Environmental Ethics and Land Management

ENVR E-120

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Elements of Ethical Reasoning

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Session 3 – Part 1
6 October 2005

Harvard University Extension School
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We need to situate environmental ethics – the principles of choice in an ecosystem -- *within* the context of the system within which it operates.

We need to situate environmental ethics – the principles of choice in an ecosystem -- *within* the context of the system within which it operates.

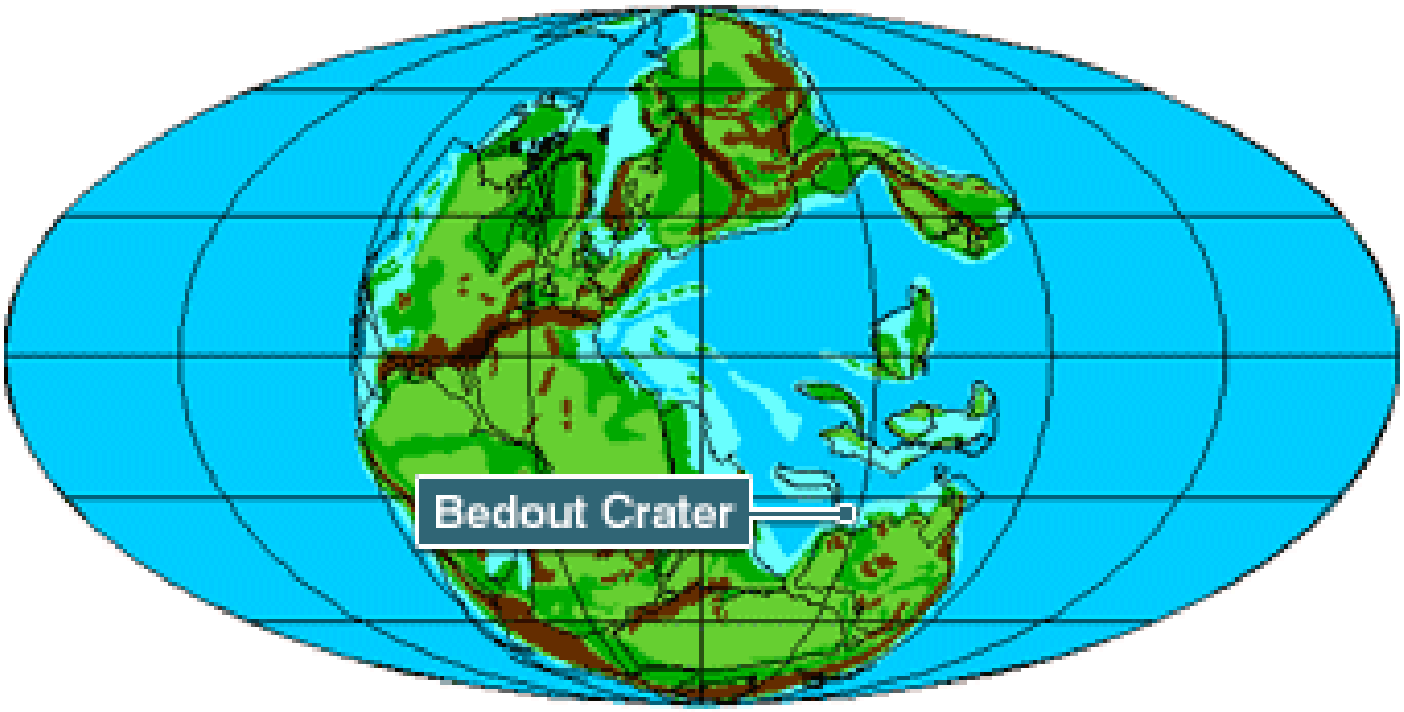
We should not expect our ethical systems to contradict natural systems.

Even the casual observer can see evidence of patterned activity – non-random events that have left their mark…

Even when we can't "see" the evidence, we are learning that it is there and that we can learn about them if we extend our scientific gaze.

Thus we are learning about life-transforming events in Earth's history that occurred that are not immediately visible to the naked-eye…

THE PANGEAN SUPERCONTINENT - 250 MILLION YEARS AGO



The Chicxulub crater is not the only major event we need to pay attention to…

The Bedout Crater has its story to tell as well.

First shown: **Thursday 5 December 2002**

The Day The Earth Nearly Died

Programme summary
Questions and answers
Transcript
Weblinks

Coming up on Horizon

Archaeologists search the Amazon for **The Secret of El Dorado.**

The Day The Earth Nearly Died - programme summary

250 million years ago, long before dinosaurs roamed the Earth, the land and oceans teemed with life. This was the Permian, a golden era of biodiversity that was about to come to a crashing end. Within just a few thousand years, 95% of the lifeforms on the planet would be wiped out, in the biggest mass extinction Earth has ever known. What natural disaster could kill on such a massive scale? It is only in recent years that evidence has begun to emerge from rocks in Antarctica, Siberia and Greenland.

The demise of the dinosaurs, 65 million years ago (at the so-called K/T boundary), was as nothing compared to the Permian mass extinction. The K/T event killed off 60% of life on Earth; the Permian event 95%. Geological data to explain the destruction have been hard to find, simply because the rocks are so old and therefore subject to all kinds of erosion processes. It seems plausible that some kind of catastrophic environmental change must have made life untenable across vast swathes of the planet.

"At the end of the Permian you'd see virtually nothing alive"

The world's biggest volcanoes

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Last Updated: Thursday, 1 April, 2004, 15:57 GMT 16:57 UK

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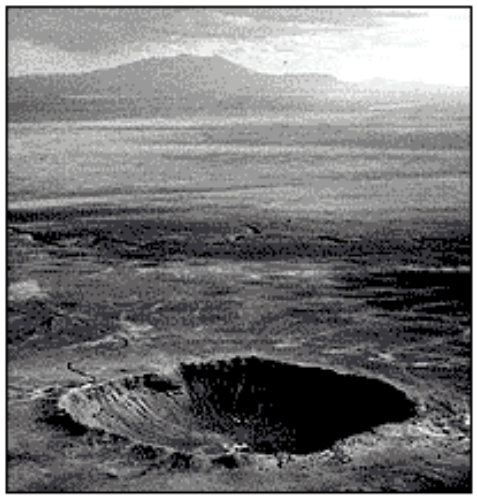
Double whammy link to extinctions

By Paul Rincon
BBC News Online science staff

The chances that asteroid impacts and huge bouts of volcanism coincide randomly to cause mass extinctions may be greater than previously imagined.



What are the chances of such great events occurring together?

UK researchers conducted statistical tests to determine the probability of such catastrophic events happening at the same time in Earth history.

They found massive releases of lava and space collisions should have overlapped three times in the last 300 million years.

Details will be published in a future issue of the geological journal Lithos.

SEE ALSO:
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- 'Quick' demise for the dinosaurs
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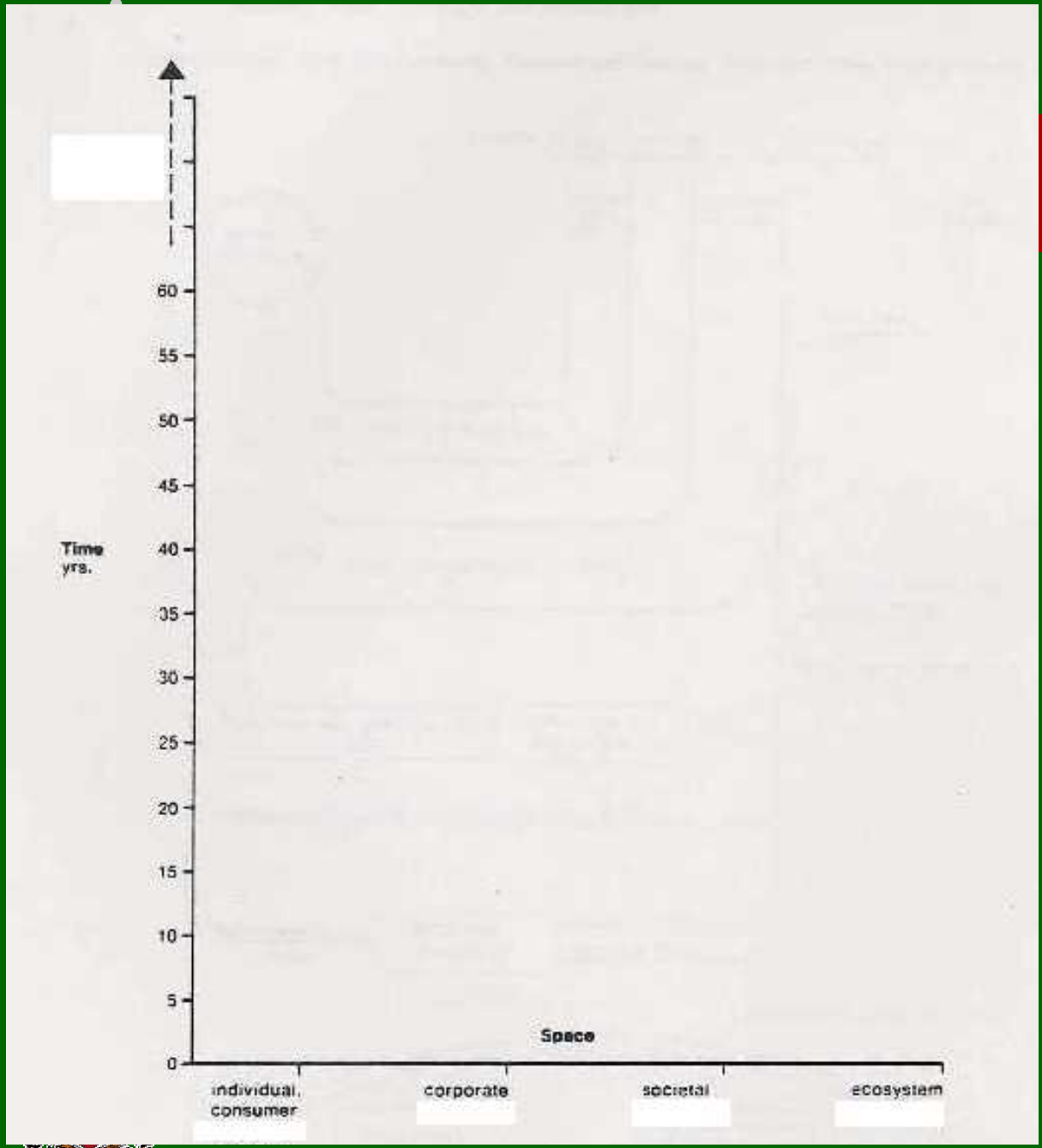
So, we have reminded ourselves that Earth and the life forms that have emerged on Earth have been shaped by cosmic events.

Further, these cosmic events continue to occur and "frame" all we undertake…

In short, in the ecosystem some very important things remain *beyond human control*. They always have been, remain now and always will be beyond our control.



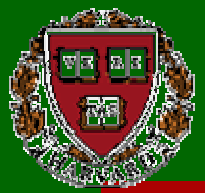
In reality, all decisions are made in a time-space continuum.

That is, all ethics are "situated" in time and space.

The question is what is the relevant time-space 'frame' for ethical choices in an ecosystem?

Considering the larger cosmic context, we have learned that life systems may not be confined to Earth….

In fact, they may not have originated “here” on Earth.



BBC NEWS WORLD EDITION

You are in: Science/Nature

Tuesday, 1 October, 2002, 11:30 GMT 12:30 UK

Life may swim within distant moons

By Dr David Whitehouse
BBC News Online science editor

Oceans of water beneath the icy surfaces of distant moons may be far more common in the outer Solar System than had been thought, according to new calculations.

Some, in theory, could harbour life, claim scientists.

Until now it was believed that oceans might be found under the icy crust of Jupiter's moons Ganymede, Europa and Callisto.

But new calculations, by Christopher England of Nasa's Jet Propulsion Laboratory (JPL), to be presented at a major astronomy conference, suggest that this may be the case on other moons, such as Titan - which orbits Saturn - and Neptune's large moon Triton.

