



Flourishing within Limits to Growth

Brian D. Fath, Ph.D. – bfath@towson.edu

- ▶ Professor, Department of Biological Sciences, Towson University, Baltimore, Maryland, USA
- ▶ Senior Research Scholar, International Institute for Applied Systems Analysis, Laxenburg, Austria
- ▶ Fulbright Distinguished Chair, Department of Environmental Studies, Masaryk University, Brno, Czech Republic



Course Goals:

1. To provide students with a basic understanding of the environment as a system including the biological, physical, and chemical foundations of ecosystem services
2. To understand how nature provides resources and constraints to socio-economic development and to students' everyday life.
3. To learn how human activities impact and interfere with this ecological functioning
4. To explore how human activities could promote sustainable, win-win, flourishing outcomes within these limits

Course Outline: Arranged in 4- 1.5 hour blocks; specific readings (in bold) from Encyclopedia of Ecology, Fath and Jørgensen (eds). 2019. Elsevier.

Wednesday, May 26, 2021, 13:00 – 14:30

Lecture 1: Systems thinking: Where it comes from and where it goes

Ecological Systems Thinking: D W Orr

Human Ecology: Overview: F Steiner

Thursday, May 27, 2021, 13:00 – 14:30

Lecture 2: Natural ecosystems, ecological succession, ecosystem services

Ecosystem Services: K A Brauman and G C Daily

Flourishing within limits: Jørgensen et al. 2015 Chapter 3

Thursday, May 27, 2021, 15:00 – 16:30

Lecture 3: Limits to growth

Limits to Growth: B D Fath

Ecological Footprint: M Wackernagel and J Kitzes

Friday, May 28, 2021, 13:00 – 14:30

Lecture 4: Flourishing within limits

Flourishing within limits: Jørgensen et al. 2015 Chapter 4

Introductions



“The greatest discovery of the past century had nothing to do with nuclear physics, or computer science, or genetic engineering. Rather it was the discovery of the essential connectedness of life and environment.”

Orr 2019

“It is a century now since Darwin gave us the first glimpse of the origin of species. We know now what was unknown to all proceeding caravan of generations: that men are only fellow-voyagers with other creatures in the odyssey of evolution.

Leopold 1949

Moving toward the Ecozoic!!

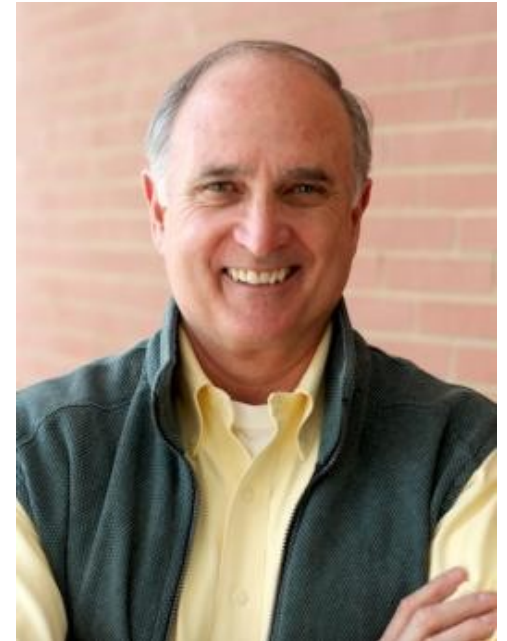
Professor David Orr

Oberlin College

Paul Sears Distinguished Professor of Environmental Studies and
Politics Emeritus

Senior Advisor to the President

Systems thinker, writer, and orator.





Oberlin's Environmental Science Building:

Adam Joseph Lewis Center, was named by an AIA panel in 2010 as “the most important green building of the past 30 years,” and as “one of 30 milestone buildings of the twentieth century” by the U.S. Dept of Energy.

ADAM JOSEPH LEWIS CENTER FOR ENVIRONMENTAL STUDIES

Oberlin College's Environmental Studies center will use 21 percent of the energy of a typical new classroom building and serve as a teaching tool itself. From the carpeting to the electrical system, the building is designed with environmental concerns in mind. College officials and architects say there is no classroom building like it in the country.

