

Aspects of a Unified Theory of Information

Agenda – Framework – Applications

Wolfgang Hofkirchner Vienna University of Technology

The *global problematique*

- Vulnerability of the technosphere
- Biosphere's limited capability of regeneration
- Susceptibility of the sociosphere to clashes due to
 - economic exclusions
 - political exclusions
 - cultural exclusions

Complex problems need complex solutions
need thinking in complexity

Framework

1. A new *weltanschauung*:
“POST-MODERNITY” (Best/Keller), “POST-
NONCLASSICALITY” (Stepin)
2. A new cross-discipline:
SELF-ORGANISATION
3. A new information theory:
“MAKE A DIFFERENCE” (Bateson)
4. A new theory of the information society:
“WISE SOCIETY” (HLEG), “COLLECTIVE
INTELLIGENCE” (Lévy)

1 *A new weltanschauung*

Objects are subjects are objects ...

1 Objects and subjects

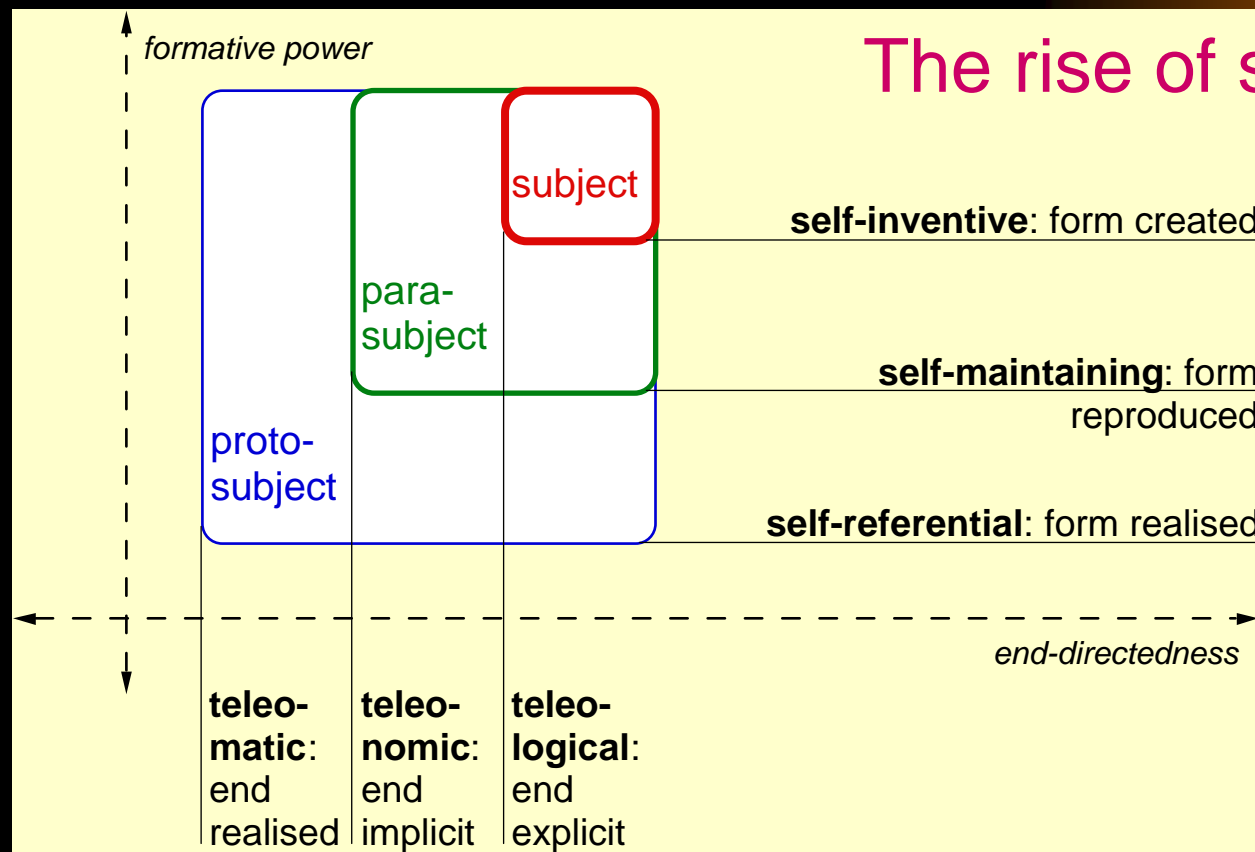
Object = something
that is determined

Subject = something
that determines
itself

1 Ways of thinking

	<i>Vision of the world</i>	<i>Model of the world</i>	<i>Approach to the world</i>
<i>Reduction</i>	Complete controllability	Complete determination	Complete deducibility
<i>Extra-polation</i>			
<i>Dis-junction</i>	Un-controllability	In-determination	Non-deducibility
<i>Integration</i>	Participation	Propensities	Proximate necessary condition

1 The integration perspective



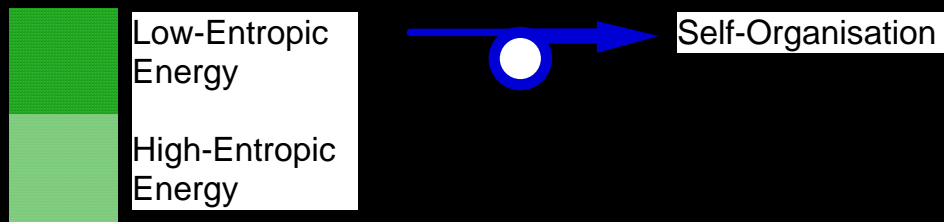
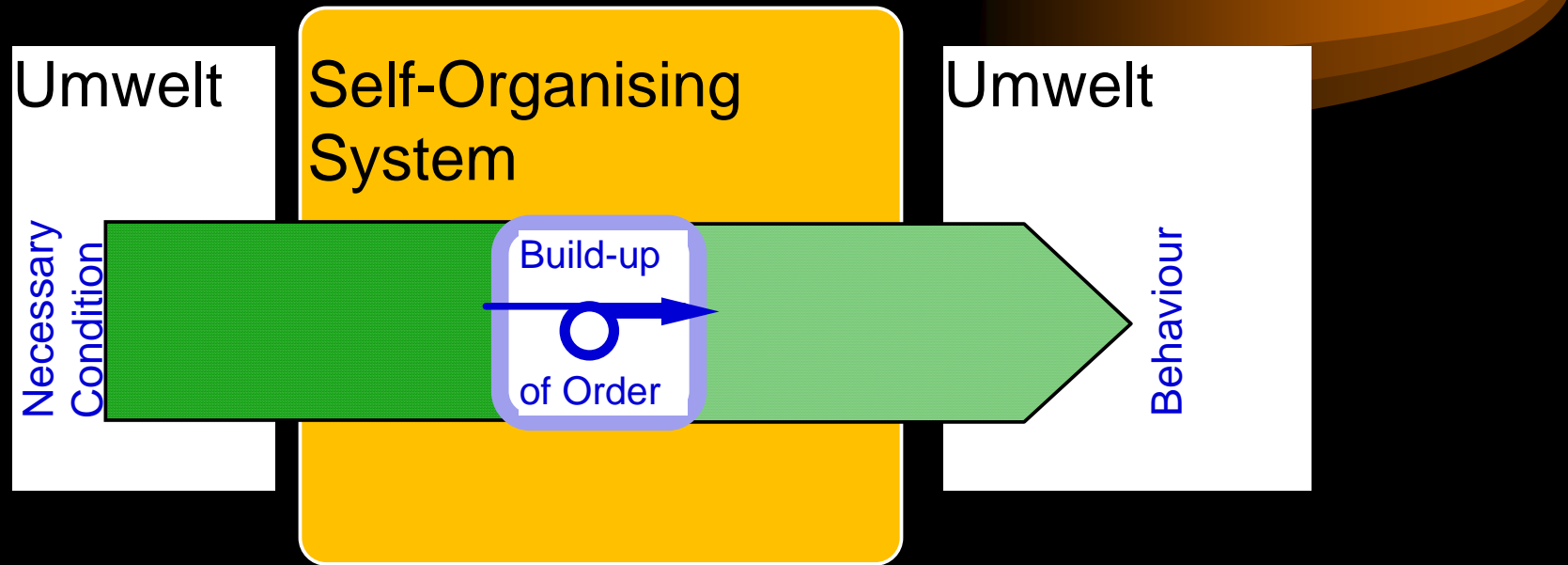
2 A new cross-discipline

