

p.f. henshaw  
10/17/09

What if our impacts aren't reduced by  
efficiency,  
because efficiency stimulates and  
doesn't change the system??

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## Everyone promotes efficiency to reduce impacts

- To reduce our consumption, costs & resource demands
- To prevent climate change, prevent ecology collapses
- Everyone teaches it for sustainability, and research

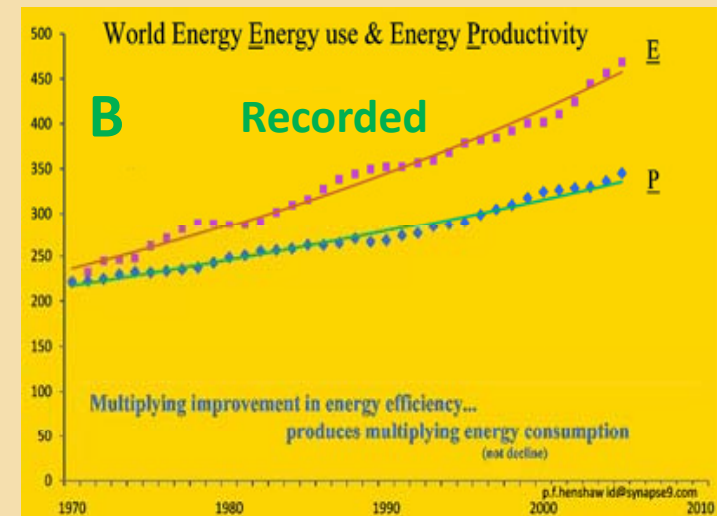
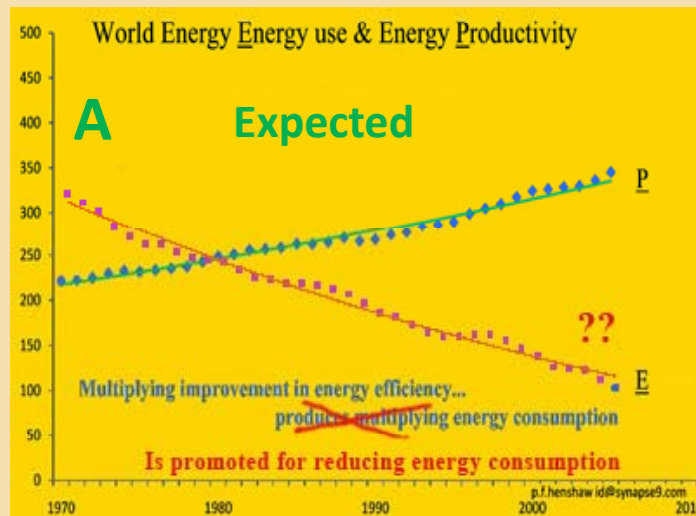
## Does it? When impacts keep growing faster...?

- Are we thinking, or just acting on old cultural assumptions
- Suffering from “distracted driving” in a complex world?
- Could it be that ‘Efficiency Codes’ just making growth more efficient and multiplying our energy use??

# Why Efficiency Multiplies Consumption

“The popular theory is” (like A)

- Improving the efficiency (\$/btu) should reduce consumption



“The recorded fact is” (like B)

- The two grow together, two parts of one system
- Improving efficiency multiplies consumption

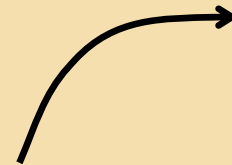
Some concrete pieces of a complex puzzle,  
to leave you with questions to think through.

## Growth Systems work as wholes

- Parts work together and rely on the whole.
- Efficiency allows the whole system to do more with less.



More scale  
(growth)