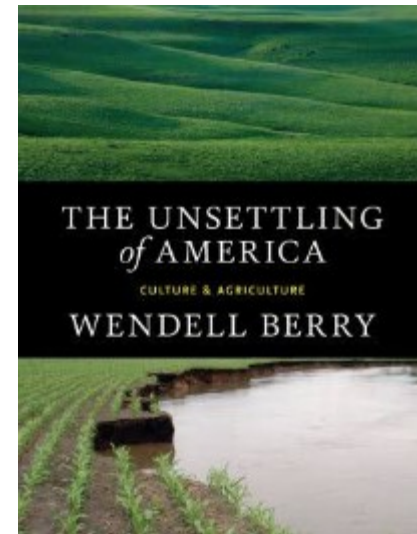


This solar-powered building showcases green building technologies and operating systems. Photovoltaic panels on the center's roof and parking pavilion capture renewable energy from the sun and south-facing windows allow for passive solar heating. Indoors, a specially engineered wetland called the Living Machine purifies non-potable wastewater for reuse in toilets and the landscape.

Flows of energy and cycling of materials are monitored and displayed by a sophisticated system (150+ sensors) that gives real-time feedback, teaching about sustainability in the built environment.

“Systems thinkers see the world as networks of interdependence” Orr, 2017, p. xv

- ▶ “There is no such thing as autonomy; there is only a distinction between responsible and irresponsible dependence” p.116 – Berry 1977

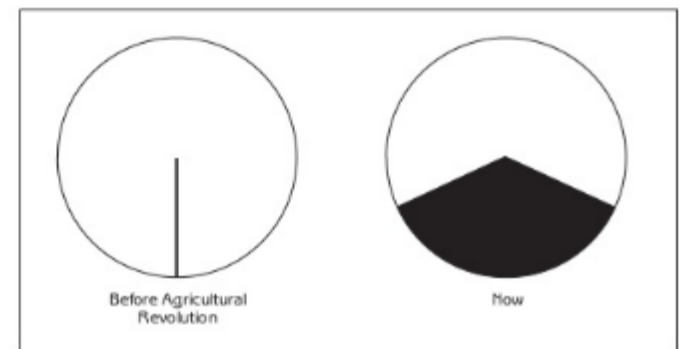


Systems thinking

- ▶ “We live in a web of obligations and relationships that transcend the conventional boundaries by which we organize academic disciplines and bureaucracies” Orr, 2017, p. xv
- ▶ “humans have appropriated the majority of the planet’s net primary productivity” Orr, 2017, p. xvi



Figure 3.8
Approximate
percentage of the
Earth's land-
based biological
production
controlled by
humans



Environmental education

should constitute a comprehensive *lifelong education* ... it should prepare the individual for life through an understanding of the major problems of the contemporary world, and the provision of skills and attributes needed to play a productive role *toward improving life and protecting the environment with due regard given to ethical values*. By adopting a *holistic approach*, rooted in a broad interdisciplinary base, it recreates an overall perspective which acknowledges the fact that *natural environment and manmade environment are profoundly interdependent*....

UN-sponsored Conference at Tbilisi, Georgia, 1978

“by 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development.”

UN Sustainable development Goals, 2015

the idea of interrelatedness has yet to take hold of us in a deep way.

We still live in thrall to a world created by Descartes, Bacon, Galileo, and their heirs who taught us to dissect, divide, parse, and analyze by reduction but not how to put things back together or see the world as systems and patterns.

Orr, 2019


What educational experiences have had the most effect on you?

How can the current educational system be reformed to focus on these items?

How will education be different in the future?



AN ASSIGNMENT FOR THE CAMPUS

- ▶ “Does four years here make your graduates better planetary citizens or does it make them, in Wendell Berry's words, ‘itinerant professional vandals’?”
 - ▶ Does this college contribute to the development of a sustainable regional economy or, in the name of efficiency, to the processes of destruction?
- 

Examine resource flows on campus: food, energy, water, materials, and waste

- ▶ Where does stuff come from? Where does it go?
- ▶ “No student should graduate without understanding how to analyze resource flows and without the opportunity to participate in the creation of real solutions to real problems.”

