

Sustainable Strategies in Fast Changing Times

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Los Alamos National Laboratory



While everyone gets settled:

- ❖ **"Problems cannot be solved at the same level of awareness that created them."** - Albert Einstein
- ❖ **"When we remember we are all mad, the mysteries disappear and life stands explained."** - Mark Twain
- ❖ **"The whole problem with the world is that fools and fanatics are always so certain of themselves, but wiser people so full of doubts."** - Bertrand Russell



Leadership in fast changing times

"As events evolved, we recognized that, despite our suspicions, it was very difficult to definitively identify a bubble until after the fact — that is, when its bursting confirmed its existence. Moreover, it was far from obvious that bubbles, even if identified early, could be pre-empted short of the central bank inducing a substantial contraction in economic activity, the very outcome we would be seeking to avoid."

Greenspan 30 Aug 2002 Jackson Hole, Wyoming



Pregame warmup

- Bioterrorism
- Researchers in social behavior
- Last talk

Complex adaptive systems

Performance from collectives

From selection

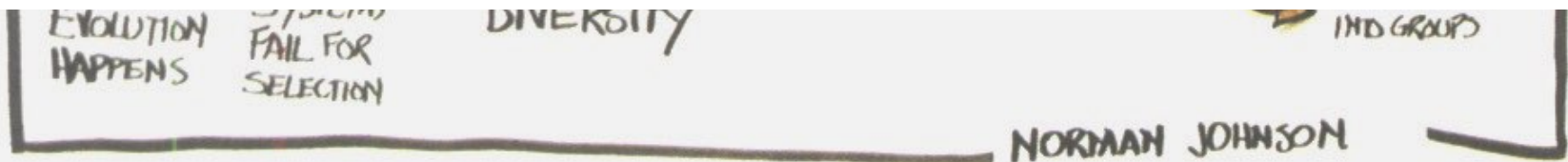
From synergy

“Experts are Phooey”

You and the speakers

Diversity or heterogeneity vs. structure

- Add change and behavior of the individual



Eroding Conventional Wisdom?

Don't fight the Fed

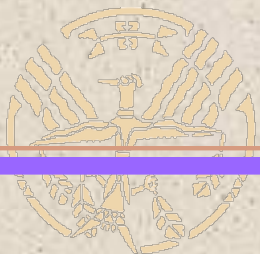
Buy on the dips

The Market is the best long term investment

Wall Street Market is an economic bellwether, early warning system

Progress is cumulative in science, but cyclical in finance

Innovation changes the way the market operates



Current situation?

Average bear market lasts for 18 months

- The 1987 bear passed in three months
- The 1973-74 bear was over in 21 months
- The longest was 33 months in 1929-32

The current bear market is now into its 28th month

❖ **The recession ended in Jan 2002**

❖ **Creative destruction is taking place**

Investors are dispensing their own brand of justice to corporate book-cookers

❖ **Irrational pessimism has replaced irrational exuberance**

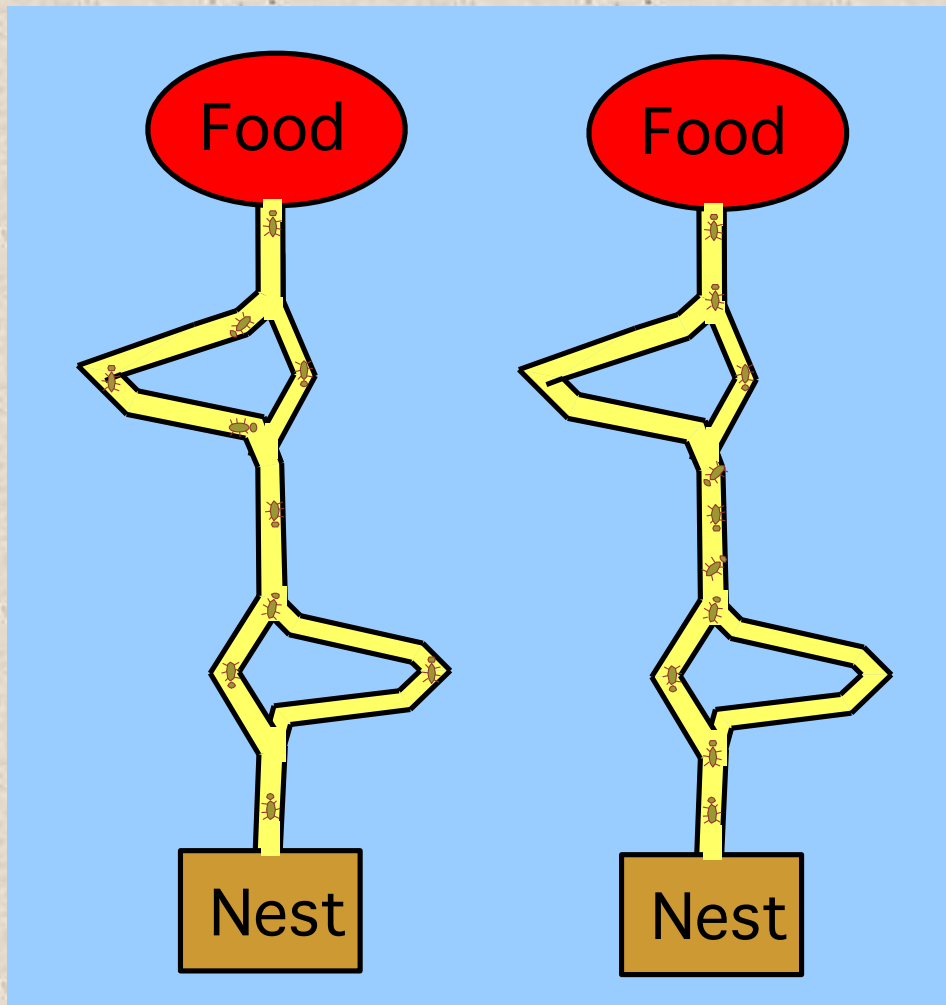
"We are in uncharted territory here. Bear markets are not supposed to hit new lows coming out of recession" - James Stack

❖ **Market is undervalued**

❖ **Market is overvalued**

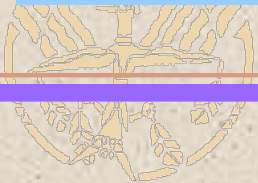


Dumb Collectives Solving “HARD” problems



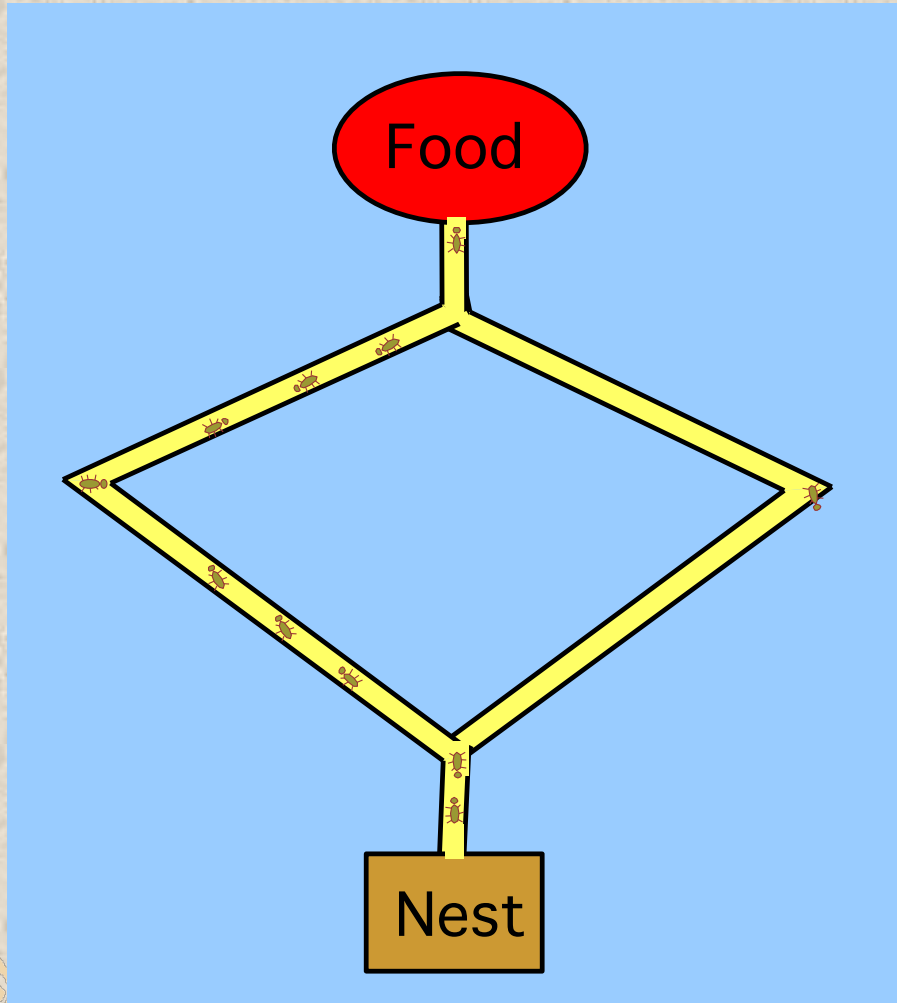
- Individuals are “dumb,” chaotic, no global perspective
- No leaders or central coordination
- Only works for groups of diverse ants (and slime molds!!)

(Goss, et al. 1989)



The Problem with Collectives

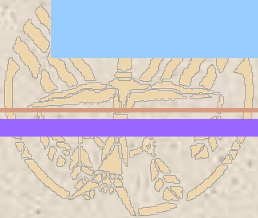
Ants foraging for food chose one path out of two equidistant paths.



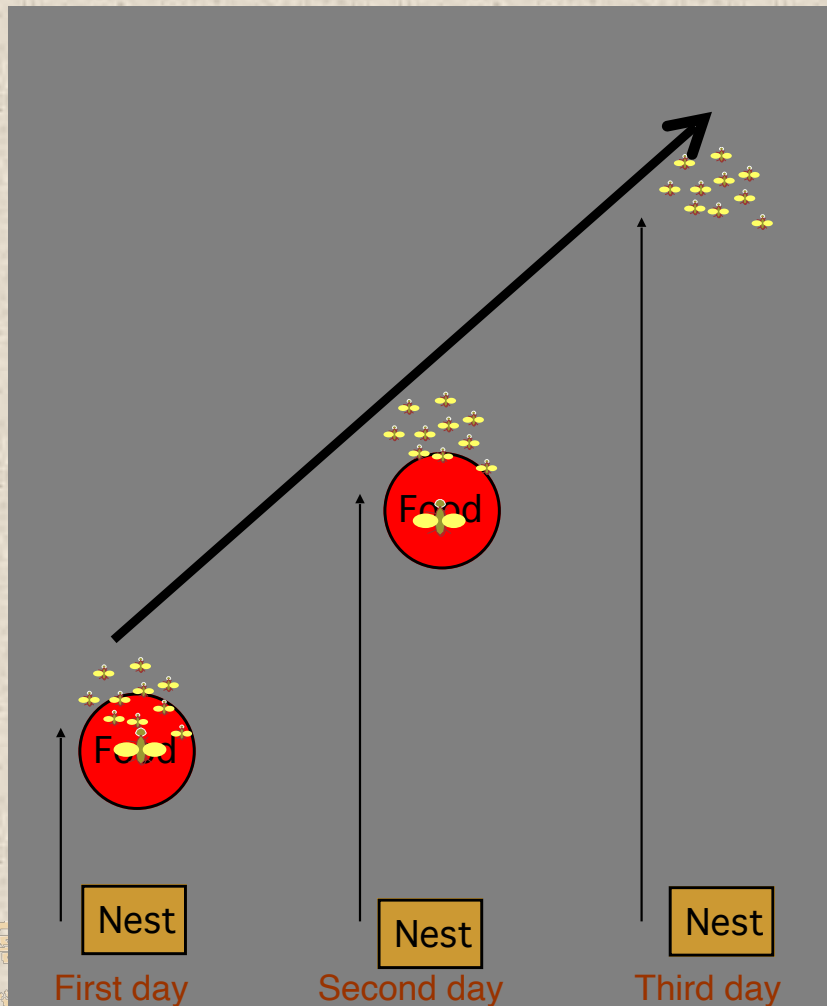
Cooperation leads to exclusive behavior in stable environments

Non-linear or Chaotic behavior: Positive reinforcements can amplify random weak signals >> global chaos.

(Deneubourg et al. 1990)



Researching Bee Talk



Why are social insects so disturbing?

Most hive functions are emergent properties (just like the human brain)

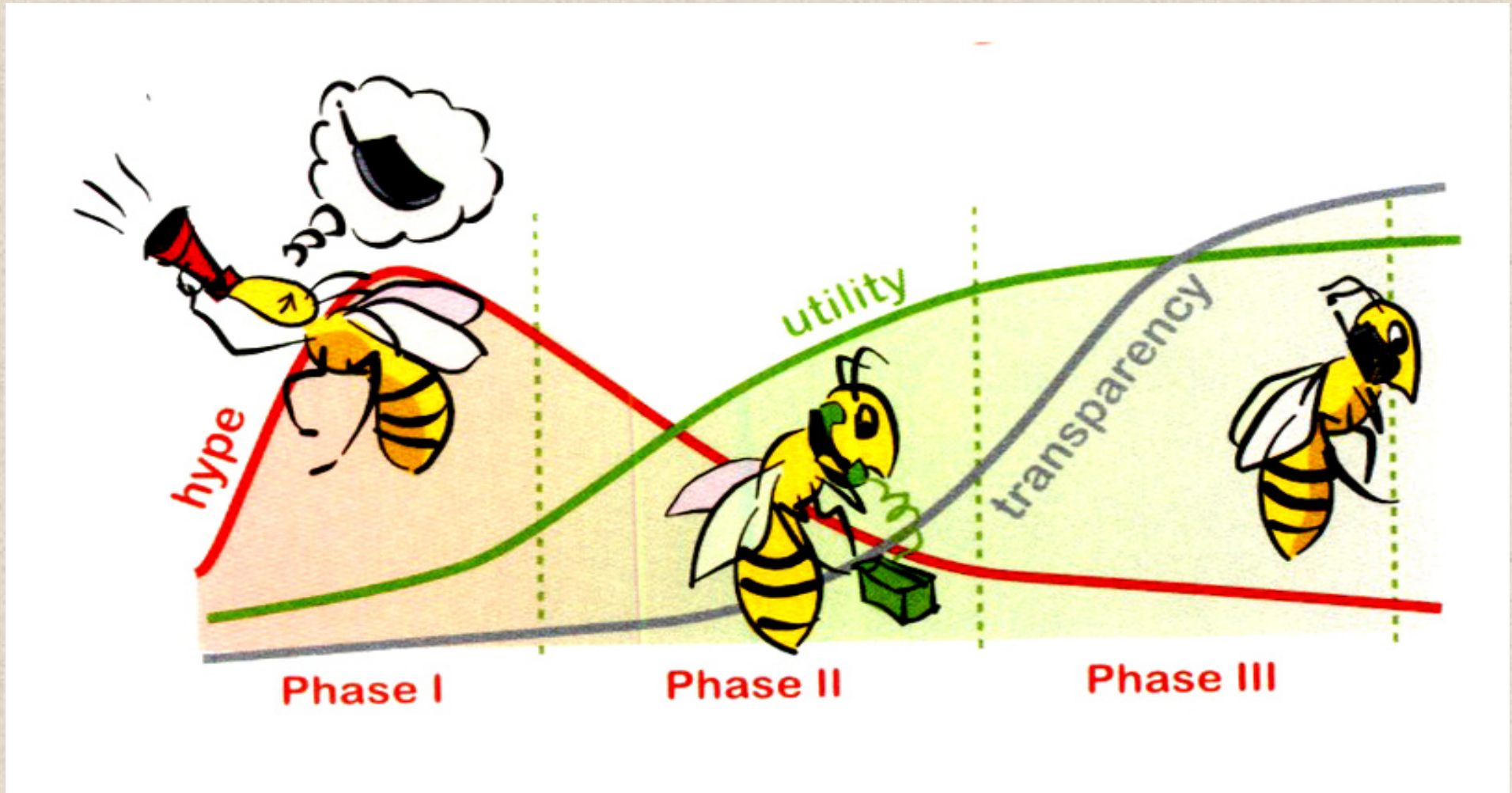
Why aren't we as impressed with human collectives?