Even Varuna, the largest so-called Trans-Neptunian object

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Wednesday, 26 January, 2000, 19:01 GMT

How life may live on Europa

Impression of a probe searching for life in Europa's ocean

By BBC News Online Science Editor Dr David Whitehouse

A radiation-driven ecosystem could exist in the ocean thought to lie beneath the surface of Jupiter's moon Europa, a scientist has suggested.

Ever since the Voyager spacecraft flew past the Jupiter system in the 1970's, astronomers have been fascinated by Europa and its bizarre striped surface and the prospects for primitive forms of life on the satellite.

But life needs energy. It has been suggested that on the floor of the suspected subterranean ocean there may be hydrothermal vents like those found on Earth.

These vents, which gush hot water and minerals, could provide both the energy and the food sources for primitive Europans.

Further, we have learned that not all life systems need to be based on carbon, just because “life as we know it” on the Earth’s surface is based on carbon.

Non-carbon-based life forms may exist elsewhere because we know they exist in remote regions of Earth itself.

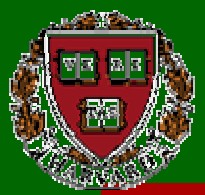
The Notion of Causality

In addition, we have observed that notions of simple causality do not really work very well in a complex ecosystem.

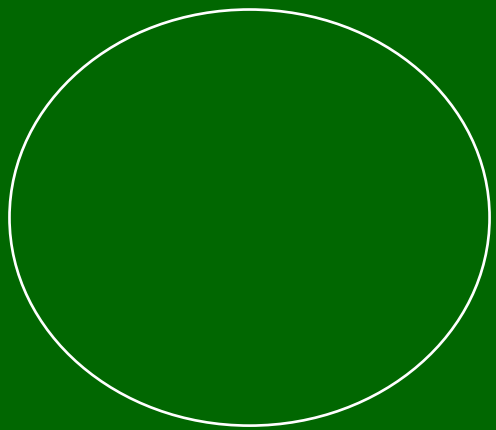
Simple causality implies that there is a linear relationship between cause and effect.

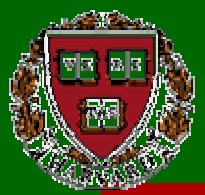
A “causes” B

therefore, if “B” then there must be a prior causal A



But what about complex systems?





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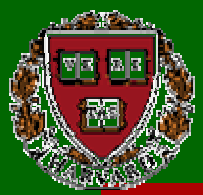

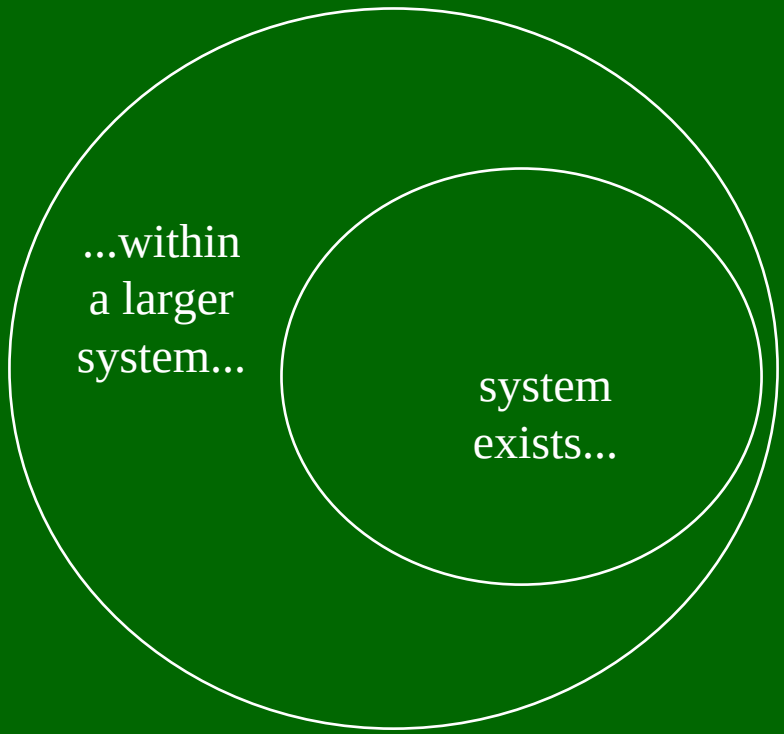
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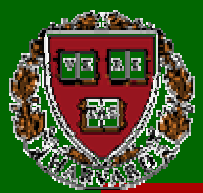

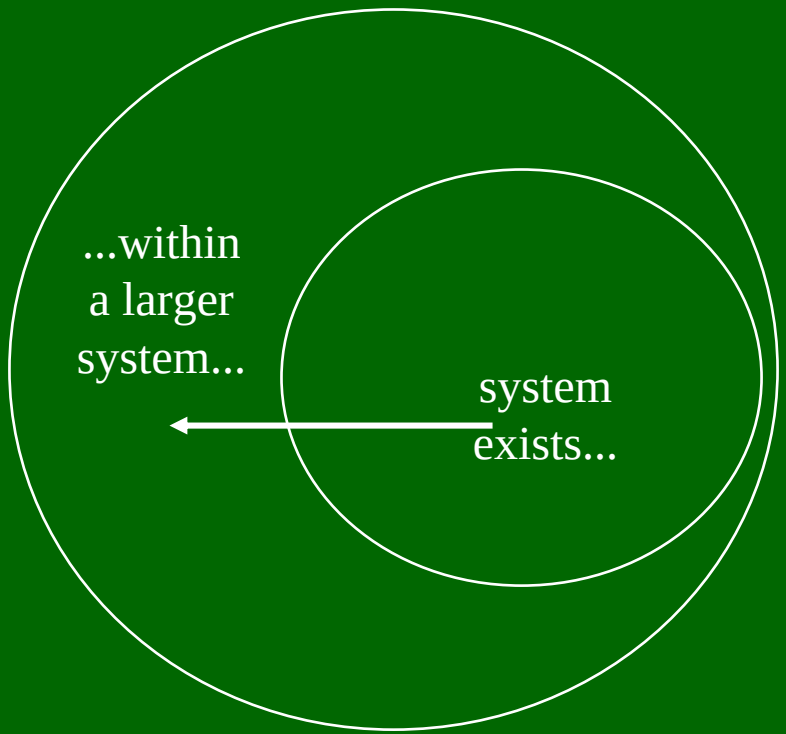
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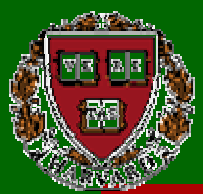

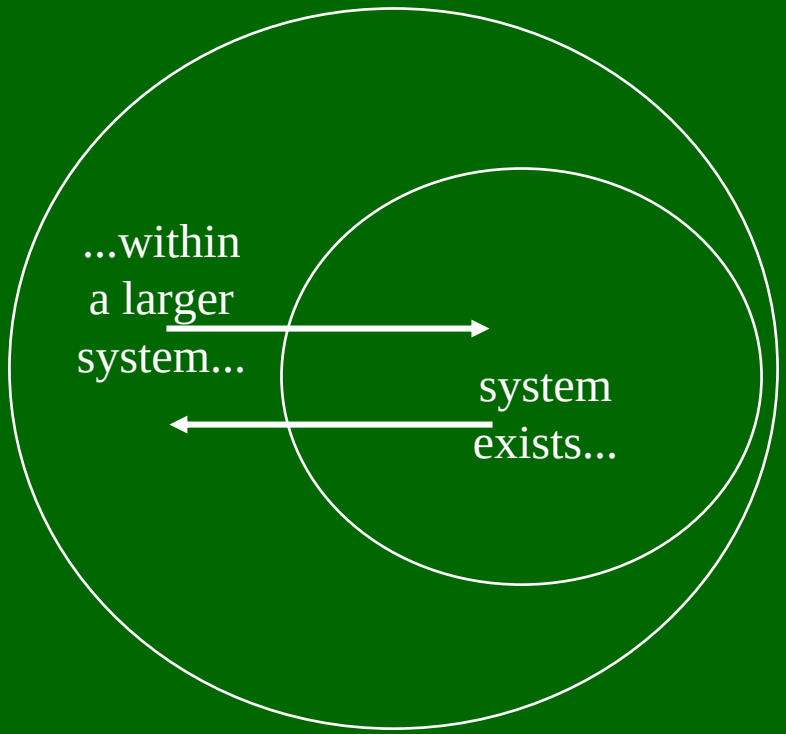
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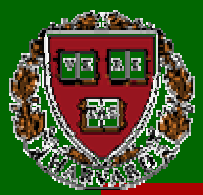

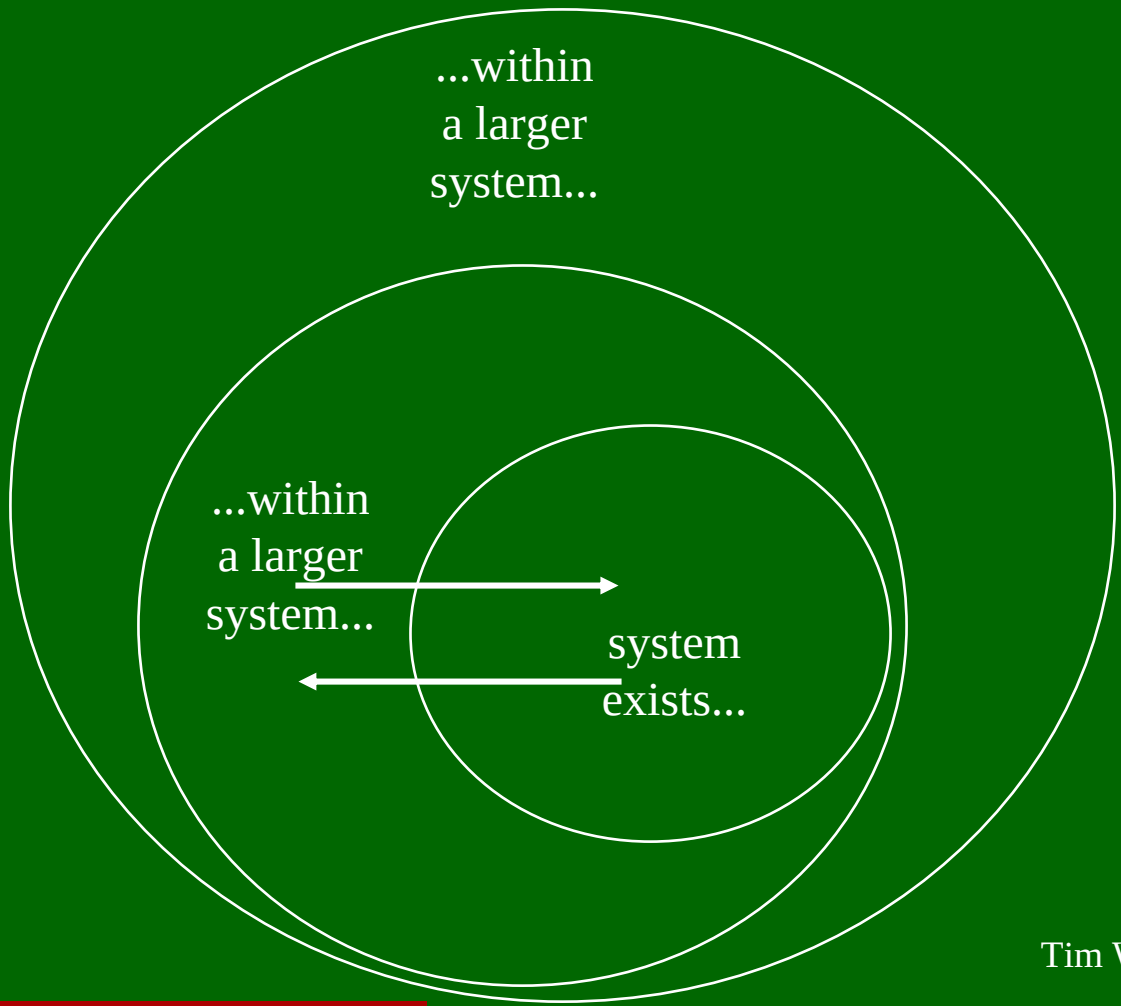
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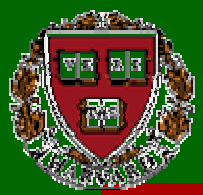

