Symbiosis and the Ecological Perspective in Biology and Society

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Overview

Civilization means a way that humans pattern their lives together, including values, institutions, beliefs, cultures, and actions. Our book, *What is Ecological Civilization? Crisis, Hope, and the Future of the Planet*, begins with a brief survey of this notion and why it remains a central concept for the global ecological transformation.

In brief, *promoting ecological civilization* means structuring human societies so that their members live cooperatively with each other, with other living beings, and with the biosphere as a whole. As David Korten notes, "Life exists only in communities of living organisms that self-organize to create and maintain the conditions essential to their individual and mutual existence…. Continued human viability depends on emergency action to stop the damage, facilitate Earth's healing, and advance the emergence of an ecological civilization, … fulfilling the distinctive responsibilities of humans within Earth's community of life."

Chinese leaders introduced the concept of an "ecological civilization" to the world almost 30 years ago. I believe that this concept continues to offer the best roadmap toward a sustainable world. The reason is that it combines a deep understanding of science with insight into the nature of civilization.

What Is "Ecological"?

The last few decades have seen explosive growth in the ecologicalsciences; *ecological* is now an everyday word. The word "ecology" means both *facts* about how the living world is organized, and *values* about how and why we must preserve natural ecosystems. Ecological facts and ecological values are inseparable for humanity, since our very existence depends on these ecosystems. They are valuable because without them we could not survive as a species. Understanding ecosystems is the foundation of knowledge.

Advances in ecology have exploded many past myths about the world. Ecosystem are highly complex adaptive systems. Very small differences in the initial state of a biological system can produce vast (and unpredictable) differences in the future. You may recall the "butterfly effect": the realization that a small change in environmental conditions — for example, more polluting cars in Germany — can have a significant negative impact on the

climate of Africa or Asia.

Organisms and ecosystems adapt constantly during the course of their lives. Some of the causes are genetic. But equally important are "top down" causes: changes in the environment permeate downwards. They range from systemic impacts, such as higher temperatures and reduced rainfall, down to very specific influence, such as changes to the chemistry of a river or the soil. A new picture of organisms and the environment has grown from these discoveries.

What Are the Core Principles of Ecology?

Ecology is the science of interdependence *par excellence*. Instead of reducing everything down to the smallest components, the ecological sciences consider the big picture. Ecosystems are complex emergent realities that are more than the sum of their parts; each one is a complex integrated whole.

Individual organisms, including humans, can only be understood in the context of the larger eocsystems that they inhabit. For example, the thriving of one species is dependent on the reproduction rate and nutritional needs of others, and the complex balance between flora and fauna is necessary for both to survive. Very large and extremely small organisms engage in an intricate dance of interdependence. Their finely tuned symbiotic relationships represent a form of cooperation that increases their odds of survival. But studies also show that inter-species cooperation also plays a crucial role in the survival and flourishing of ecosystems and the organisms of which they are composed. Other organisms do not influence them only externally, but transform them *internally* as well. Waste products from mammals, or fallen trees, become nutrients for other species. Different species cooperate together in maintaining natural systems. Unless we understand the rich interdependence of the world's ecosystems, we will never understand the behavior of their members.

We have seen that the interdependence of ecosystems comes in part because their member organisms are not only externally related, but also internally related to each other. From genes to organisms to broader systems of cooperation, living beings mutually transform each other. Process philosophy is an effective way to understand the interdependence of all living beings.

The starting point for ecology is *emergence*. At some point the conditions were right for the emergence of the first self-reproducing cell. This same principle of emergence describes the dynamic of all life. Every time organisms reproduce, minor variations arise. These can give rise to changes in the structure or behavior of the organism. Some of these structures make it better adapted to its environment. When that happens, it can create more little copies of itself, and they begin to fill the environment more quickly and effectively than others. Minor variations in one of their offspring lead to some that are better adapted … and so on,

and so on.

What we see here is the growth in *complexity*. Over time more complex structures and behaviors emerge, which increase the survival advantages for organisms. What makes the study of biology so fasci- nating is that immensely complex systems arise through the simple interaction of these little variations with the surrounding organisms and environment.

This is why we call organisms *self-organizing systems*: the complexity arises from the dynamics of evolution alone, as life-forms organize themselves in ever-different ways. It is an *open-ended process*. Amazing new structures and behaviors emerge over time. The result of this process is visible all around us: the polar bear's fur, the flamingo's color, the peacock's feathers, the gazelle's speed, chimpanzee communication, bonobo social structures, the dog-human relation, and the rise of a species, humanity that can create the *Tao te Ching*, recognize galaxies, and dream of world peace.