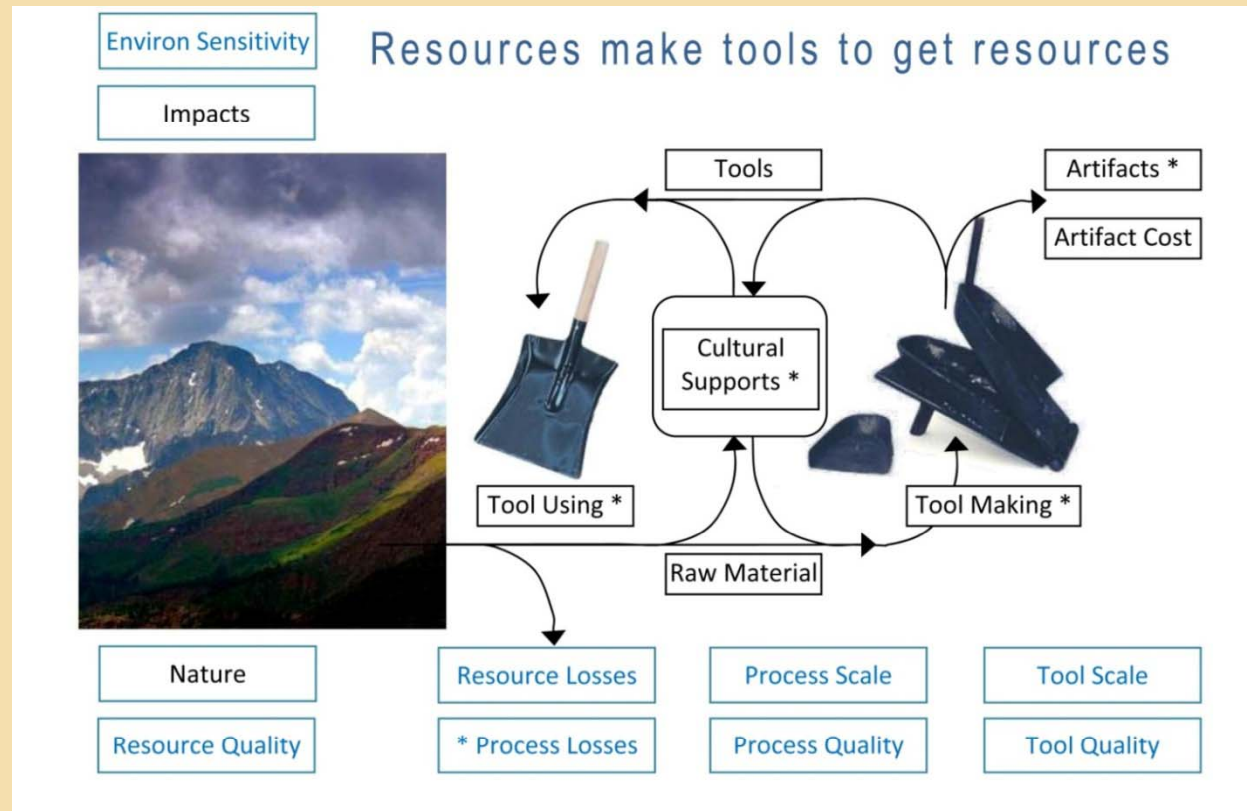
More quality  
(maturation)

- Our economy is operated to continually grow in scale
- Growing in scale:
  - a) begins with starting up ever more unfinished things
  - b) ends in completing and making them sustainable, or
  - c) running out of choices & leaving things incomplete.

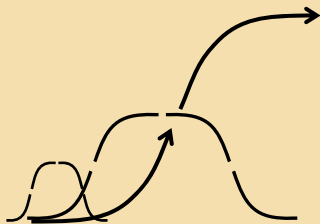
# EMC

## Economies Grow Their Own Environment

- Tools access resources and resources make more tools



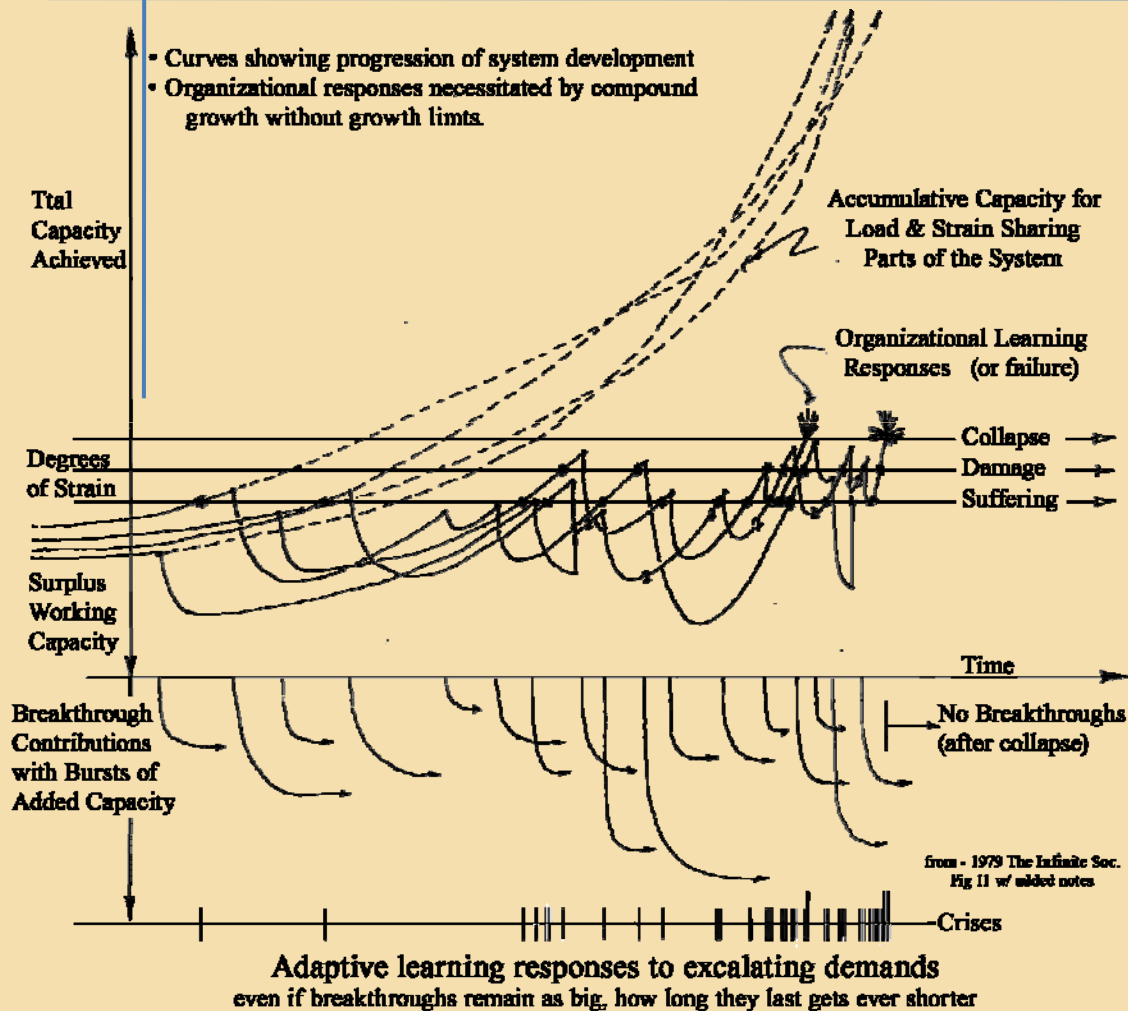
Calculate System ROI  
SimpleSysEROI.pdf