Self-organising systems are
subject-objects

2 Self-organisation

Evolving systems manifest capability of
spontaneous build-up of order

2 Self-organisation

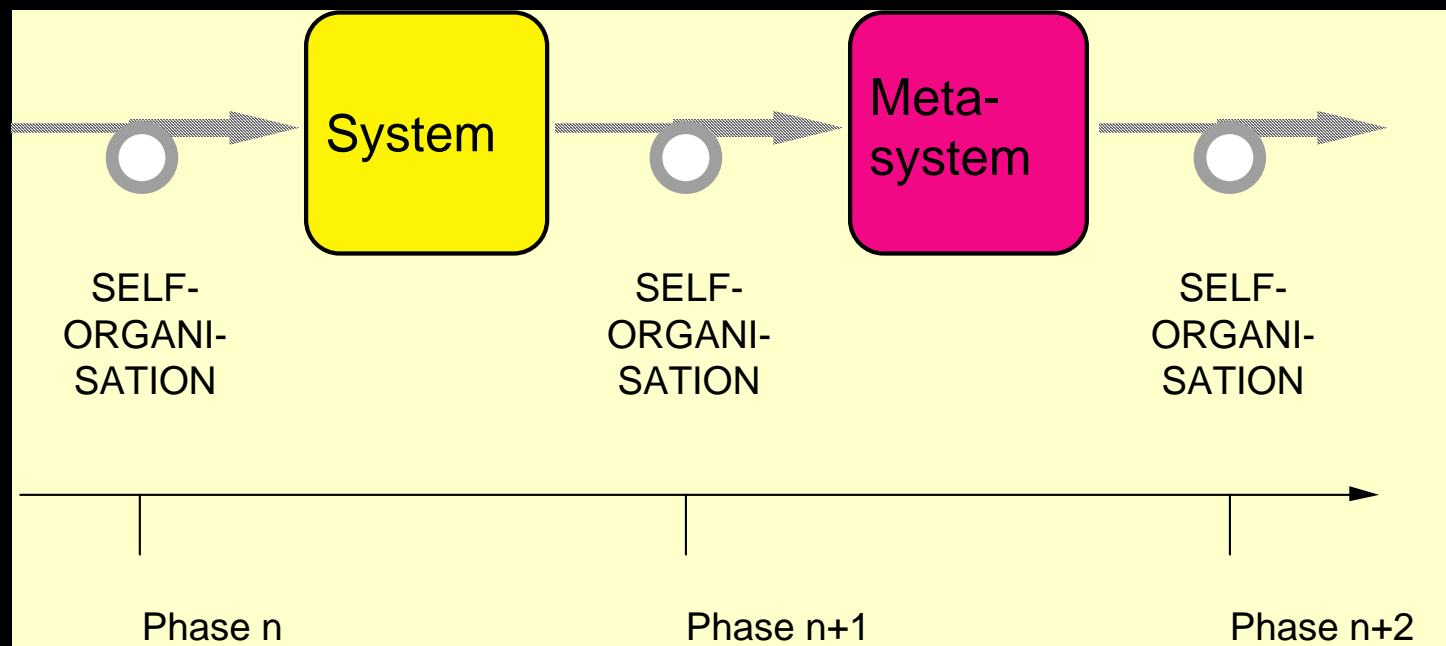


2 *Self-organisation*

1. Evolution
2. Hierarchy
3. Evolutionary hierarchy, hierarchical evolution

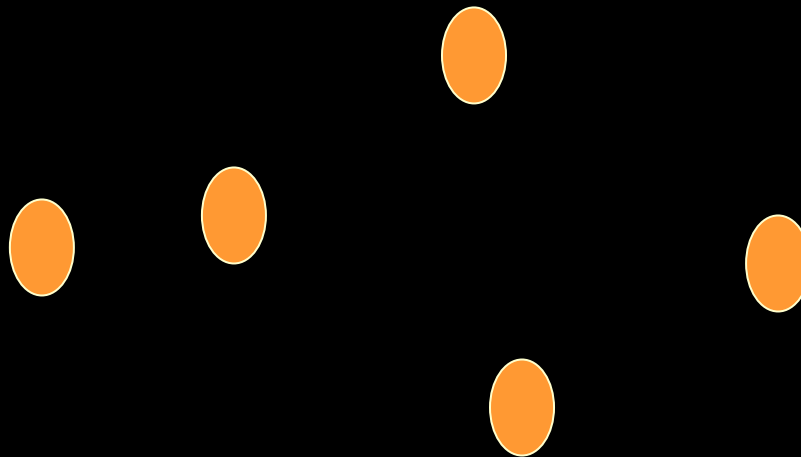
2.1 Evolution

A chain of self-organisation cycles



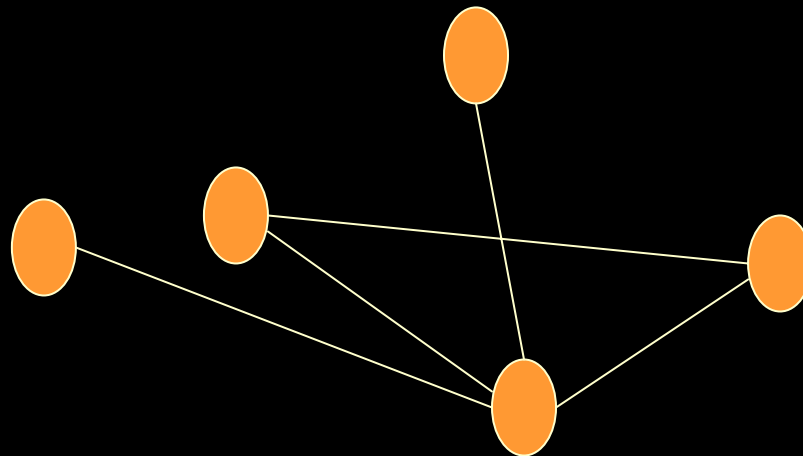
2.1 Metasystem transition

Phase 1 (individual dimension)



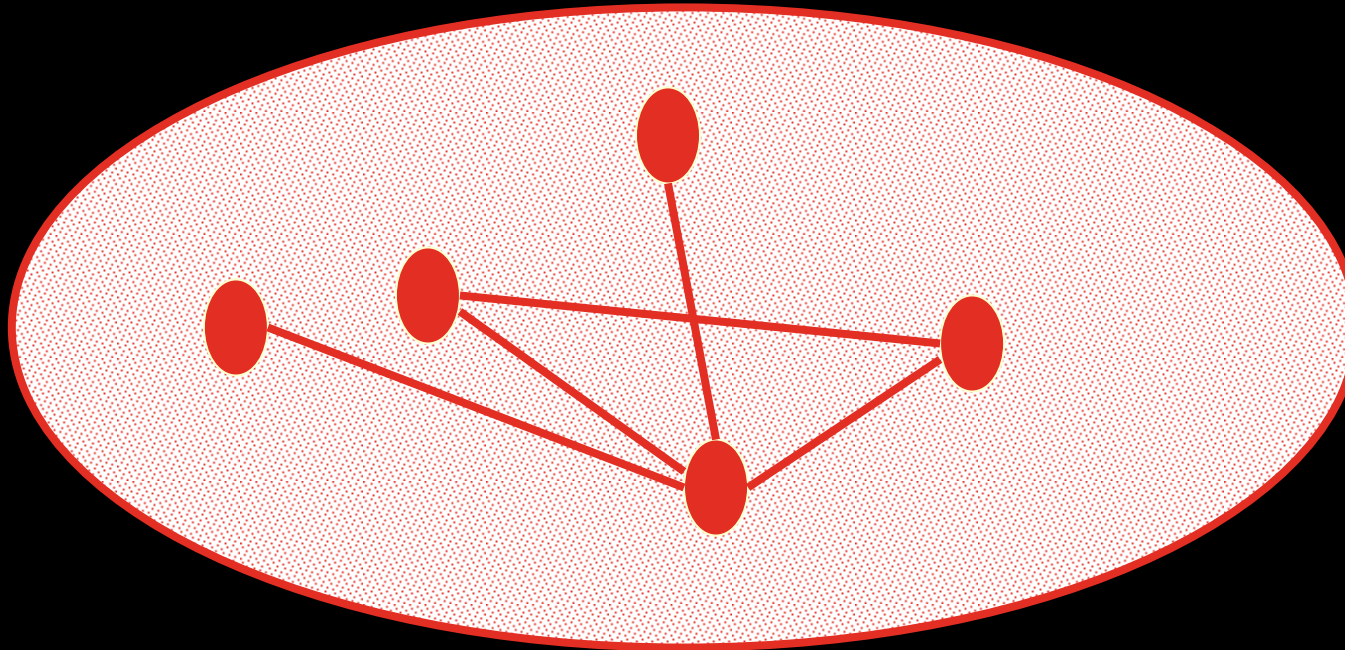
2.1 Metasystem transition

Phase 2 (interactional dimension)

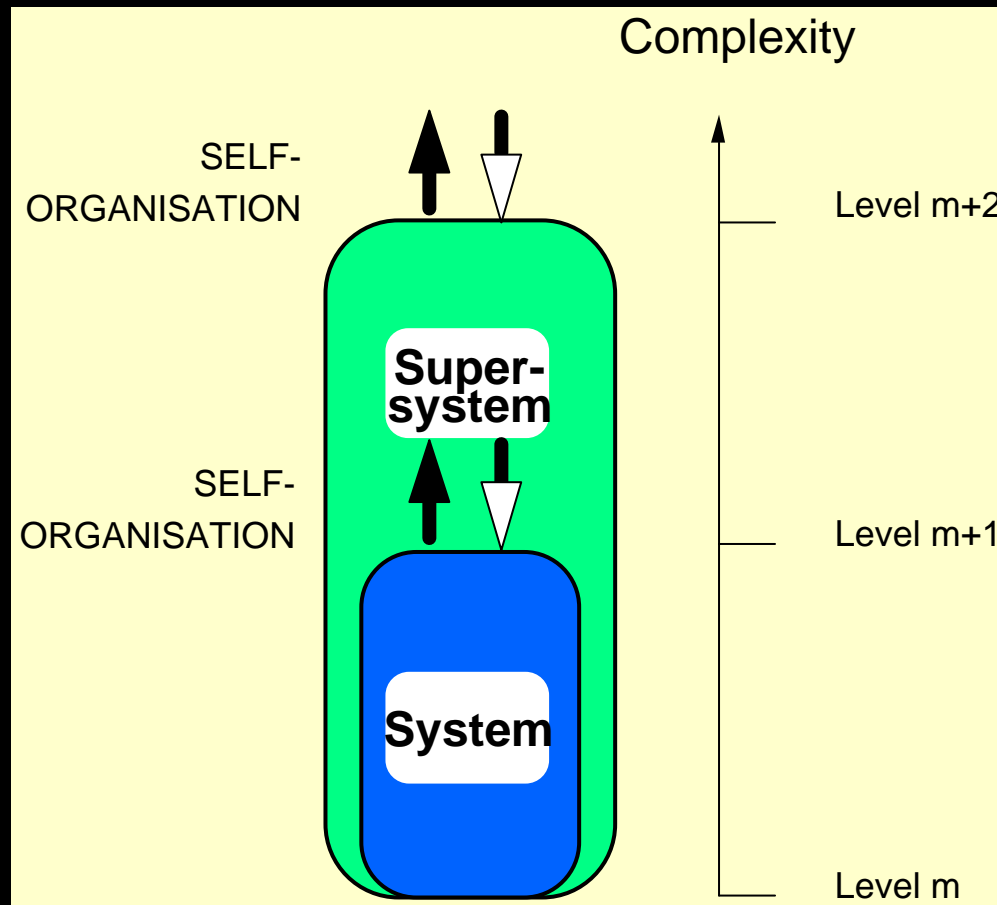


2.1 Metasystem transition

Phase 3 (integrational dimension)



