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Dynamic & Thermodynamic Worldviews: Life, Earth and Beyond

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Issues of Concern

- ***Empathy/Entropy Paradox*** : the collision of ‘biosphere consciousness’ and ‘global capitalism’
- ***Visioneering*** : How can we mobilize nations and people towards sustainability?
- ***Bottlenecks*** to sustainability :
 - *Lack of Willingness* to practice stewardship
 - *Lack of Resilience & Capacity Building* in complex Ecological-Societal Systems (ESS)
 - *Lack of Understanding* of complex ESS



Reconnecting to the Biosphere

- Humanity emerged as a major force in the operation of the biosphere, challenging social-ecological resilience
- New situation calls for a fundamental shift in perspective, worldviews and institutions
- The Millennium Development Goals need to be reframed in a planetary stewardship context combined with a call for a new social development (in collaboration with the biosphere) – a global sustainability agenda for humanity!

Rockstrom et al., 2011



Resilience Thinking

- Diversity – promoting and sustaining all forms of diversity
- Ecological variability – embracing and working with variability rather than attempting to control and change it
- Modularity – consisting of modular components
- Acknowledging slow variables – having a policy focused on slow controlling variables associated with thresholds
- Tight feedbacks – possessing tight feedbacks, but not too tight
- Social capital – promoting trust, social networks and stewardship
- Innovation – emphasizing learning, experimentation, locally developed rules and embracing changes
- Overlap governance – having institutions that include redundancy
- Ecosystem service – include all the un-priced ecosystem services in development proposals and assessments of ecosystem health



Key Issues & Questions

- Ecosystems (ESS) have unique properties: openness, connectivity, directionality, and complex dynamics (for growth, development, disturbances, and decay)
- How does novelty arise in ecosystems (ESS)?
- What is the impact and importance of interconnectedness for behavior and development of ecosystems (ESS)?
- Are certain directions preferred during ecosystem (ESS) development? If so, then how?
- Are there general pathways that ecosystems (ESS) follow during their dynamics?
- How do they reorganize in response to disturbances?
- How can we apply our understanding to sustainable management and assessment of ecosystem (ESS) health?



7 Complex Lessons in Education

for the Future (UNESCO, 2001)

- 1. Detecting Error and Illusion:** *Education is BLIND* to the realities of human knowledge, its systems, infirmities, difficulties, propensity to error & illusion
- 2. Principles of Pertinent Knowledge:** *Fragmented learning* divided up into disciplines hinders to grasp fundamental problems, connect parts and wholes; must teach how to grasp mutual relations/reciprocal influence b/w parts & the whole in a complex world
- 3. Teaching the Human Condition:** Must teach *what being human means*, the connection between the complex unity and diversity of all that is human



7 Complex Lessons in Education

for the Future (UNESCO, 2001)

4. Earth Identity: *Our future is now situated on a planetary scale.* Teach planet under pressure, global trajectory, earth citizenship, planetary stewardship

5. Confronting Uncertainty: *End of certainty and dominance of determinist conception,* need to teach uncertainties emerging in the physical sciences (e.g., microphysics, thermodynamics, cosmology), the sciences of biological evolution, historical sciences

6. Understanding Each Other: Understanding is *both a means and end of human communication,* and yet we do not teach understanding, (to know as we are known)



7 Complex Lessons in Education

for the Future (UNESCO, 2001)