- It starts with a seed resource & inventing a value for it.
- Part of the product is growing the process, self-investment
- They switch to declining self-investment as they mature.

## Where this started... Growing Changes Change

From 1979 paper "The Infinite Society"



- Changes of scale & speed demand new organization
- Breakthroughs expand limits at each scale
- Families of technologies share the learning & load
- Learning processes involve search, experiment & time
- Our cultural image is of growth as a "constant"
- Hasty learning still causes mistakes
- ....
- No one seems to notice??

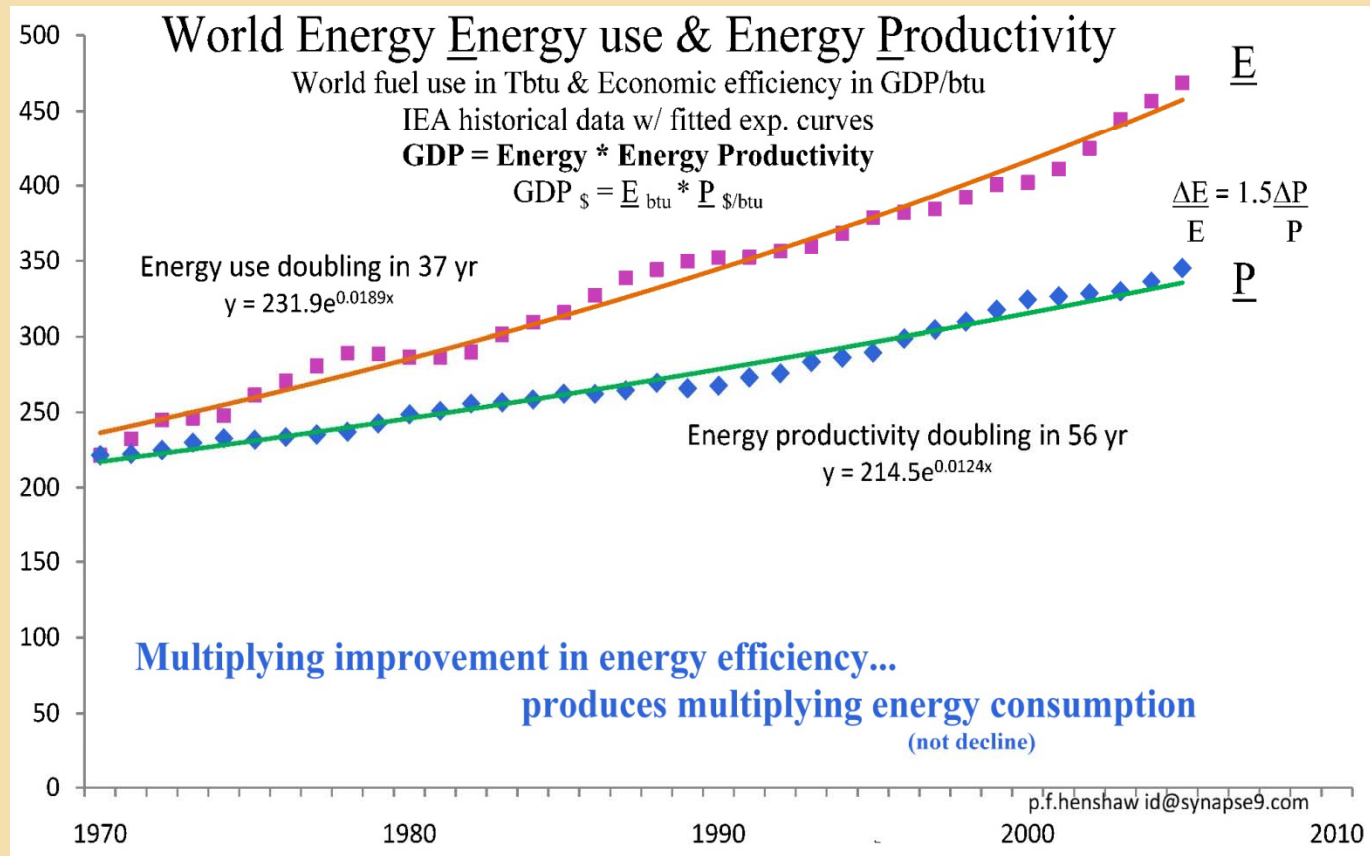
Evolving Process of Learning? Or Following Fixed Rules?