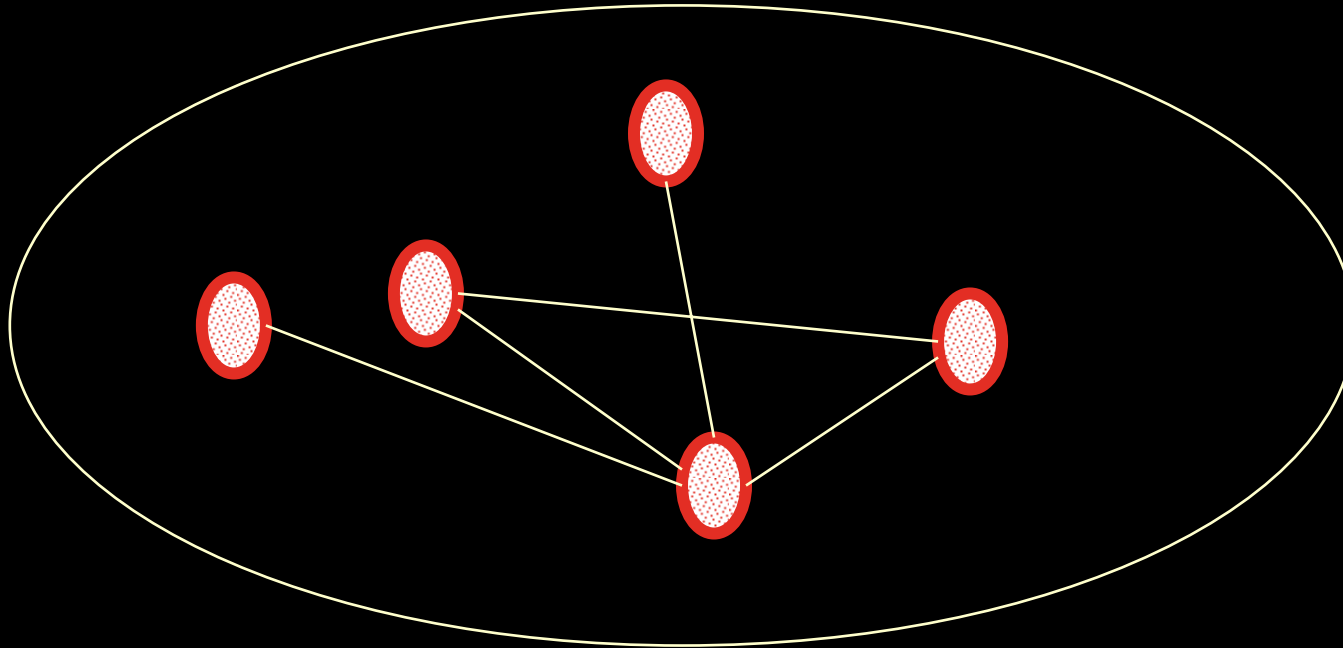
2.2 Hierarchy



A multi-levelled
architecture

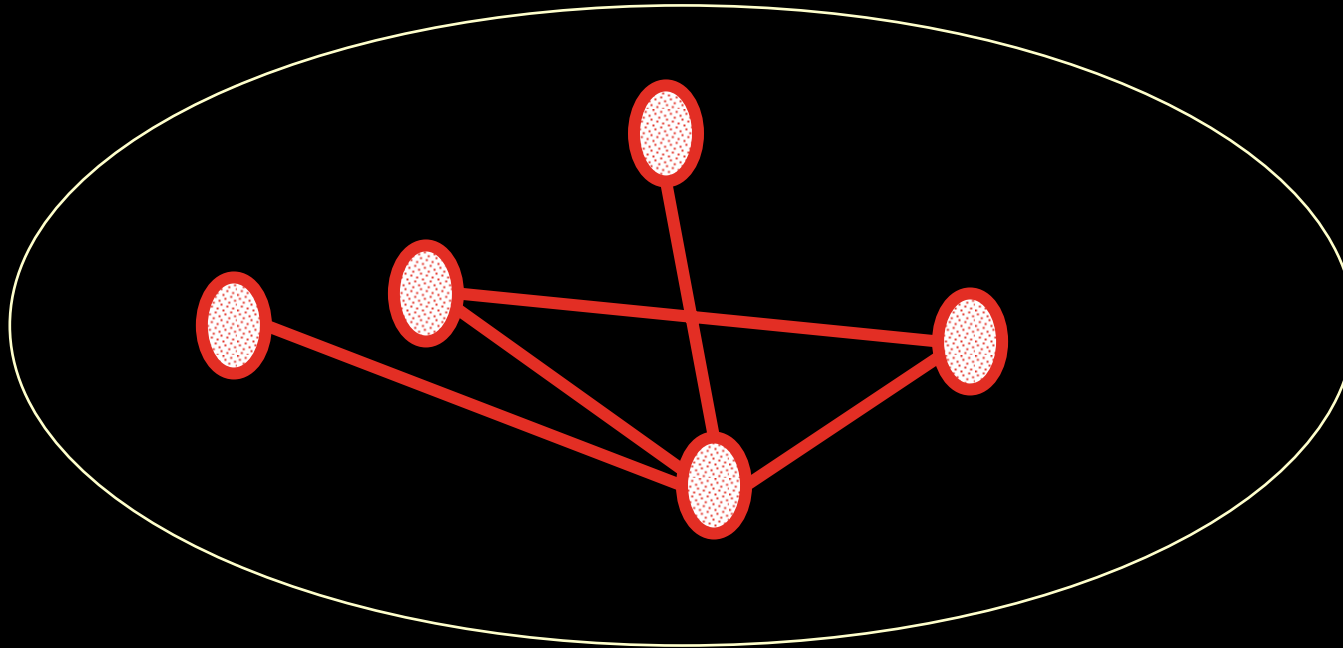
2.2 Supersystem hierarchy

Level 1 (individual dimension)



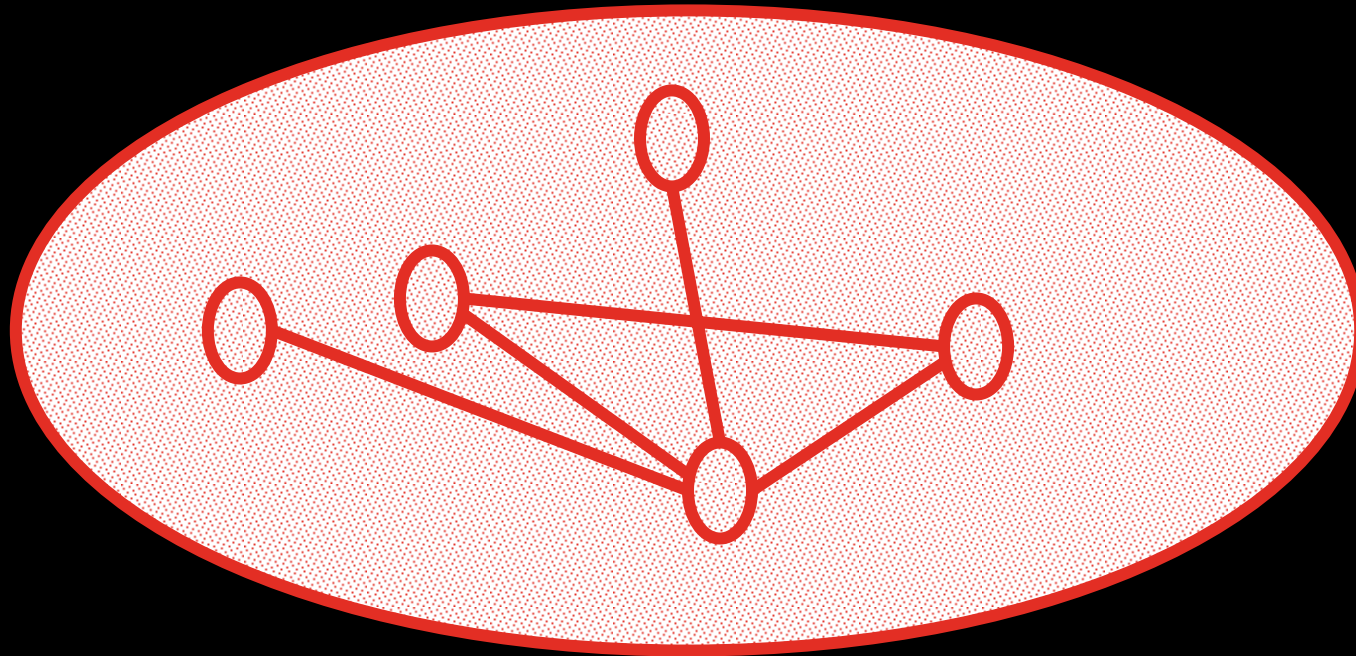
2.2 *Supersystem hierarchy*

Level 2 (interactional dimension)