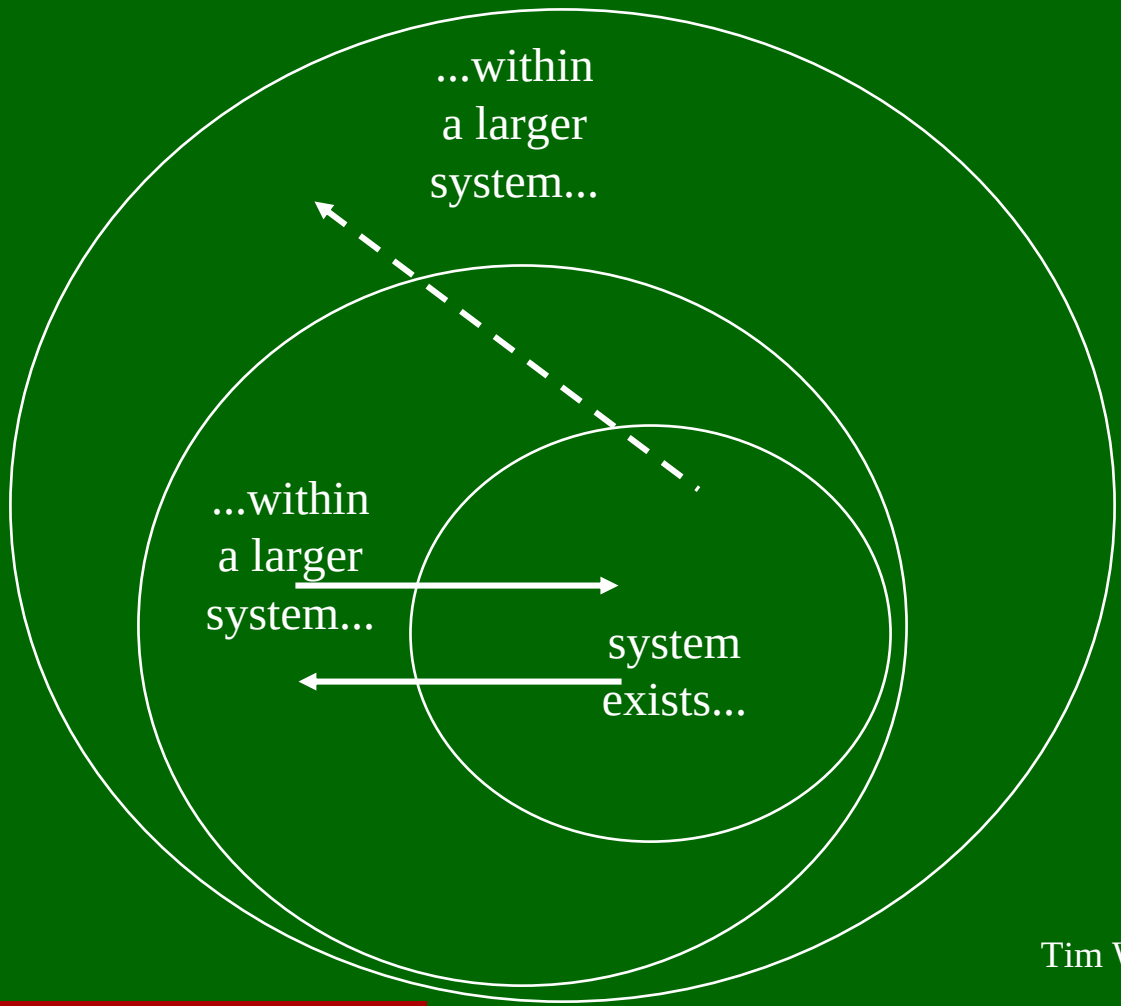
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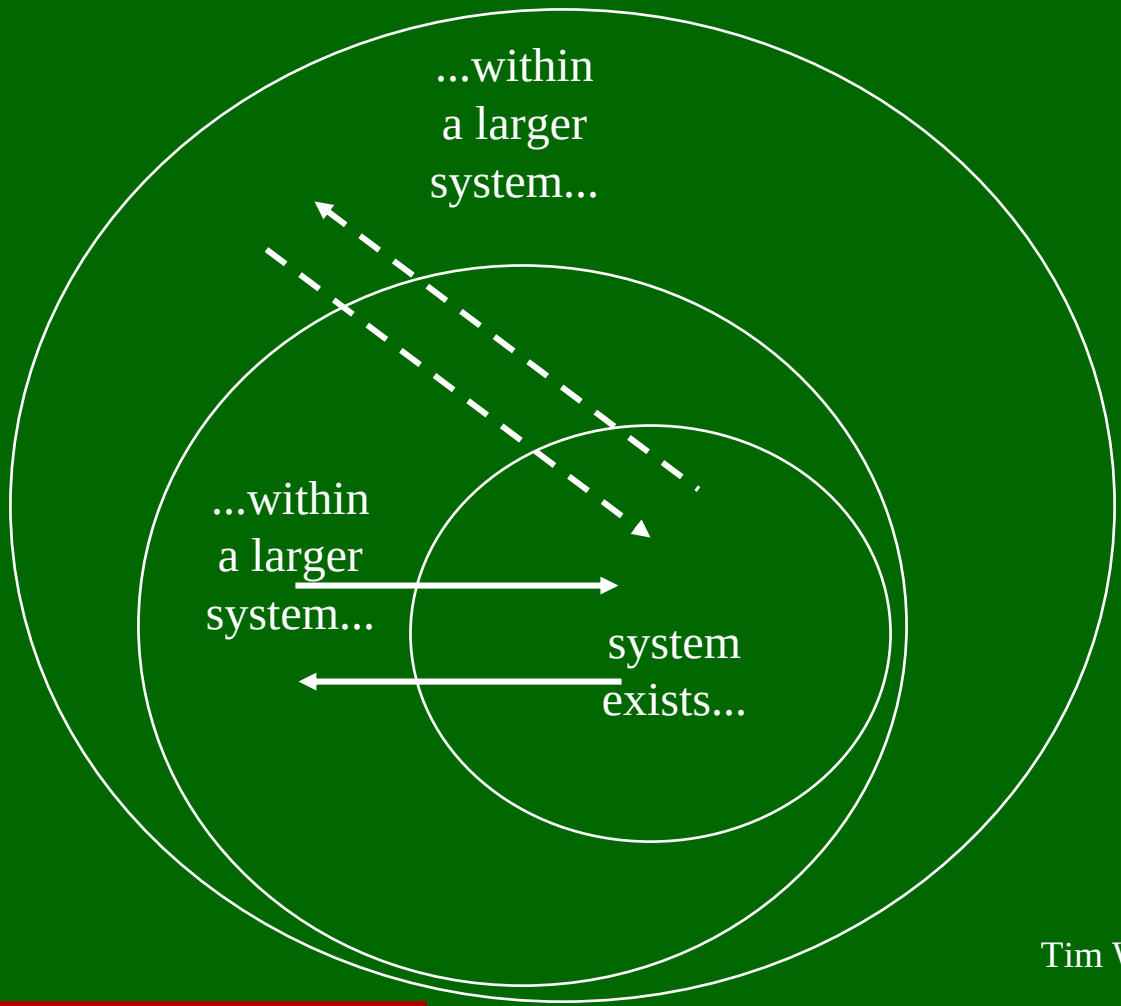
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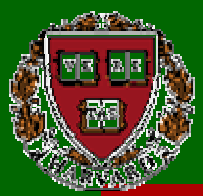

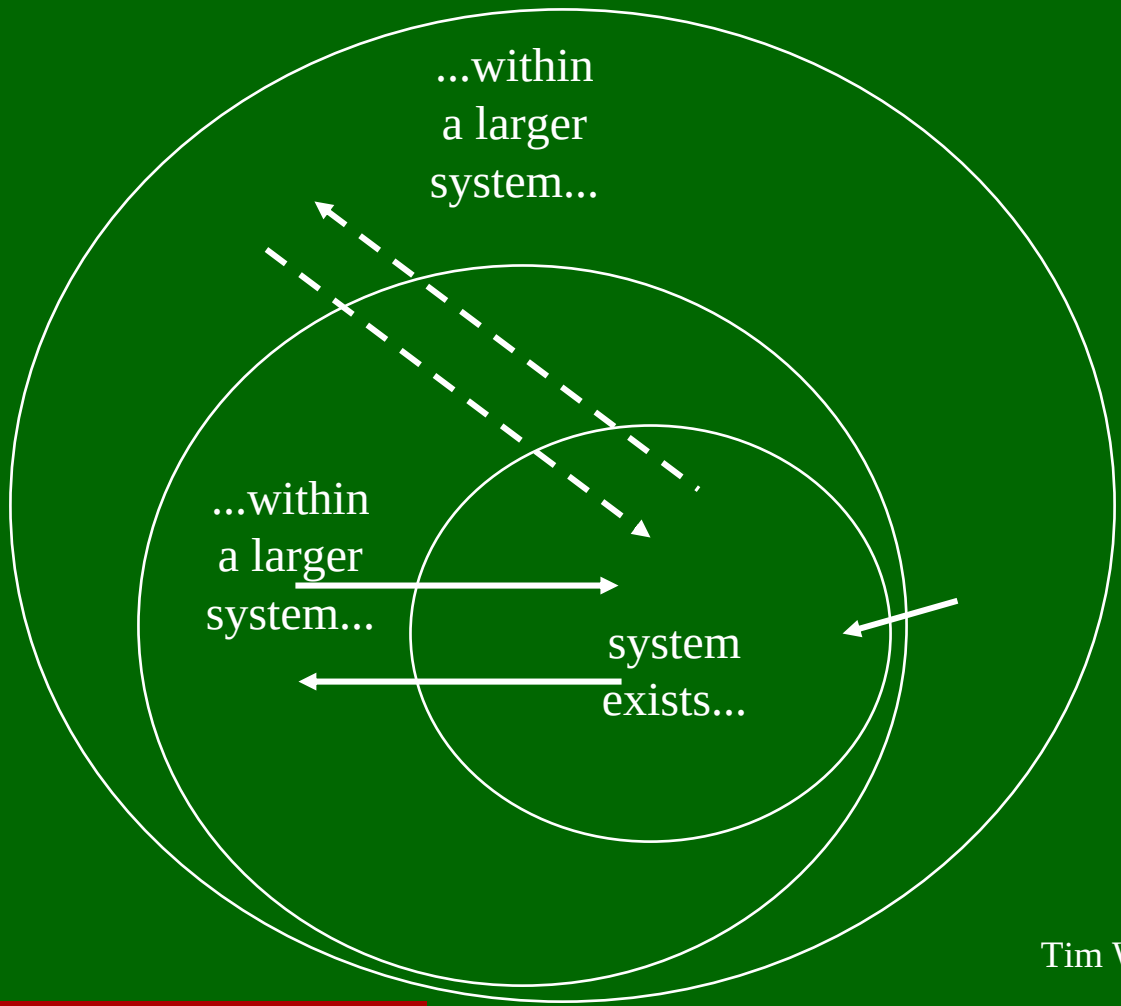
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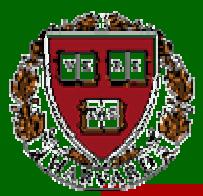