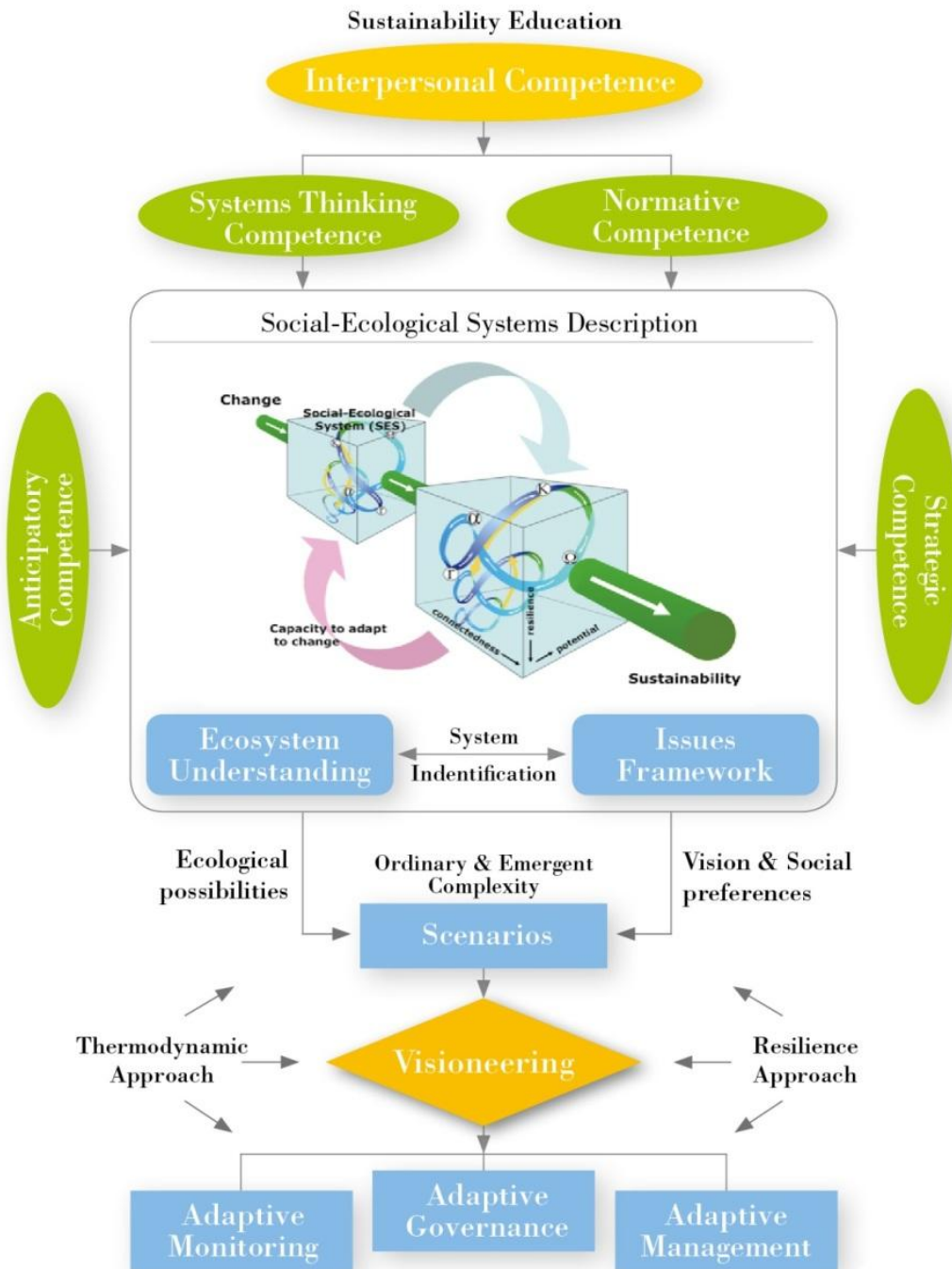
7. Ethics for the Human Genre: *Education should lead to an 'anthropo-ethics' through recognition of the ternary quality of the human condition: a human being is an 'individual ↔ society ↔ species' i.e. a joint development of individual autonomy, community participation and awareness of belonging to the human species. Education should contribute to an 'establishment of a relationship of mutual control between society and individual' and 'fulfillment of humanity as a planetary community' (need to teach ontology, epistemology, pedagogy & ethics)*



Thinking in Systems, Complexity

- We do not seek prediction, control, right answer or efficiency
- We seek understanding, adaptability and resilience
- Role of expert shifts
 - from ‘problem solving’ to
 - ‘an exploration of possibilities’
 - from ‘giving correct advice’ to
 - ‘sharing information on options & trade-offs’





1. Framing the Situation
Developing System Description
2. Describing the Dynamics of the Situations
3. Synthesizing the Understanding into Narratives for Future Adaptation
4. Engineering of Vision

Framing the Situation ...