We are part of the system. And we generally underestimate self-organizing processes.

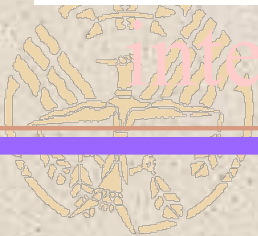
Don't underestimate collectives, Mr. Greenspan



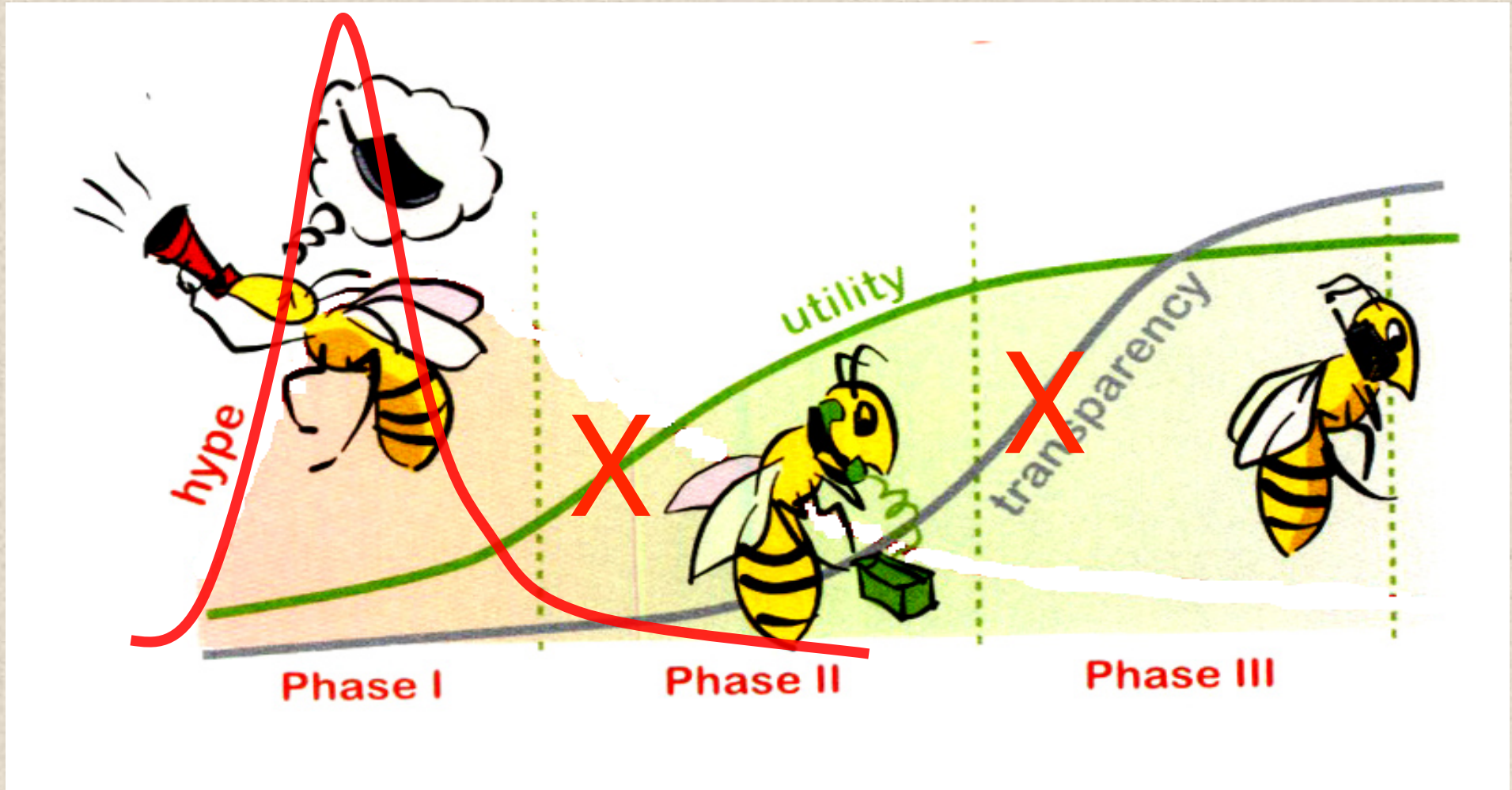
Normal Technology Development Phases



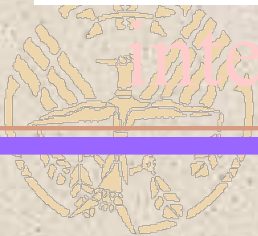
interruption of the developmental cycle



Mismatched times to develop resources



interruption of the developmental cycle

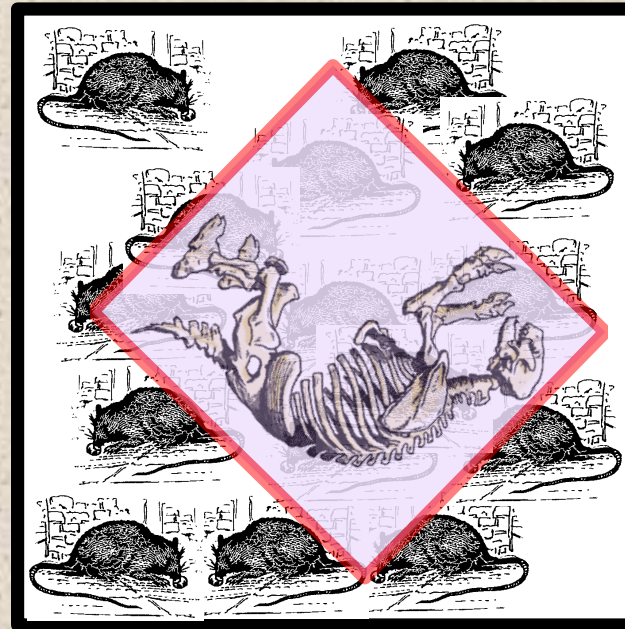


Rat Studies of Maximum Carrying Capacity

Cooperative social structure



Control - no imposed social structure



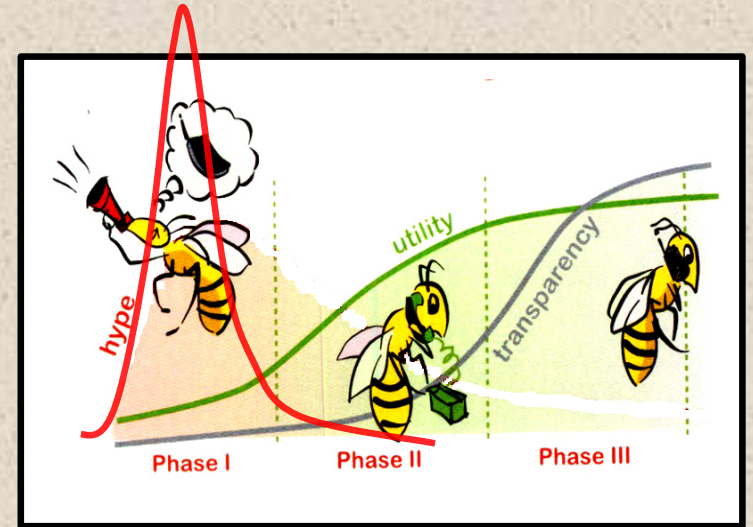
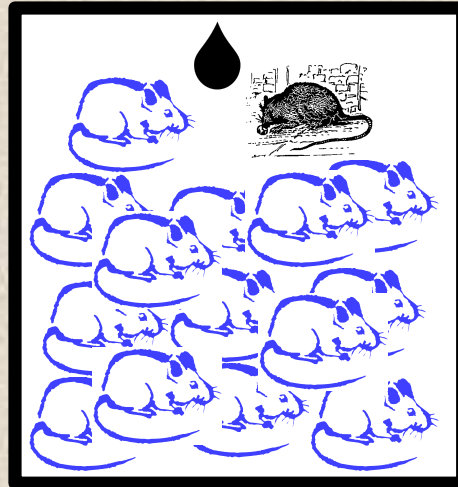
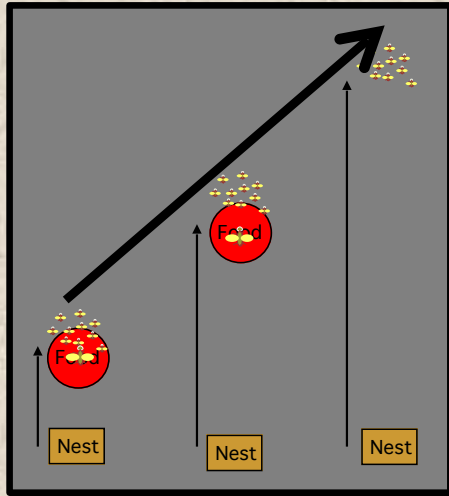
NIMH psychologist John B. Calhoun, 1971

Both systems loaded to 2 1/2 times the optimal capacity.

Social order system can carry 8 times the optimal capacity.



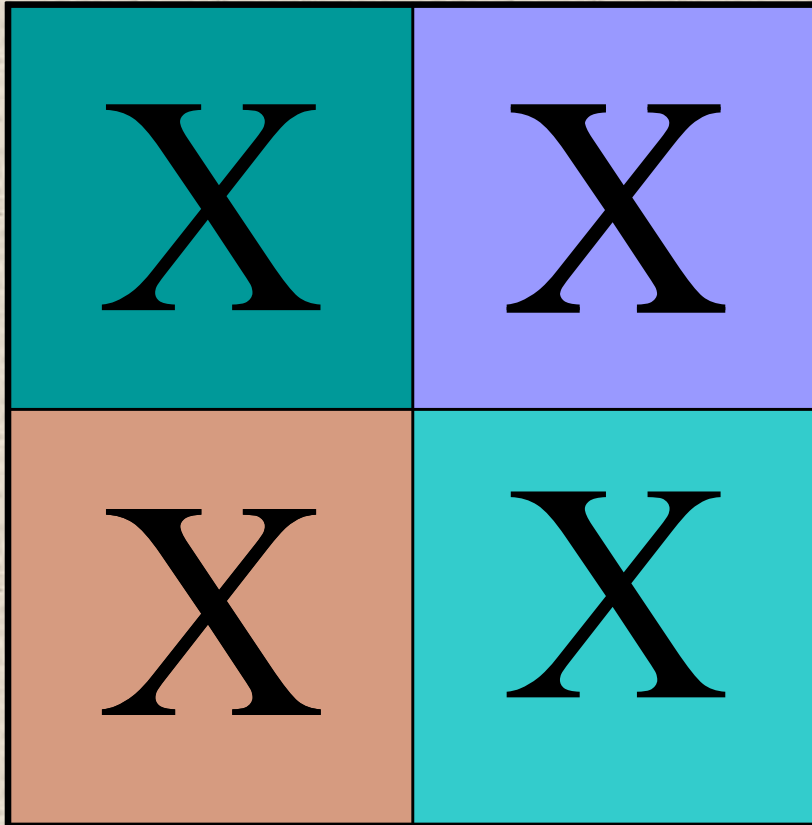
First Quarter Status



How to make use of these ideas in your work?



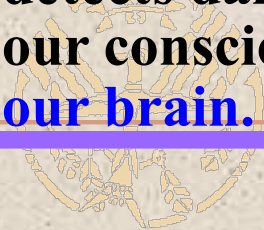
Power of the Mind



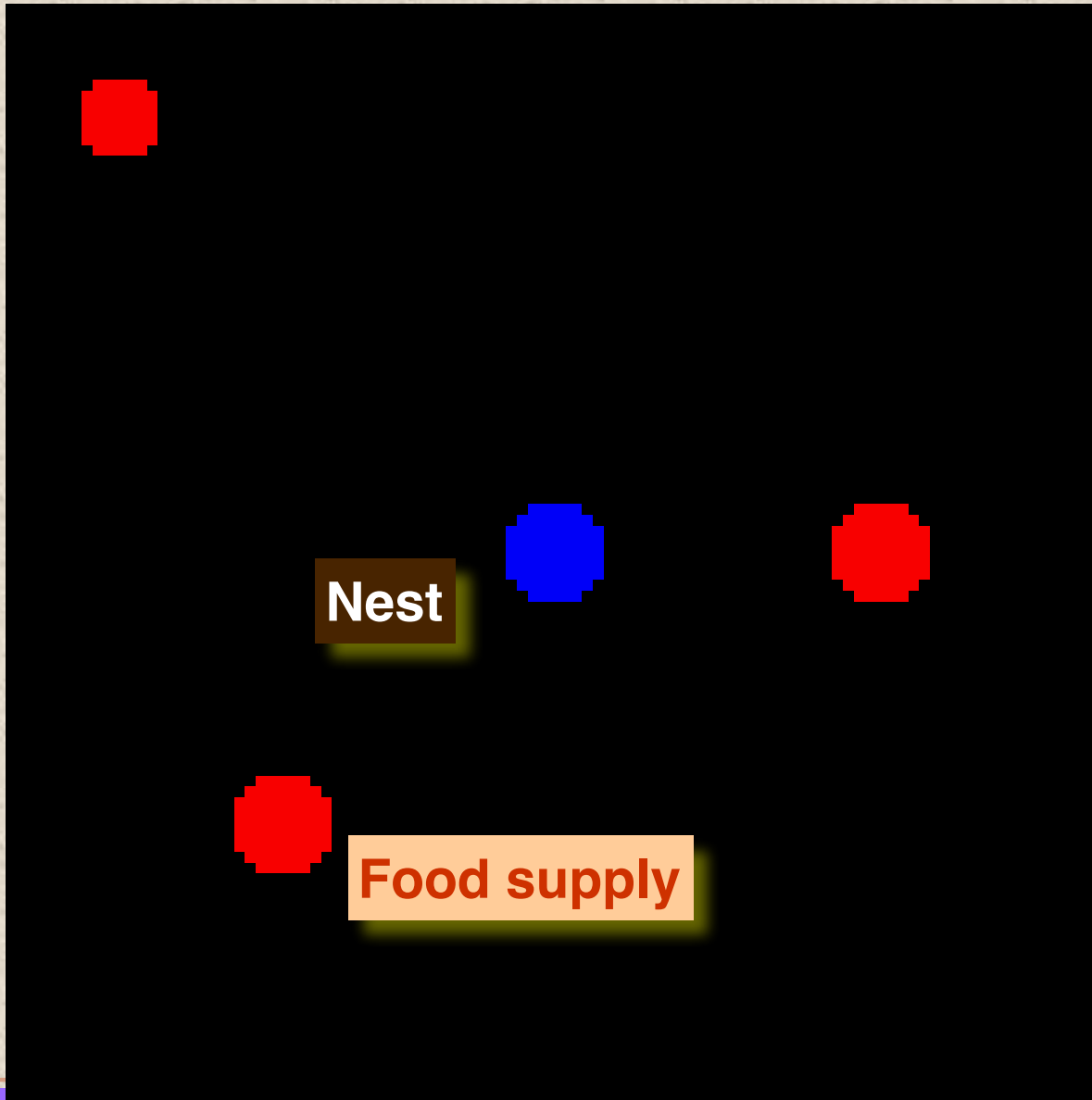
Click on where the X is

Timothy D. Wilson, Professor of psychology at the University of Virginia, Charlottesville

We need to process so much information to survive that some of it has to occur unconsciously. The unconscious can process data, sets goals, judges people, detects danger, formulates stereotypes and infers causes, sometimes better than our conscious abilities. **It's intuition.** **And how we use our brain also changes our brain.**



Simple Ant Consumer Model



Collective information

Evaporation
Diffusion

Agent internal state:

Current direction
Have food?