# EMC

## Efficiency (for doer) = Productivity (for receiver)

Resources(E) \* Knowhow(P) = Wealth(GDP)

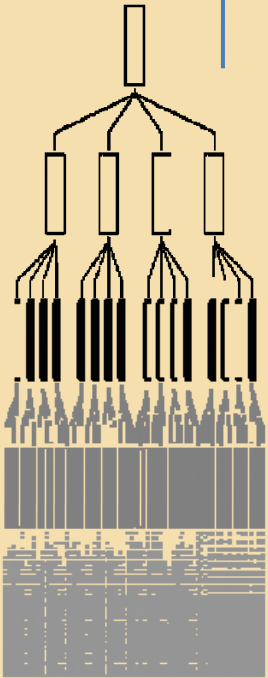
GDP =  
A little  
productivity  
and a lot of  
energy



- Having more skill in using energy lets us have more energy to use.
- Smooth curves display the liquidity of the whole system.
- The parts smoothly allocate resources for the best returns.

# EMC How Efficiencies Spread Their Effects

Cascading  
of Effects



## Creating opportunity for other things For Saving resources:

- Efficiencies relieve strains on one thing... that expand markets, profits and uses of other things.
- Water conservation lets each user use less & allows more users, expanding development and urban impacts.
- Not eating beef buys creates resources for other products
- Saving old growth forest “silences the squeaking wheel” hides quiet growing impacts “removes the canary from the coal mine”.

## For Saving money:

- Efficiency directly creates wealth, the physical system equivalent of “printing money”.
- Money saved is money spent somewhere else.
- Or invested to multiply businesses, selected to be the most efficient at growing faster.

Choosing what to do “for more return” ...or... “for no return” 8



# EMC | Traditional Ideas of Rebound Effects

# Jevons paradox

- lowering demand lowers price and increases demand
- Improving utility stimulates growth

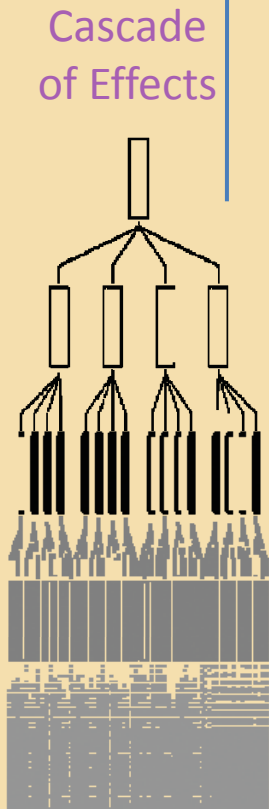
# Macro economic multiplier

- More spending creates a cascade of other spending.
- More technology, investment, population too.
- Returns on investments are added to investment.

# Micro economic multiplier

- Businesses compete by reducing costs, increasing demand, and attracting investment with it.
- Copying each other's efficiencies as a focus for growth.

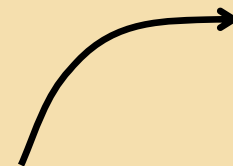
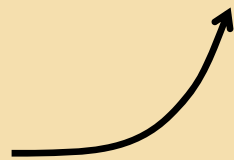
Often described as “tailing off” but some hide “fat tails”  
... effects multiplying beyond our view



