Designing Within A Culture Of Sustainability

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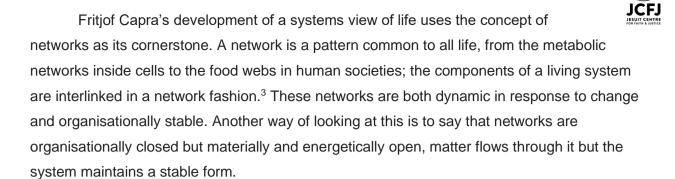
"…sustainability is not an individual property but a property of an entire web of relationships: it involves a whole community" – Fritjof Capra[1]

Introduction

Climate change and biodiversity loss are crises that not only put ecosystems, but also human societies at risk. Our present mainstream sustainability thinking discusses the compromises between the three pillars of social justice, ecological integrity and economic well-being and puts its hopes in environmental salvation through green technological innovations. We need, however, a more paradigmatic shift in world views if ecology and human society are to survive and flourish. The design of our built environment has a critical role to play in making a positive contribution to our environment and in this essay it is argued that the foundations of this shift towards a culture of sustainability should be based in systems thinking[2] and complexity theory.

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[1] **Fritjof Capra.** *Community is the way to sustain life.* (Ecologist, 2018)
https://theecologist.org/2018/apr/30/way-sustain-life-build-and-nurture-community
[2] Leyla Acaroglu,.*Tools for Systems Thinkers: The 6 Fundamental Concepts of Systems Thinking* (2017)
https://medium.com/disruptive-design/tools-for-systems-thinkers-the-6-fundamental-concepts-of-systems-thinking-379cdac3dc6a

Fritjof Capra's development of a systems view of life uses the concept of networks as its cornerstone. A network is a pattern common to all life, from the metabolic networks inside cells to the food webs in human societies; the components of a living system are interlinked in a network fashion.[3] These networks are both dynamic in response to change and organisationally stable. Another way of looking at this is to say that networks are organisationally closed but materially and energetically open, matter flows through it but the system maintains a stable form.

An important point about systems thinking is that it is contextual; systems thinking means that we develop understanding of something by putting it into the context of a larger whole. Philosopher and sociologist, Edgar Morin, makes the point that the "alpha idea" of all ecological thought is that the independence of a living being necessitates its dependence within its environment. What can be termed our state of interdependence.[4]

From a systems point of view, the understanding of life begins with the understanding of patterns, for example the pattern of organisation, a configuration of relationships characteristic of a particular system. Networks are the patterns of life. They are non-linear, going in all directions, and may include feedback loops; importantly these feedback loops permit the possibility of self-regulation within a living system, achieving an equilibrium in which the factors of the system are balanced.[5]

Capra helps us define the key criteria of a living system: firstly, the *pattern of organisation*: the configuration of relationships that determines the system's essential characteristics. Secondly, the *structure*: the physical embodiment of the systems pattern of organisation. Thirdly, the *life process*: the activity involved in the continual embodiment of the system's pattern of organisation.[6] Capra argues that the key to a comprehensive theory of living systems lies in the synthesis of two different approaches: the study of substance or structure (something measured and weighed in quantities) and the study of form or pattern (something mapped which involves *qualities*).

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[3]Fritjof Capra,.*The Web of Life: A New Scientific Understanding of Living Systems* (London, Random House, 1996) 33 - 35

[4] Edgar Morin, *Method: Towards a Study of Humankind The Nature of Nature* (New York, NY: Peter Lang, 1992), 202.

[5]*Ecological Feedback Loops.* Available at:https://systemsinnovation.io/ecological-feedback-loops/

[6] Capra, 157 - 176

The Environment as a System

Ecology is the study of the relationships that interlink all members of Planet Earth. Ecologists picture ecosystems in terms of flow diagrams, mapping out the pathways of energy and matter in food webs and it is this thinking that established recycling as a key principle of ecology. The environment's organisational complexity allows the transformation of the living beings' destructive and wasteful productions into food for other living beings. This happens at all levels across the ecosystem, from the top predators to the smallest microbe and fungi.

The environment is in itself a system, an eco-organisation, self-regulating with multiple feedback loops. It's an integration of the physical environment and all living organisms into the cyclical order of what could be termed the solar poly machine (climates, seasons, diurnal rhythms)[7]. It can also be considered an open system from an energetic perspective; the environment needs permanent input of solar energy to counteract the thermodynamic process of entropy. Eco-organisation constitutes not just one but several great cycles including the hydrologic cycle, the carbon cycle and the food cycle (energy and nutrients).[8]

In eco organisations, diversity and complexity are complementary: eco systems reach points of optimum diversity with a dominating feedback loop involving only a few species, surrounded by a great variety of other species contributing to maintain the dynamic balance. Diversity matters in these systems; genetic diversity, for example, increases a species's resilience to disease. Complexity preserves diversity as complex life forms have evolved to interrelate with simpler life forms, creating dependence on the functioning of each other. Cultures of sustainability should keep this in mind – in architecture, though, this should not be about forced complexity or contrivance, but about recognising and working within the inherent complexity of our environment.

Humanity and Ecology

Human society has developed transformational capabilities in its relationship to the world ecosystem and with this comes responsibilities. This includes how we choose to build and to

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[7]Sacha Kagan, *Art and Sustainability: Connecting Patterns for a Culture of Complexity (*Bielefeld. Transcript Verlag, 2011) 175

[8] The Gaia theory of earth environmental system also notes the self regulation of the planet through feedback loops, and interestingly links both living with non living elements e.g with rocks and water into this self-regulating process.

live. Kagan argues for a symbiotic co-development between man and nature as co-pilots.[9] We need to apply our ecological knowledge to the fundamental redesign of our technologies and social institutions, so as to bridge the current gap between human design and the ecologically sustainable systems of nature. McDonough and Braungart noted in their 'cradle to cradle' methodology that the first principle of eco-design is that waste equals food.[10] This closed loop thinking begins to inform all our spatial design strategies so that they are fundamentally concerned with ecological networks of energy and material flows.