Three rules of action:

Carry food
Drop food
Search

■ Productive collective

■ "Salaried men"

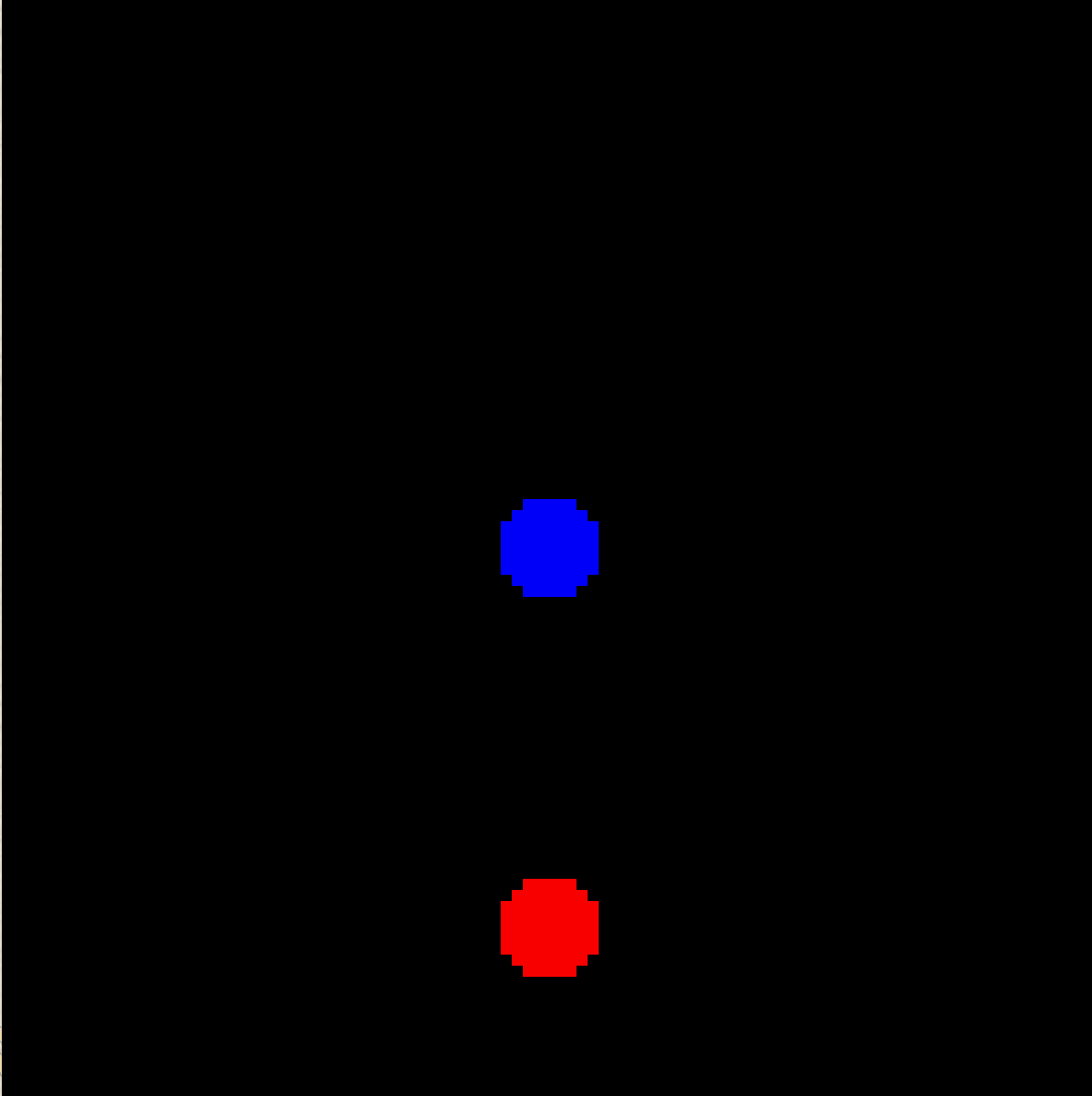
■ Individual/Innovator

■ Collective structure

Key concepts:

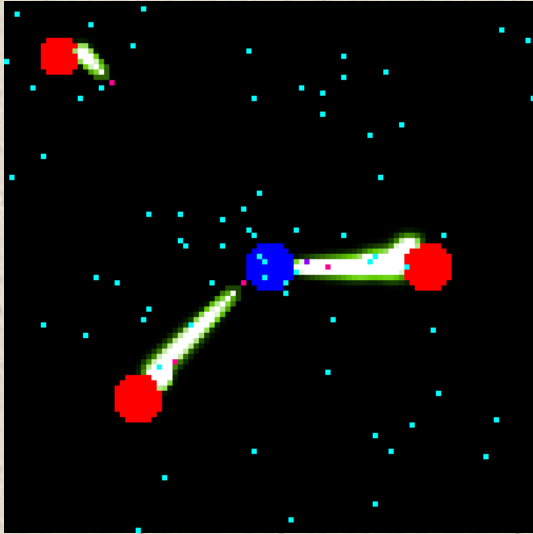
Diversity, Structure

A single stationary source of infinite supply

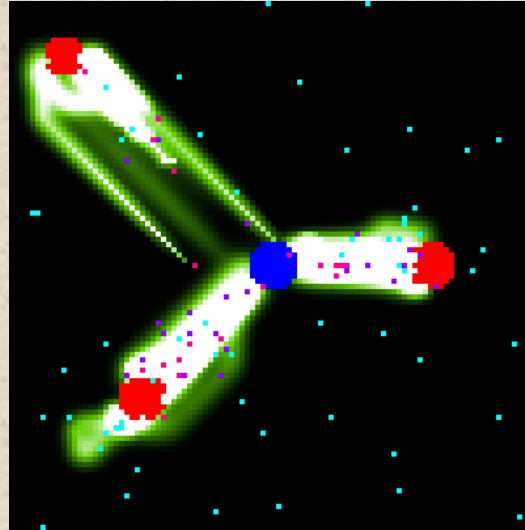


Stages of Development

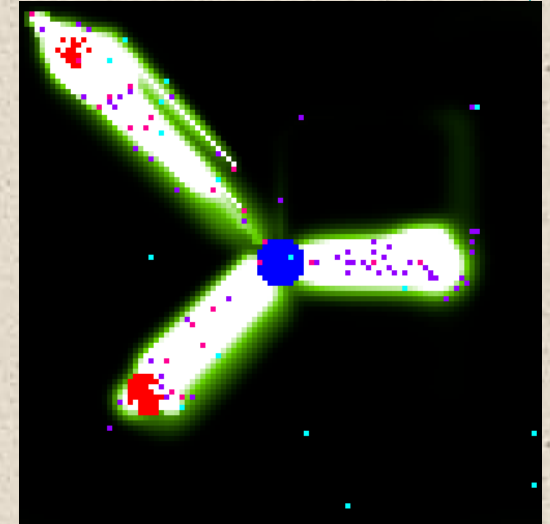
Formative
Forming definition



Co-Operational
Synergy of Individuals



Condensed
System optimization



- Locally chaotic (agent's path)
- Globally chaotic (productivity)
- Low and evolving "structure" – no collective network
- Performance due to uncorrelated diverse contributions
- Production by "innovative" agents
- High (spatial) diversity

- Locally chaotic
- Globally predictable
- Adaptive "structure" – robust collective network
- Performance from combination of diverse contributions
- Production by both classes
- High (spatial) diversity

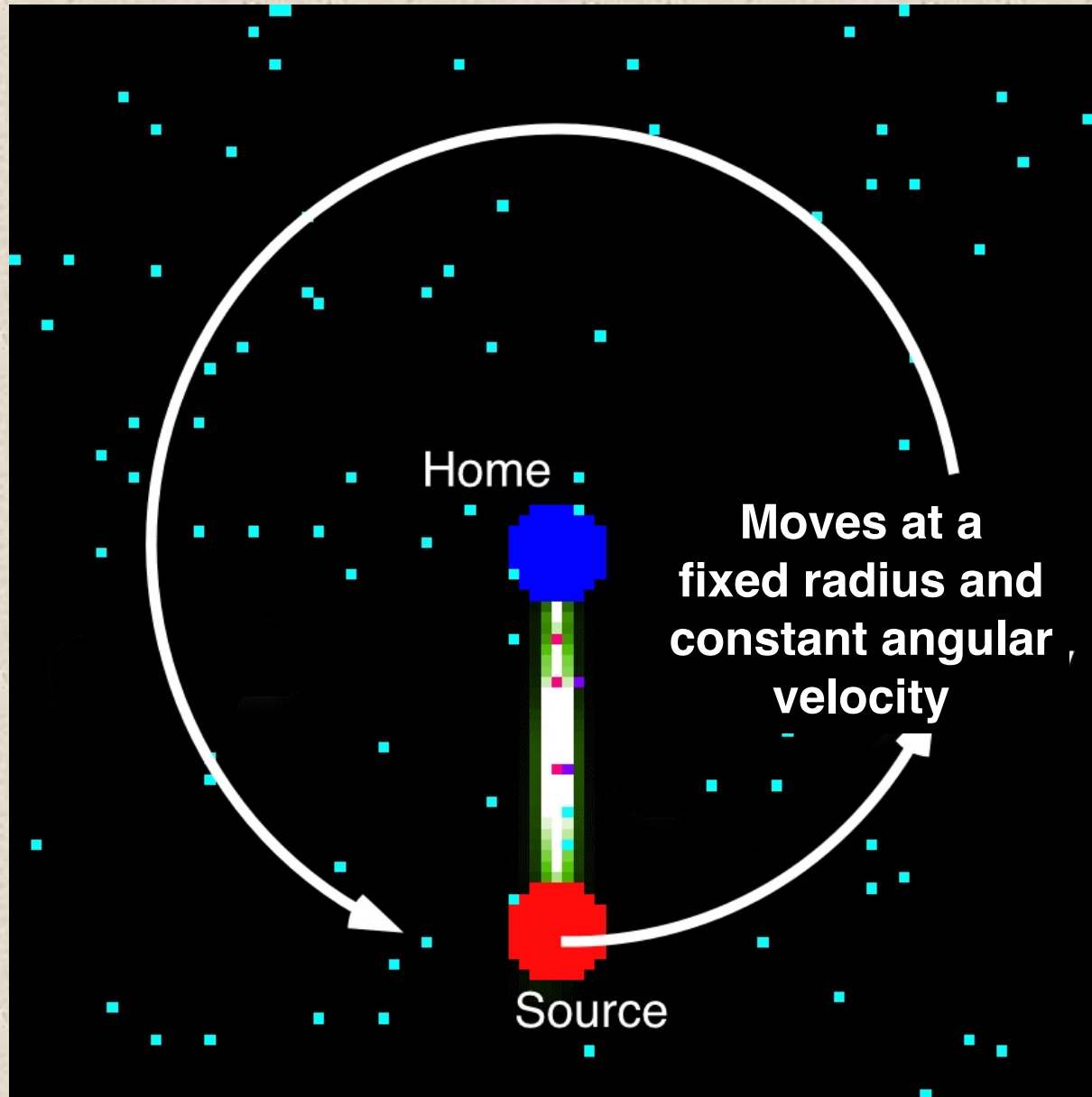
- Locally predictable
- Globally predictable
- Unchanging "structure" – dominant collective network
- Performance due to optimized population (low diversity)
- Production by collective
- Low (spatial) diversity



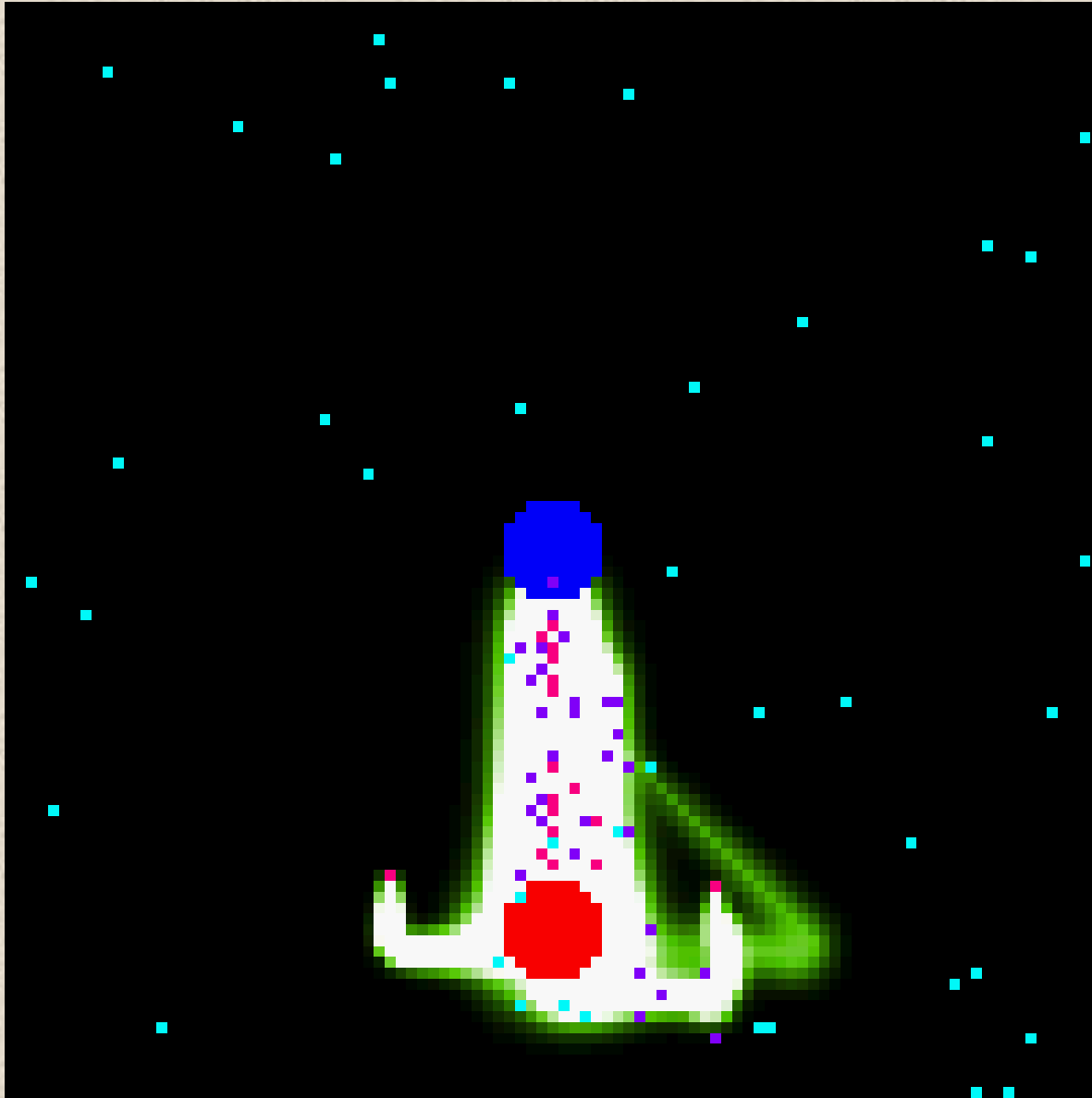
THOUGHT LEADER FORUM



Training the mental simulation



Slowly changing environment



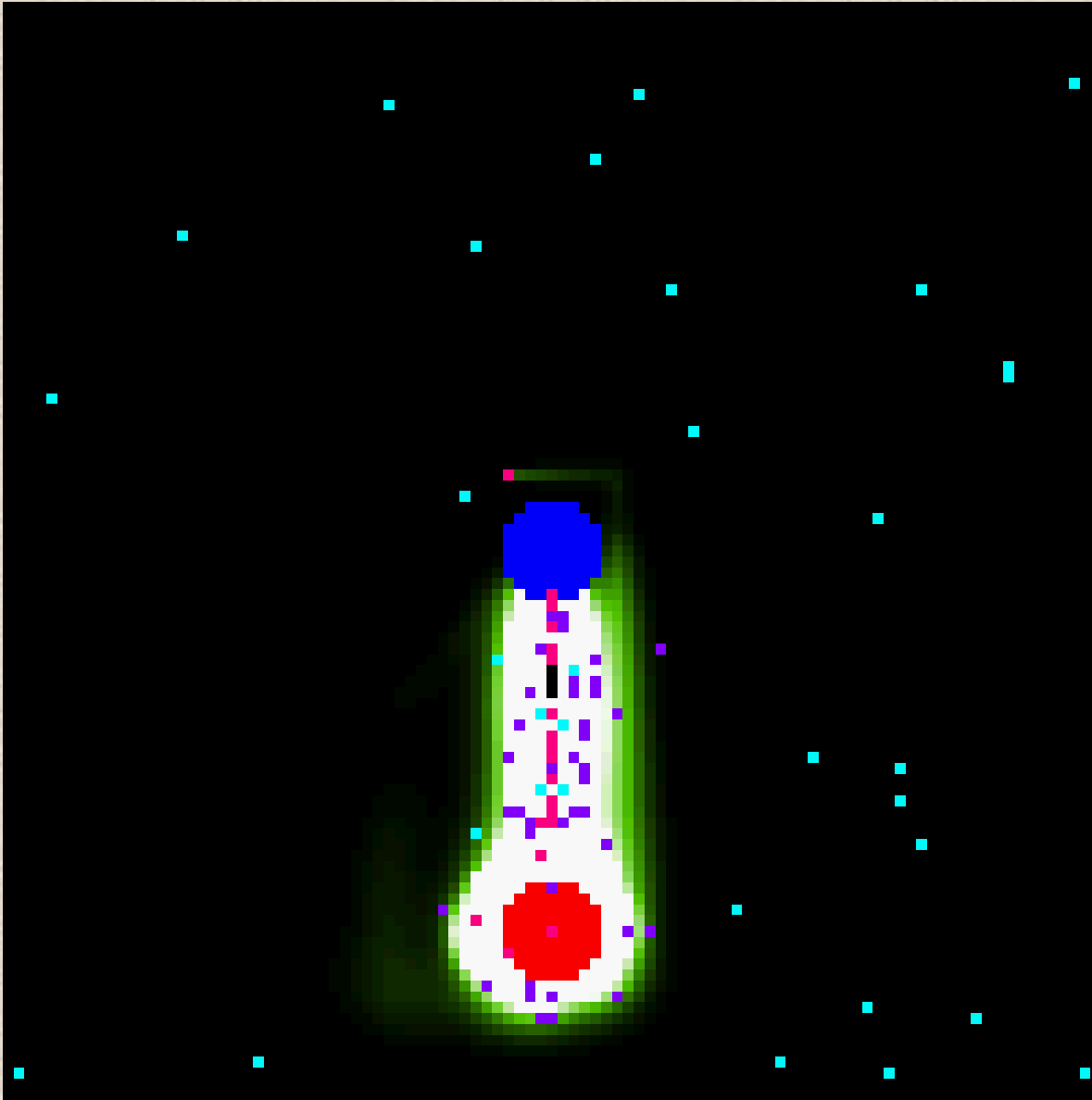
Productivity is only slightly less than an unchanging source