- First Phase – System Identification. The system must be identified, which ends up with a rich picture of the situation, a conceptual roadmap of the interrelationships
- Second phase - Describing the Dynamics. Having identified the system (building a mental roadmap to frame the situation), next is to describe how the system changes over time – its dynamics



Main Issue? ... a paradigm

- Does observer have a “Paradigm”?
- Paradigm – Normative framework that is characterized by shared tools, vocabulary, protocols, questions and ... (worldviews)
- ‘What is of interest’ is equivocal in complex systems!
- Paradigms assert “pattern” that make complexity simple and tractable

Searching for a Paradigm

- We cannot model complexity but can approach it using analogy and narrative
- Dealing with complexity amounts “searching for a paradigm” – a narrative that highlights what matters
- Without a paradigm, change that amounts from the emergence of structure is indistinguishable from the change of the state of a recognized structure!



Observer without a Paradigm

- The observer of complex systems who lacks a normative framework can neither bound the system nor define its parts until ...
- Dealing with complexity – finding simple expressions of the system by making decisions that remove the dilemmas
- Success is achieved by imposing a workable paradigm, whereupon normal scientists can then make their contributions!



Paradigm puts the study of a

- System in a frame of reference that recognizes constraints that impose certain limits
- (In experimental science, a system is physically and literally put under constraints so that simplicity prevails)
- What post-normal and complexity scientists are doing is suggesting ways to relax suppression of information at the critical times when normal science approaches get stuck!



Prediction as Benchmark?

- Models approach reality?
- Understanding constraints make systems simple and predictable. Choosing one paradigmatic framework necessarily excludes, for the time being, all others. Excluding other frameworks imposes constraints by eliminating options
- Simplicity comes from an explicit juxtaposition of parts so as to expose a relationship that is significant.



WORLDVIEW

- A world view, (or worldview) is a term calqued (loan translation) from the German word *Weltanschauung* (pronounced /vɛlt.anʃaʊ.ʊŋ/) meaning a "look onto the world".

It implies a concept fundamental to German philosophy and epistemology and refers to a *wide world perception*. It refers to the framework through which an individual interprets the world and interacts in it. The German word is also in wide use in English, as well as the "translated" form *world outlook*.



So What is a Worldview?