Fostering ecological literacy in human societies is one of the key stepping-stones towards a culture of sustainability. Capra explores some basic principles of eco-literacy: interdependence, recycling, partnership, flexibility, diversity, resilience, and as a consequence of all these, sustainability.[11] Interdependence means understanding relationships, our network pattern. Recycling is the understanding that waste for one is food for another. Partnership is the tendency to associate, to establish links and cooperate, while flexibility is a consequence of multiple feedback loops. Diversity brings resilience because it contains overlapping ecological functions, other links can be formed or utilised. Resilience is the capacity to adapt to change from the outside; there must be a certain openness within an organisation, which is a basic property of life because survival depends on a constant flow of incoming resources. David Orr, the environmentalist and educator, has written at length on the necessity for ecological literacy in society and he has noted that good design needs to respond positively to its ecological, social and cultural context.[12] Eco literacy is a detailed understanding of nature as a complex interacting creative process in which humanity participates. Eco literacy results in an increased awareness of the basic dependence of all biological and ecological systems (architecture and its occupancy being but one facet of this) on their underlying physical and material systems.

How can we contribute creatively towards a better understanding of the complexity of the global crisis, towards strategies of resilience and sustainability?[13] This is a question that anthropologist and cyberneticist Gregory Bateson has sought to answer with the development of a sensibility to the *pattern which connects*.[14] Art and architecture have the potential to create

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[9]Kagan, 193

[10] William McDonough and Michael Braungart, *Cradle to Cradle: Remaking the Way We Make Things*. (New York, USA: Macmillan, 2002) 92 - 117.

[11]Capra, 297 - 304

[12] David W. Orr *Earth in Mind: On Education, Environment, and the Human Prospect*. (Washington DC USA: Island Press, 2004) 117 - 121

[13]Kagan S. (2011) Art and Sustainability: Connecting Patterns for a Culture of Complexity Bielefeld. Transcript Verlag

[14]Bateson G., (1972). Steps to an Ecology of Mind. Chicago, USA: University of Chicago Press

experience, make relationships of an expanded experience of reality which is critical to understanding our inter connectivity – the integration of subject and object. The environment is not only a setting but also contextualises experience. Understanding reality implies that form can be thought of no longer as an idea of an essence but rather an idea of existence and organisation just as matter is an organising system of elements and processes.

Ecological Aesthetic and Tangibility

Defining an ecological aesthetic from the point of view of systems and complexity theory leads one to look at the connections between nature and culture, what could be called an aesthetic of integration.[15] Philosopher and cultural ecologist David Abram sees the purpose of aesthetics as to assist in restoring our closeness to the rest of nature, "the touchstone for an experiential world now inundated with electronically generated vistas and engineered pleasures"[16] would be the reconnection to a direct sensuous reality. New forms are needed to emphasise our essential connectedness rather than our separateness, forms that evoke the feeling of belonging to a larger whole, to an ecosystem[17].Defining the difference in the perception of human-designed artifices against evolved forms of nature can help design these new forms. The former are based mostly in linear, functional logic. They cannot repair themselves and do not evolve; plus there is also a predictability of artificial artefacts which means these objects, after we have mastered them, can teach our senses nothing new and so we must continually acquire new built objects in order to stimulate ourselves, arguably fostering a consumerist, throw-away society. The latter, which include patterns on a stream, starling murmuration, and the seasonal cycles of trees are all composed of repetitive figures but never exactly repeat themselves, are in constant metamorphosis, and hold our attention again and again.

The *pattern which connects* is as clear in the cycles of oxygen and carbon dioxide within our breathing as much as it is in the hydrological cycle, energy flows and material cycles of our built environment. Our awareness of the air forces us to recognise, ever more vividly our interdependence with the countless organisms that surround us.

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[15]Wahl, D. C.,(2006). Eco-literacy, ethics, and aesthetics in natural design: The artificial as an expression of appropriate participation in natural process. Dundee, UK: Centre for the Study of Natural Design, University of Dundee.

[16]David Abram, *Spell of the Sensuous'* (New York, NY: Random House, 1996),9

[17] See for example: Suzi Gablik, *The Reenchantment of Art* (Thames and Hudson, 1991) and Morin (1992)

"The air is the soul of the visible landscape flowing in and out of the earthly living beings, constantly bathed in it."[18] " for it is only at the scale of our direct sensory interactions with the land around us that we appropriately notice and respond to the immediate needs of our living world."[19]

The recognition of this pattern in architecture and art would utilise environmental function to assist in the generation of environmental form. It moreover needs to engage not only with further complexities within the networks of our environment but also needs to engage with the occupant and wider public at a cultural level in order to foster ecological literacy

Conclusion

A science of systems and complexity forms the basis for cultures of sustainability. Green aesthetics grow from the knowledge of complexity within ecology, generating an architectural aesthetic that engages with interactions and relationships, not with objects alone. It is this potential for spatial inventiveness, derived from a systems thinking approach, which comes to inform our architectural response to climate change. Working with this approach gives a basis for designing structures that are ecologically sustainable and directs our understanding of design elements such as daylight, natural ventilation strategies, water and wastewater systems or the incorporation of biodiversity.[20] These are all elements which demand to be viewed as part of a larger interconnected system where form follows environmental function.

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[18] David Abram, *Spell of the Sensuous* (New York, NY: Random House, 1995), 226
[19] Abram, 268.
[20] See for example, Michael Pawlyn, *Biomimicry in Architecture* (London: RIBA publishing, 2011)