Herd effect allows for quick utilization of new resource location

Innovators become important (again) by sustaining optimal performance of the collective



Faster by 1/3



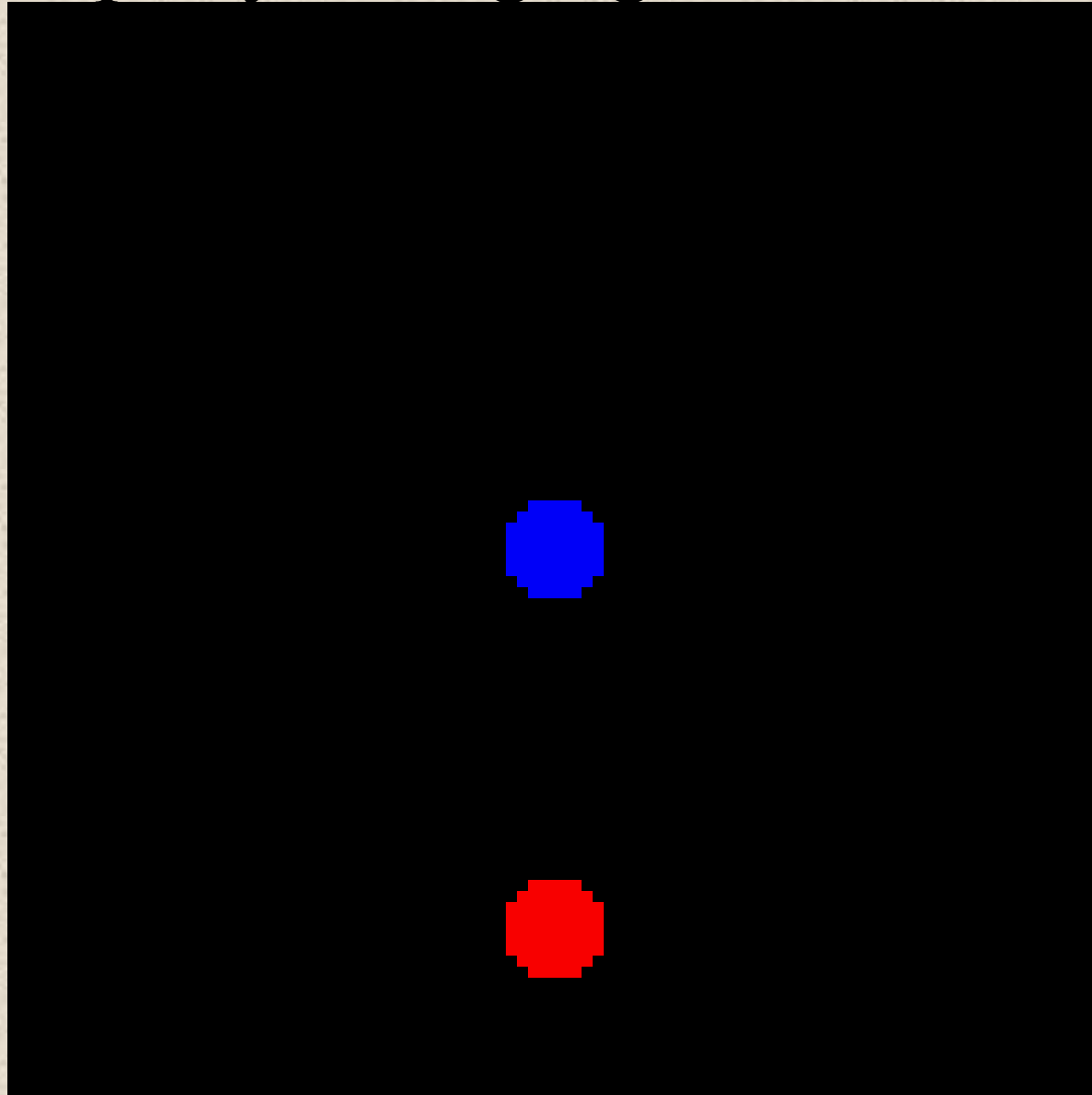
Boom and bust cycle

Instabilities lead to reversion to prior developmental stages.

Equal importance of herd effect and innovators



Rapidly changing in environment



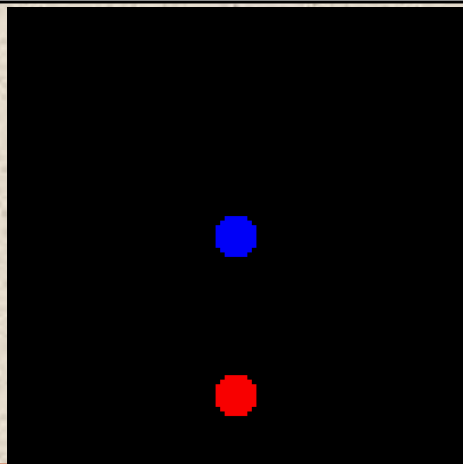
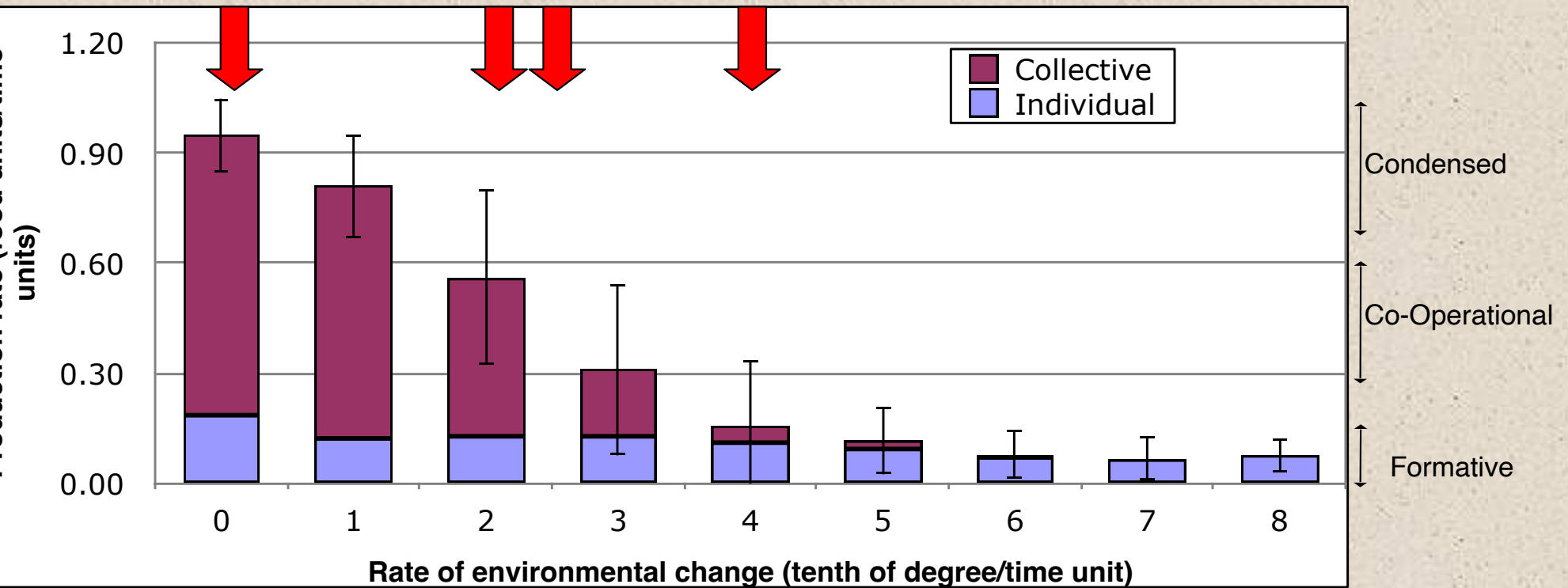
Almost all productivity is from innovators

The highly productive Condensed stage is never realized

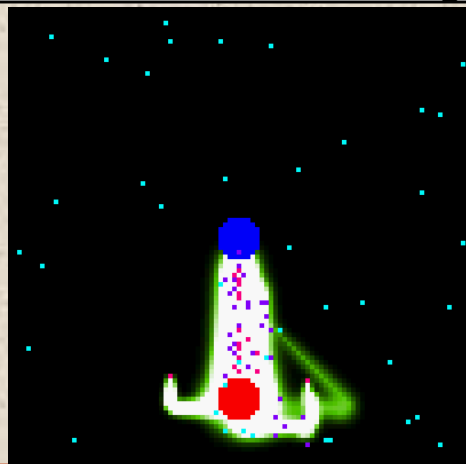
The herd effect can actually degrade the performance by tying up resources



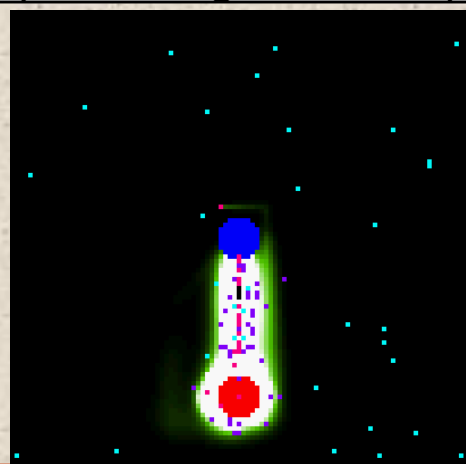
Food Production Rate



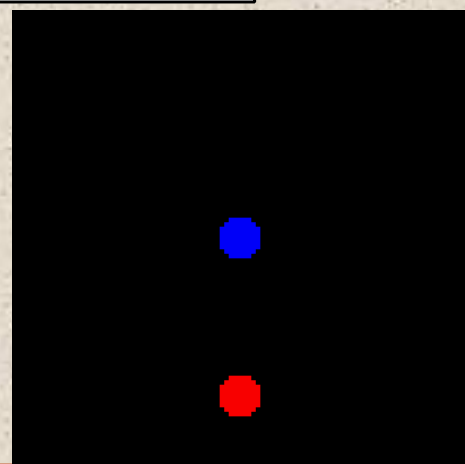
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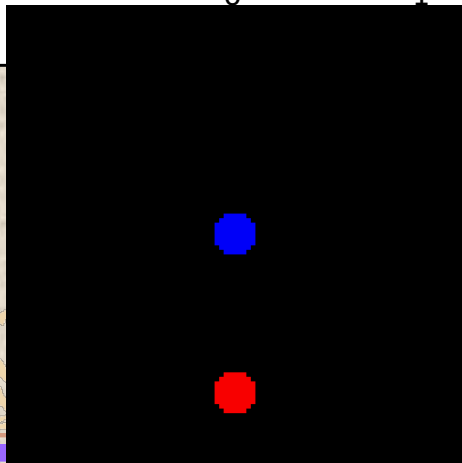
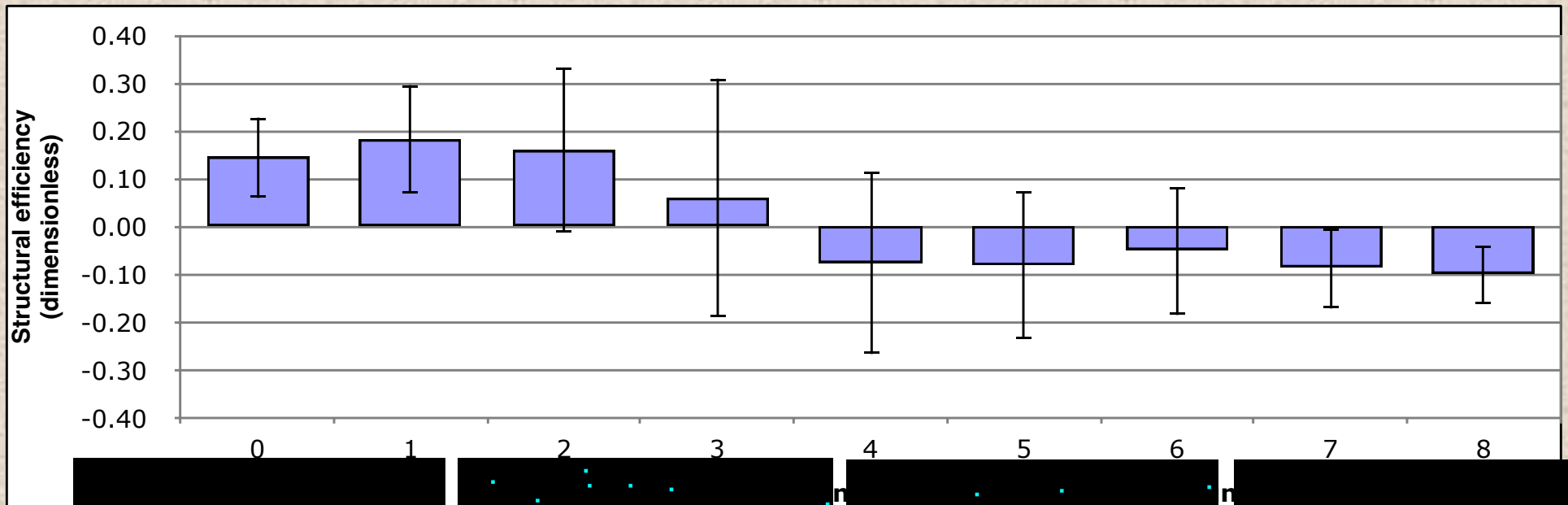


2.5



4

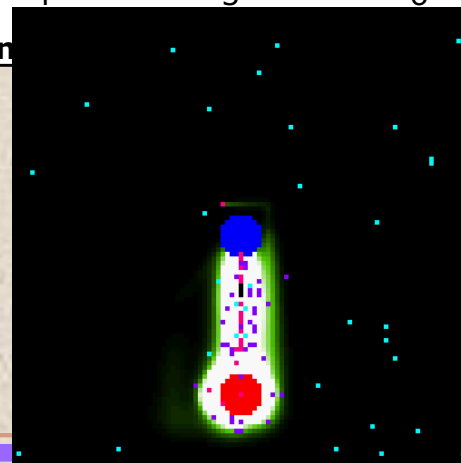
Collective efficacy (structural efficiency) vs. Diversity