## What seemed to happen...

### Apparently without thinking

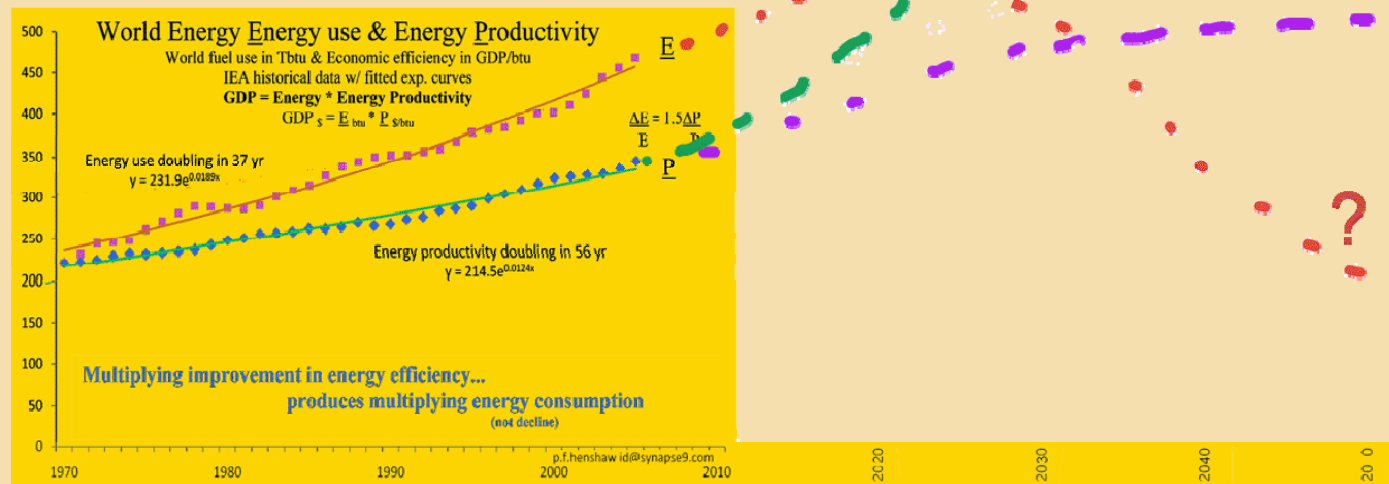
- A new generation invented a new theory.
- They seemed to ignore current economic theory that efficiency stimulates growth and increasing consumption.
- They promoted efficiency as a moral principle, easy to explain and profit from, local effects add up to total effects.
- They used a linear model for feedbacks (e.g.  $I = P \cdot A \cdot T$ )
- They didn't check the effect. They just intuitively understood self-restraint is needed for a sustainable world.
- And so promoted the problem rather than the solution, by not restraining the right thing.



# What we seem to be missing - I.

$I = P * A * T$  - is linear thinking for a growth system

- In a growth system  $P * A = f(T * S)$  where  $S$  = Service multiplies
- Decoupling: ever less material wealth of ever more value.



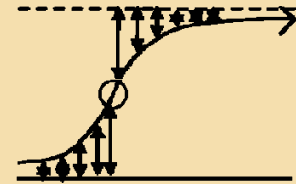
We got here by being confused:

- Both neo-classical and sustainability theory explain how to reduce our impacts in ways that increase them faster.
- They seem to agree more money balances its own impacts & turning more things into resources removes their limits.

# What we seem to be missing – II.

## What effect our choices have:

- Our choices leave unseen opportunities for other things.  
Today's average is:  $\sim 6,000\text{btu}/\$$  and  $\sim .34\text{kgCO}_2/\$$  (12oz)
- What any new opportunities will get used for,  
So I ask what the system I'm part of is doing:



## In the investment cycle:

- How efficiency effects tend to spread and stimulates all the ways surpluses are used to steer the system.
- How investment in growth uses up cheap resources needed for converting to the use of expensive ones.

...More inclusive questions lead to what's missing

### Get people curious about:

- Economies as learning systems exploring environments.
- How our rules rely on their changing states of organization.
- Studying other familiar natural growth & learning systems.
- How natural language terms refer to natural systems.

### In the science:

- Documenting natural growth & learning systems
- Connecting them with the theories of diverse disciplines.

### Career-wise:

- How people can make money at this.
- The “true currency” of learning systems being so different from what people want.

... among other things

### What else could we be productively efficient in?

- What is responsive self-investment?
- Examples of responsive switch from past to future
- Basic strategy, unplug the pumps

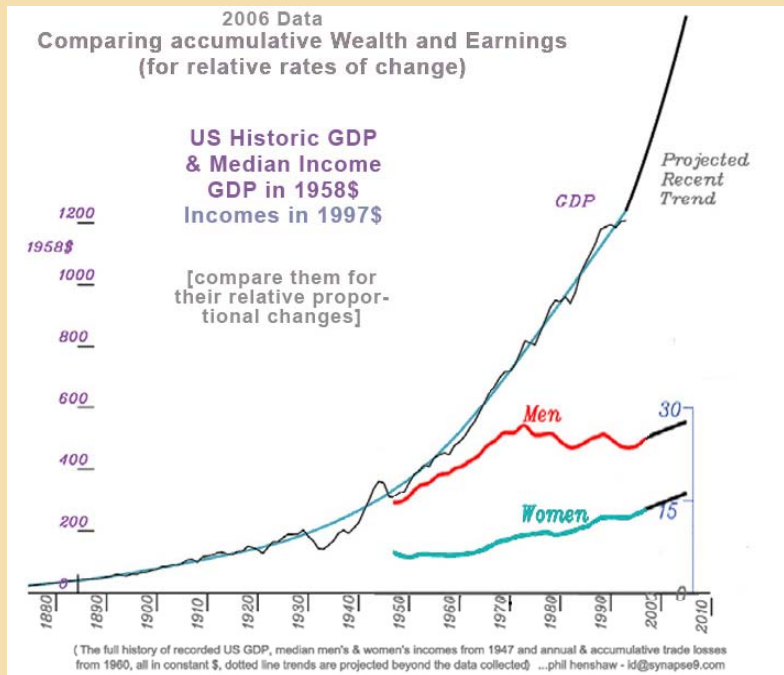
### Identifying more of the working parts

