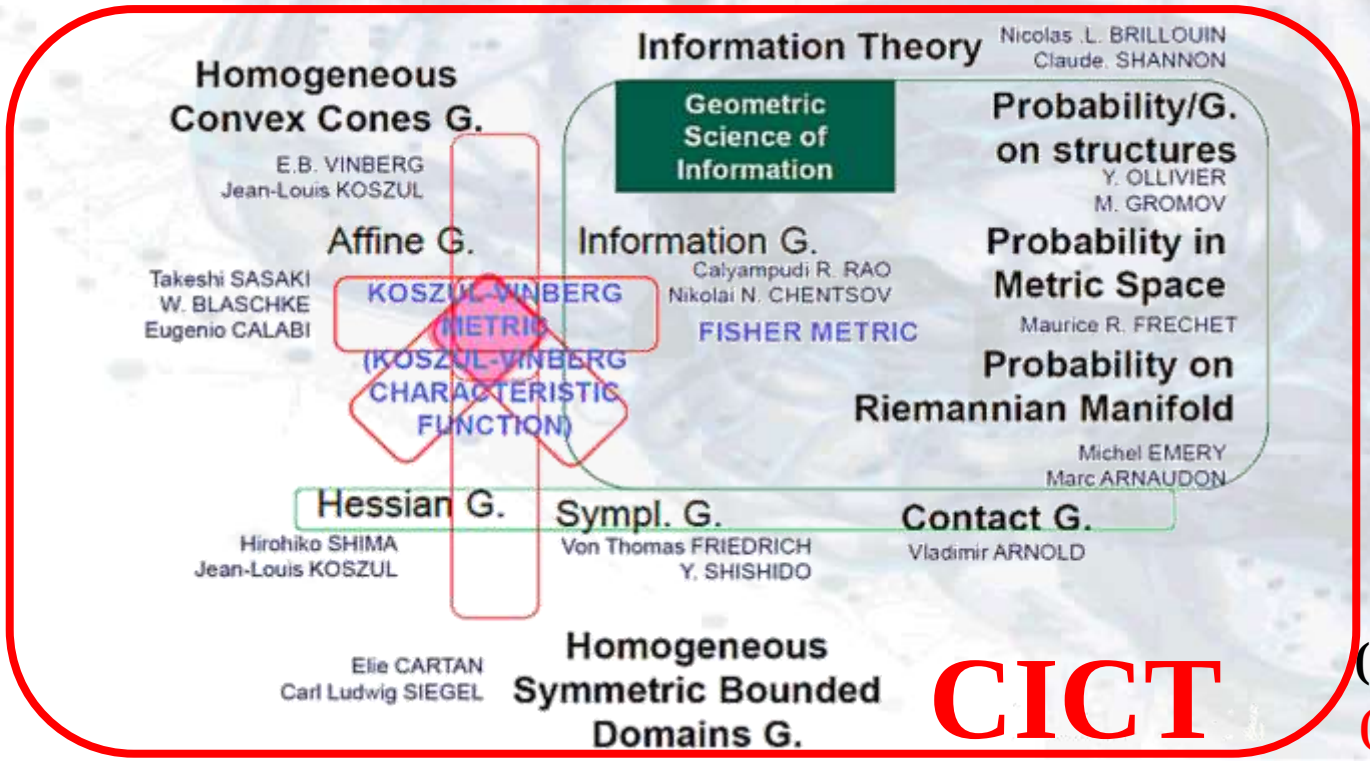
OECS Space

- Livig matter best representation operational compromise.
- An Outer Representation Space one-to-one linked to its Inner Representation Space.
- Natural system dynamics framework (Quantum Field Theory Approach).
- To model projective relativistic geometry and to anticipate emergent system dynamics.
- An Observer can become a system natural co-artifex.

Initiating Social Transformation

Current Landscape of Geometric Science of Information

Hessian (J.L. Koszul), Homogeneous Convex Cones (E. Vinberg), Homogeneous Symmetric Bounded Domains (E. Cartan, C.L. Siegel), Symplectic (T. von Friedrich, J.M. Souriau), Affine (T. Sasaki, E. Calabi), Information (C. Rao, N. Chentsov). Through Legendre Duality, Contact (V. Arnold) is considered as the odd-dimensional twin of symplectic geometry and could be used to understand Legendre mapping in information geometry.