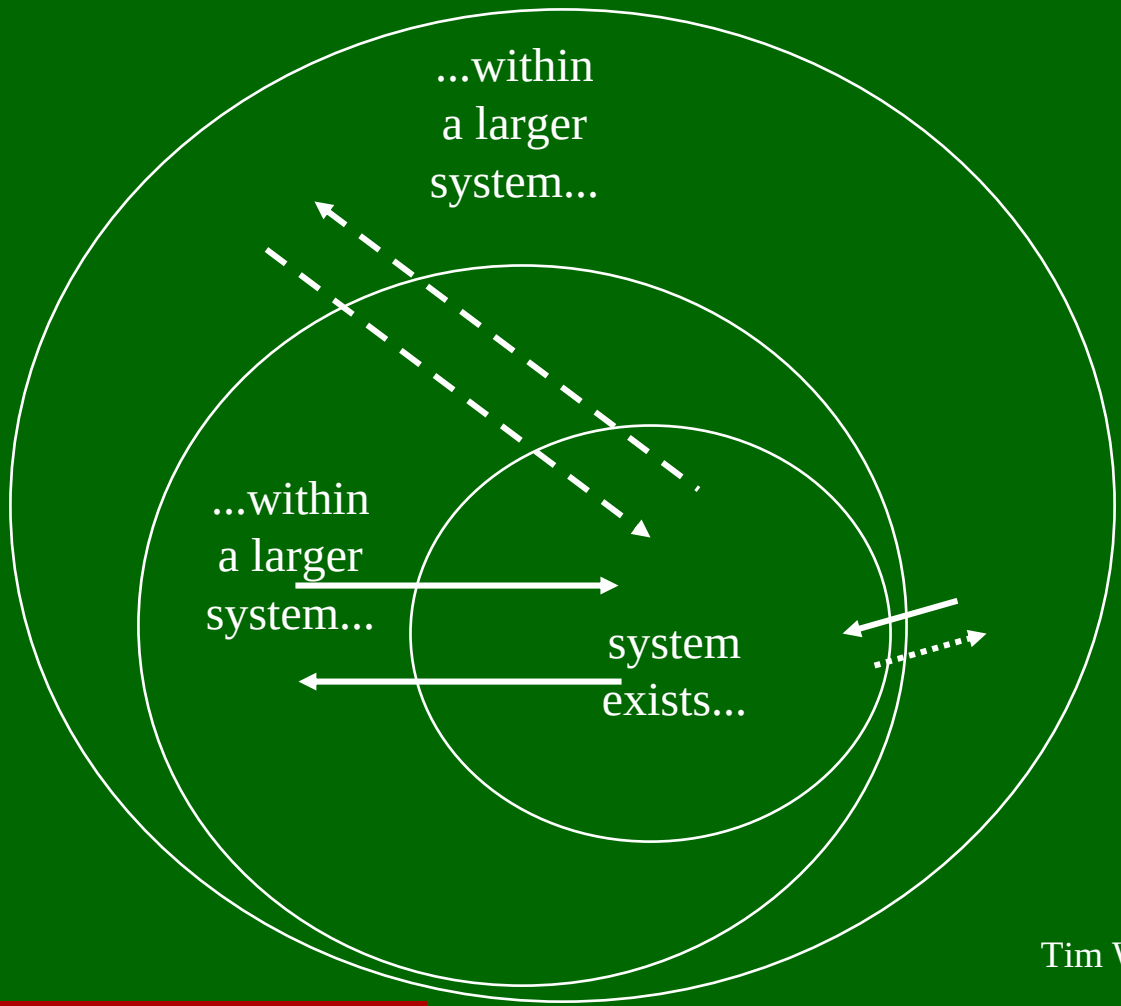
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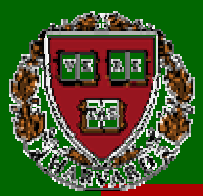
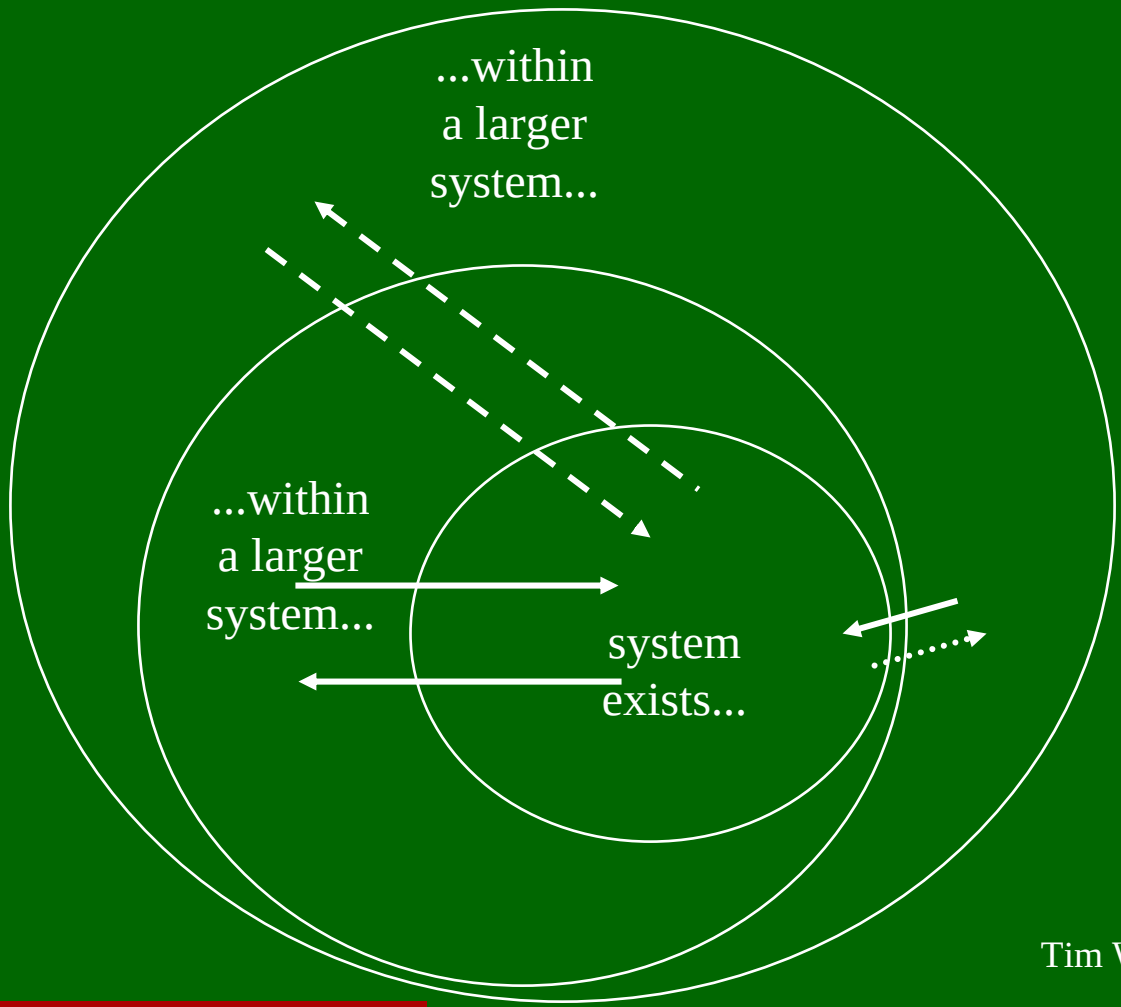
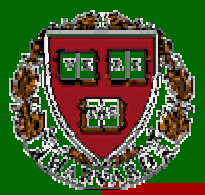


How can we locate causality in ‘non-linear’ systems?

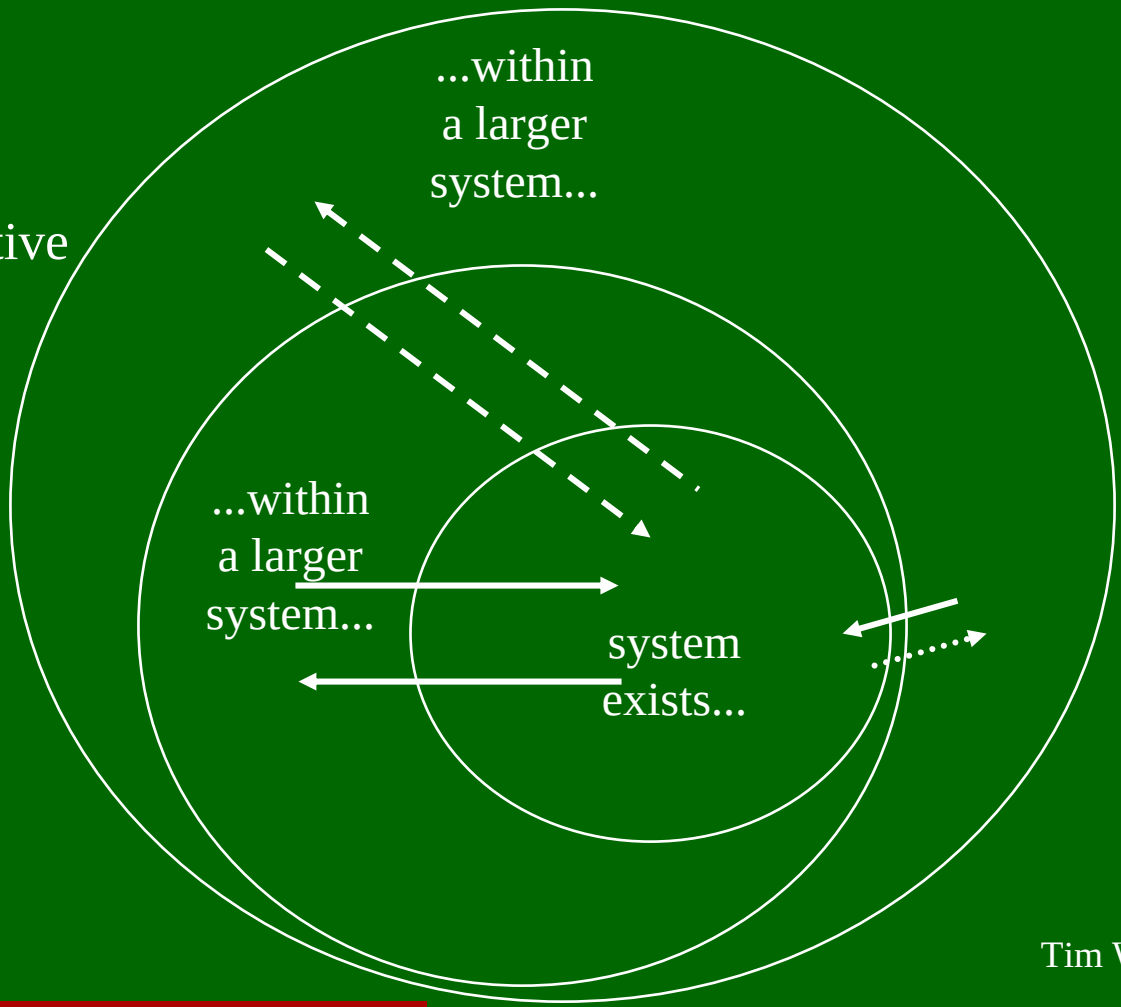




How can we locate causality in ‘non-linear’ systems?