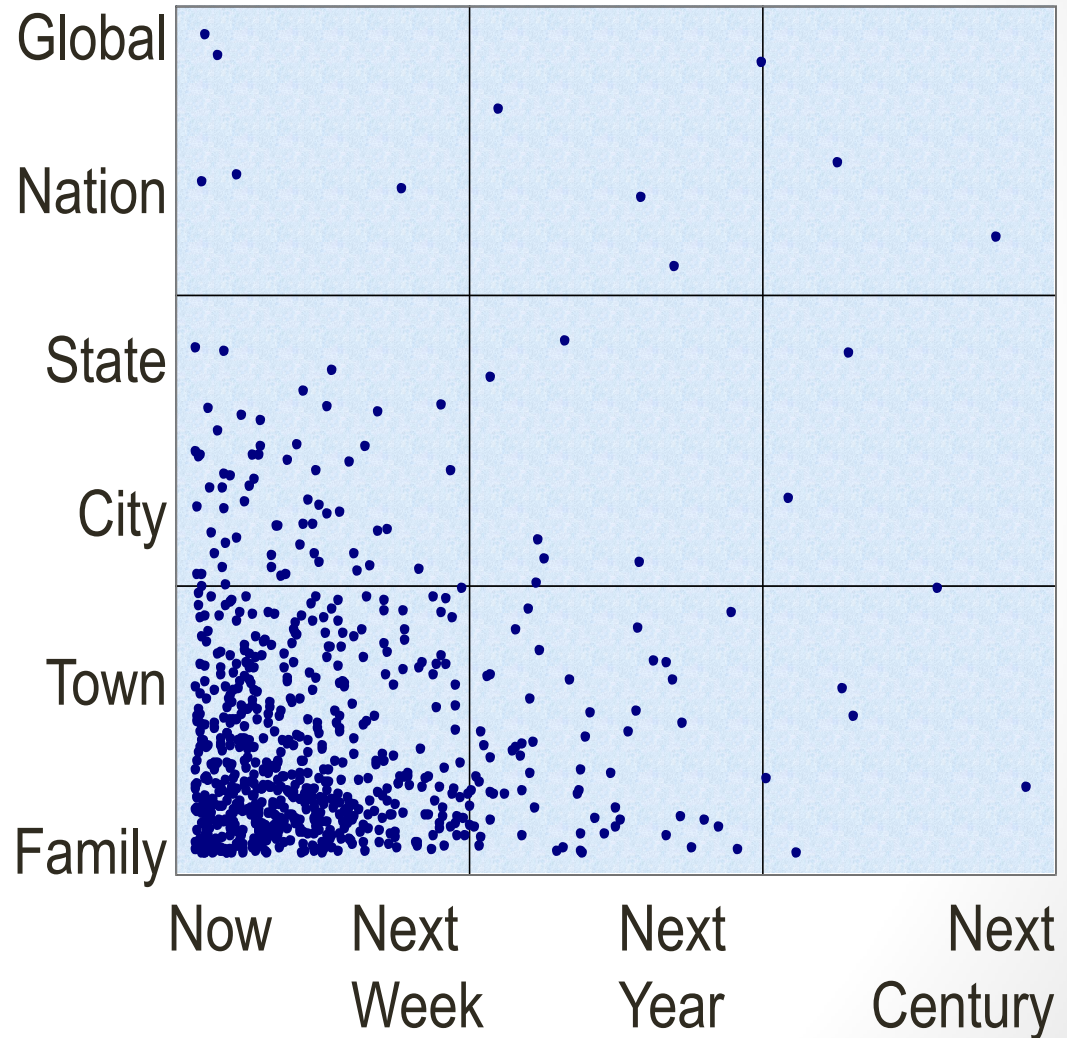
- “A set of basic beliefs - about God, the world, human beings, history, death, knowing, as well as much more mundane things - that make up what a person assumes to be true. Out of one's worldview, a person evaluates, makes decisions, and makes meaning and sense of his or her life”
(Wesley Hurd)
- “A basic set of beliefs and concepts that work together to provide a more or less coherent frame of reference for all thought and action.”
(James Sire)

- A framework of fundamental beliefs through which we view the world and our calling and future in it;
- It is a channel for the ultimate beliefs which give direction and meaning to life.
- It is the integrative & interpretive framework by which order and disorder are judged, the standard by which reality is managed and pursued.
- It is the set of hinges on which all our everyday thinking/doing turns. Although it is held only by individuals, it's communal in scope and structure, thereby binding its adherents together into a community (James Olthuis)



Time and Space Scales

Although the perspectives of the world's people vary in space and time, every human concern falls somewhere on this graph. The majority of the world's people are concerned with matters that affect only family or friends over a short time period. Others look farther ahead or over a larger area. Only a few people have a global perspective that extends far into the future.



Eco-Fundamentalists

- Moral viewpoint: global change is evil
- There is no technology solution, anyway



Gaia

- The earth is a complex system that's in some way “alive”
- This is a pantheistic view
- The earth is homeostatic, constantly reacting to changes, and will “punish” Man if he does not protect the environment.