The wonder of life is visible in this interdependence. Even the simplest single-celled organism is the result of an immensely complex, ongoing interaction between it and its surrounding environment. A relatively simple organism such as an earthworm interacts with its environment in millions of ways; the body and mind of a human being interact with the world billions of times each day. Obviously, we would not exist at all without the stable and nurturing life-systems around us. In fact, in one sense we are not separately existing creatures at all. We are, from the bottom up, *beings in community*. We are, from our simplest cell to our highest thought, an organic expression of the ecosystems that nourish us and give us life.

I believe that the science of ecology offers many lessons as we seek to build an ecological civilization. Here are three ideas.

(1) Ecology teaches the interdependence of all living things. No man is an island; every life is connected together in the earth's one biosphere. Pollution and climate change are not problems for one people or nation; they are threats to all of us.

(2) Ecology teaches the principle of *symbiosis,* which means "living together." Modern Western philosophy proclaimed that individual persons are the basic unit, and groups are just collections of individuals. By contrast, ecology teaches that the larger whole, the ecosystem, is the basic unit, and what we call individuals are only parts of a broader whole. Our bodies are literally constituted by what we eat, and what we eat are the products of other living things: fruits and vegetables and grains, for example. Process philosophy affirms that we are "internally related" to all other individuals, and ecology provides scientific evidence of the truth of this claim.

(3) In a healthy ecosystem there is no waste. Organisms die and become the raw materials for other organisms. An ecosystem is a closed system in which *everything* is recycled. Put differently, a healthy ecosystem is a circular economy. Contrast how nature works with how humans live. In our "take-make-waste system" (Ellen MacArthur), we take from the earth, make products, and throw away the waste, such as the plastic bottles, into garbage dumps. We will return to the idea of a circular economy in a few minutes.

In short, *to live ecologically* is to recognize that all living things are members of ecosystems. Living ecologically is a *biological* concept, but it is also an *ethical* concept. As the famous environmental philosopher Aldo Leopold writes, living ecologically means to act "to preserve the integrity, stability, and beauty of the biotic community" (*Sand County Almanac*, 1949).

Now you have some sense of how important is the idea of an ecological civilization! Imagine that we take the central principles of the ecological sciences — the sciences of life — and use them as our model for building and maintaining human societies.

What Is a Civilization?

Civilizations are particular ways that groups of humans—societies, cultures, countries—organize their lives together. What's unique about the term is that it expresses the *largest* or *broadest* framework that we can find for expressing commonalities across large groups of people, large regions of the world, and large expanses of time. The rise of civilization came with the movement away from hunting and gathering societies that were tightly adapted to their natural environments, to societies based on agricultural settlements, which began to alter the natural environment for the benefit of the people. Modifying nature is a distinctive mark of civilization. But the modification of nature on the global scale has led to the commodification of nature that lies at the heart of our current crisis. How we relate to our environment is a fundamental matter, but it is not separate from how we relate to one another.

In one sense, a civilization is the sum total of the cultures that it encompasses. It's a style, a set of practices and fundamental values that its members share. In another sense, a civilization is far more than the sum of its parts. Often, the fundamental values and practices of a civilization are tied to an underlying set of assumptions that pervade all that its members do—assumptions so deep that people may not even be aware of them.

In the context of an "ecological civilization," the term "civilization" refers broadly to a way of living together with shared values. It encompasses everything from agriculture and economics, to governance, education, religion, transportation, medicine, architecture, art, music, and others. It is this broader sense of civilization that is being used by 21st century scholars to identify and study vastly different civilizations around the world and across the

ages.

What we call "modern" civilization arose around 400 years ago. Modern societies organized themselves around a very specific set of social forms, such as the market economy, the public sphere, and the idea of a self-governing people.

Charles Taylor emphasizes three distinctive features of modern civilization[1]:

- we came to imagine society primarily as an economy for exchanging goods and services to promote mutual prosperity;
- we began to imagine the public sphere as a metaphorical place for deliberation and discussion among strangers on issues of mutual concern; and
- we invented the idea of a self-governing people capable of secular "founding" acts without recourse to transcendent principles.

Symbiosis in Society

Although the concept of symbiosis emerged in biology, it has now come to play a central role in the study of human society. In the social context, it is defined as "a mutually beneficial relationship between different people or groups."

Social relations may be characterized by either cooperation or competition. In one case, the students work together so that all of them can get the highest score; in the other case, the banks fight for the highest profit, until one bank succeeds and the others go out of business. The difference from biology is that *humans* decide whether or not a social system will be based on symbiosis. The managers design one business so that the employees compete against each other for promotions and of the highest salary. By contrast, in a co-op (a cooperative business) people contribute their time so that all gain from the success of the co-op. Religious communities are expected not to compete with others but to work for the benefit of all. A good sports team will show great cooperation among the players on one team, while the overall goal is to beat every other team.