Causality is:

- nested
- reciprocal
- and cumulative

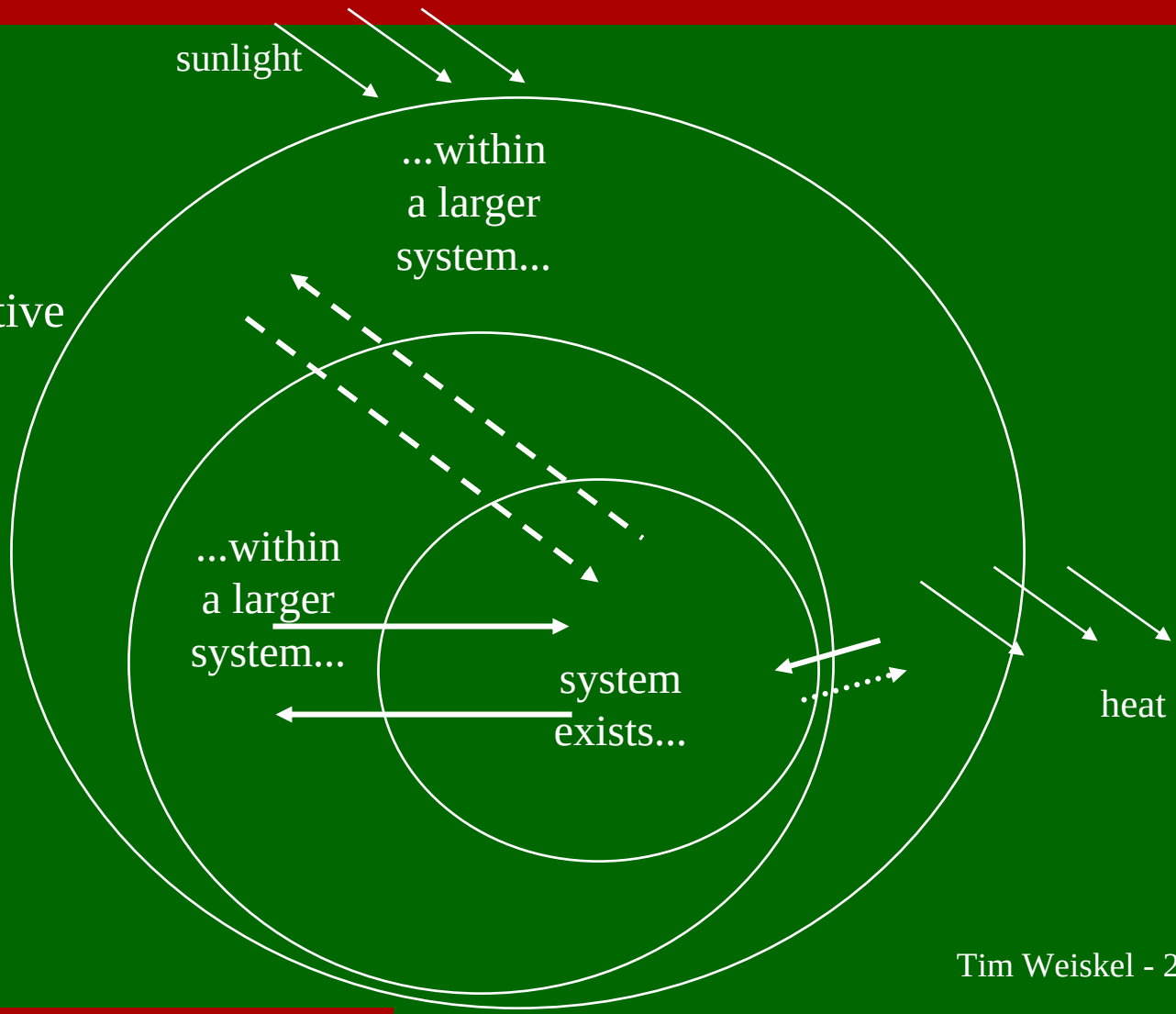


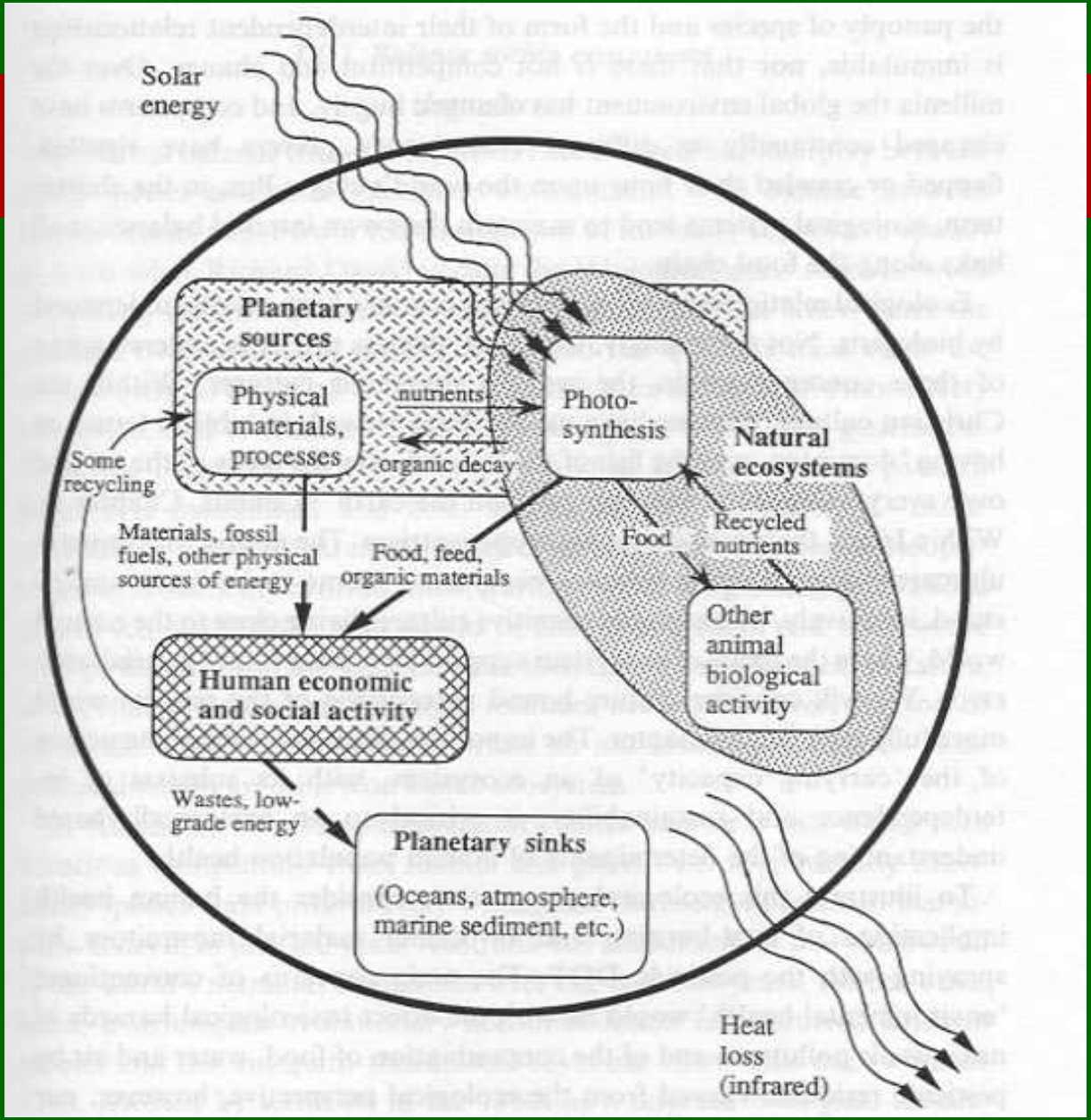
How can we locate causality in ‘non-linear’ systems?

Causality is:

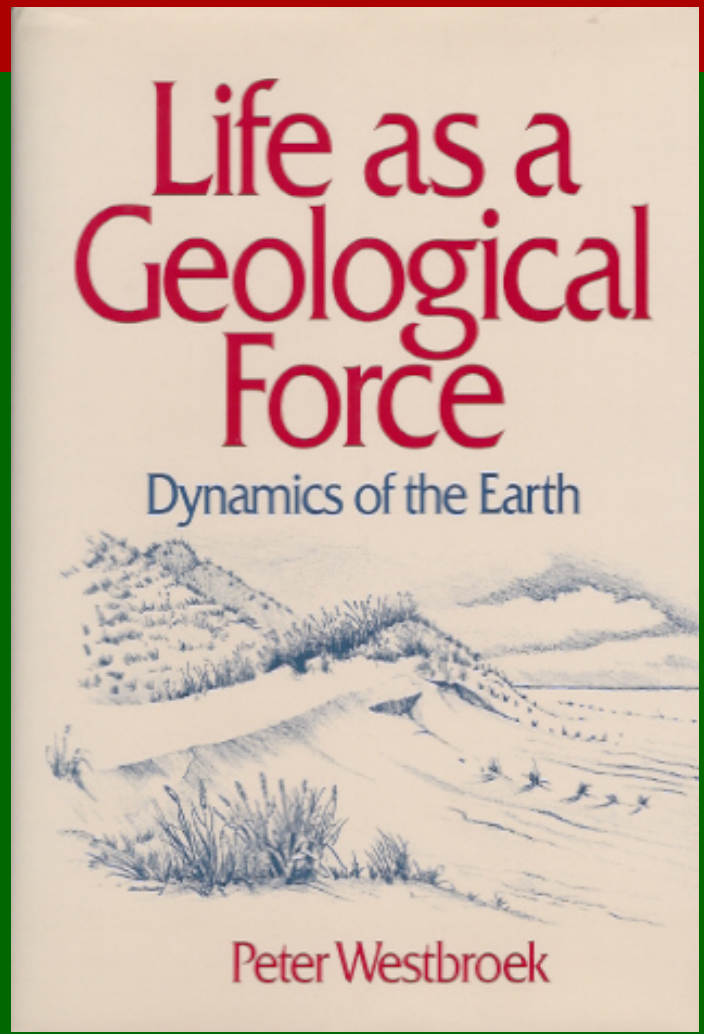
- nested
- reciprocal
- and cumulative

… in an overall system governed by the first and second laws of thermodynamics.



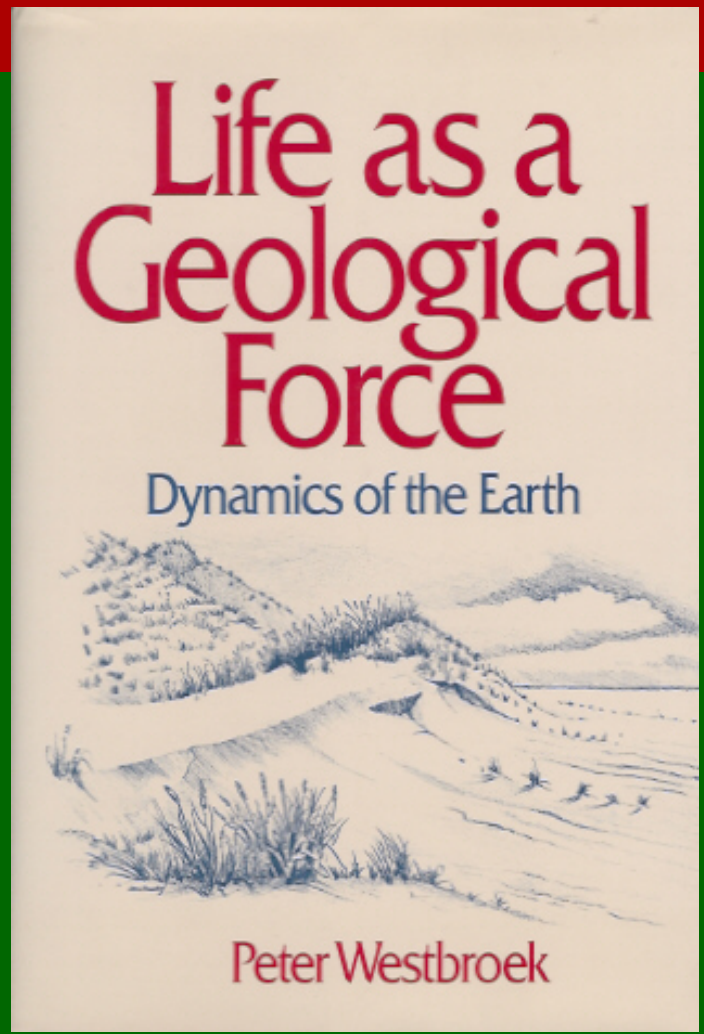

Solar energy
Planetary sources
Physical materials, processes
nutrients
organic decay
Photo-synthesis
Natural ecosystems
Some recycling
Materials, fossil fuels, other physical sources of energy
Food, feed, organic materials
Food
Recycled nutrients
Other animal biological activity
Human economic and social activity
Wastes, low-grade energy
Planetary sinks
(Oceans, atmosphere, marine sediment, etc.)
Heat loss (infrared)

So, with nested, reciprocal and cumulative causality, while larger systems seem to condition smaller systems within them, the reverse is also true.



So, with nested, reciprocal and cumulative causality, while larger systems seem to condition smaller systems within them, the reverse is also true.

Geological systems condition the emergence of life forms, but, over time, life forms can also alter geology. Our atmosphere is the result of the waste of bacteria. The “Cliffs of Dover” are rock that used to be “alive.” Coral reefs are still alive … let’s hope.



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Tuesday, 1 October, 2002, 17:23 GMT 18:23 UK

Land use 'alters climate'

By Alex Kirby
BBC News Online environment correspondent

The way humans alter the surface of the Earth may be a key factor in climate change, scientists believe.

They say land-use changes are probably just as important as greenhouse gas emissions.

They think tropical land surface changes are probably a greater influence on climate than the seasonal El Nino weather disturbances in the Pacific.