Eco-Conservatives

- Economic viewpoint: cost-benefit analysis
- Free market, pro-GDP (gross domestic product) growth
- GDP growth is good for the environment
- Technological advancement will rescue us
- Sustainable development



Pragmatism

- Policy negotiates the “fuzzy” middle
- Self-interest determines position
 - not a concern for the environment



Consilience

- The unity of knowledge (literally a "*jumping together*" of knowledge), has its roots in the ancient Greek concept of an intrinsic orderliness that governs our cosmos, inherently comprehensible by logical process. The rational view was recovered during the high Middle Ages, separated from theology during the Renaissance, found its apogee in the Age of Enlightenment. With the rise of the modern sciences, the sense of unity was lost with increasing fragmentation and specialization of knowledge in the last two centuries. The converse is Reductionism.



Consilience - Edward Wilson -

“ Every college student should be able to answer the following question: What is the relation between science and the humanities, and how is it important for human welfare? Every public intellectual and political leader should be able to answer that as well. Already half the legislation coming before the United States Congress contains important scientific and technological components. Most of the issues that vex humanity daily - ethnic conflict, arms escalation, overpopulation, abortion, environment, endemic poverty... - cannot be solved without integrating knowledge from the natural sciences with that of social sciences & humanities.



Consilience - Edward Wilson -

Only fluency across the boundaries will provide a clear view of the world as it really is, not as seen through the lens of ideologies and religious dogmas or commanded by myopic response to immediate need. Yet the vast majority of our political leaders are trained exclusively in the social sciences and humanities, and have little or no knowledge of the natural sciences. The same is true for the public intellectuals, the columnists, the media interrogators, and think-tank gurus. The best of their analyses are careful and responsible, sometimes correct, but the substantive base of their wisdom is fragmented and lopsided. ... ”



Consilience - Edward Wilson -

- “ ... If the natural sciences can be successfully united with social sciences and humanities, the liberal arts in higher education will be revitalized. Even the attempt to accomplish that much is a worthwhile goal. Profession-bent students should be helped to understand that, in the twenty-first century, the world will not be run by those possessing mere information alone. Thanks to science and technology, access to factual knowledge of all kinds is rising exponentially while dropping in unit cost. It is destined to become global and democratic. Soon it will be available everywhere on TV and computer screens. What then? The answer is clear: synthesis. We are drowning in information, while starving for wisdom. The world henceforth will be run by synthesizers, people able to put together the right information at the right time, think critically about it, and make important choices wisely. ... ”