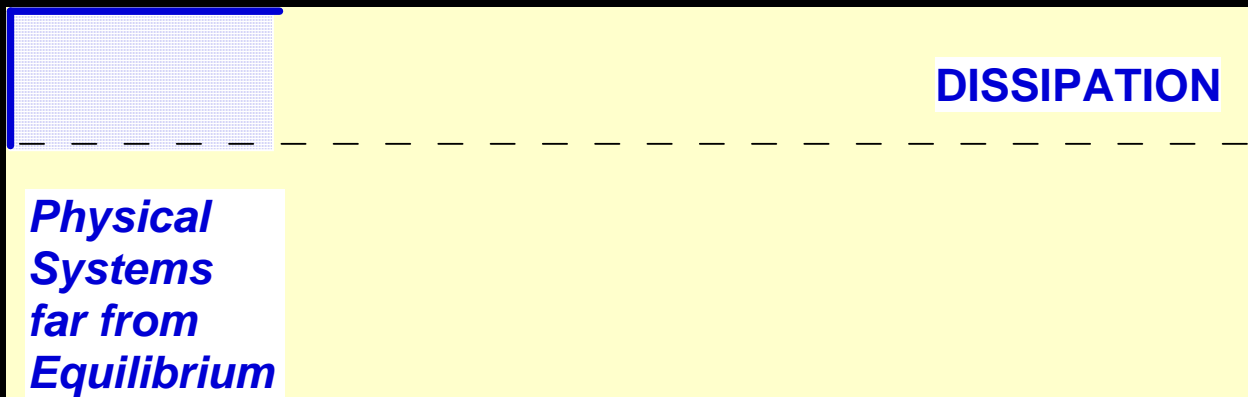
2.2 Supersystem hierarchy

Level 3 (integrational dimension)

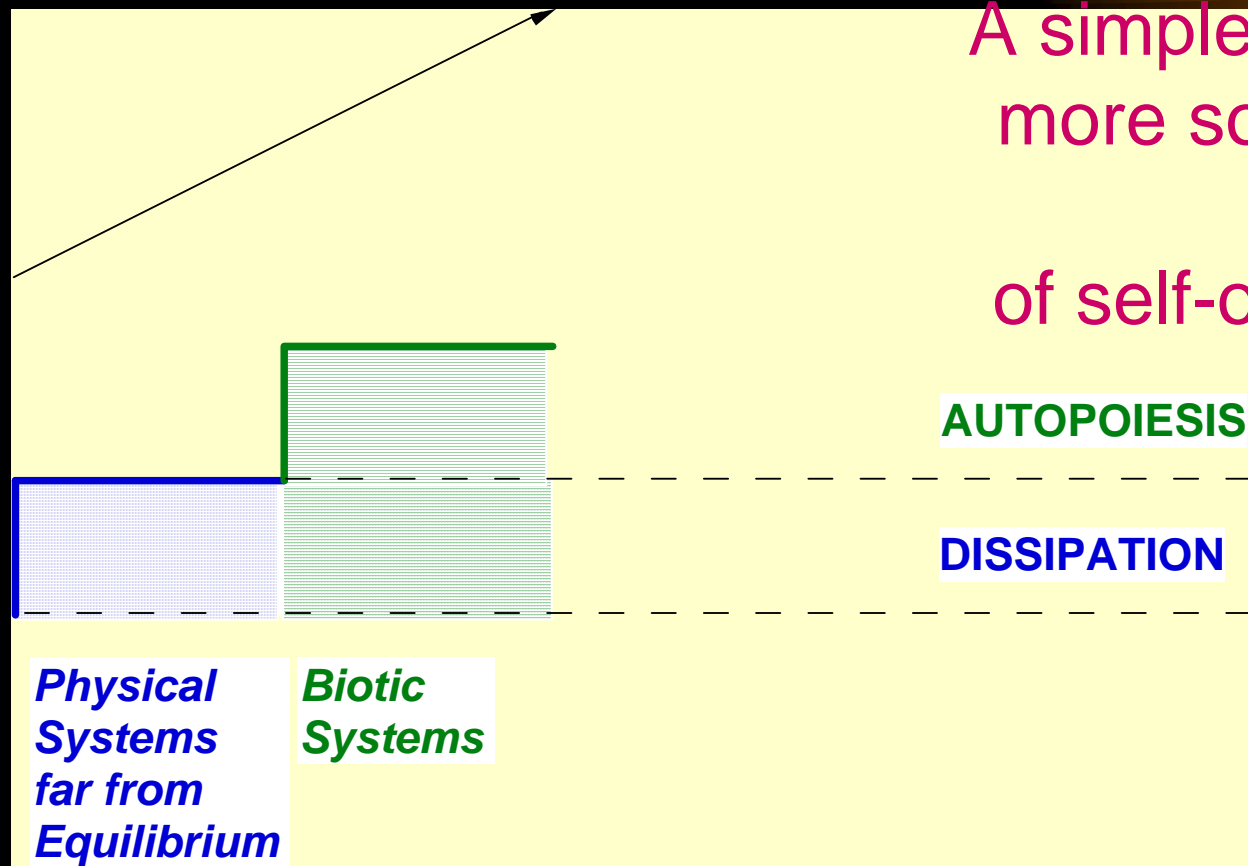


2.3 Stage model

Simple type of self-organisation

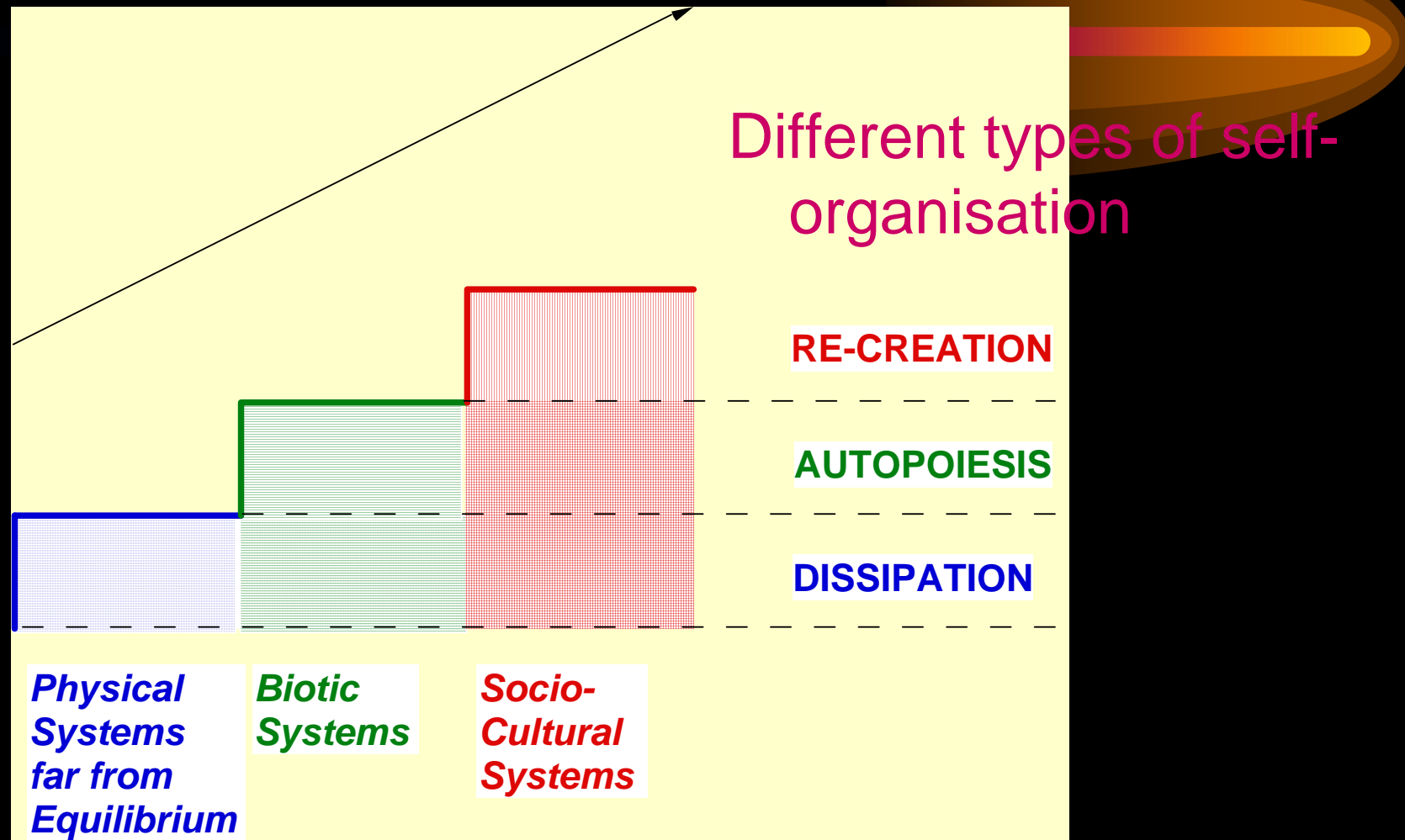


2.3 Stage model



A simple type and a more sophisticated type of self-organisation

2.3 Stage model



3 A new information theory

Information-generating systems are
self-organising systems

Information

	<i>Cognition</i>	<i>Communication</i>	<i>Co-operation</i>
<i>Science and technology perspective</i>	Information is a “thing” that is...		
	received and processed	transmitted	stored and retrieved
<i>Humanities perspective</i>	Or it is constructed by actors...		
	internally	interactionally	externally
<i>Unifying perspective</i>	It emerges whenever systems relate to...		
	their umwelt	each other	their super-system

3 Information

The system lets make a difference in its *umwelt* make a difference to itself

- The system: *signator* (signmaker)
- The difference in the umwelt: *signandum/signatum* (to be/signified)
- The making of the difference: *signans* (sign)