And they suggest a new formula for measuring all human-caused climate influences.

The scientists, whose work was funded by the US space agency Nasa, published their findings in the Philosophical Transactions of London's Royal Society, the UK's national academy of sciences.

And we are learning that changes in behavior of some species can lead to changes in the larger systems of which they are a part…

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And we are learning that changes in behavior of some species can lead to changes in the larger systems of which they are a part…

For example, the way landscapes change over time, may in turn change climate in some measurable ways.

Sometimes Humans behave as a “Geological Force”

Human behavior has been an increasingly important ‘geological force,’ altering land, water and air.

Sometimes Humans behave as a “Geological Force”

Human behavior has been an increasingly important ‘geological force,’ altering land, water and air.

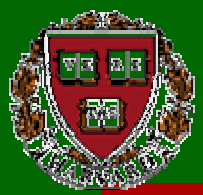
But all human activity operates *within the “laws of nature.”*

(On this issue, among others, some of our leadership seems to be sadly mis-informed.)

Laws of Thermodynamics Govern the Known Universe

First Law:

Energy is neither created nor destroyed; it changes form from one form into another.



Laws of Thermodynamics Govern the Known Universe

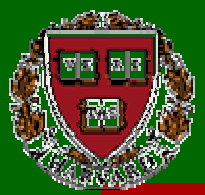
First Law:

Energy is neither created nor destroyed; it changes form from one form into another.

Second Law:

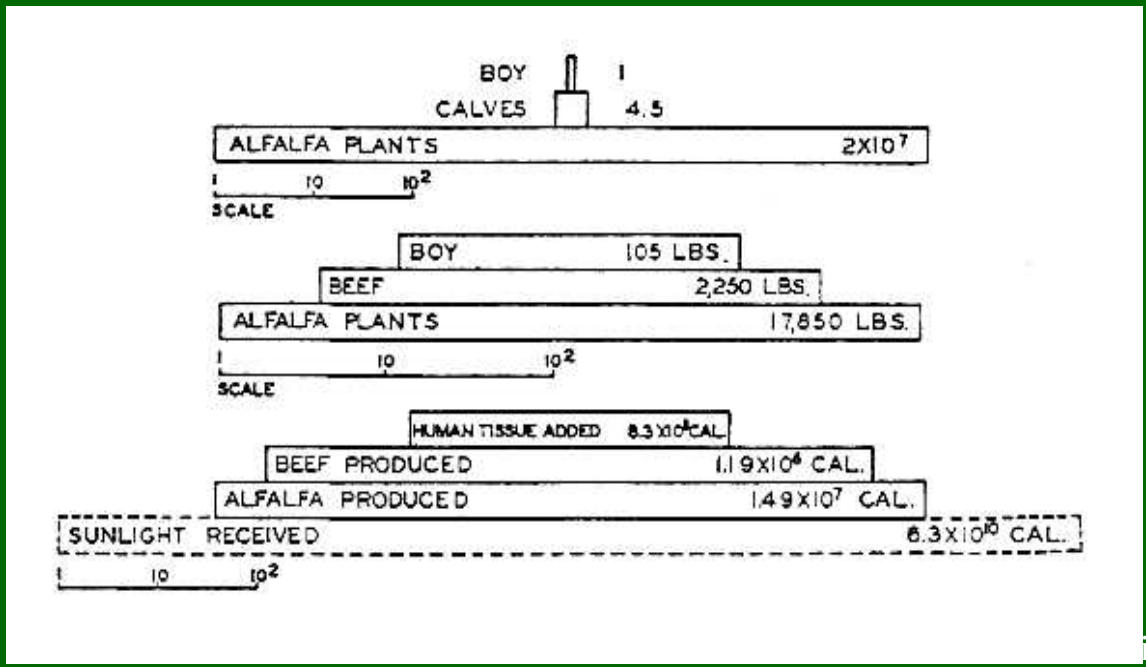
In spontaneous transformations, energy moves from more highly organized forms to less organized forms. That is, for example, from the high energy wave lengths of light to the dissipated long wave lengths of heat.

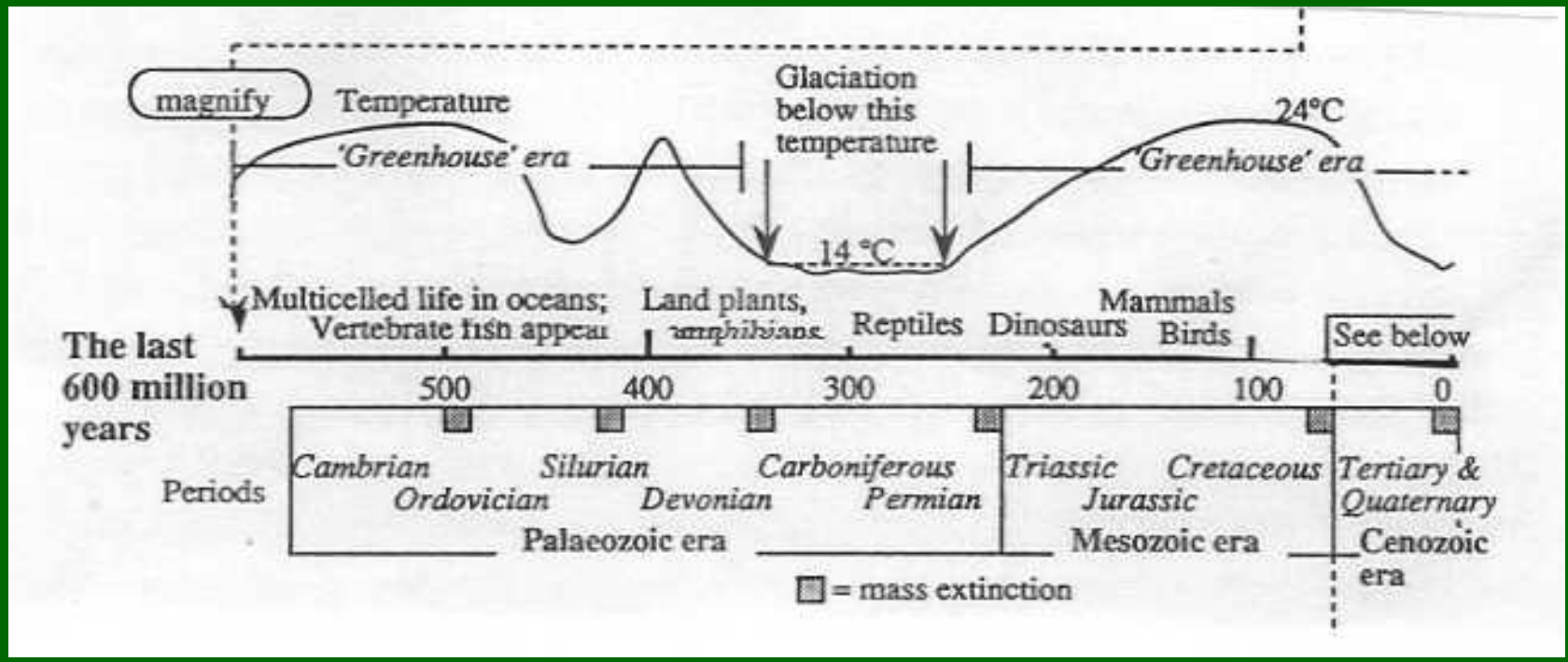
All “work” in the system requires the dissipative expenditure of energy. This is the “no free lunch” principle of the universe.



Where are we located in this system?

Where are we located as individuals -- and *as a species* -- in the circulation of materials and the flow of energy? Where are we in the web of life on earth?