Dynamic & Thermodynamic

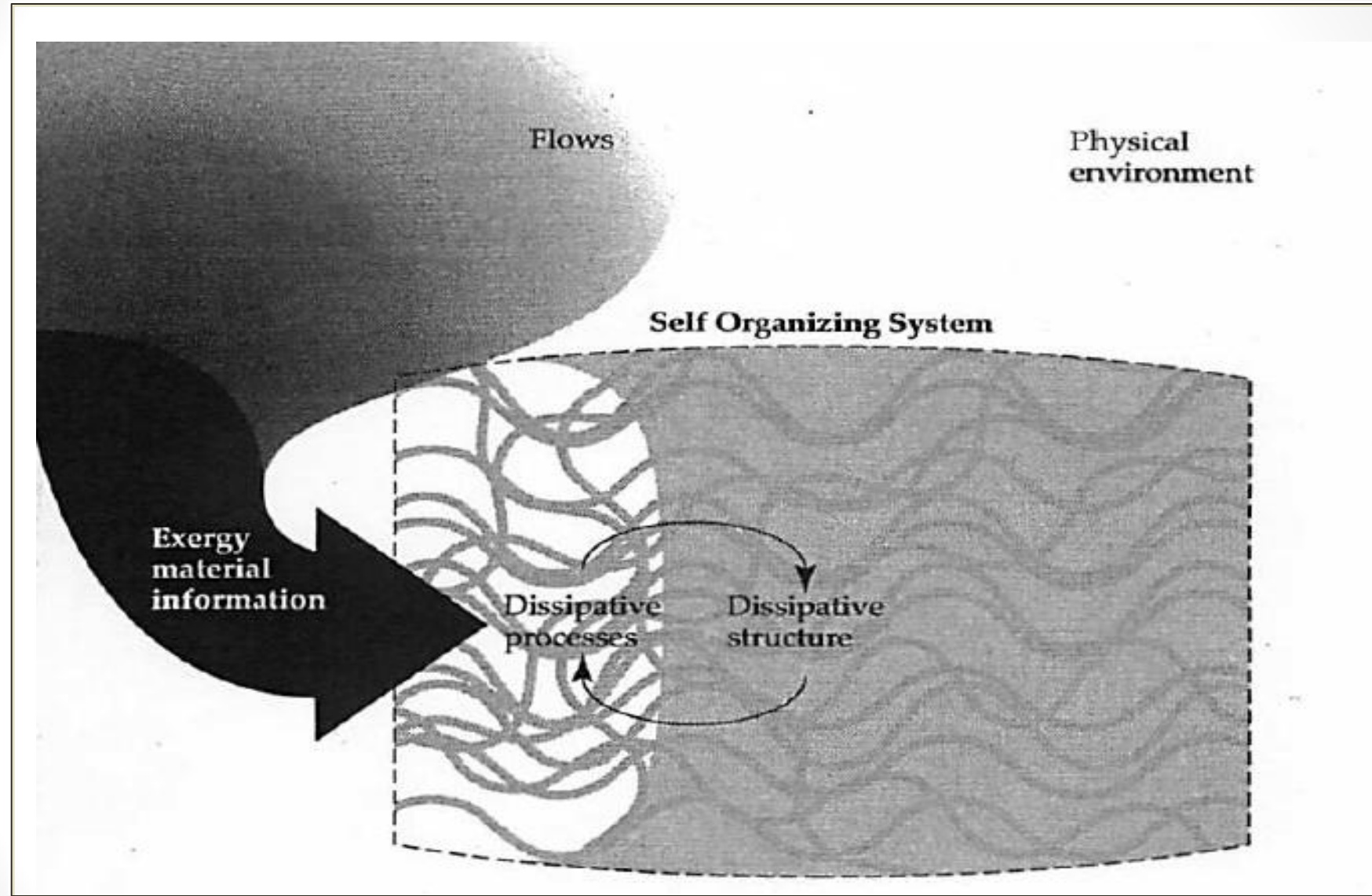
- The worldview of dynamics - everything occurs in a predetermined way
- The worldview of thermodynamics - everything goes to death, the so-called 'thermal death'
- Both pessimistic; no privileged direction of time (future and past play the same role)