3 Information

Sign relations

- Pragmatics: to the *signator*
includes
- Semantics: to the *signandum/signatum*
includes
- Syntactics: to another *signans*

3 Information

1. Dimensions
2. Types
3. Categories (cross-tabling dimensions and types)

3.1 Dimensions

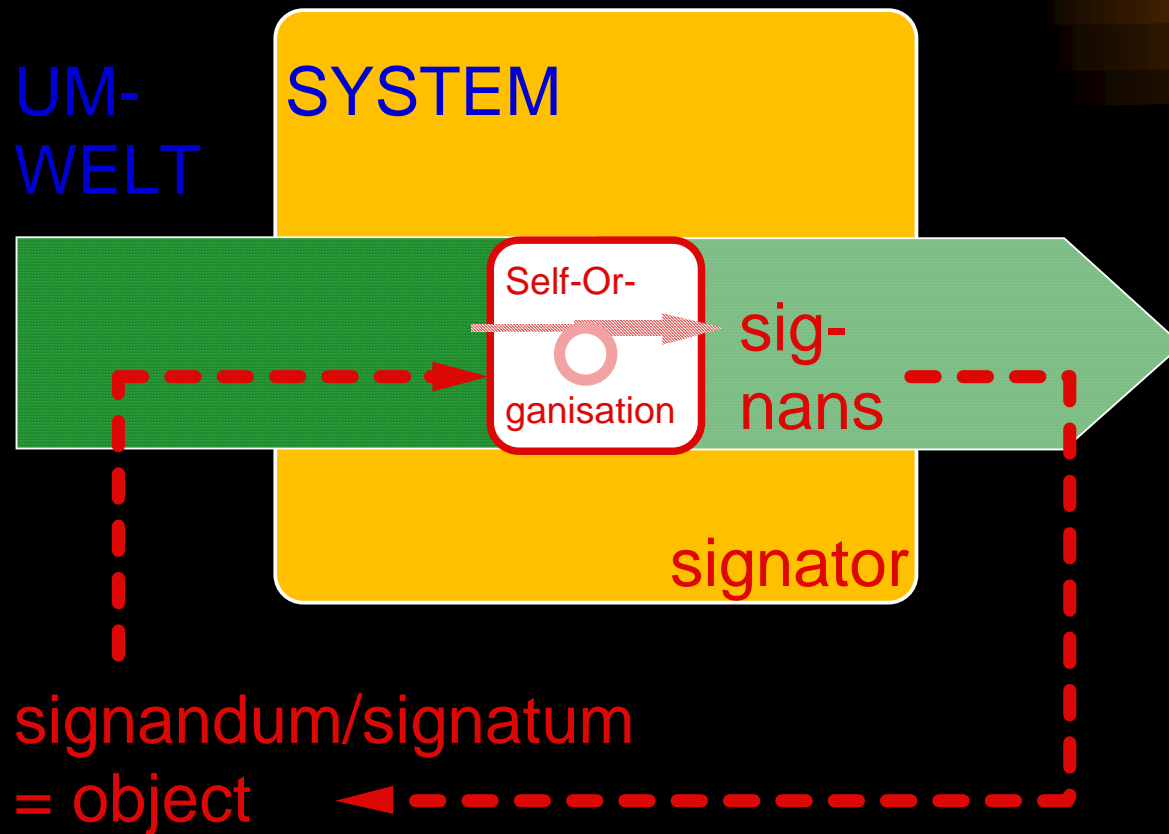
Self-organisation dimensions:

- Individual
- Interactional
- Integrational

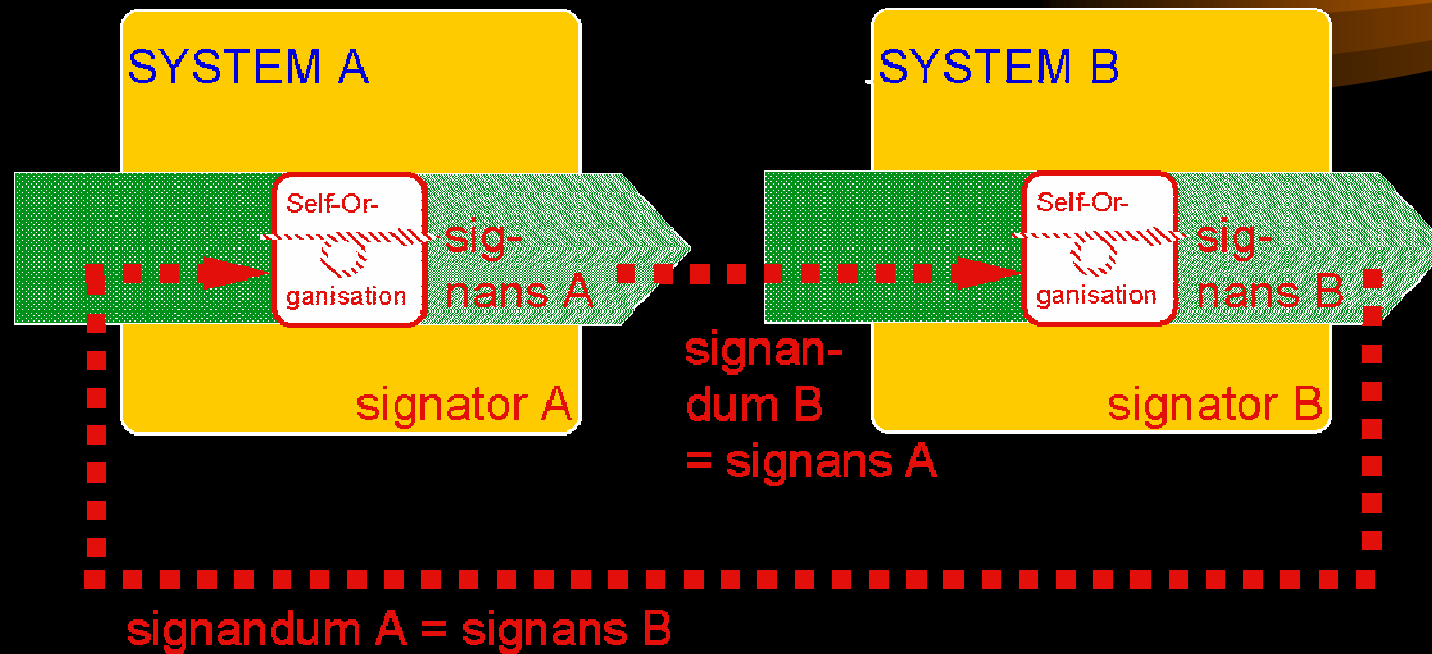
Information generation dimensions:

1. Cognitive
2. Communicative
3. Co-operative

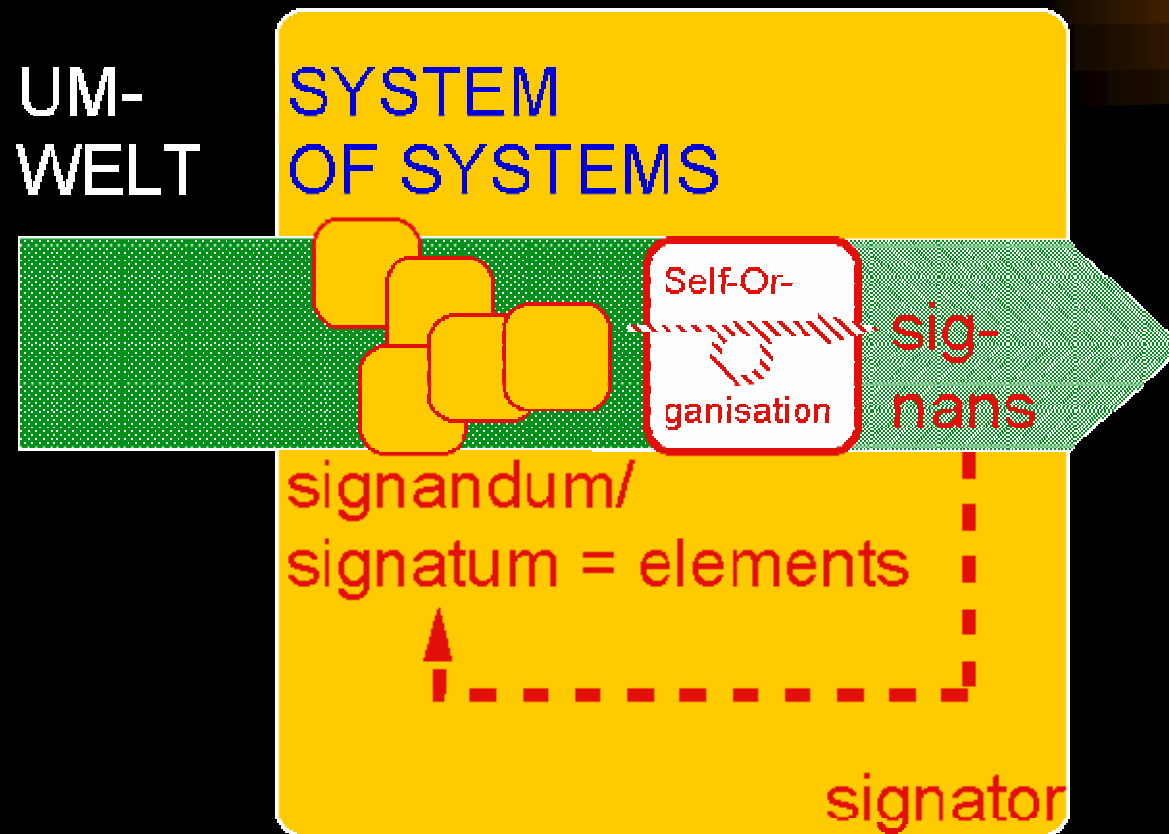
3.1.1 Cognitive information



3.1.2 Communicative information



3.1.3 Co-operative information



3.2 Types

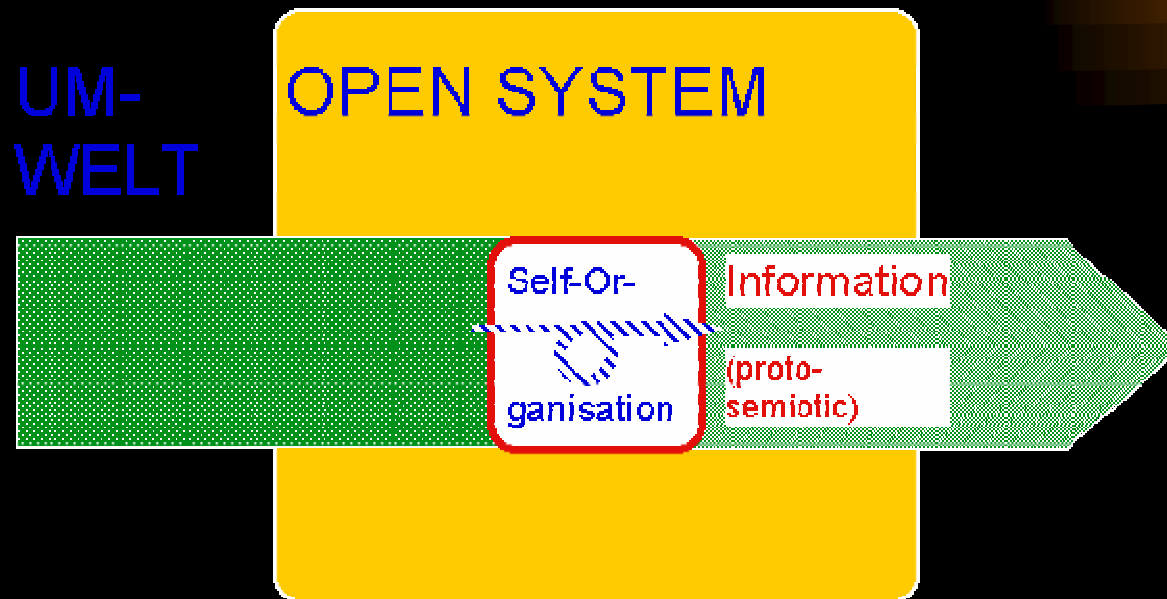
Self-organisation types:

- Dissipation
- Autopoiesis
- Re-creation

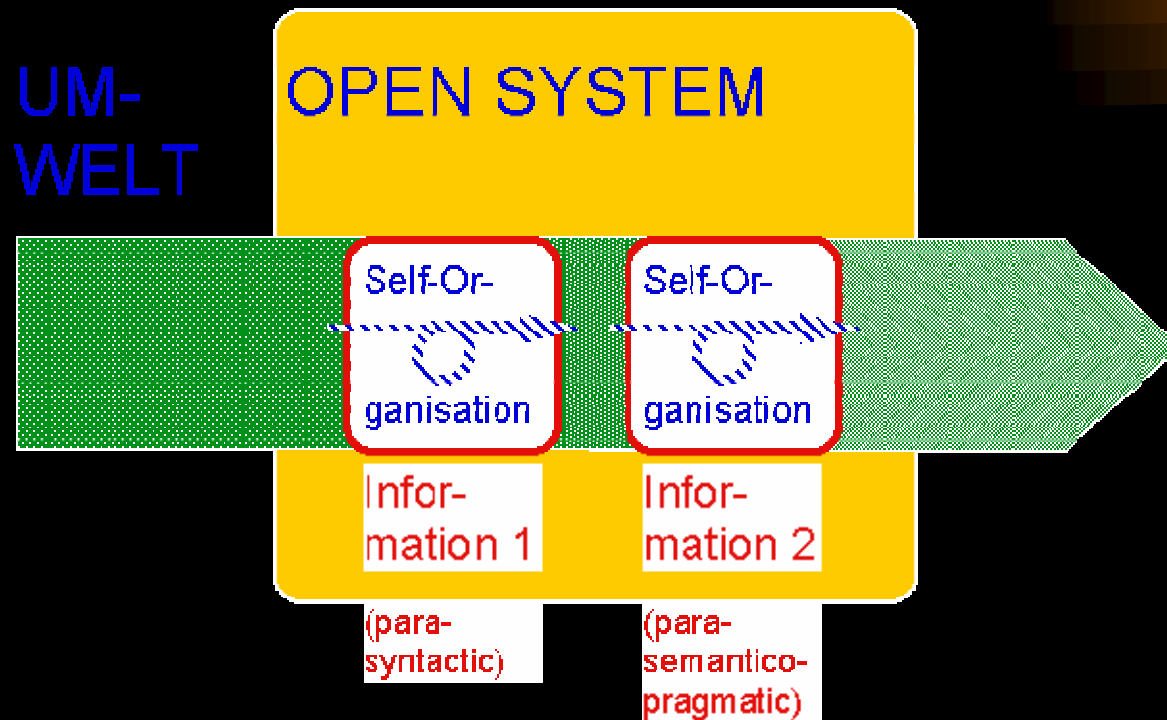
Information generation types:

1. Pattern formation
2. Formation of functions
3. Formation of expectations

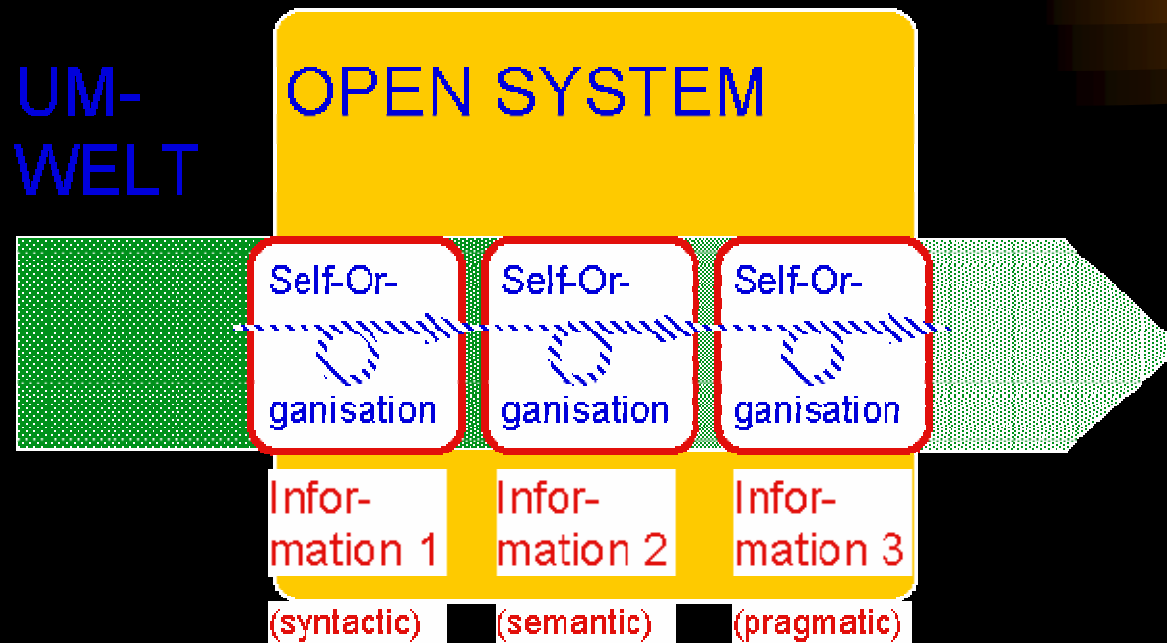
3.2.1 Pattern formation



3.2.2 Formation of functions



3.2.3 Formation of expectations



3.3 Dimensions and types

	<i>Pattern formation</i>	<i>Formation of functions</i>	<i>Formation of expectations</i>
<i>Cognisability</i>	Reflectivity	Psyche	Consciousness
<i>Communicability</i>	Coherency	Signalability	Languageability
<i>Cooperability</i>	Cohesiveness	Organicity	Sociability

3.3.1 Cognisability

- *In dissipative systems*
REFLECTIVITY: reflection
(protosemiotic echoes)
- *In autopoietic systems*
PSYCHE: flexible response
(parasyntactic sensation – para-semanticopragmatic motivation)
- *In re-creative systems*
CONSCIOUSNESS: idea
(syntactic data – semantic knowledge – pragmatic wisdom)

3.3.2 Communicability

- *In dissipative systems*
COHERENCY: coherence
(protosemiotic resonances)
- *In autopoietic systems*
SIGNALABILITY: anticipation
(para syntactic re-presentation –
para-semanticopragmatic reorientation)
- *In re-creative systems*
LANGUAGEABILITY: understanding
(syntactic expressive tuning – semantic indicative
tuning – pragmatic appellative tuning)