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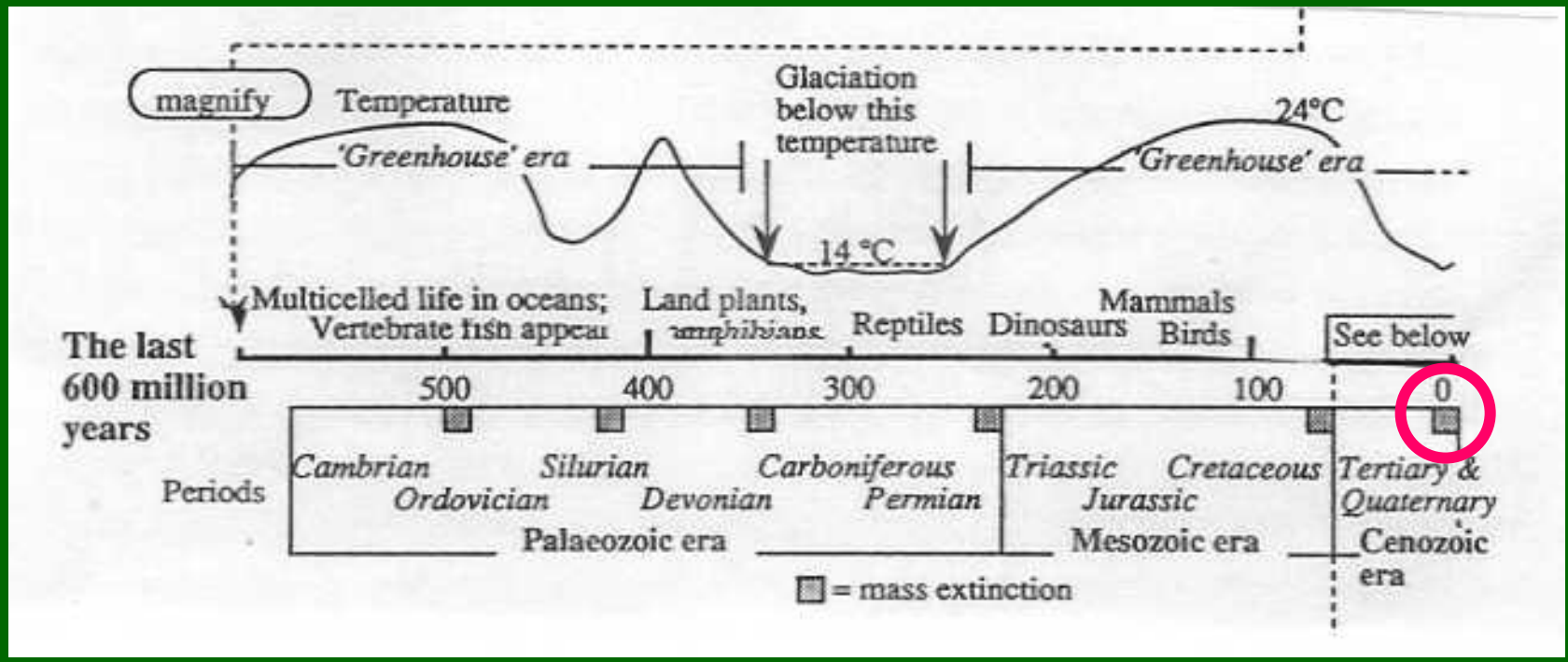
Temperature
'Greenhouse' era
Glaciation below this temperature
14 °C
24°C
'Greenhouse' era
Multicelled life in oceans; Vertebrate fish appear
Land plants, amphibians
Reptiles
Dinosaurs
Mammals Birds
See below
The last 600 million years
500
400
300
200
100
0
Periods
Cambrian
Ordovician
Silurian
Devonian
Carboniferous
Permian
Triassic
Jurassic
Cretaceous
Tertiary & Quaternary
Palaeozoic era
Mesozoic era
Cenozoic era
= mass extinction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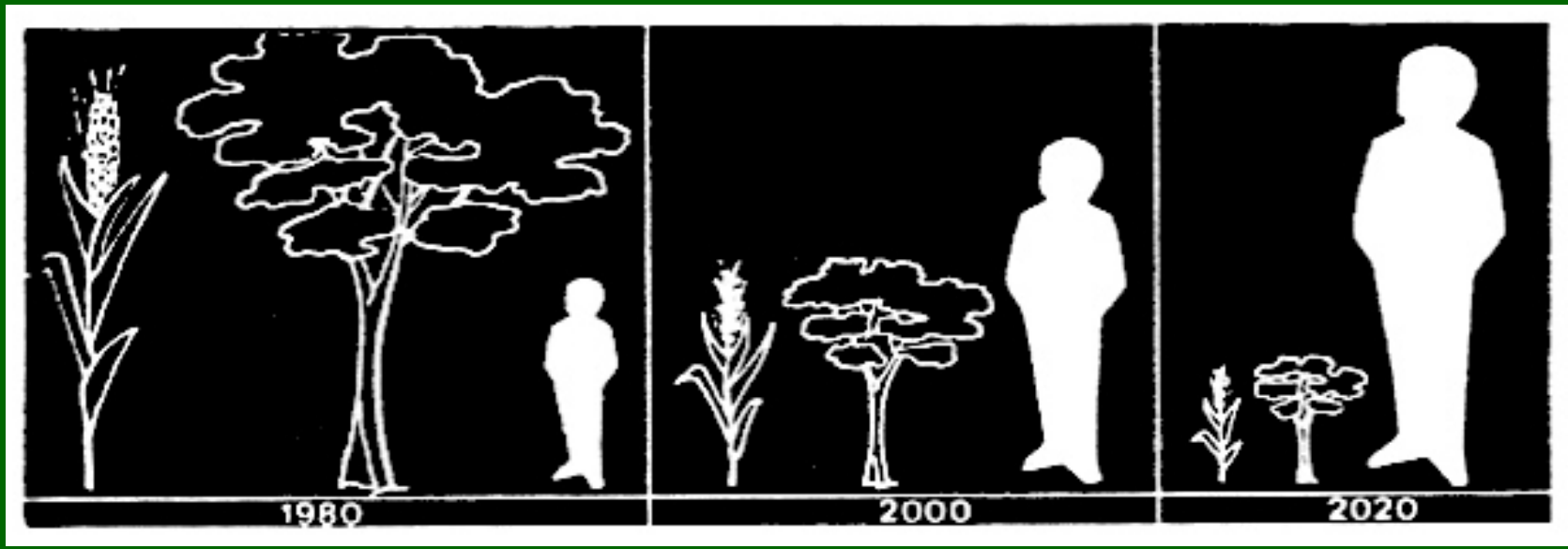
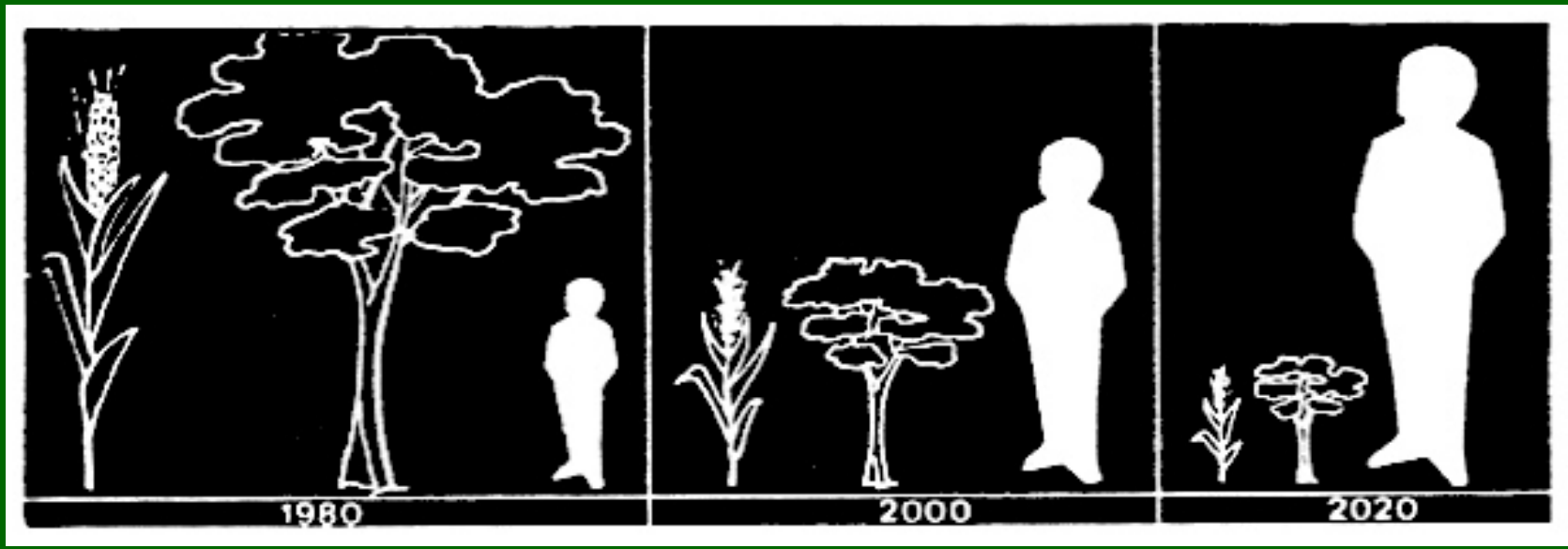
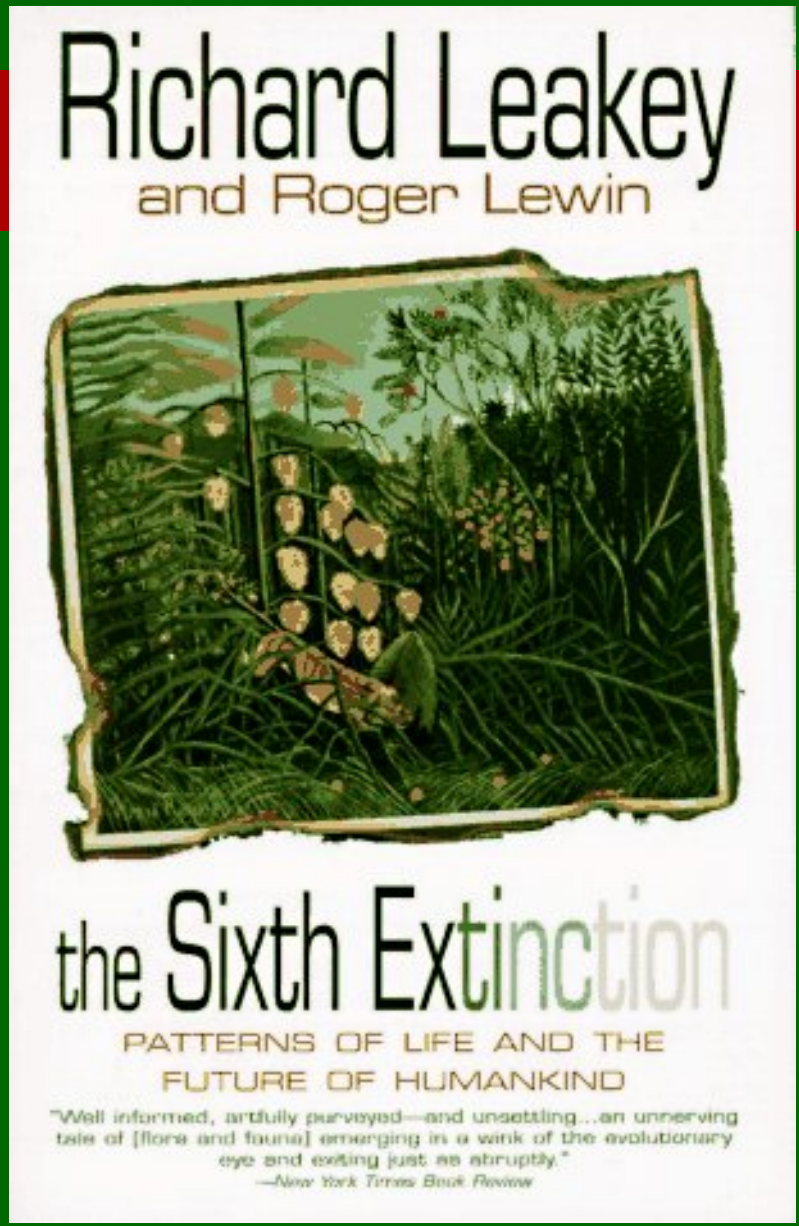
Temperature
'Greenhouse' era
Glaciation below this temperature
14 °C
24°C
'Greenhouse' era
Multicelled life in oceans; Vertebrate fish appear
Land plants, amphibians
Reptiles
Dinosaurs
Mammals
Birds
See below
The last 600 million years
500
400
300
200
100
0
Periods
Cambrian
Ordovician
Silurian
Devonian
Carboniferous
Permian
Triassic
Jurassic
Cretaceous
Tertiary & Quaternary
Palaeozoic era
Mesozoic era
Cenozoic era
= mass extinction


1980
2000
2020



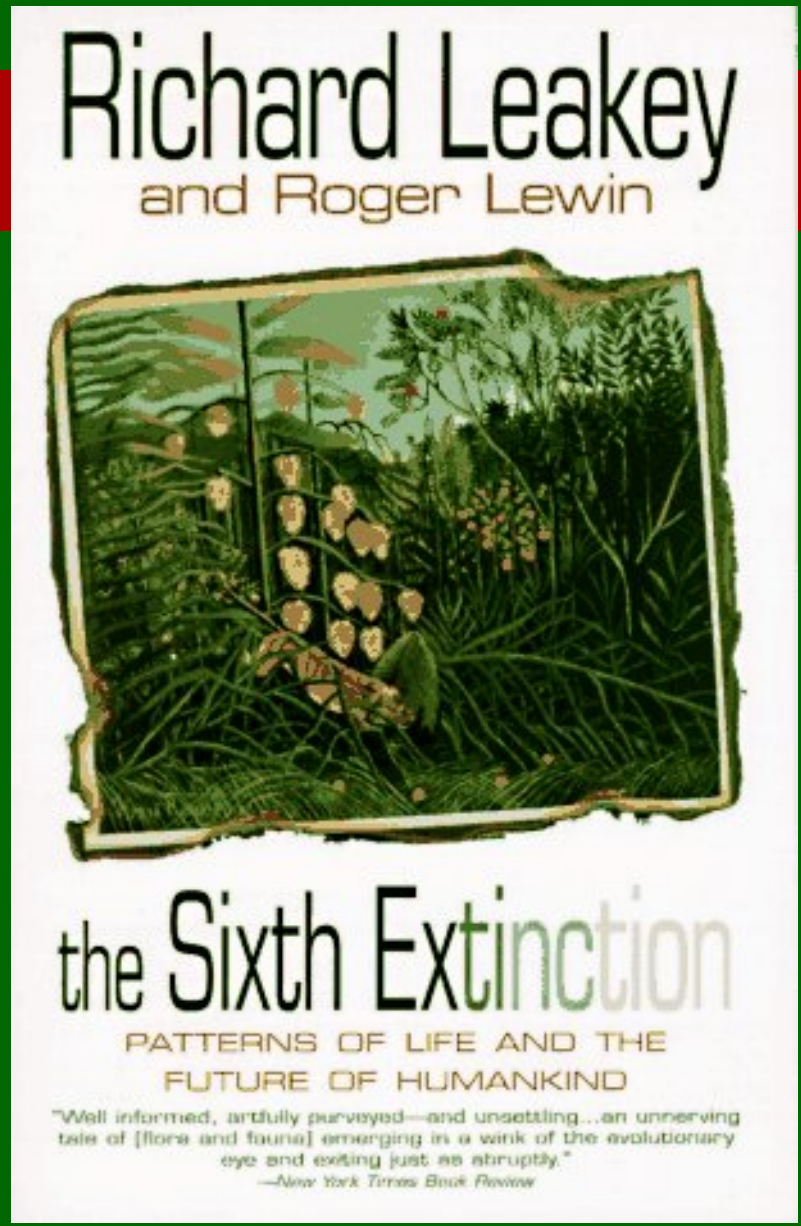
Remember, …in the trophic structure of the ecosystem is crucially important.

Naturalists have been warning scientists for quite some time about the "biodiversity crisis."



Naturalists have been warning scientists for quite some time about the "biodiversity crisis."

The "loss," destruction or displacement of biodiversity appears to be taking place on the scale of a "geological extinction event" – comparable in scope and scale to those witnessed before in Earth's history.



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Animals 'hit by global warming'

By Tim Hirsch
Environment Correspondent, BBC News

Climate change could lead to the extinction of many animals including migratory birds, says a report commissioned by the UK government.