When our social institutions are functioning well, they enable people to act collectively. A functional government (local, state, or federal) works out compromises that are in the best interest of the citizens. In a dysfunctional government, like the U.S. Congress, the different parties refuse to compromise, so that the needs of the citizens are not met. The truth is that humans are both competitive and cooperative by nature. As the famous sociologist Robert E. Park writes, "In so far as the customary and moral order prevails over temporary impulses

[1] Charles Taylor, "Modern Social Imaginaries," *Public Culture* 14.1 (Winter 2002).

and interest of its individual members, society will be capable not only of concerted but consistent collective action."[2]

Symbiosis arises naturally in in biology. In human society, by contrast, social structures must be built to keep people from harming others for their own gain. The referee ensures that the soccer players obey the rules of soccer, and the policeman stops people who steal or are violent. The larger the group of people, the less likely they are to live in a symbiotic way and the more likely they are to be selfish. This is why large multinational corporations today are acting for their own profit, regardless of the costs to society or nature. Unrestrained capitalism means unrestrained competition — which means that the powerful will win and the less powerful will lose. This is also the reason why wars between nations are always destructive. When there is no judge or referee to restrain the battle, the stronger nation will use every means available to it to destroy the other side and gain total victory for itself. There is no global structure to restrain them. Not long ago, we saw Syria use deadly chemical weapons on its own citizens, killing women and children, in order to win the civil war.

Only when a social system is based on symbiotic or cooperative relations will it function for the common good. Maibom and Smith argue in a recent article that non-profit social organizations have a cooperative logic, in contrast to the "market logic" that controls the for-profit world.[3] Even the relationship between humans and machines can be constructed in a symbiotic way.[4]

It would not be difficult to take the knowledge we have gained from studying biological ecosystems and apply it in order to create human social, political, and economic systems that promote symbiotic relations. Unfortunately, however, symbiosis has largely been lost in late modern societies. Living together for mutual benefit is easiest in the family, harder in the village, and even more difficult in the city. The leaders of a country can sometimes lead for the common good, but only with wise leadership, shared values, and limits on the wealthy and powerful. In our world today, there is local symbiosis but not a global symbiosis.

Conclusion

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[2] Robert E. Park, "Symbiosis and Socialization: A Frame of Reference for the Study of Society," *American Journal of Sociology* 45, no. 1 (July 1939): 1-25.

[3] Cæcilie Maibom and Pernille Smith, "Symbiosis across institutional logics in a social enterprise," *Social Enterprise Journal*, vol. 12/ 3 (2016). See https://www.emeraldinsight.com/doi/abs/10.1108/SEJ-02-2016-0002, accessed April 10, 2018.

[4] See the work of the Smart Society Project at http://www.smart-society-project.eu/research/wp3/index.html, accessed April 10, 2018.

What, then, will be necessary for humanity to establish global symbiotic structures? The truth is that modern global capitalism is antithetical to a human symbiosis with other persons and with nature. The structures of modernity are built upon the worldview of modernity, which includes individualism, nationalism, and (of course) competition. The reason we speak of the modern *civilization* that evolved over the last 400 years is that it is an entire world-and-life-view. An civilization that spans the globe can be replaced with a completely different system of global interaction, but it cannot just be fixed by changing a few pieces.

The death of modern civilization and the birth of a new global, ecological civilization will not be gentle. The destructive systems of capitalism, militarism, and egoism are all forms of power, and it is the nature of power to battle its enemies until it wins. As long as these people and structures retain their power, they will continue to do damage. Those of us who live through the coming decades, I fear, will witness unbelievable changes, not only in the climate and ecosystems, but also in the behavior of the powerful nations, businesses, and individuals.

The good news is that, as the earth reaches its limits, change will happen, whether the rich and powerful wish to see it or not. As the old English expression describes it, "you can't squeeze water from a stone." When all the minerals and oil have been taken, there is no more; when the symbiosis on which living systems depend has been destroyed, they collapse.

Perhaps what is most important of all is that people are beginning to learn how to build symbiotic communities. We can help restore symbiosis in ecosystems. We can build symbiotic cities and farms and transportation systems. We can design symbiotic social structures and then educate our children to protect and deepen them. Step by step, we can begin the movement toward civilizational change.

A journey of a thousand miles begins with a single step. Living together (symbiosis) with family, friends, and small communities is something that we already know how to do. From living together well at the small scale we will eventually learn how to live together well on the larger scale and, we hope, someday at the global scale. It is this dream that we call ecological civilization.