- How developing economies become part nature:
- Economic markets, the blood streams of the organism

### More of what we seem to be missing

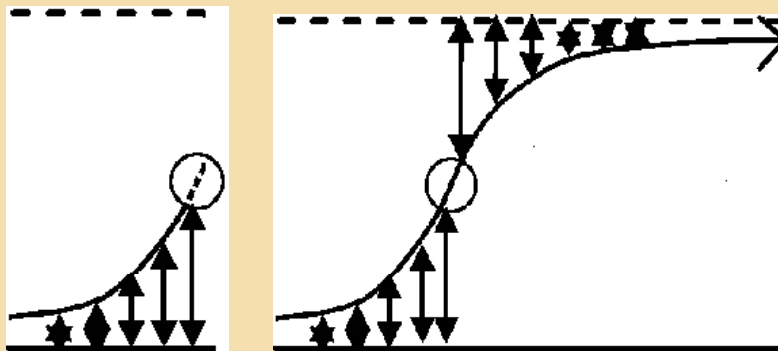
- In the environment, In reasoning

# What is responsive self-investment?



## Diverging investment responses

- Commitments & expectations
- Capabilities



## Reorienting learning

- Expanding on what was before
- Fitting in with what's to come

## Examples of enduring economies

### Plant or Tree

- Seed, explosive growth
- Seedling's choice, seasonal growth (daily or yearly)

### Animals

- Single cell, explosive growth forces a change
- The limits of the womb , immature, mature development
- (Top predators lazy enough not to collapse their food chain)

### Family

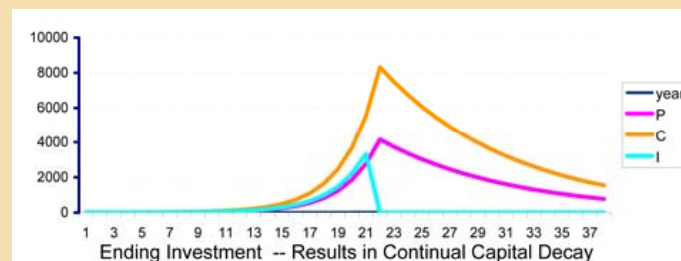
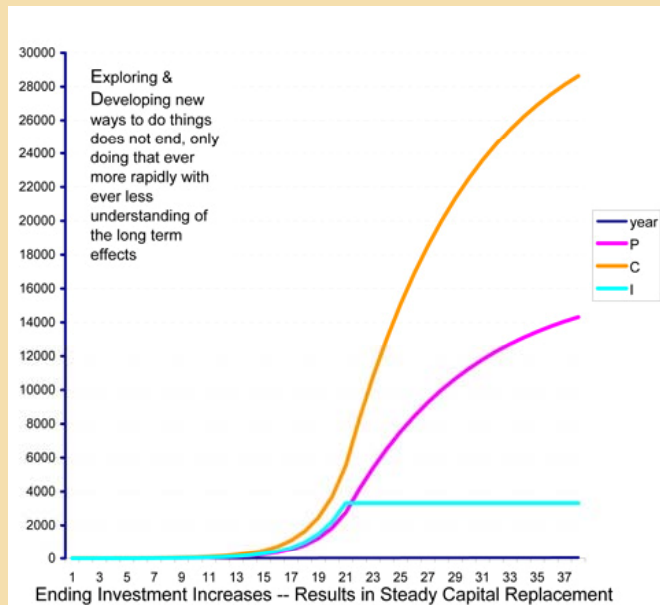
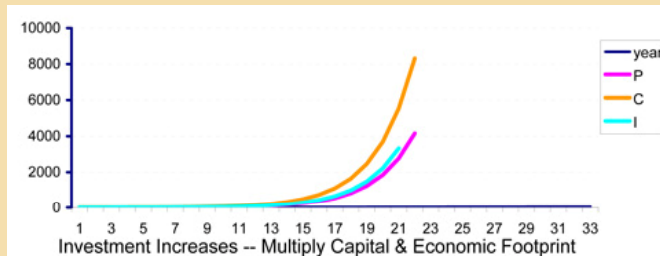
- Meeting, courtship, commitment
- Rush of connections, solidifying connections