Ecological literacy

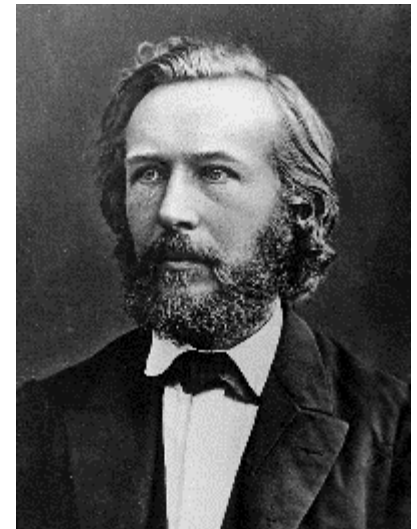
Every student should graduate with basic comprehension of:

- ▶ the laws of thermodynamics
- ▶ the basic principles of ecology
- ▶ carrying capacity
- ▶ energetics
- ▶ least-cost, end-use analysis
- ▶ how to live well in a place
- ▶ limits of technology
- ▶ appropriate scale
- ▶ sustainable agriculture and forestry
- ▶ steady-state economics
- ▶ environmental ethics

Are you learning these topics

Ecology

- ▶ Science of relations between living organisms and their environment (Ernst Haeckel – 1866)



What is Human Ecology?

- ▶ Science of interrelationships between people and the environment
- ▶ 1920s used by urban sociologists with ecological concepts to explain urban dynamics
- ▶ 1960–1970s used by biologists and ecologists alarmed by human population explosion and environmental degradation. Also used by anthropologists to see impact of env on culture
- ▶ 1980s multidisciplinary research with natural and social scientists addressing env problems
- ▶ 1990s–present: sustainability science

Tracing the chain of effects through ecosystems and human society

- ▶ anticipate the long-range environmental consequences of human actions
- ▶ avoid disastrous surprises from the environment
- ▶ generate ideas for dealing with environmental problems; and, in general
- ▶ maintain a livable and sustainable relationship with the environment.

How are ways that you depend on the environment?



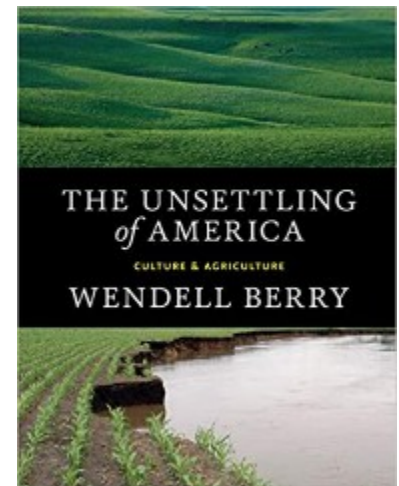
“What is Environment”

System
(Self,
Campus,
City,
State,
Nation)

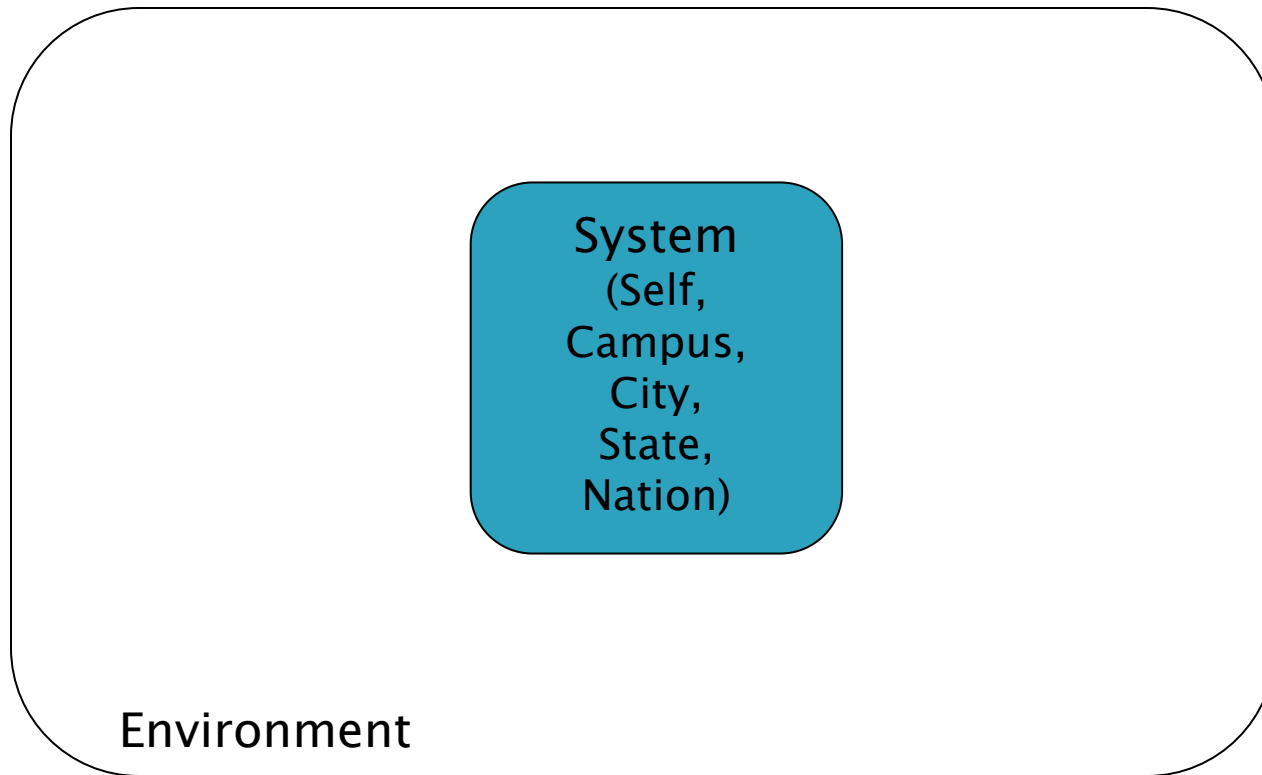
The concept of country, homeland, dwelling place becomes simplified as ‘the environment’—that is, what surrounds us. Once we see our place, our part of the world, as surrounding us, we have already made a profound division between it and ourselves.