3.3.3 Co-operability

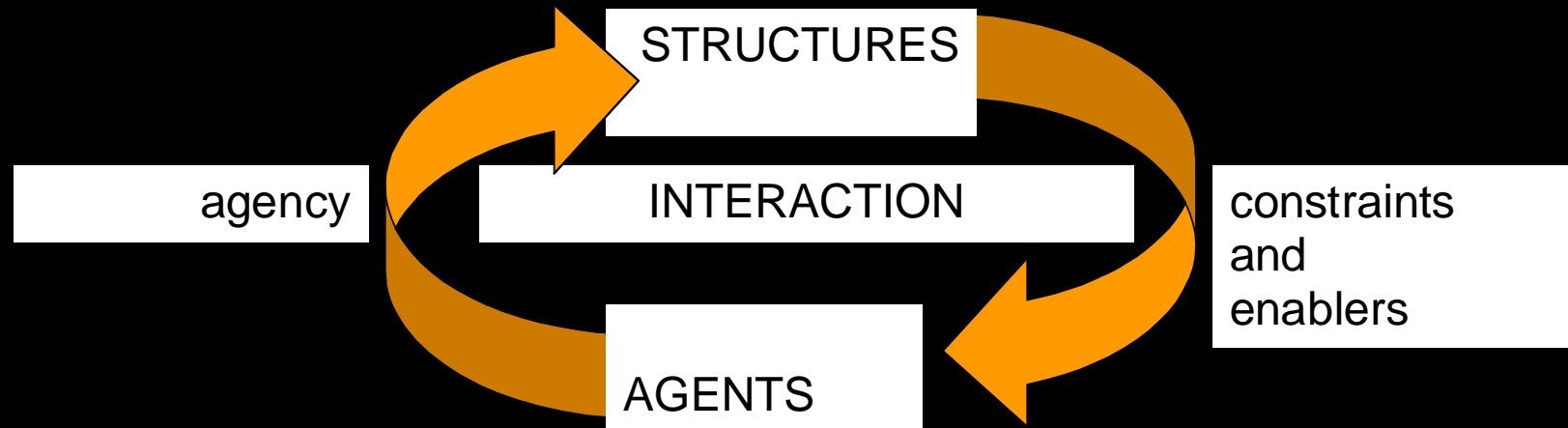
- *In dissipative systems*
COHESIVENESS: cohesion
(protosemiotic collectives)
- *In autopoietic systems*
ORGANICITY: organic organisation
(parasyntactic specialisation –
para-semanticopragmatic complementation)
- *In re-creative systems*
SOCIABILITY: sense
(syntactic coordination – semantic collaboration –
pragmatic consensualisation)

4 A new theory of the information society

1. Social systems are information-generating systems
2. The emerging global information society is a social system

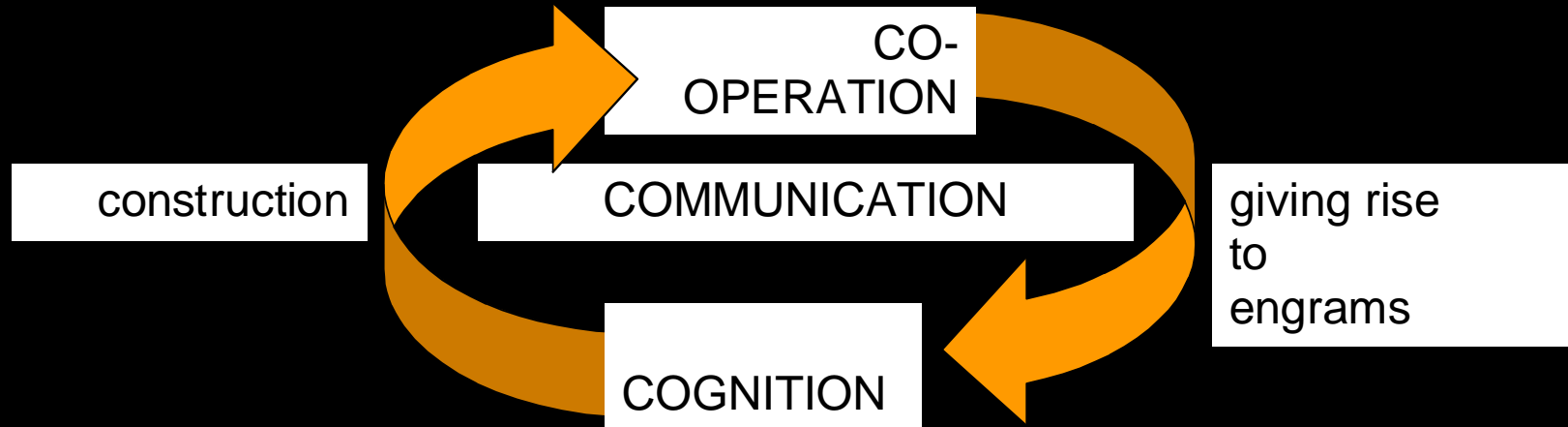
4.1 Social self-organisation

Structures are outcome and medium of actions



4.1 Social information generation

Information is outcome and medium of self-organisation at all levels (dimensions)



4.2 Informatisation

ICTs mediate a variety of information-generation cycles:

- augmenting productive forces (technology)
- life support (natural environment)
- supply of sense (society), that is,
 - disposing of resources (economy)
 - decision-making (politics)
 - defining rules (culture)

ICTs change the character of social systems.

4.2 Nathaniel Hawthorne 1851

had his novel character Clifford in "The House of the Seven Gables" make the comparison of the globe with a head and brain, in view of the telegraph: "...by means of electricity, the world of matter has become a great nerve, vibrating thousands of miles... the round globe is a vast head, a brain, instinct with intelligence!"

4.2 Teilhard de Chardin 1925

regarded the "astonishing system of land, sea and air channels, the postal connections, wires, cables and radio waves, which encircle the earth more each day" as the "creation of a real nervous system of humanity, development of a common consciousness, networking of the mass of humanity."

4.2 V. I. Vernadsky 1937/38

"Human life has, in all its diversity, become indivisible. An event that takes place in the remotest corner of any continent or ocean has consequences, and causes reactions in a number of other places on the earth, be they great or small. The telegraph, telephone, radio, airplanes and balloons have encircled the globe. Connections are becoming ever simpler and faster. Their degree of organization increases every year.. this process of *complete habitation of the biosphere* by humans is caused by the course of history of scientific thinking, inextricably linked with the speed of communications, the success of transport technology, the possibility of *instant* transfer of thought, and its simultaneous discussion everywhere on the planet."

4.2 Marshall McLuhan 1964

"Today, after more than a century of electric technology, we have extended our central nervous system itself in a global embrace, abolishing both space and time as far as our planet is concerned. Rapidly, we approach the final phase of the extensions of man - the technological simulation of consciousness, when the creative process of knowing will be collectively and corporately extended to the whole of human society, much as we have already extended our senses and our nerves by the various media."

4.2 Tom Stonier 1992

"In principle, this process does not differ from the evolution of primitive nervous systems into advanced mammalian brains: Relatively few nerve cells, relatively poorly co-ordinated, evolving into an organ consisting of trillions of cells, so exquisitely co-ordinated that our understanding of how it works still eludes us. With the evolution of the global brain we are dealing with a parallel process, but at a much higher level of complexity... each node, rather than being a neuron, is a person comprising trillions of neurons ... coupled ... to their personal computers... We are now dealing with the very top end of the known spectrum of intelligence."

4.2 Francis Heylighen 1997

"The medium that seems best suited to implement such a brain-like, intelligent network is the World-Wide Web... due to the Web's extremely simple, but powerful way of representing networked information: *distributed hypemedia*. It is this architecture that turns the Web into a prime candidate for the substrate of a global brain."

4.2 HLEG 1997

"However, these new technologies have had no such effect on the generation or acquisition of knowledge, still less on wisdom. One would hope, of course, that society would be shifting more and more towards a "wise society", where scientifically supported data, information and knowledge would increasingly be used to make informed decisions to improve the quality of all aspects of life. Such wisdom would help to form a society that is environmentally sustainable, that takes the well-being of all its members into consideration and that values the social and cultural aspects of life as much as the material and economic. Our hope is that the emerging information society will develop in such a way as to advance this vision of wisdom."

4.2 Pierre Lévy 1997

"Collective intelligence is more a field of problems than a solution. It is commonly recognized that the best use we can make of cyberspace is to combine the experience, imagination, and spiritual energy of those who are connected to it. But in what sense? ... Will each of us become a neuron in a planetary megabrain, or will we constitute a multitude of virtual communities in which nomadic brains join together to produce and share meaning?"

4.2 Ways of theorising information society

	<i>Eutopianism</i>	<i>Dystopianism</i>
<i>Technological determinism</i>	Vernadsky, McLuhan, Stonier, Heylighen,
<i>Metaphysical determinism</i>	de Chardin,
<i>Social constructivism</i>
<i>Technology design</i>	HLEG, Lévy, ...	

4.2 Technology design perspective

Technological interdependence is but a step towards social integration, not social integration itself.