(F. Barbaresco, 2014)

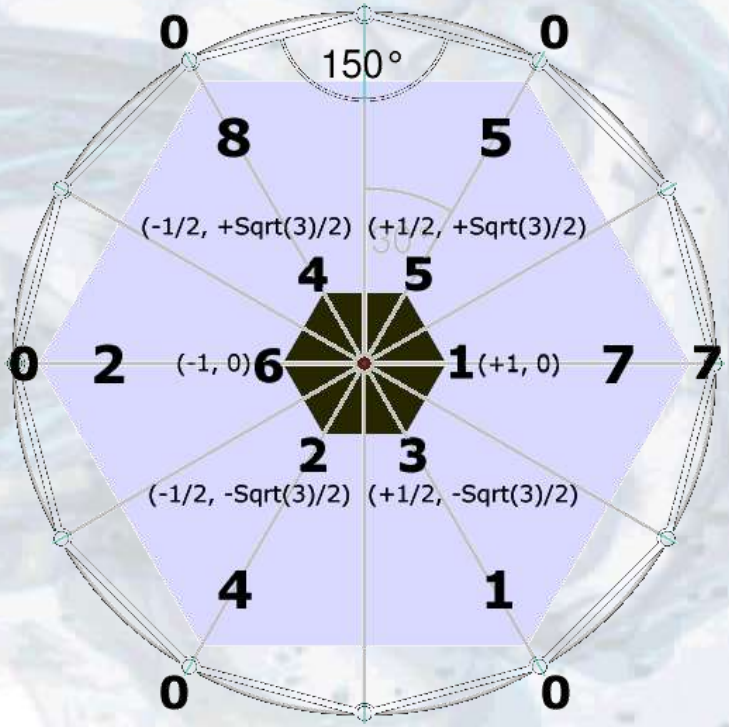
(R.A. Fiorini, 2014)

Initiating Social Transformation

CICT EPG-IPG

Fundamental Relationship for $SN_1 = 7$

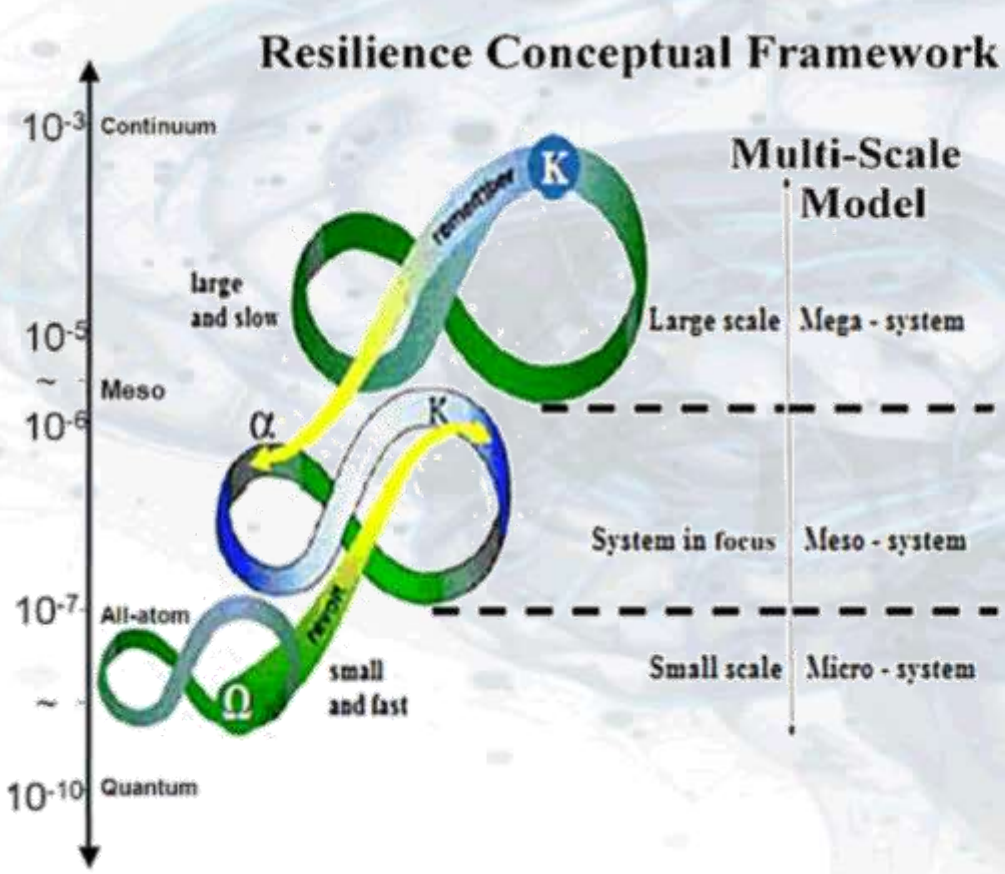
⇐	5	4	3	2	1	0	5	4	3	2	1	0	RTL
LTR	1	2	3	4	5	6	1	2	3	4	5	6	⇒
Q_L	1	4	2	8	5	7	1	4	2	8	5	7	
R_L	**3**	**2**	**6**	**4**	**5**	**1**	**3**	**2**	**6**	**4**	**5**	**1**	