### Business

- Initial venture with compound growth
- Maximizing market s, choice in using good returns, divest for new purpose or continue compounding for old purpose



## Efficiently unplugging the problem



### Growth

- Sustainable system with positive returns reinvested

### Maturation

- Sustainable system with positive returns divested
- In the elementary model there are three terms, and one is removed to let the system coast to a climax
- </issues/NatClimax.htm> & <GrowthSwitch.xls>

### Decline

- Returns not materializing to use for either growth or stabilization

## Other Possible responses....



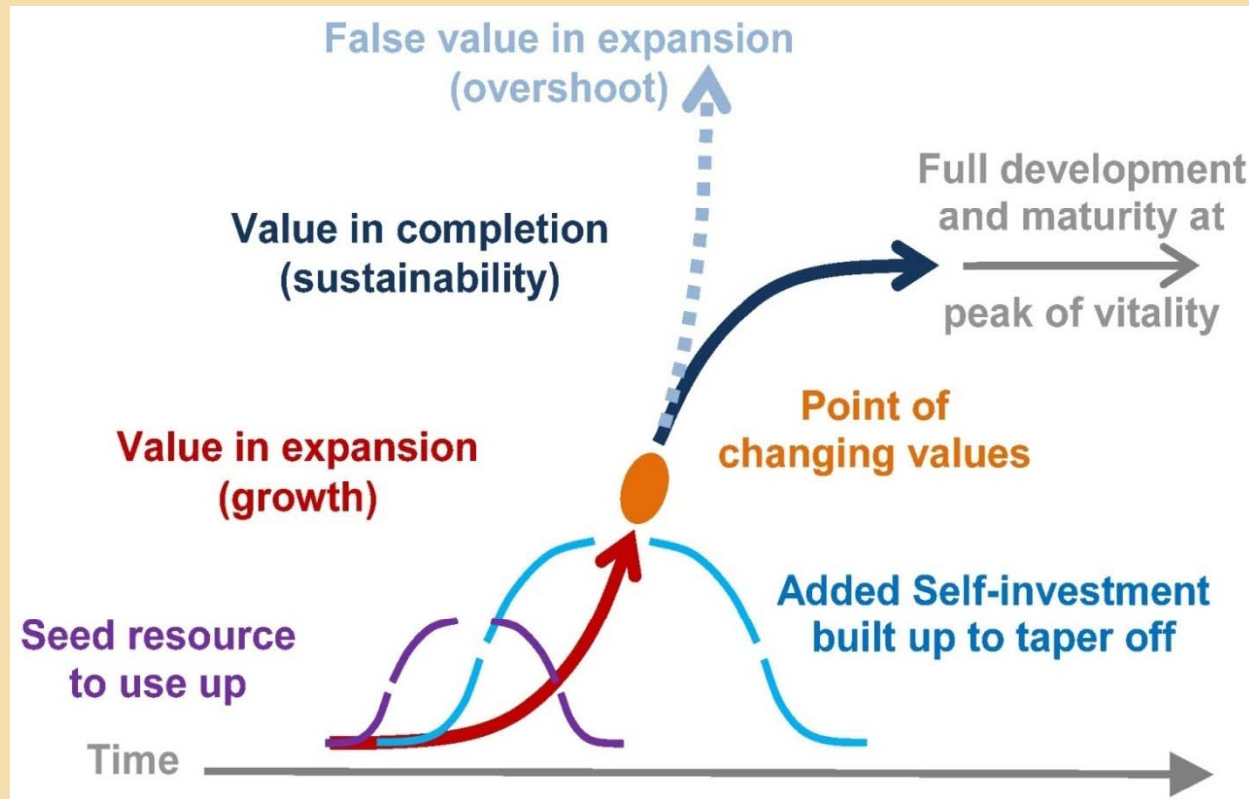
### Negligence, complacency & denial

- Simply being unobservant and not noticing your environment changing



### Panic

- Making mistakes that multiply the problems

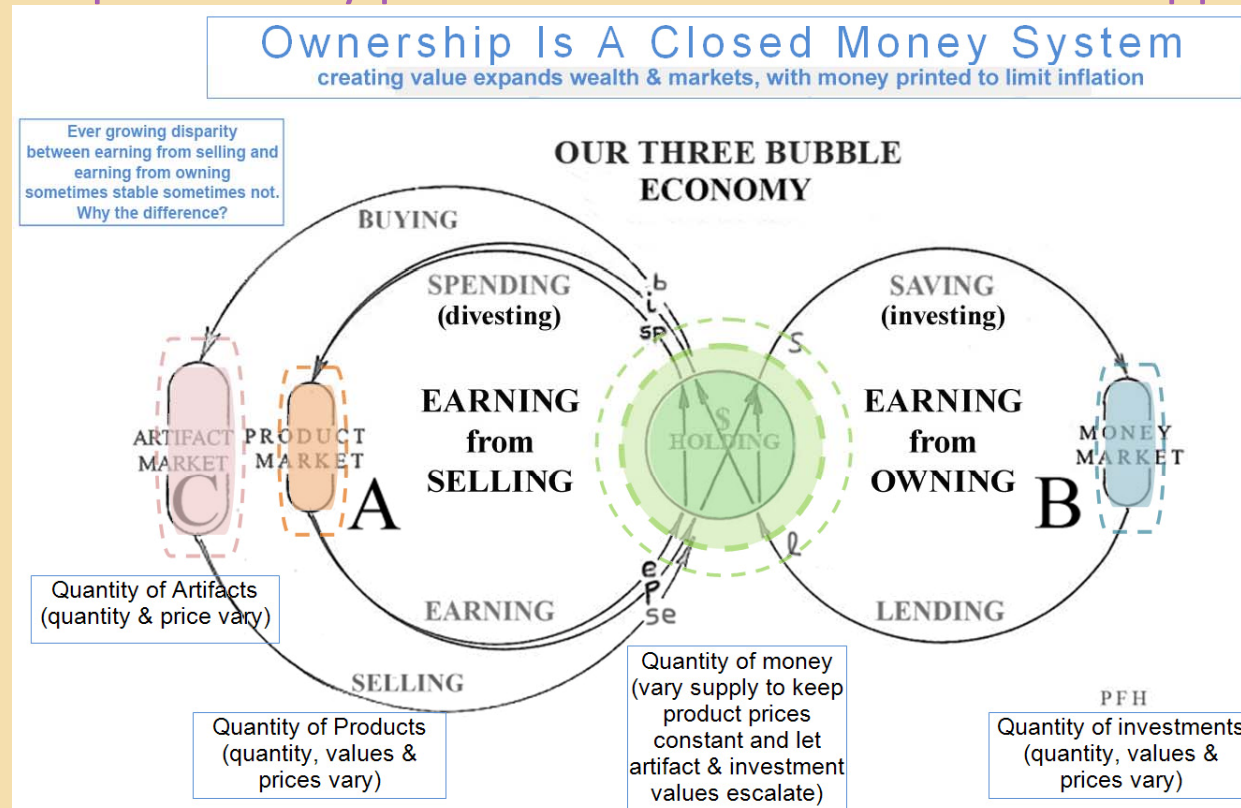


## Lasting systems - multiply scale & mature.

- The use of surpluses steers the whole development.
- Start-up's that go unfinished, like running out of lumber before building a roof on your house, are left unused.

## Economies are Closed Market Organisms

- Growth systems are organized around internalized markets
- Complementary products accumulate and make opportunity



- Efficiency smoothes and accelerates all the flows
- Assuring % returns for multiplying markets, assures their containments are pumped to the point of bursting.

### In the environment:

- How lots of uncontrolled systems take care of themselves, and so create “the rules” we use.
- How lots of natural growth systems come very close to this same combined whole system growth crisis and make it!
- How change is accumulative rates of change signal changing states of organizational development

### In reasoning:

- Speaking & acting as if consciousness was reality... as if words were the working parts of nature.
- Explaining things with moral & social values without identifying nature’s working parts.
- Discussing systems as “pressures” between “numbers”, not evolving organisms learning from and with each other.