We have given up the understanding—dropped it out of our language and so out of our thought—that we and our country create one another, depend on one another, are literally part of one another; that our land passes in and out of our bodies just as our bodies pass in and out of our land; that as we and our land are part of one another, so all who are living as neighbors here, human and plant and animal, are part of one another, and so cannot possibly flourish alone; that, therefore, our culture must be our response to our place, our culture and our place are images of each other and inseparably from each other, and so neither can be better than the other.

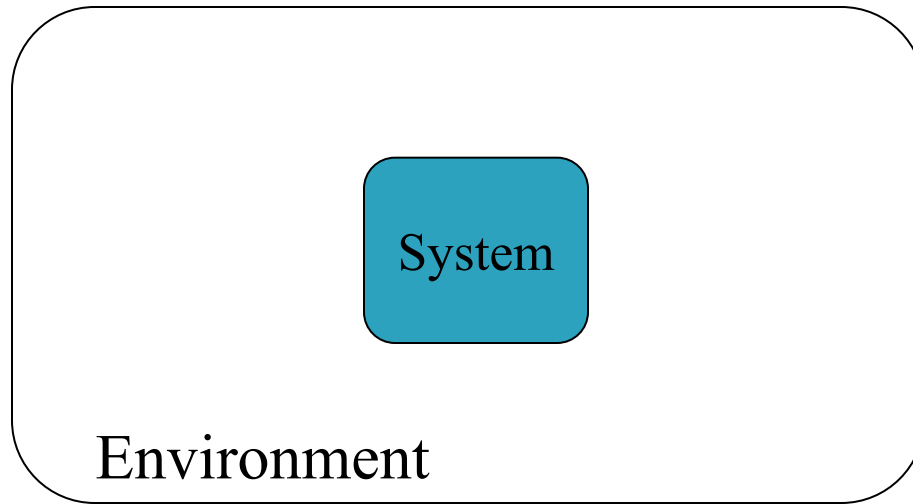
Berry (1977, p. 24).