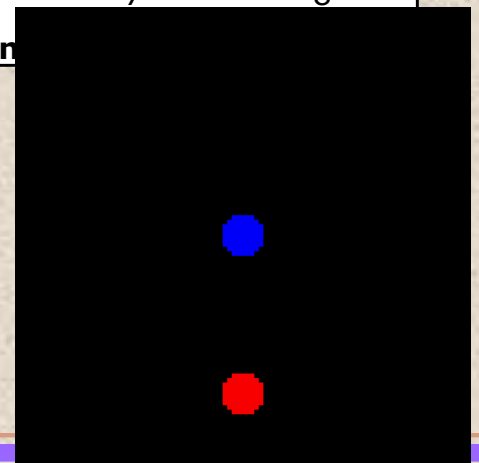
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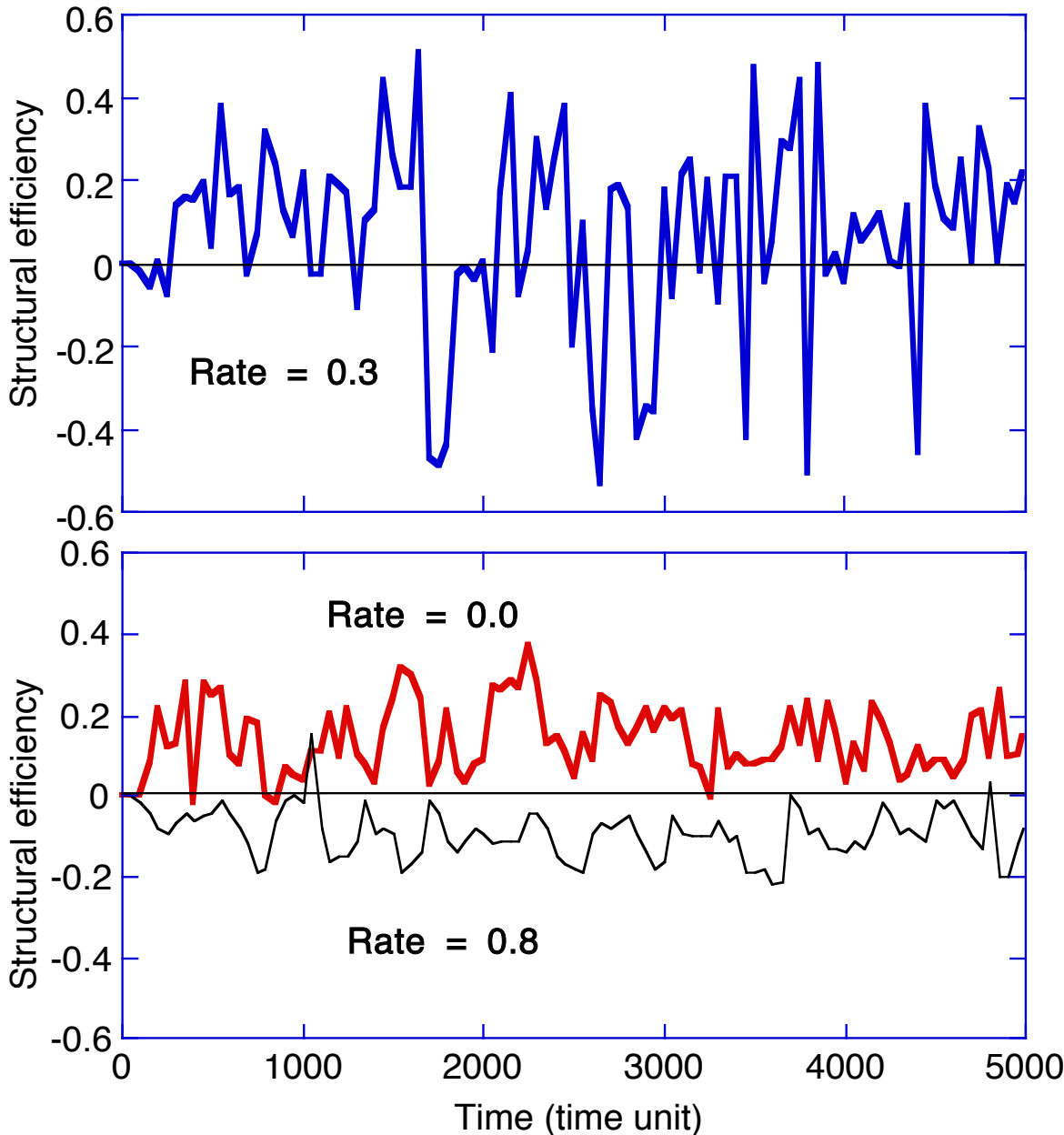


2.5



4

Structural Efficiency - Boom and Bust



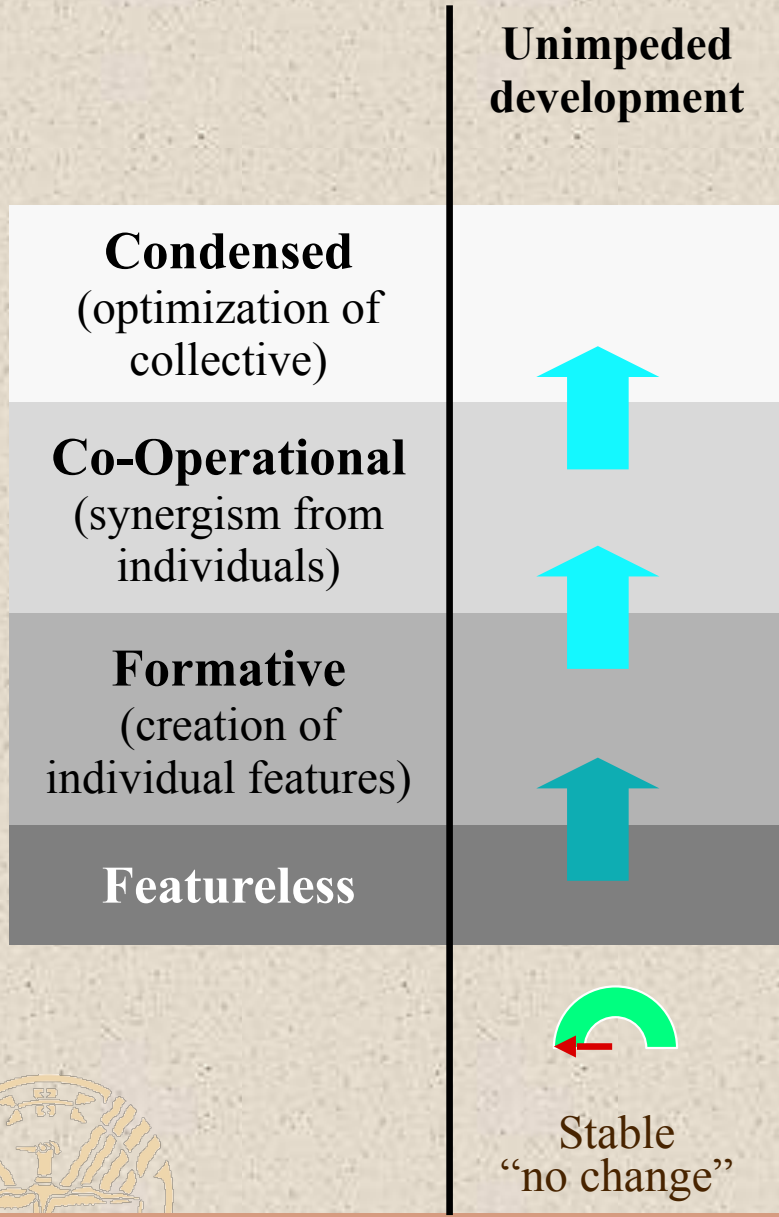
Lower average production -> crash avoidance

Greater minimums and maximum when compared to extreme rates!

Bust is preceded by increased production

Collective Response to Rates of Change

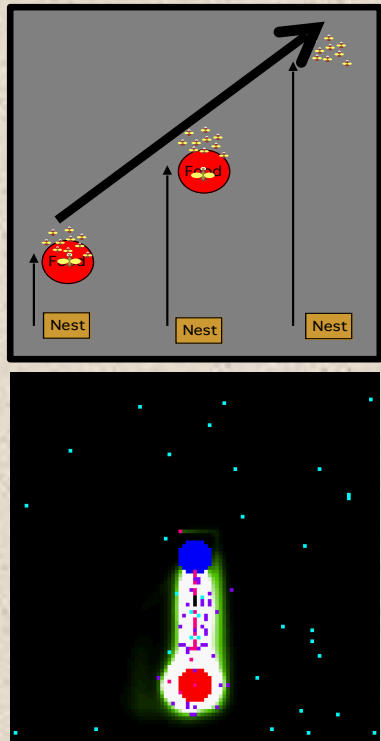
Stages in Development



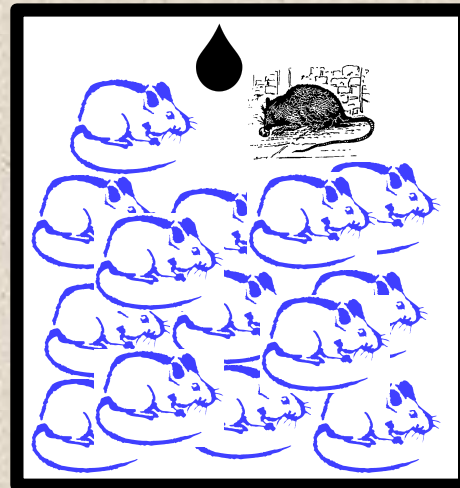
Rate of Change



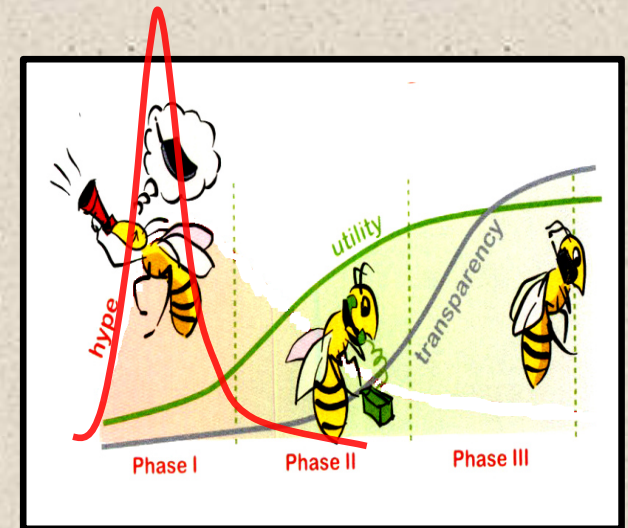
Half Time Status



+

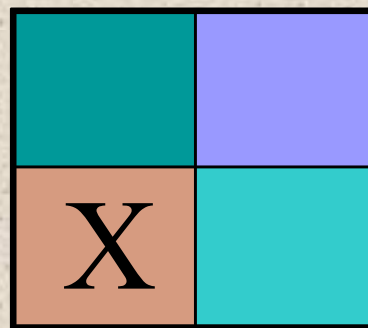


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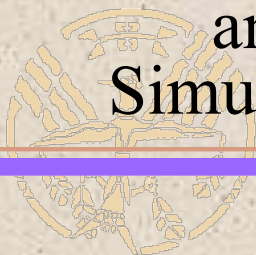


Dynamical excursions + Behavior lock-in = Long term dynamics

Feeding your
Mental model
and
Simulation



Missing the
behavioral
component



Historical Bubbles and Busts

- ❖ **The Netherlands' Tulipmania of 1637** (Netherlands)
- ❖ **Salvage of sunken ships of 1690** (England)
- ❖ **South Sea Bubble of 1720** (England)
 - "I can predict the motion of heavenly bodies, but not the madness of crowds."
- Isaac Newton
- ❖ **Mississippi Bubble** (French)
- ❖ **U.S. stock market crash of 1929** (US)
- ❖ **Gold speculation in the early 1980s** (US)
- ❖ **Kamikaze capitalism in 1990s** (Japan)