Habitat for seals is disappearing

Melting ice, spreading deserts and the impact of warm seas on the sex of turtles are among threats identified.

The report is being launched at a meeting of EU nature conservation chiefs in Scotland.

It says that warming has already changed the migration routes of some birds and other animals

BBC NEWS:VIDEO AND AUDIO

See the polar bears and seals affected by the change

VIDEO

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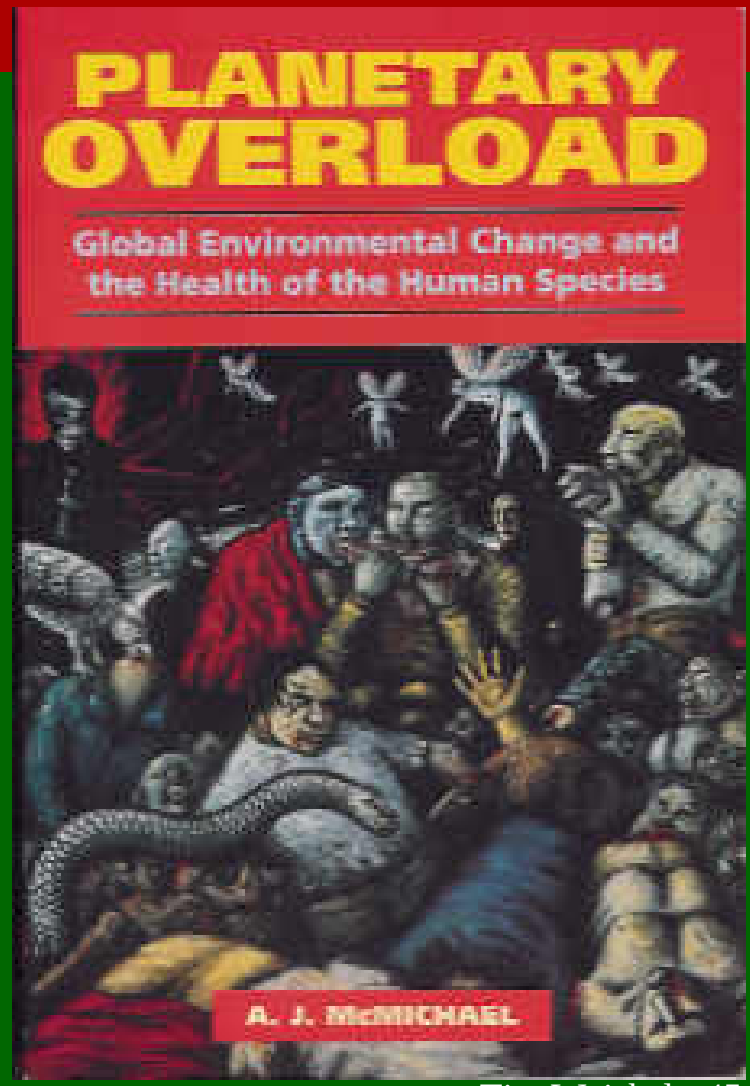
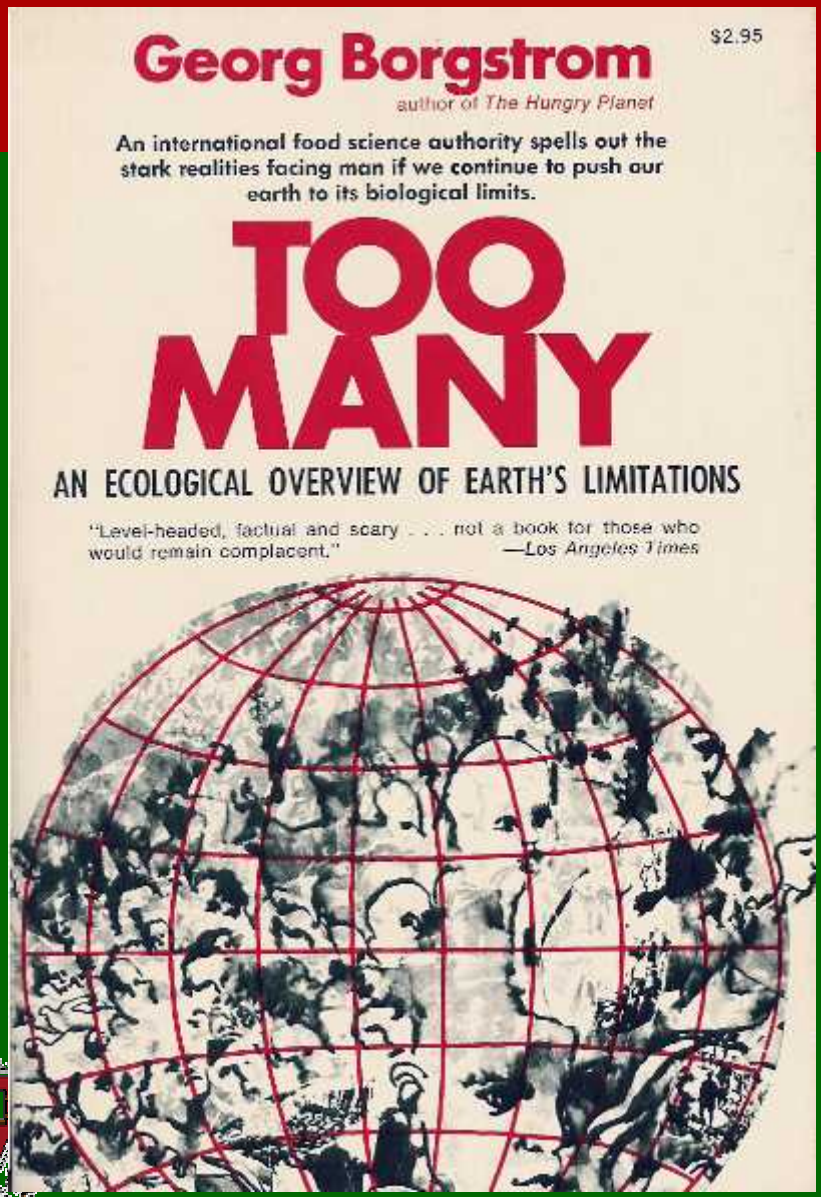
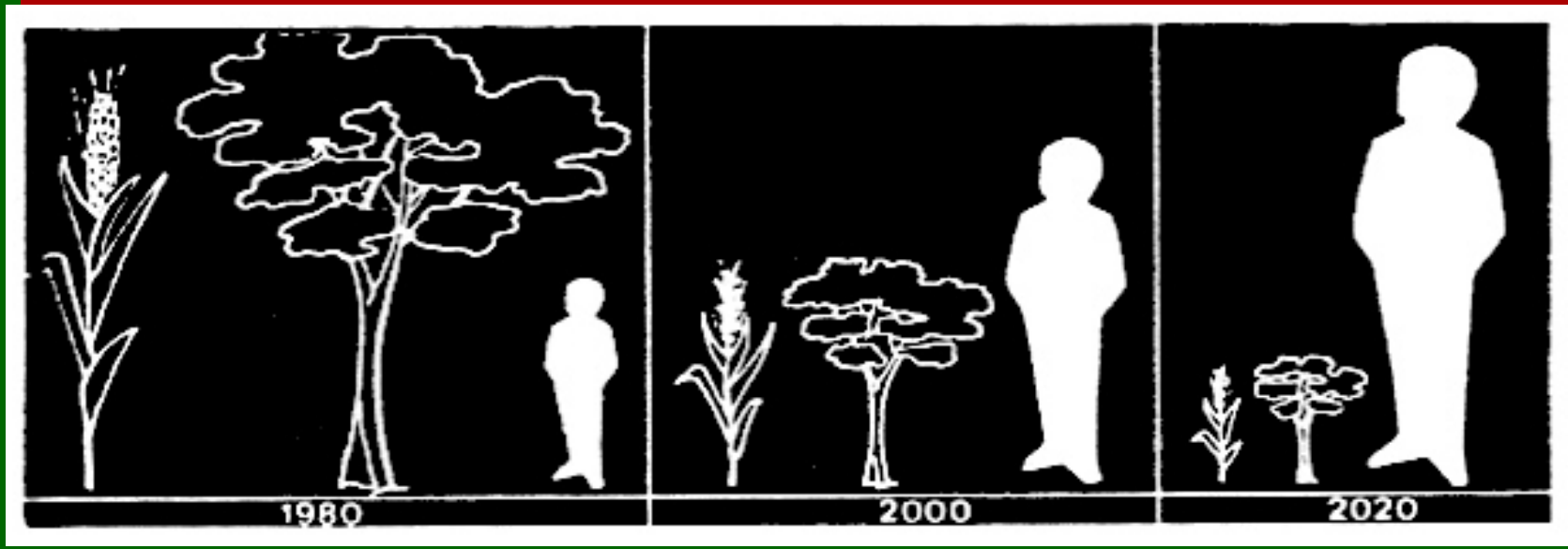
We can begin to ask about “overload” questions, but answering these questions will inevitably raise further questions of ratios.

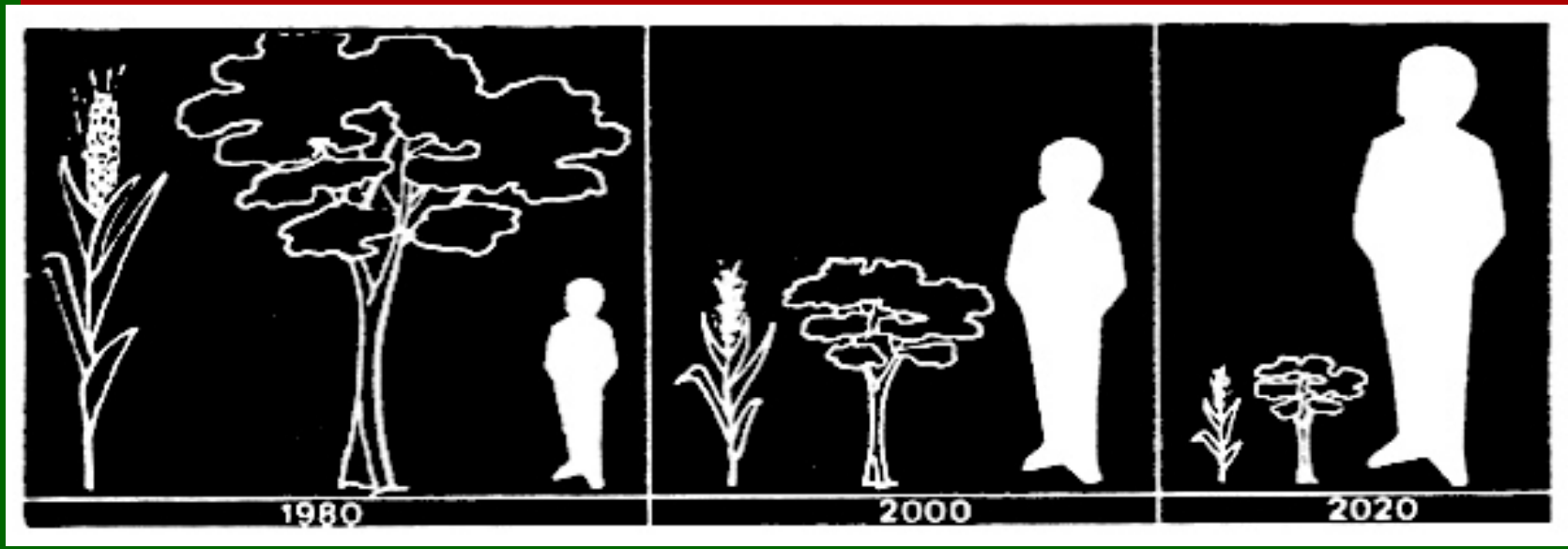




Some have already argued that there are too many humans currently alive and about to live for the planet to sustain them.



The international scientific community has been convened to address this question. And they have issued the *Millennium Ecosystem Assessment Report* (March 2005).



To understand these questions we need to address the concept **“niche”** in an ecosystem.

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Elements of Ethical Reasoning

Timothy C. Weiskel

Session 3 – Part 1
6 October 2005

Harvard University Extension School
Fall Semester 2005