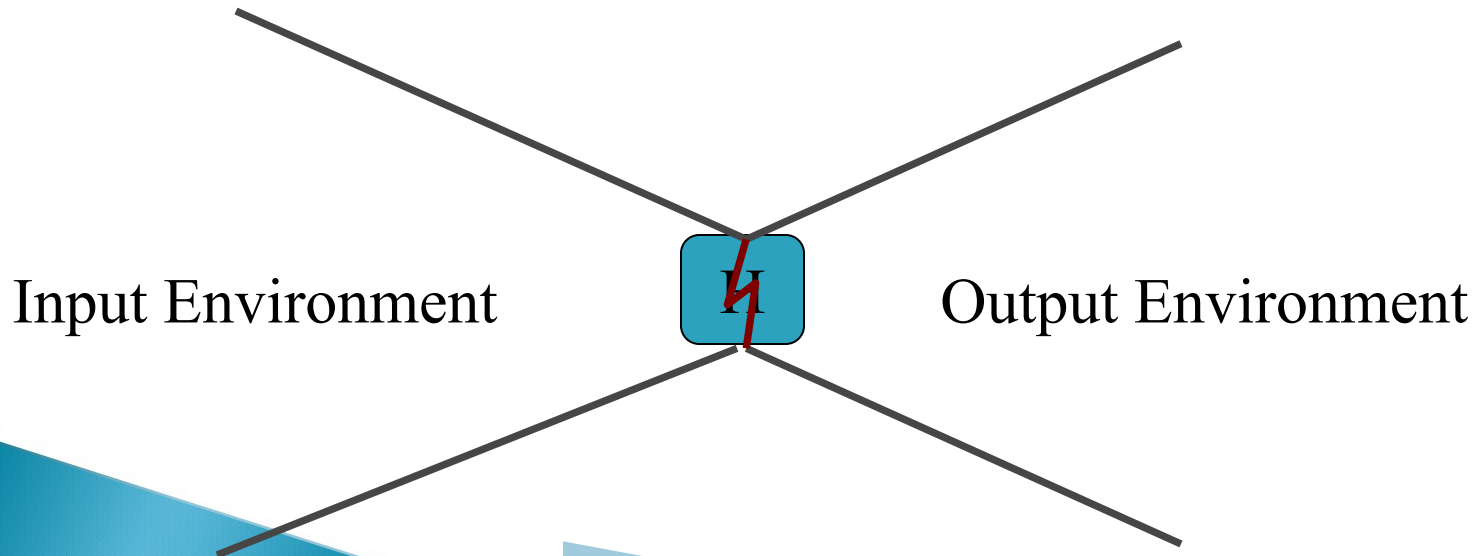
Systems Theory – boundaries



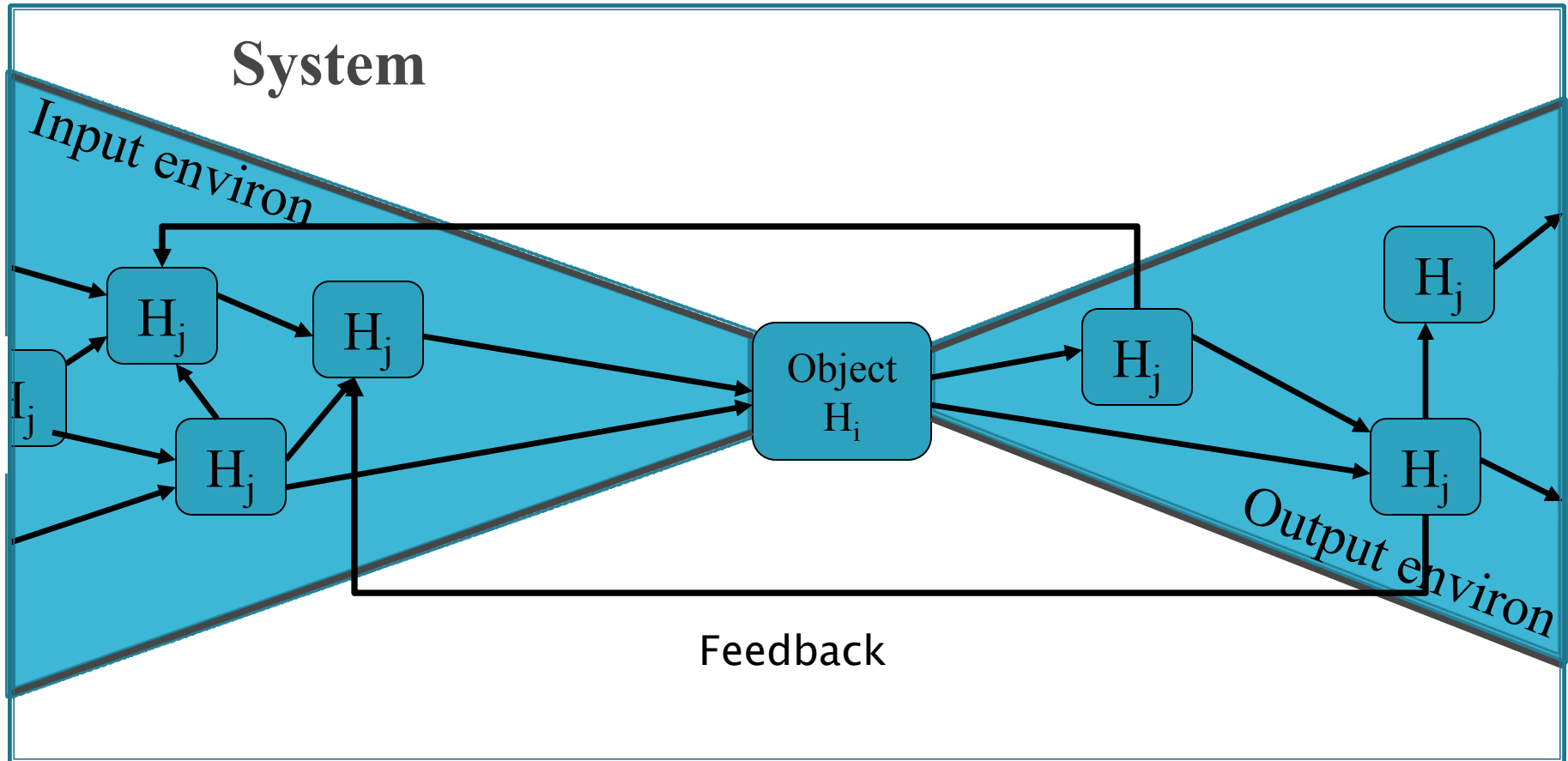
Old perspective, dichotomy between system and environment