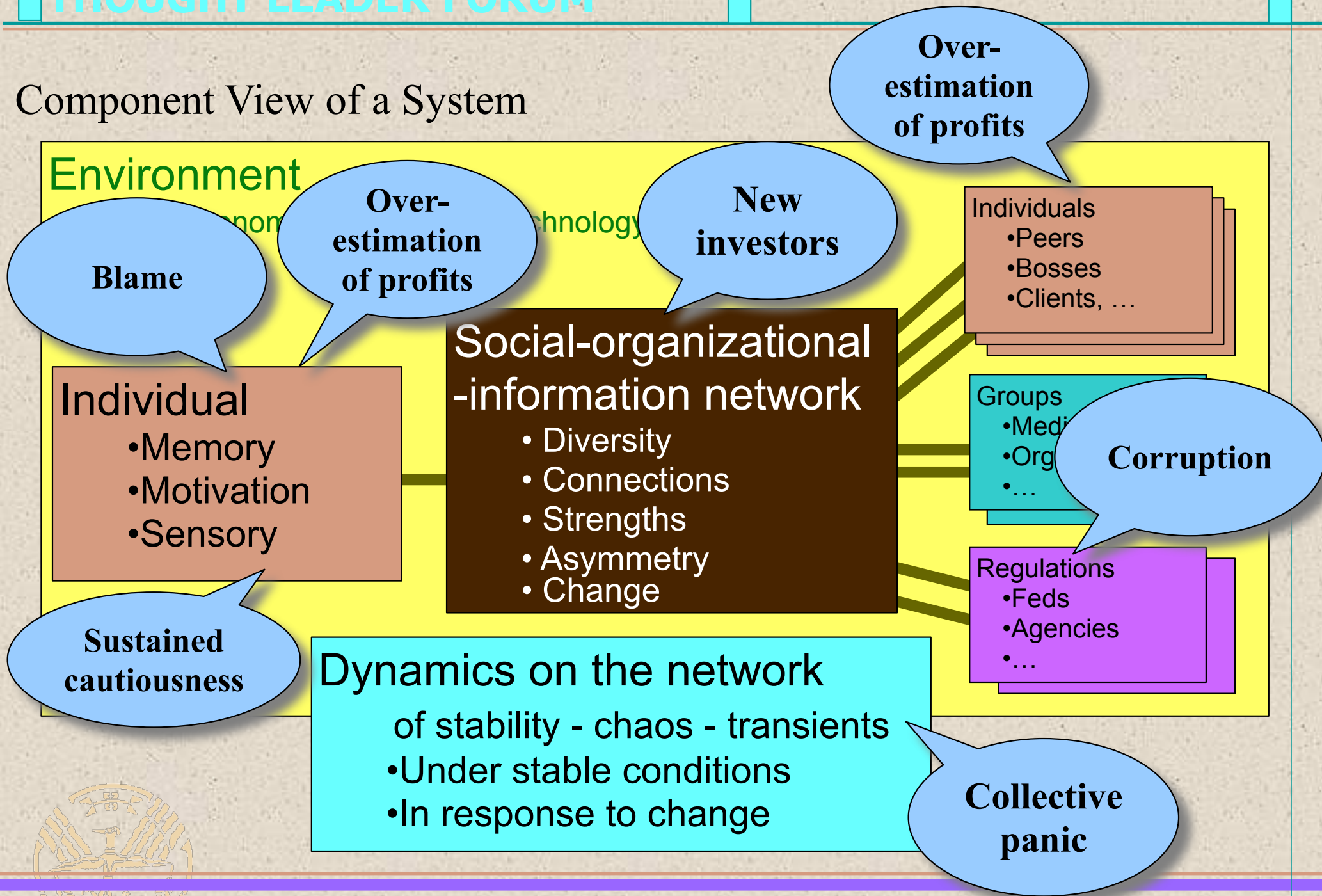


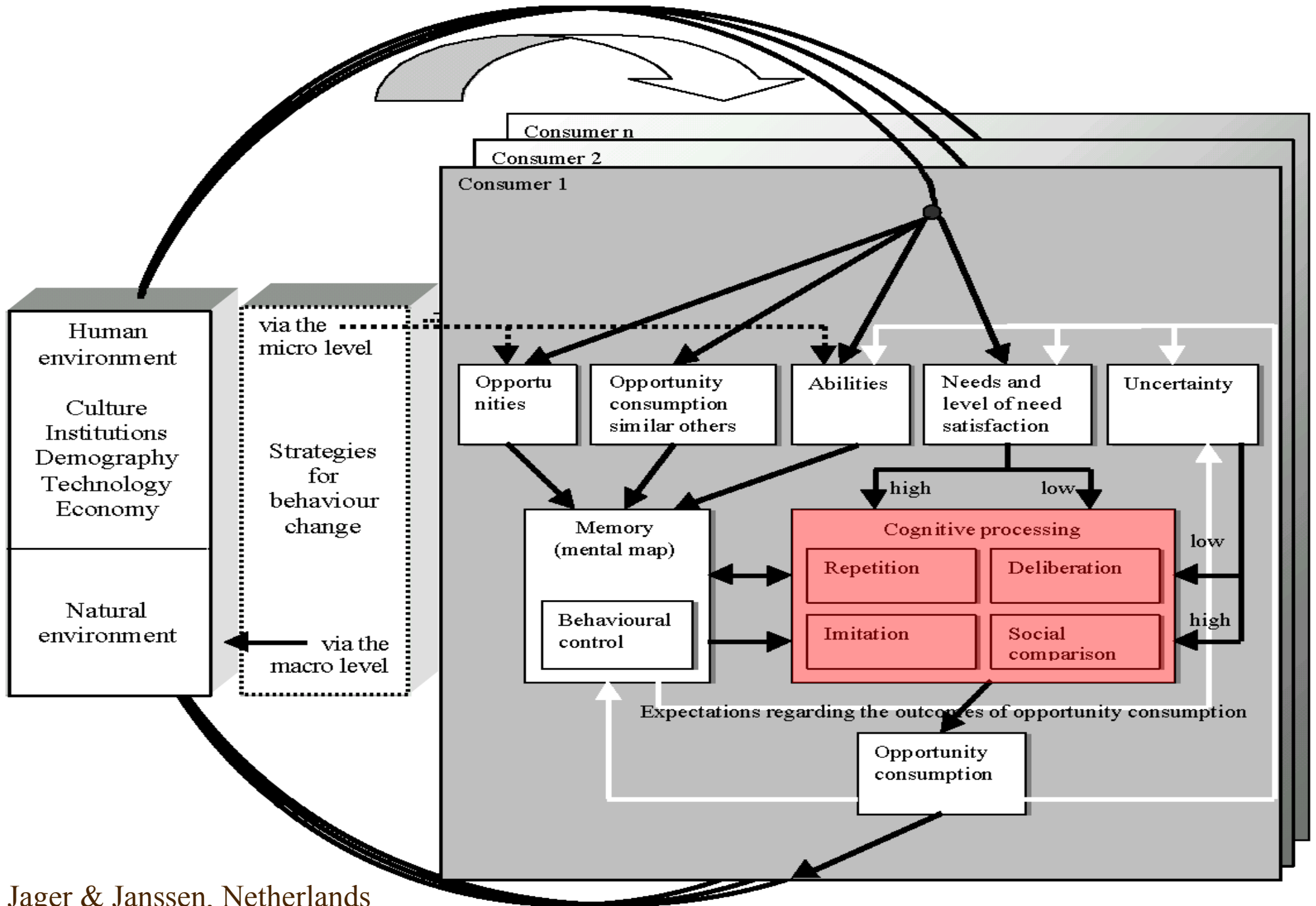
Common Traits of Bubbles and Busts

- ❖ **Focus the attention** – often an invention, technology or concept
- ❖ **Positive feedback loop causes rapid increase in prices**
 - Often encouraged by changes in traditional rules of investment
- ❖ **Introduction of new, often inexperienced, investors**
 - Investors sort out between believers and non-believer exploiters
- ❖ **Overestimation of the potential profits** - credit overextended
- ❖ **Corruption of the systems, particularly in centralized regulation**
- ❖ **Diversity lost - Elites supported, naysayers rejected**
- ❖ **Transition** - dynamics change— prices drop
- ❖ **Collective panic**
- ❖ **Finger pointing, recrimination, blame**
- ❖ **Sustained cautiousness**



Component View of a System

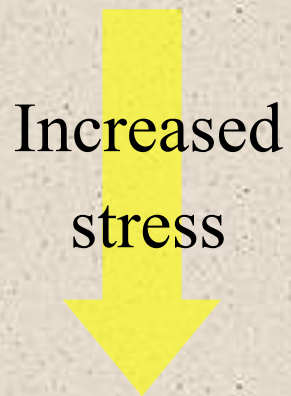




Individual Behavior Styles and Dynamics



Satisfied Dissatisfied



Certain
Uncertain

Repeater	Deliberator
Imitator	Comparer



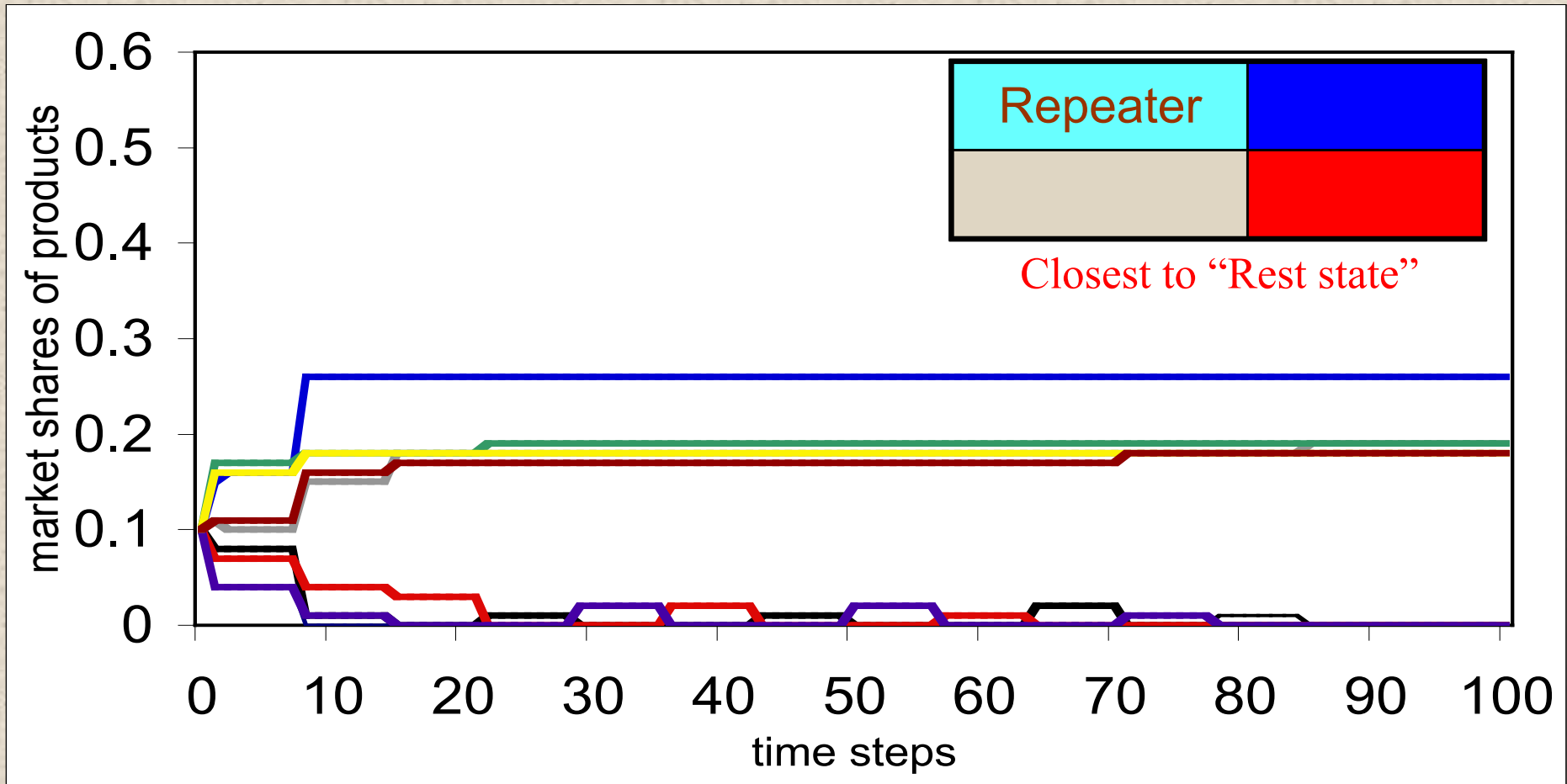
Individual Behavior Styles and their Dynamics

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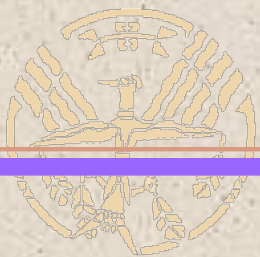
1000 Consumers with the same behavioral tendency
buying 10 products on a small-world network



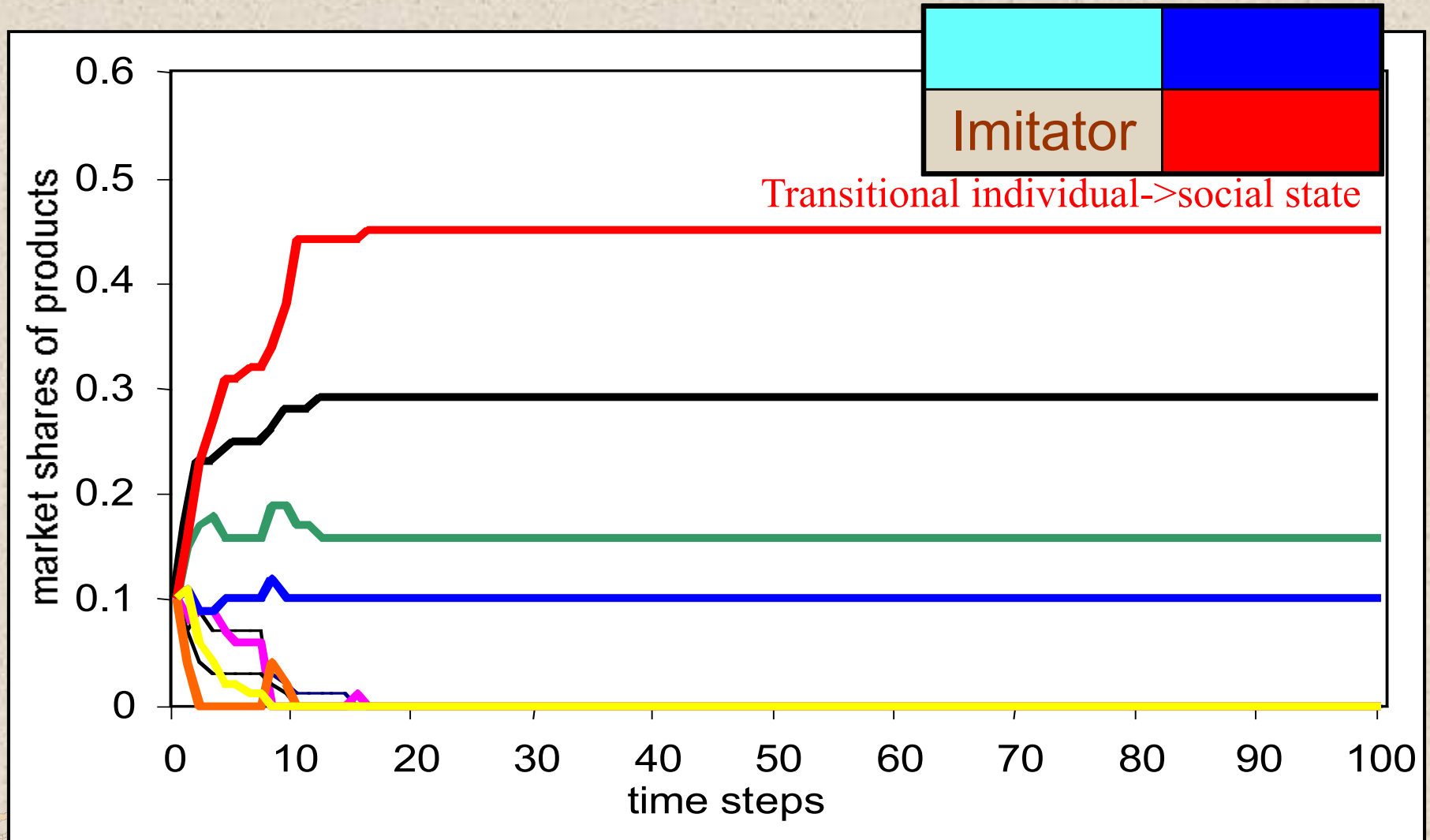
Population of “Repeaters” - satisfied & certain