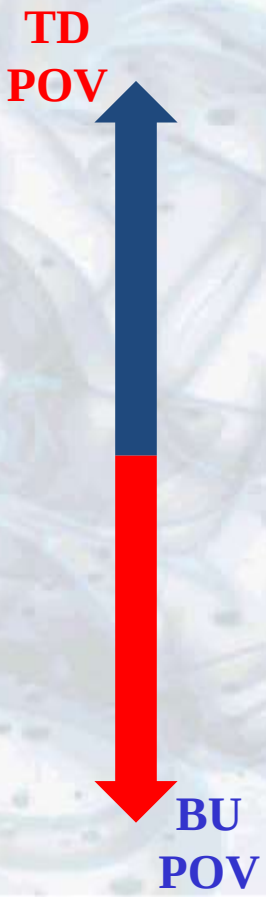


(R.A. Fiorini, 2013)

Initiating Social Transformation

CICT Solution to the Problem for ACM System Modelling





Initiating Social Transformation

Main CICT OECS Properties

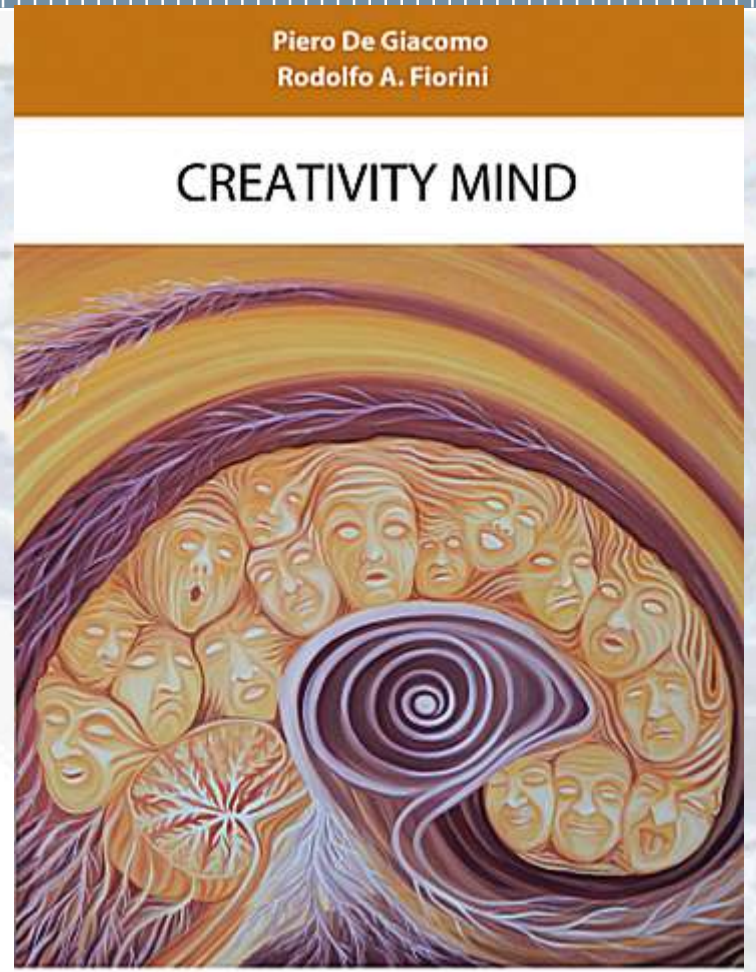
We got rich new knowledge about fundamental arithmetic number concept and properties by **Optimized Exponential Cyclic Sequences** (OECS):

a) Symbolic vs. **OpeRational** Number Representation;
b) Prime vs. **SN Family Group Order** properties;
c) Arbitrary Precision **Exact Rational Number Representation**;
d) Incidence vs. **Correspondence** in **OECS Word Space**;
e) OECS phased generators **Fixed Point** vs. **Pairing** properties;
f) etc… etc…

More specifically, **OECS Family Group of any order** can play a fundamental role by capturing and optimally encoding deterministic information to be lossless recovered at any arbitrary precision.

Combinatorially **OECS** are totally indistinguishable from computer generated pseudo-random sequences or traditional "system noise" to an external Observer.

Initiating Social Transformation



Initiating Social Transformation

Neuralizer Work In Progress

Initiating Social Transformation