New perspective, system is focus of two environments



Environment



Any object/system is inseparable from its TWO ENVIRONMENTS


How are ways that you depend on the environment?

The environment is not “out there”, but rather in you and on you, a part of you

Homework – identify 1 mineral element that is used in the making of your smart phone, describe where it comes from and the extraction methods to get it. What happens to it when you are done with the phone? Post your findings on the Blackboard discussion page.

Systems Perspective

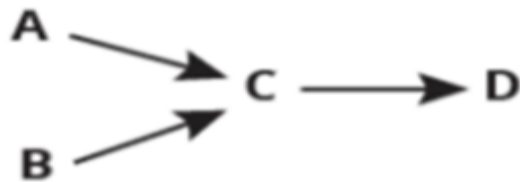
- ▶ See how things are connected and interrelated
 - ▶ Where does it come from?
 - ▶ Where does it go?

 - ▶ **Complex** – many parts, many interactions
 - ▶ **Adaptive** – respond and change
 - ▶ **Systems** – set of parts interacting together to function as a whole
- 

Systems Perspective

Event Oriented Thinking

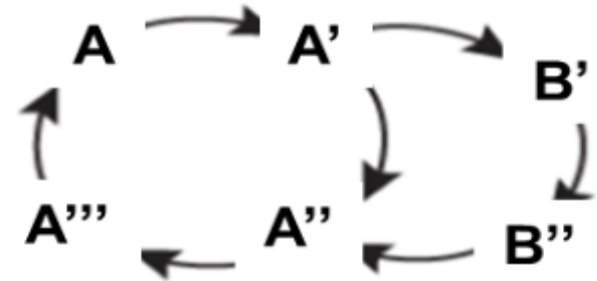
Thinks in straight lines



In event oriented thinking everything can be explained by causal chains of events. From this perspective the **root causes** are the events starting the chains of cause and effect, such as A and B.

Systems Thinking

Thinks in loop structure

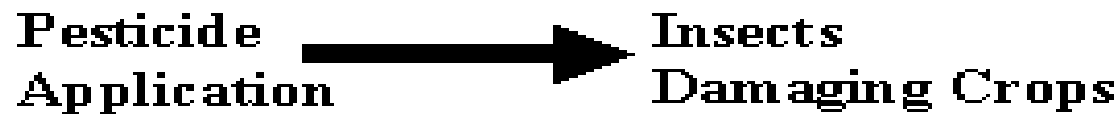


In systems thinking a system's behavior emerges from the structure of its feedback loops. **Root causes** are not individual nodes. They are the forces emerging from particular feedback loops.

kill
d

Is using this pesticide likely to make the farmer better off?