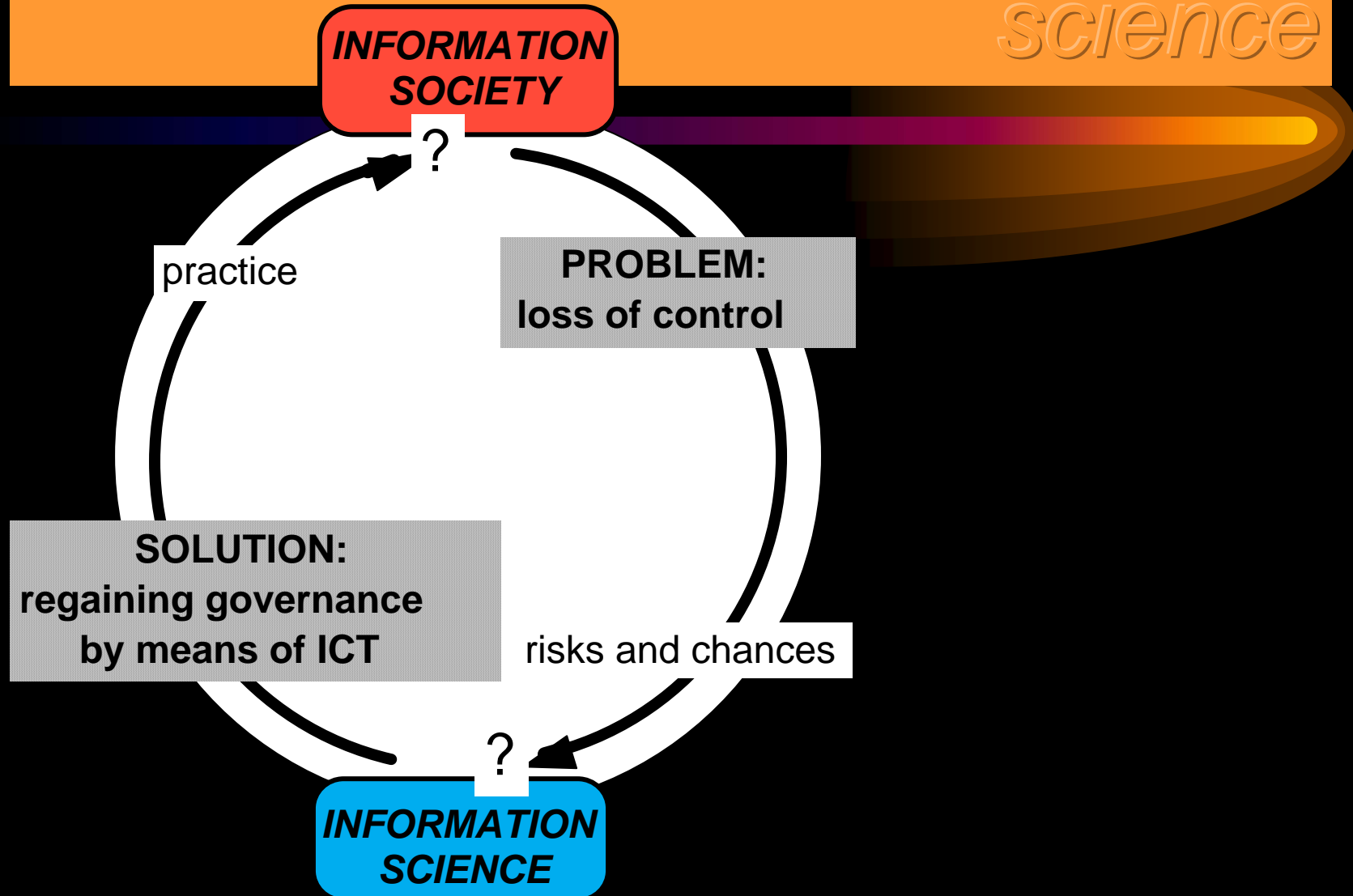


4.2 Science of the information society

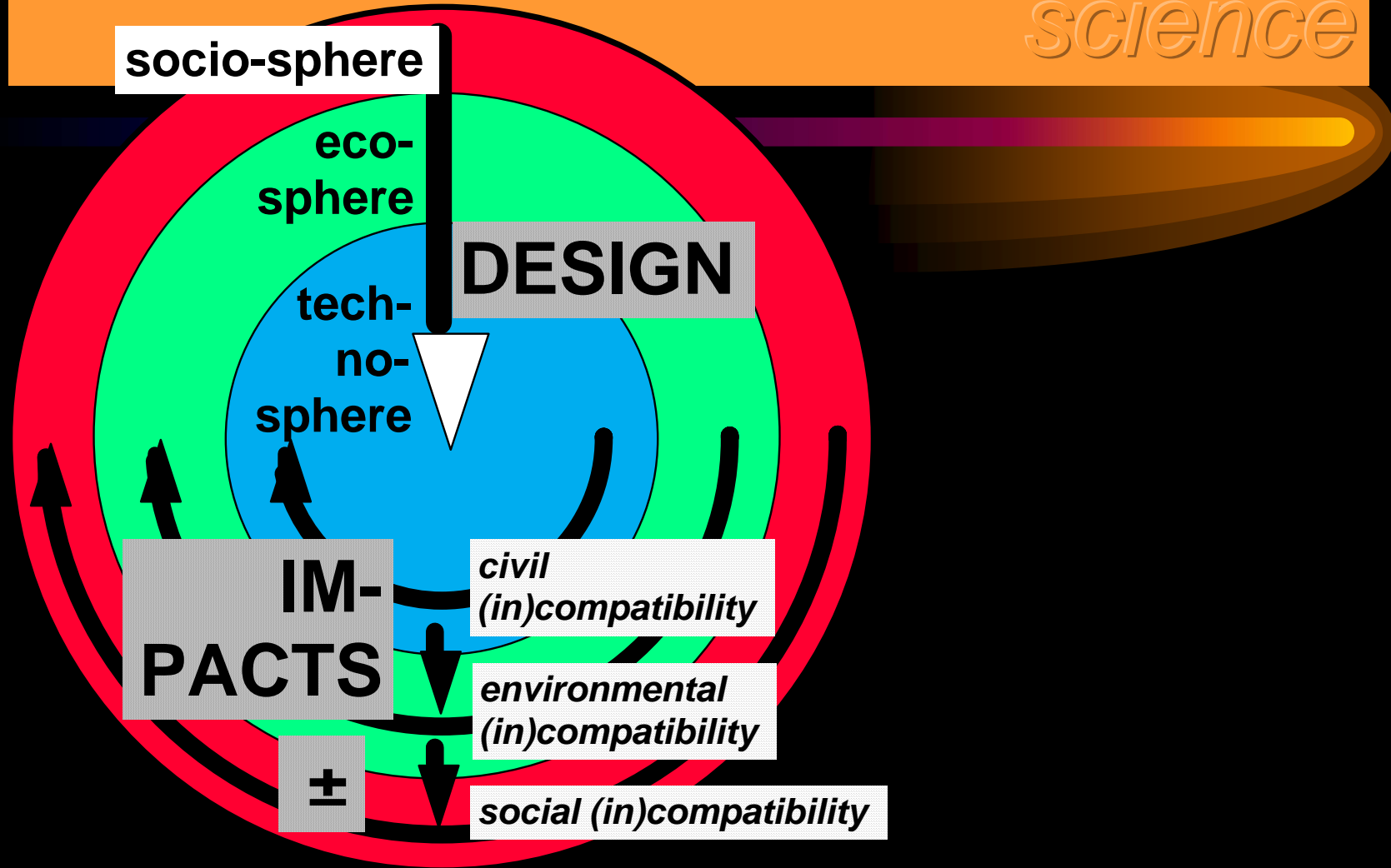
Information science

1. Task: social cybernetics
2. Domain: interplay of social subsystems as information-generating systems
3. Approach: transversality

4.2.1 Task of information science



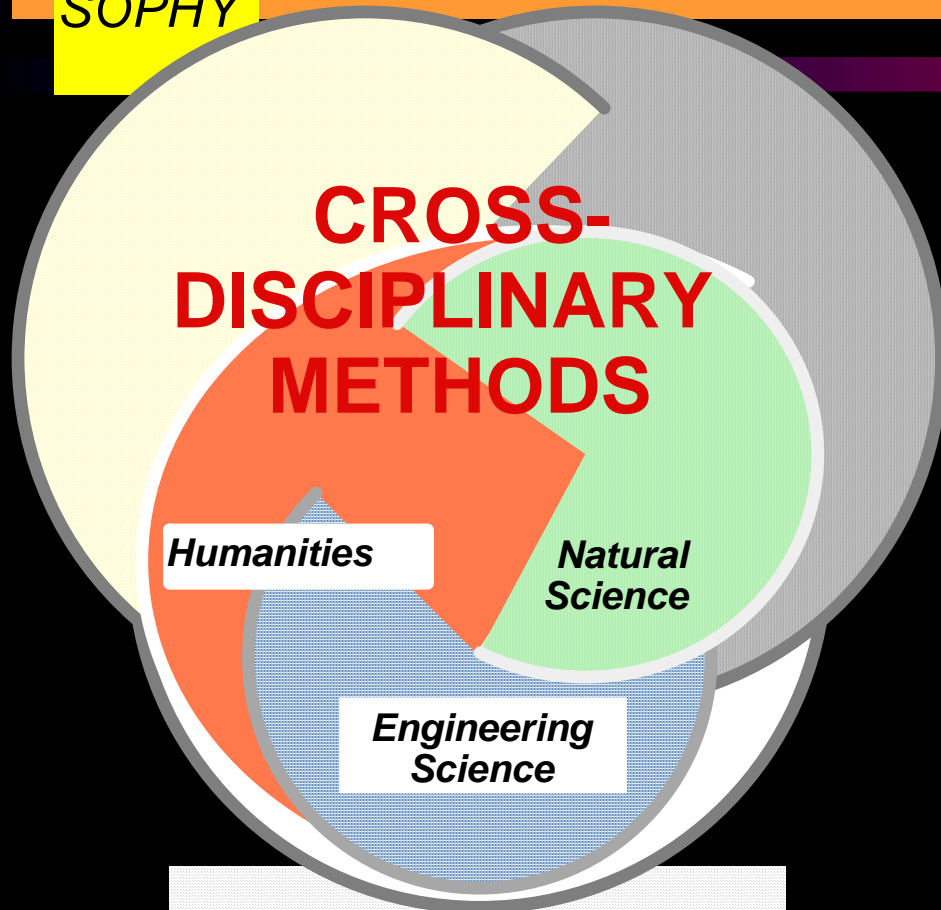
4.2.2 Domain of information science



4.2.3 Approach of information science

PHILO-
SOPHY

FORMAL SCIENCES



REAL SCIENCES

Socio-technical systems design principles

- Peace and security instead of alienation from the “Megamachine”
- Sustainability instead of alienation from “Gaia”
- Justice instead of alienation from the “Net”
 - Solidarity instead of commodification of information
 - Freedom instead of Big Brother
 - Equality instead of false consciousness