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**Abstract** - Improving technological efficiency, “doing more with less”, is presently the main focus of public and private efforts for decreasing our resource use. It always had the opposite effect in the past, though, and why the theory changed is unclear. There seems to be a misunderstanding. Jevon’s paradox identifies a modest ‘rebound effect’ to explain smaller than expected effects of using efficiency to reduce resource demands, but that does not explain the clear multiplying resource use that continual technology improvement causes. We ask why people would choose the same cause for having the opposite effect as before.

Using better technology has always been at the heart of business competition for market share, to increase sales, expand jobs and markets, and still is. We seem to have changed theories without changing methods. The old theory of technology, economics, was for stimulating growing resource use, and the new theory, sustainability, is to reduce it, by doing the same thing. What seems to change is the language used, switching from theories about whole systems to ones about individual choices. The new theory holds that reducing the demands of each part reduces the whole, as the direct sum of the parts. The prior one considered the whole to exhibit effects greater than the sum of the parts, but ignored the physical impacts that got us in trouble.

People need to basically start over in understanding of how systems work. We see our economic organism from the view of a cell. Cells have a poor view of the whole, and can’t imagine what the other parts are learning. Economies behave as a whole and have diverse networks of behaviors no one can be aware of. One part always hidden is how change in one place becomes opportunity in others. We imagine things working by deterministic causation, but miss the major role of opportunistic causation. Not seeing how they connect to create the system as a whole keeps us from asking what would be good for the whole. Studying systems as a whole learning environments, animated by opportunistic parts & bounded by environmental constraints, offers a rigorous approach for studying where their whole system opportunities lead.