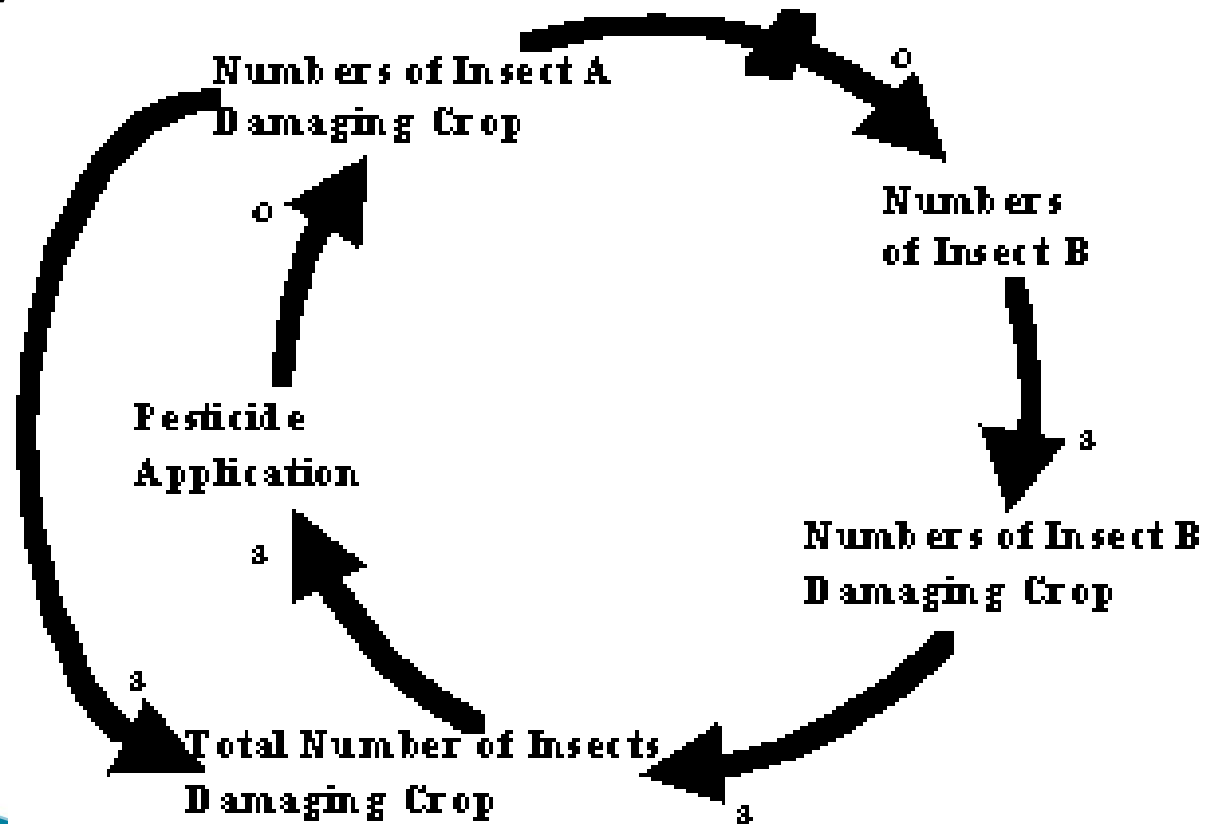
Representing the thinking used by those applying the pesticides would look like this



Unfortunately, often crop damage gets worse in following years and the pesticide that seemed so effective does not help.


Unfortunately, often crop damage gets worse in following years and the pesticide that seemed so effective does not help.

the indirect effects cascade through the ecosystem; the pest was controlling another insect population, either by predation or competition. The effective pesticide eliminates the control that those insects were applying on the population of the other insects. Then non-target insect populations explode and cause more damage than the insects killed by the pesticide.