Few products of equal distribution - highly stable

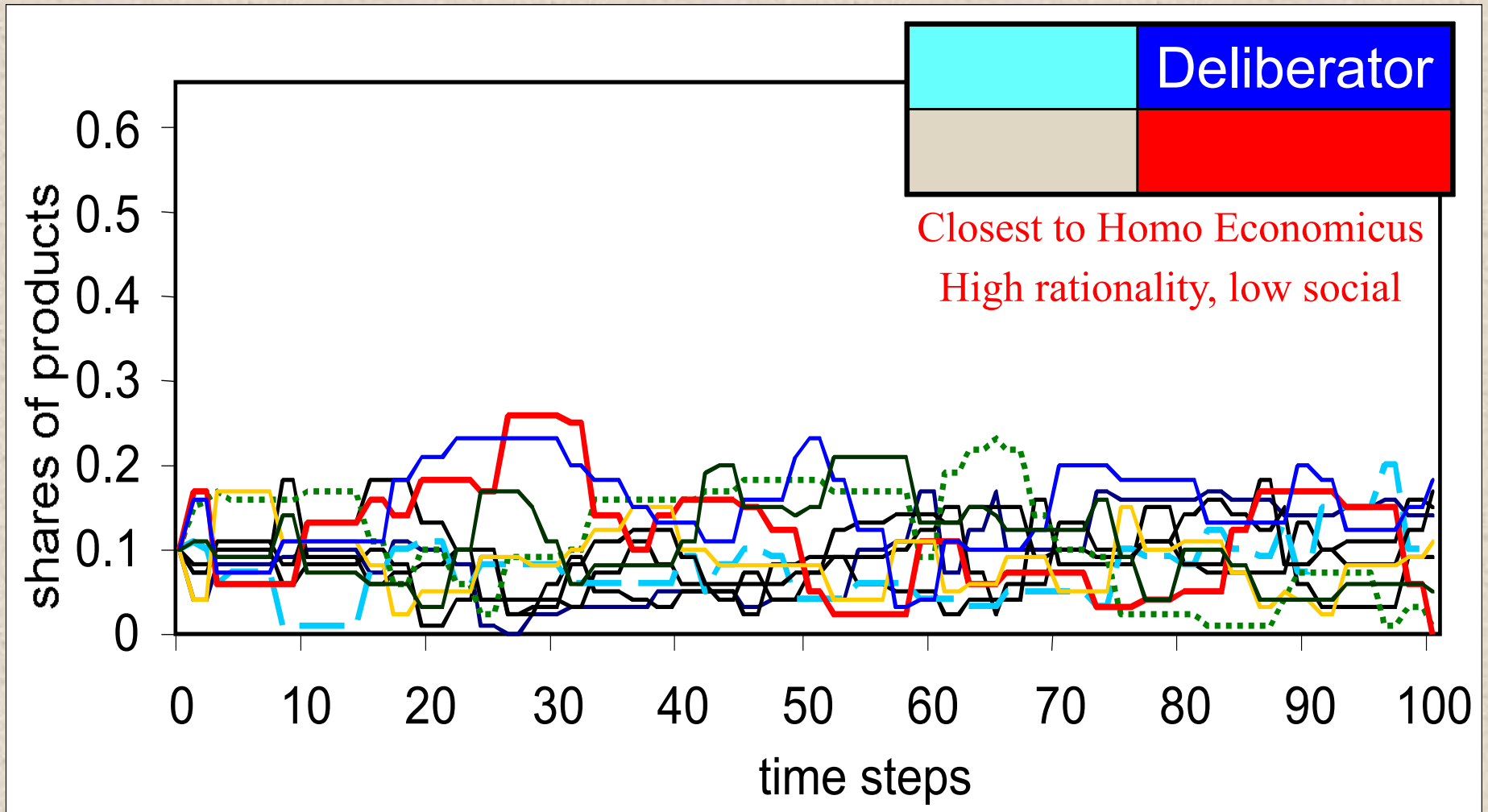


Population of “Imitators” - satisfied & uncertain



Few products of unequal distribution - highly stable

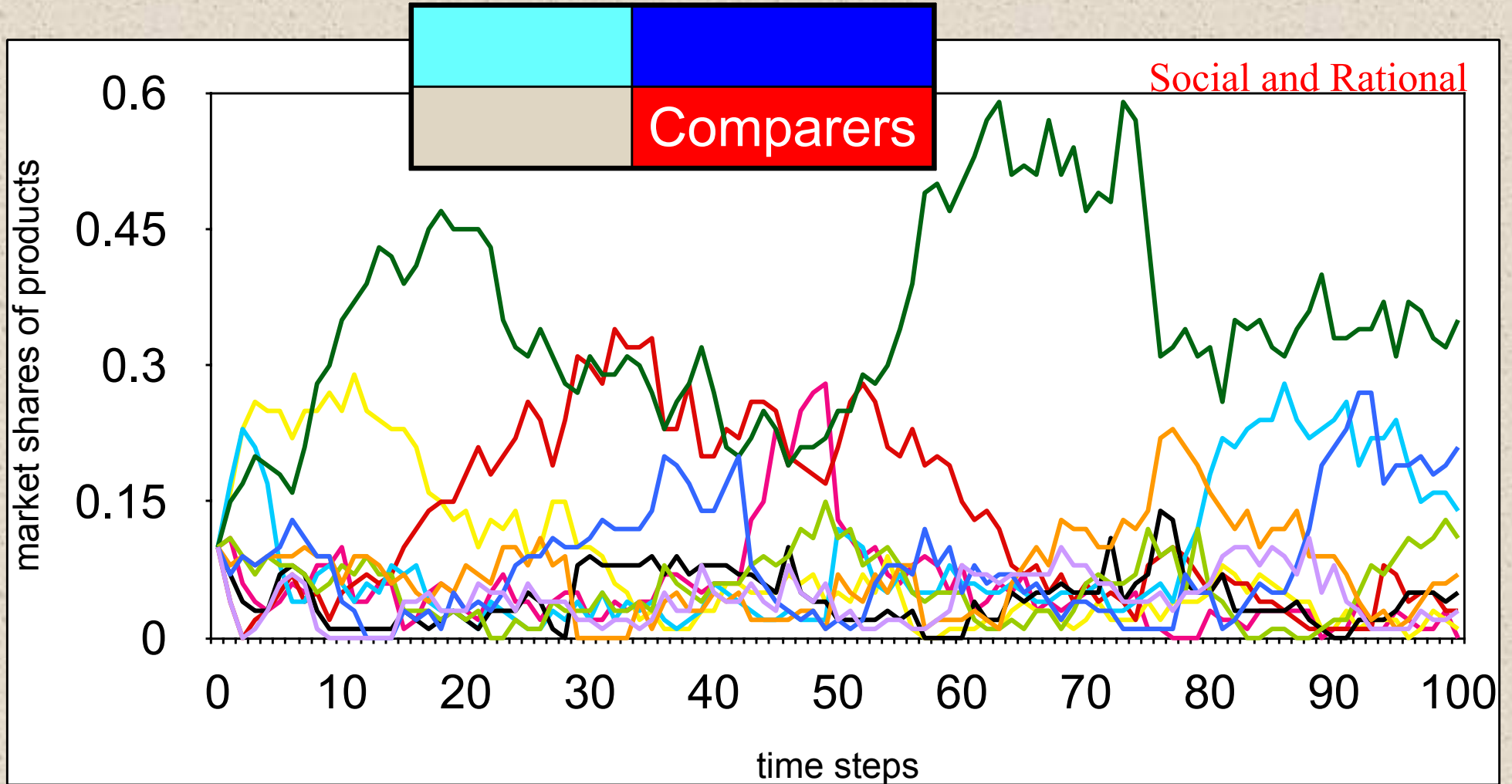
Population of “Deliberators” - dissatisfied & certain



High volatility on all products



Population of “Comparers” - dissatisfied & uncertain



Volatility over long times on few products



Highly stable with
low diversity

“Dumb” agent

Repeater

Imitator

Socially driven

Highly stable -
moderate diversity

Short term volatility
on all products

Homo Economicus

Deliberator

Comparer

Social and Rational

Long time volatility
on few products

Missing change of behavior due to feedback from dynamics



Final quarter review

Individual behavior

Habitual behaviour



Socially driven



Homo Economicus

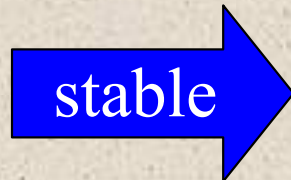
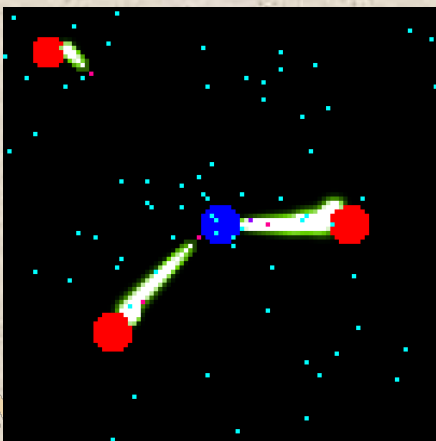


Social and Rational

Collective behavior

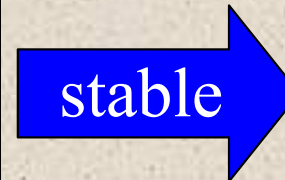
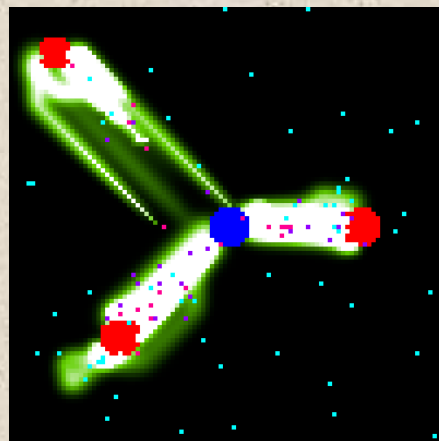
Formative

Chaos - low structure



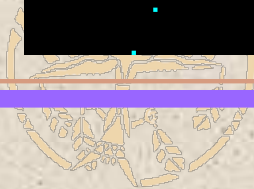
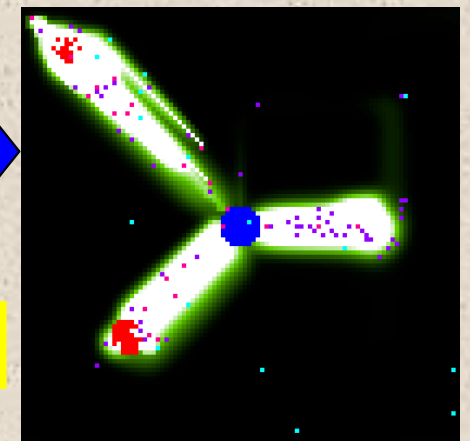
Co-Operational

Synergy of Individuals



Condensed

Low Diversity



Sustainable strategies in fast changing times

- ❖ Feed your mental simulation
- ❖ Keep it simple (Eisenhardt)
- ❖ Recognize stages and states (systems and individuals)
 - ◆ Strategies always match the stage
 - ◆ Enable diversity - best at recognizing the herd
- ❖ Focus on processes, not specific predictions (Drucker)
 - ◆ “History does not repeat itself - it rhymes.” Mark Twain
 - ◆ Strategic planning is about developing process not product
- ❖ Optimize your response to herd behavior
 - ◆ Recognize herding by loss of diversity
 - ◆ Resist condensing your social network
 - ◆ Rely on Diverse communities
 - ◆ Become more flexible in responding to change
- ❖ Universal ethics vs community ethics



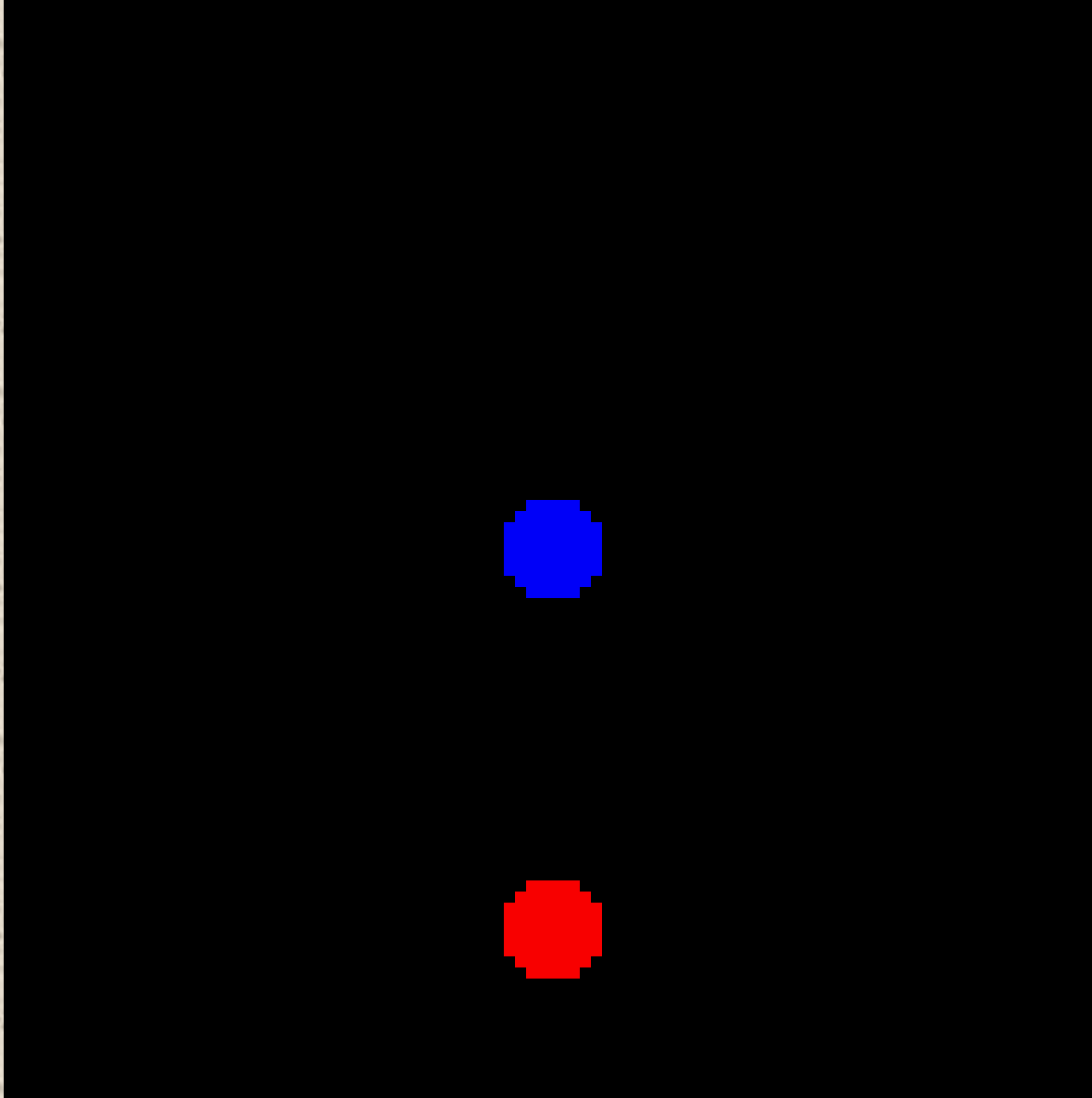
Alternative Leadership on change

- ❖ **"Problems cannot be solved at the same level of awareness that created them."** - Albert Einstein
- ❖ **"When we remember we are all mad, the mysteries disappear and life stands explained."** - Mark Twain
- ❖ **"The whole problem with the world is that fools and fanatics are always so certain of themselves, but wiser people so full of doubts."** - Bertrand Russell





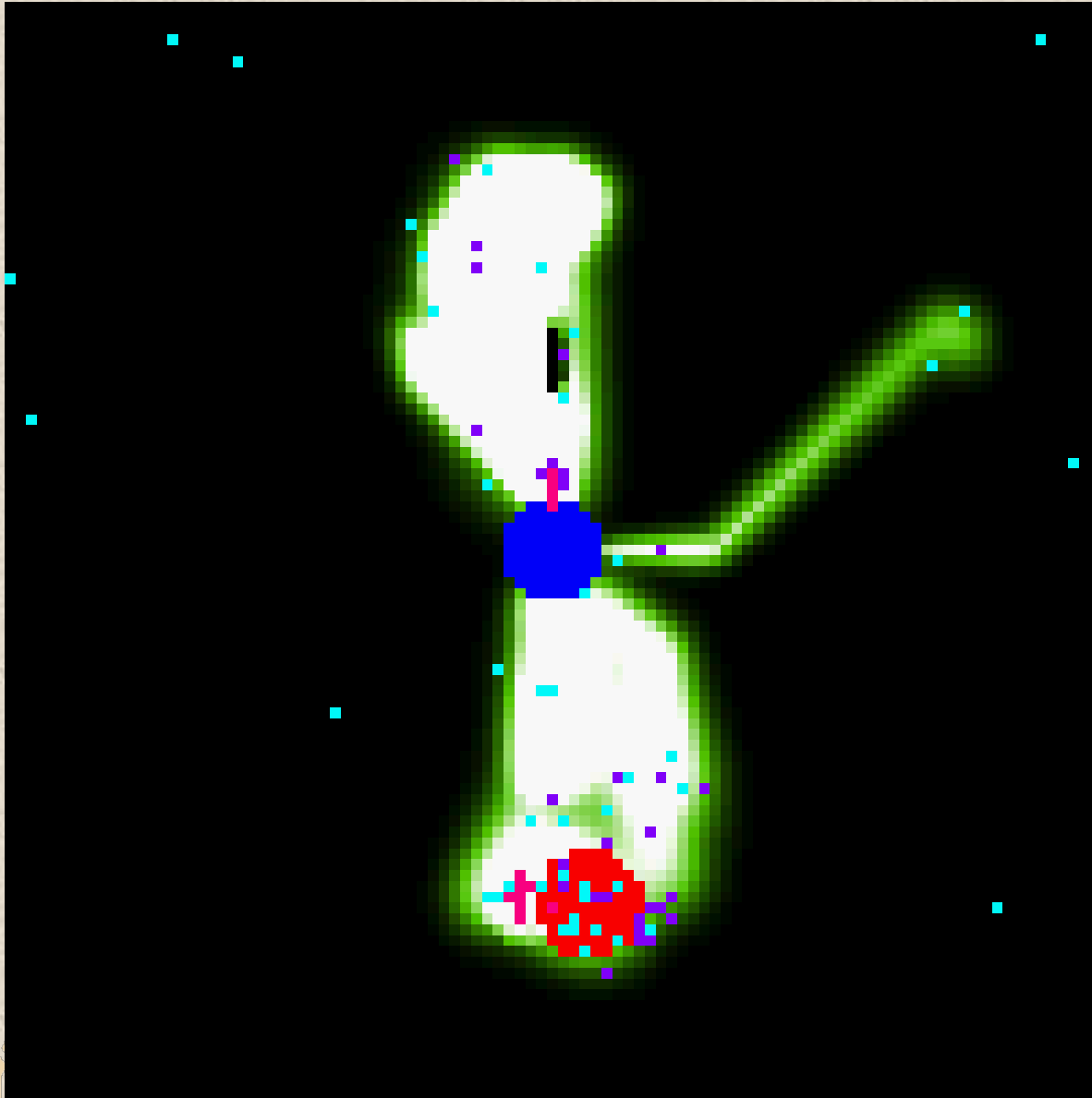
Prediction: Speed up by 10 times & change distance



**Almost as productive
at stationary source!**



At a later time...