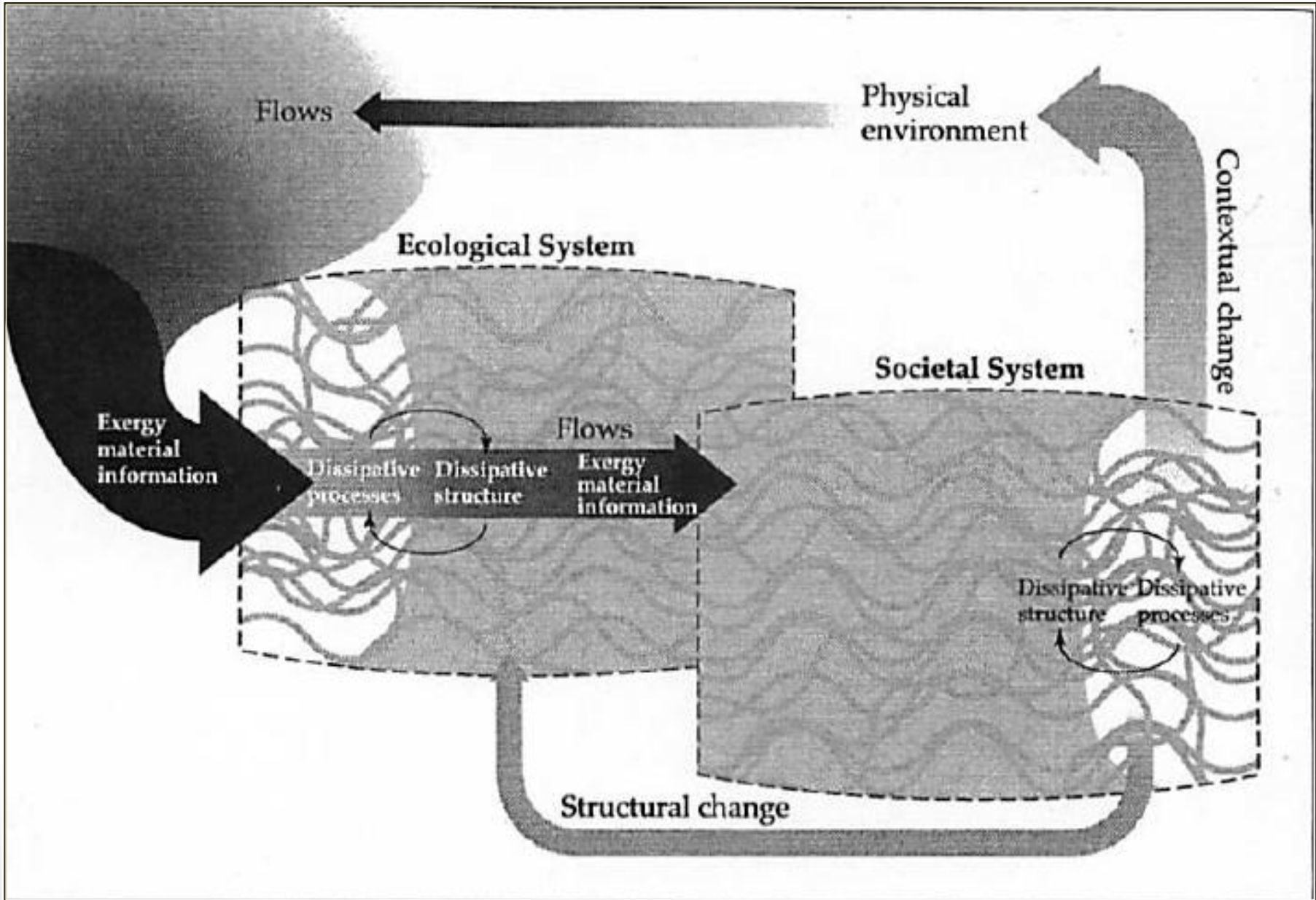


Non-Equilibrium Thermodynamic

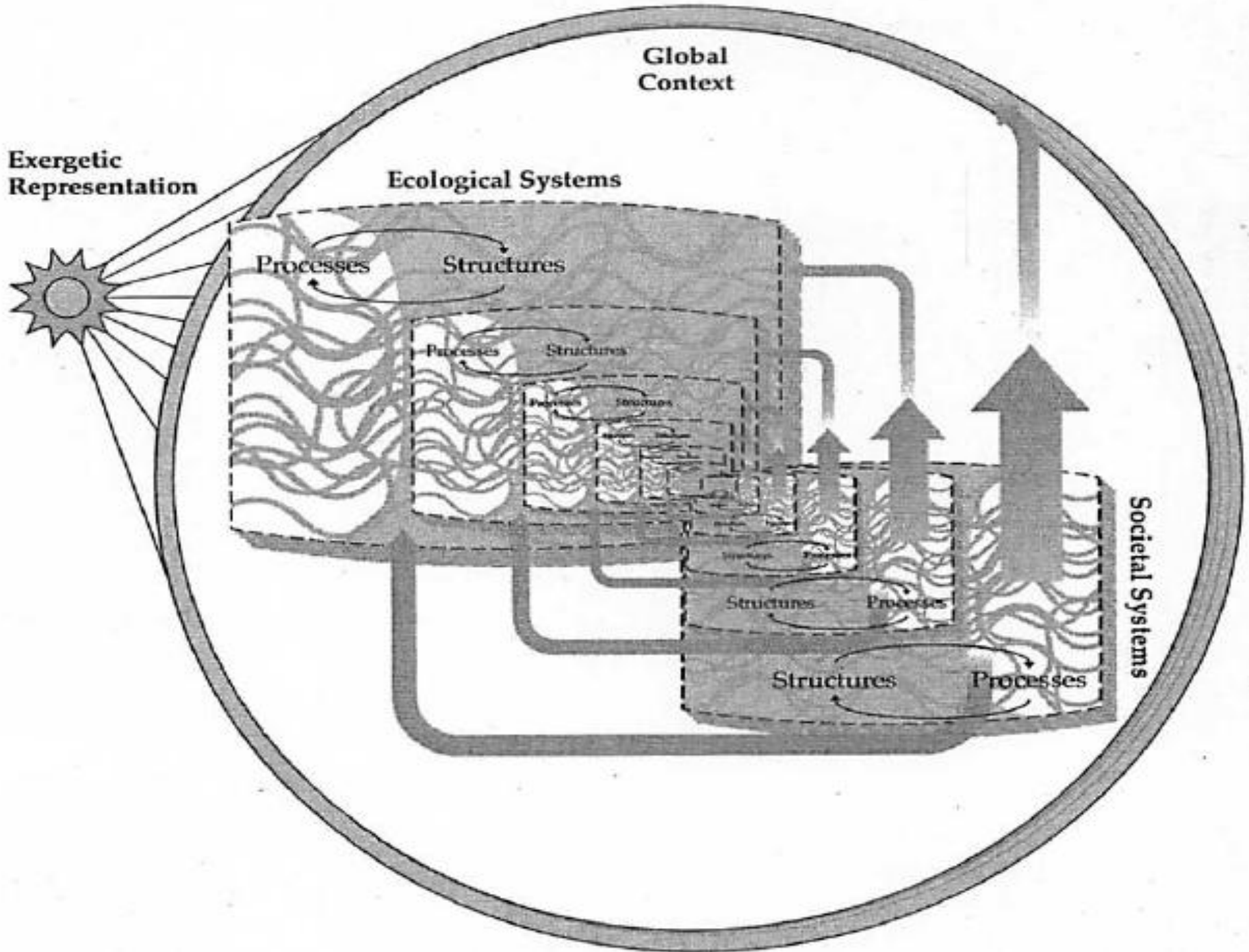
- The future is not determined
- Provides better understanding of the world of the emergence of events (self-organizing holarchic open systems)
- Non-equilibrium leads to the system structure (the way components are interconnected) → the system's organization (which allows the system to do something)







**Exergetic
Representation**



Christian Stewardship

- Cultural Mandate
- God directed Man to watch over creation
- Therefore Man has a moral and ethical obligation to prevent its destruction
- Man has a privilege (& responsibility) to preserve its essence



“ Then the Lord God took the man and put him into the garden of Eden to work it and take care of it ”

- Genesis 2:15 -

work (עֲבַד): cultivate; serve; plow; cause to worship
take care of (שָׁמַר): keep within bounds; watch as a watchman; guard as a prophet

“ My privilege and responsibility is to recognize the expanding boundaries of my garden (i.e., *me, family, neighbor, school, company, nation, earth, universe ...*). As God’s *steward*, I need to *stand, guard* and *protect* my garden in the same way a shepherd or a *watchman* watches over his sheep in a *proactive* and *prophetic manner* ”

Areas of Convergence

- Man must act responsibly toward the environment with enlarged perspectives



Areas of Disagreement

- Who should bear the costs of solution?
- Severity of the problem
 - “Is there really a problem?”
 - “Why me?”
 - ...



Thinking in Systems toward Planetary Stewardship & Global Sustainability



Seeing beyond the Majority



Foresight with Insight based on Hindsight

Take Home Message

*“ How can we apply the scientific understanding & the lessons learned to ‘ **Visioneering** ’ – a harmonious triad of adaptive governance, adaptive management & adaptive monitoring towards sustainable social-ecological systems and global stewardship ?”*