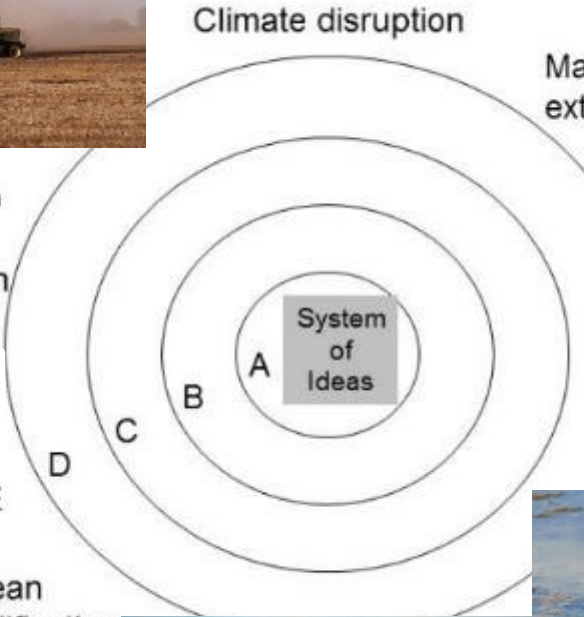


In other words, the action intended to solve the problem actually makes it worse because unintended side effects change the system & end up exacerbating the problem.

Unintended consequences

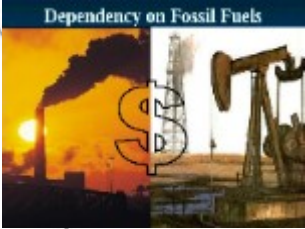
- ▶ Acid precipitation/rain
 - ▶ Ozone depletion
 - ▶ Eutrophication
 - ▶ Global climate change
 - ▶ Automobile dependency
 - ▶ ...
 - ▶ All of today's major environmental problems emerge from yesterday's solutions.
- 

Environmental challenges are symptoms of deeper problems



Climate disruption

Mass species extinctions



Threats to food production

N cycle disruption

Ocean acidification



Automobile dependency



What is life?

- ▶ One of the core flawed paradigms is the separation between system and environment, or between life and its environment



A single organism that possesses all necessary aspects to be alive



Abiotic and ecological interactions



A single organism possesses all the necessary aspects to be alive

Interacting ecological community and its non-living environment is an ecosystem



An ecosystem possesses all the necessary aspects to sustain life

Recursive nature of nature

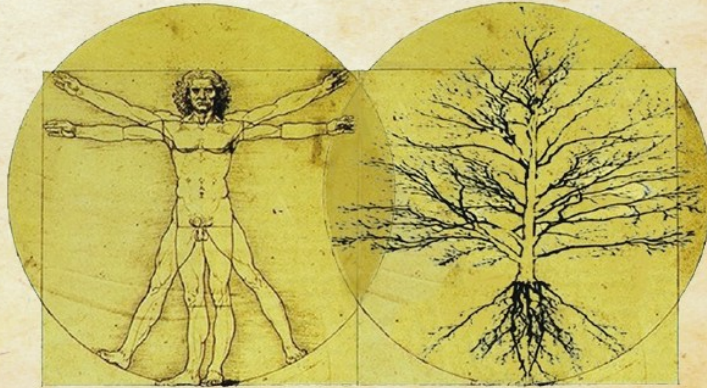
- 1) Life and environment are best understood and modeled as unified as a single “life–environment” system.
- 2) “Discrete life” and “sustained life” are dual models that must always be used in concert in both thought and action
- 3) A hyperset equation explicitly and formally *prohibits fragmentation of life from environment*

life–environment =

{environment {ecosystems {organisms {environment} } } }

Foundations *for* Sustainability

A Coherent Framework of Life-Environment Relations



Daniel A. Fiscus, Brian D. Fath



RECENT BOOK

Foundations for Sustainability is an important synthesis that points the way, along a long and rocky road, to an ultimate solution of humanity's environmental problem. --
Edward O. Wilson, Emeritus professor, Harvard University

www.elsevier.com/books/foundations-for-sustainability/fiscus/978-0-12-811460-5

Human Ecology summary

- ▶ Humans are part of the biosphere;
- ▶ We are living organisms like other animals in many respects, but
 - we have an advanced social organization, and
 - the ability to extract and use energy and resources that characterizes us and our impacts on the planet.
- ▶ That does not make us independent from the environment though

Flourishing within limits to growth

- ▶ Recognize physical, planetary boundaries and capacities
- ▶ Understand sustainable system design and function
- ▶ Act accordingly, in all things, at all times, as part of a routine with nature