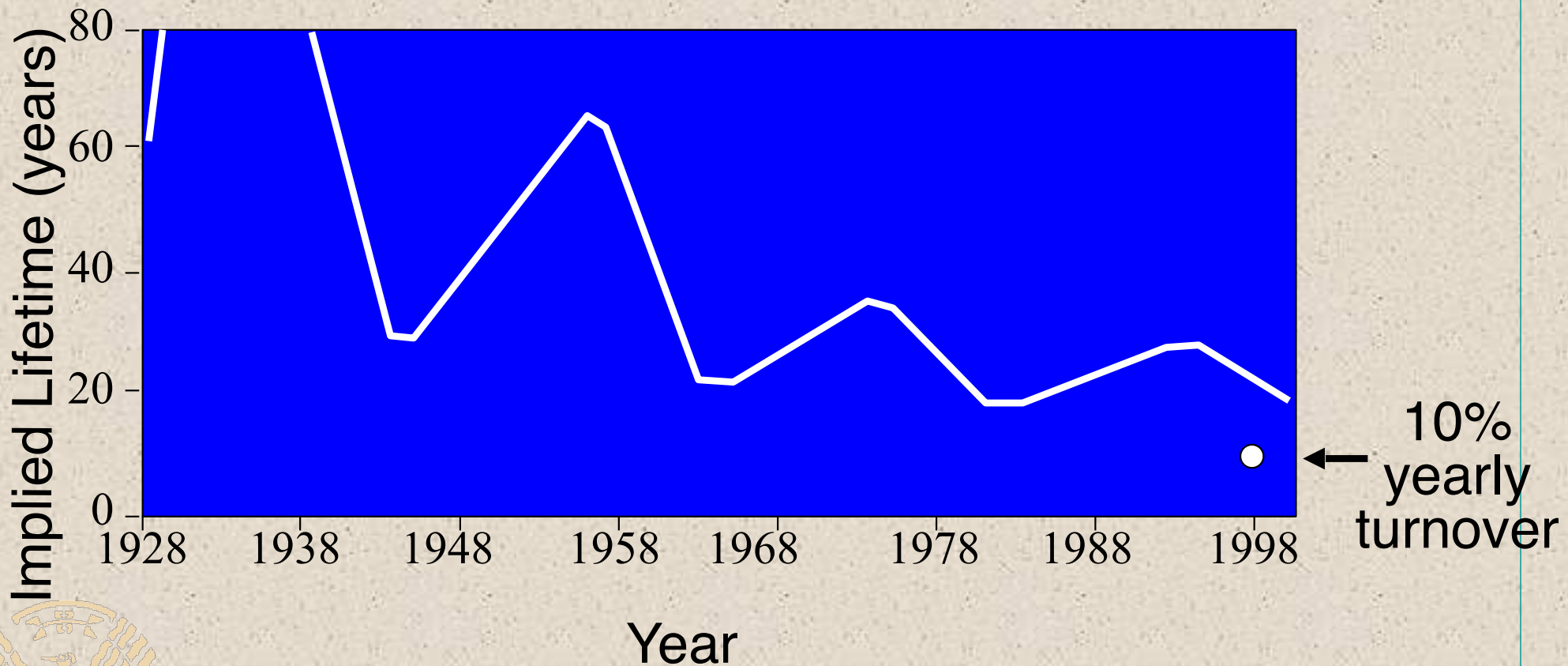
Exploits natural resonance of collective



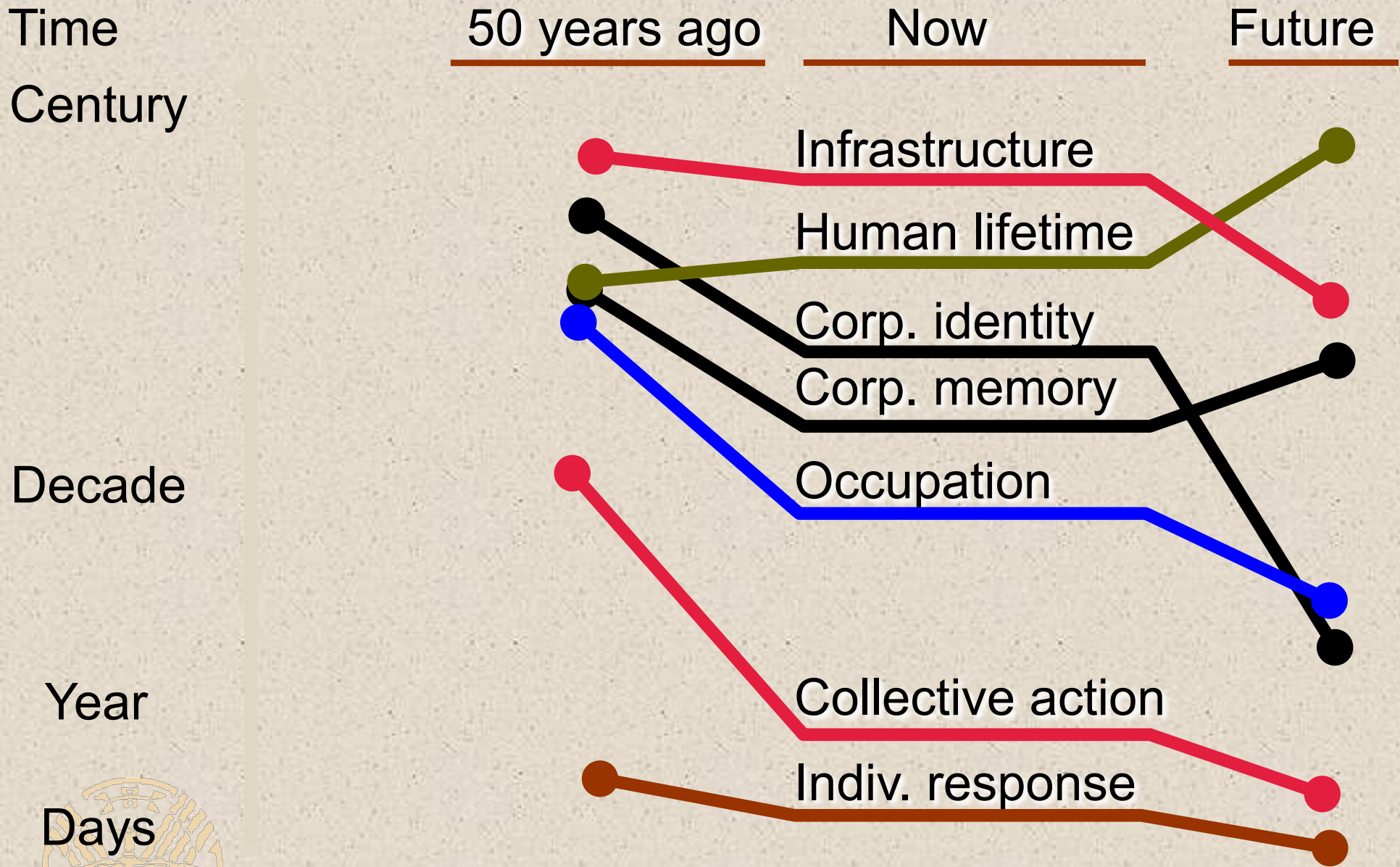
Average Lifetime of S&P 500 Companies

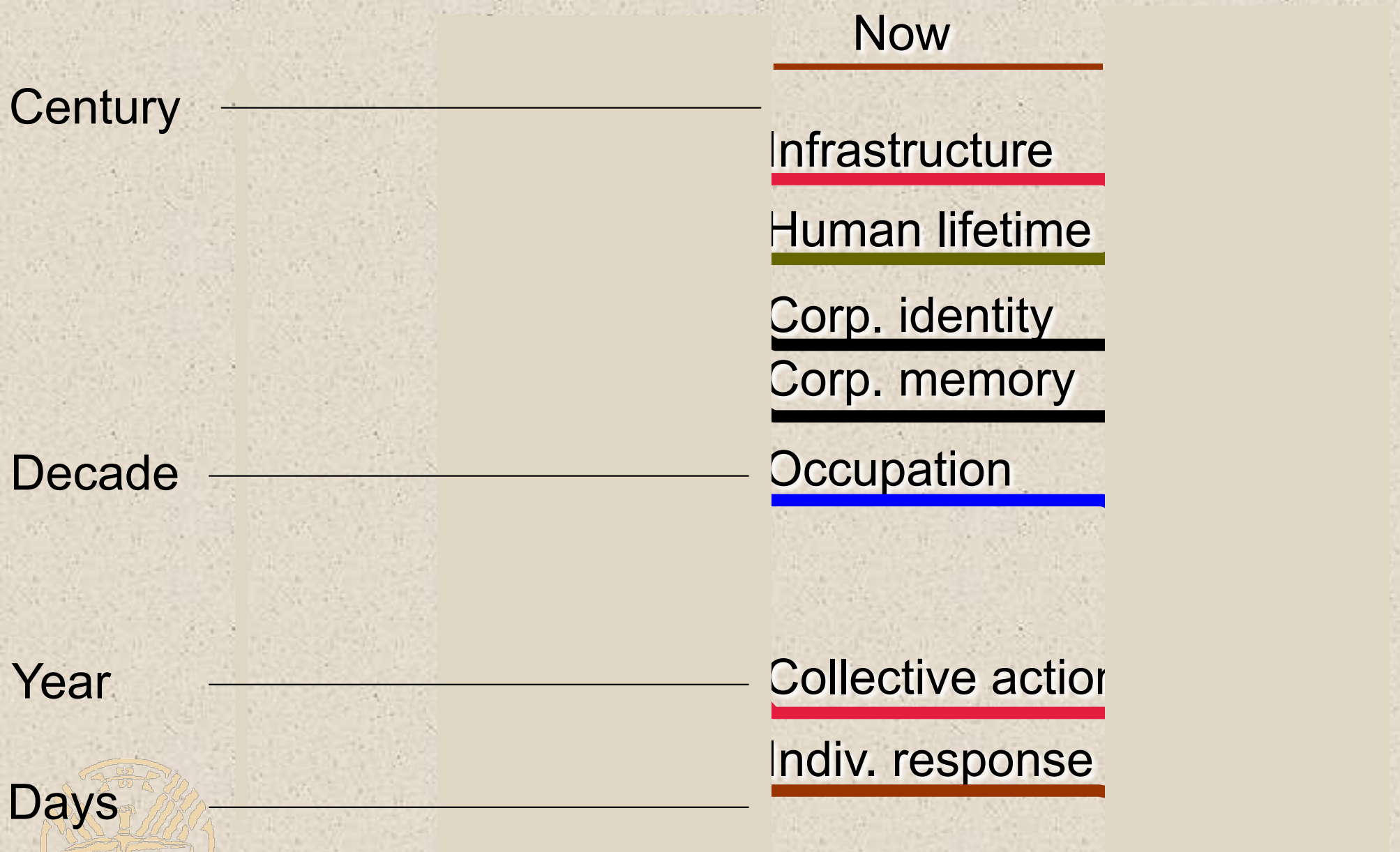
From *Creative Destruction*

by R. Foster and S. Kaplan









Common Traits of Bubbles and Busts

Size doesn't matter

❖ **Focus the attention** – often an invention, technology or concept

❖ **Positive feedback loop causes rapid increase in prices**

Often encouraged by changes in traditional rules of investment

❖ **Introduction of new, often inexperienced, investors**

Investors sort out between exploiters of believers and non-believer

❖ **Overestimation of the potential profits** - credit overextended

❖ **Corruption of the systems**, particularly in centralized regulation

❖ **Diversity lost** - Elites supported, naysayers rejected

❖ **Transition** - dynamics change— prices drop

❖ **Collective panic**

❖ **Finger pointing, recrimination, blame**

❖ **Sustained cautiousness**

- Edward Chancellor: *"Devil Take The Hindmost"*
- John Kenneth Galbraith: *"A Short History of Financial Euphoria"*
- Charles Mackay: *"The Madness of Crowds"*



Component View of a System

Environment

(culture, economy, demography, technology, nature)

Individual

- Memory
- Motivation
- Sensory

Social-organizational -information network

- Diversity
- Connections
- Strengths
- Asymmetry
- Change

Dynamics on the network

- Under stable conditions
- In response to change

Individuals

- Peers
- Bosses
- Clients, ...

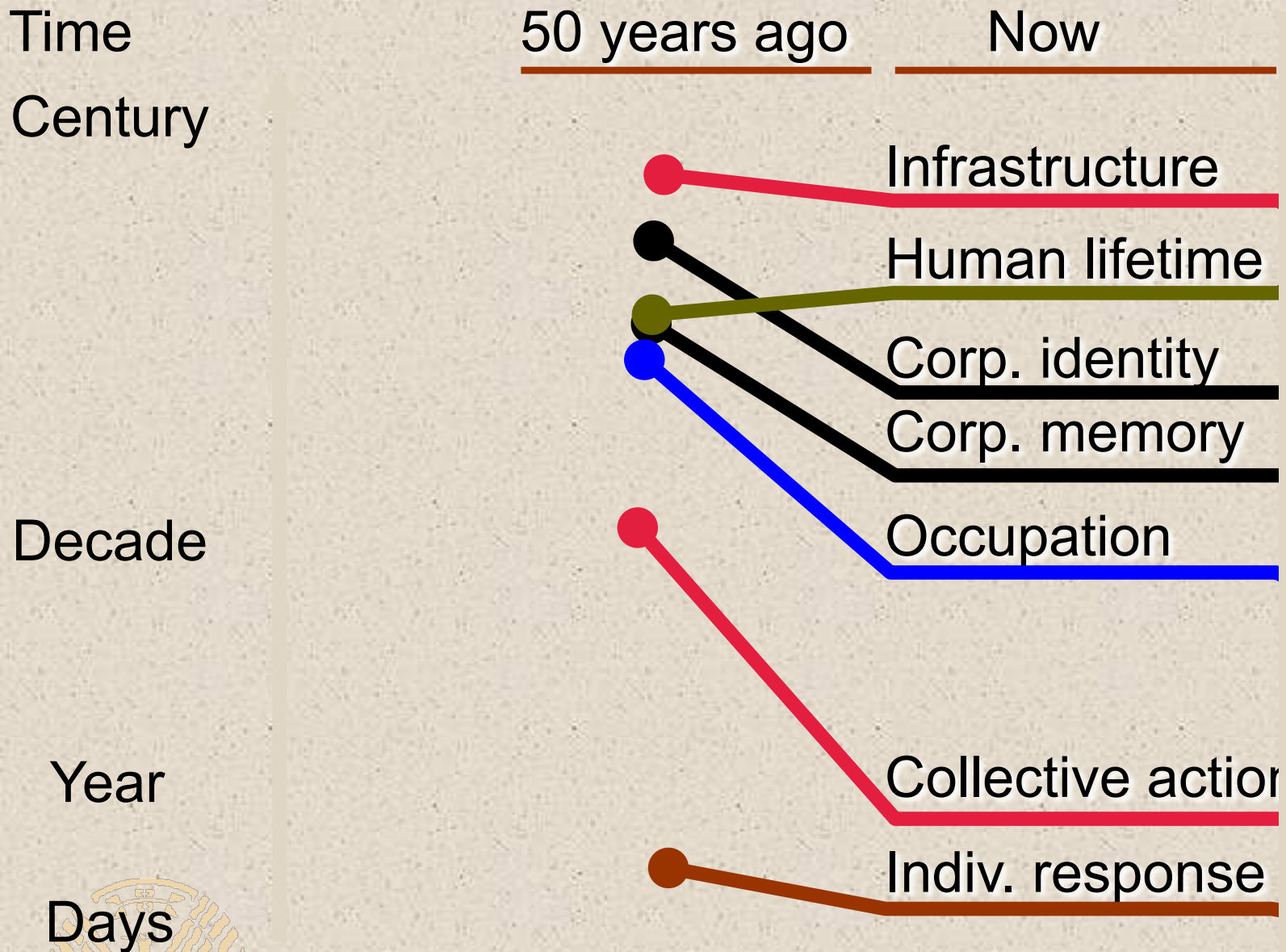
Groups

- Media
- Organization
- ...

Regulations

- Feds
- Agencies
- ...





Final quarter review

