

ADVANCING THE FIELD

REFLECTIONS AND EMERGING TRENDS
FROM THE FIELD-SUPPORT LWA



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Learning from Nature's Designs

How The Study Of Form, Function & Flow Can
Help Us Understand & Measure Systemic Health

Dr. Sally Goerner

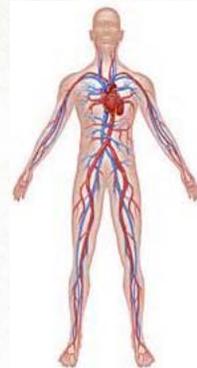


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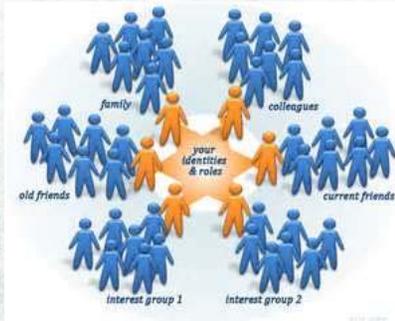
Modeling Complex Systems Using... The Physics of Flow Networks *(similar rules apply across widely different systems)*



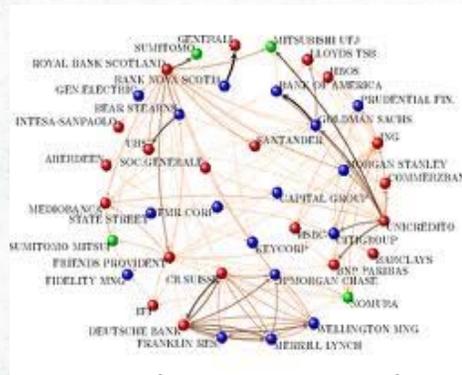
Living Organisms



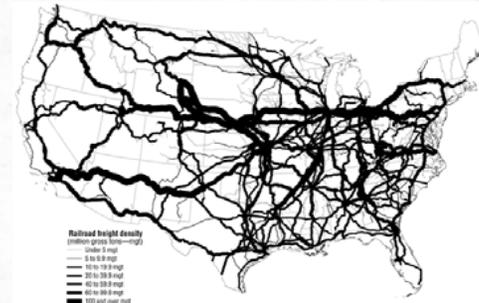
Biosphere



Economic Network



Banking Network

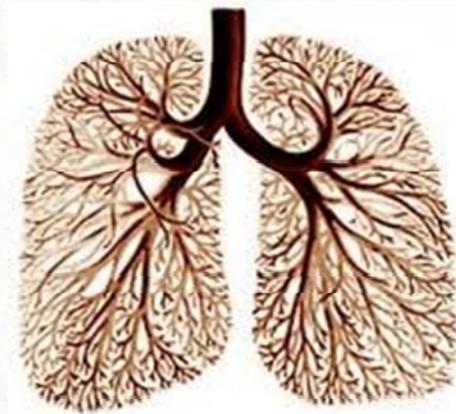


Railroad Network

Systems whose existence depends on circulation

Nature Selects Network Structures That Optimize Systemic Health

Universal Patterns Provide Targets for Health



The same ratio holds across scales N^x

Lungs



River Delta



Ant Trails

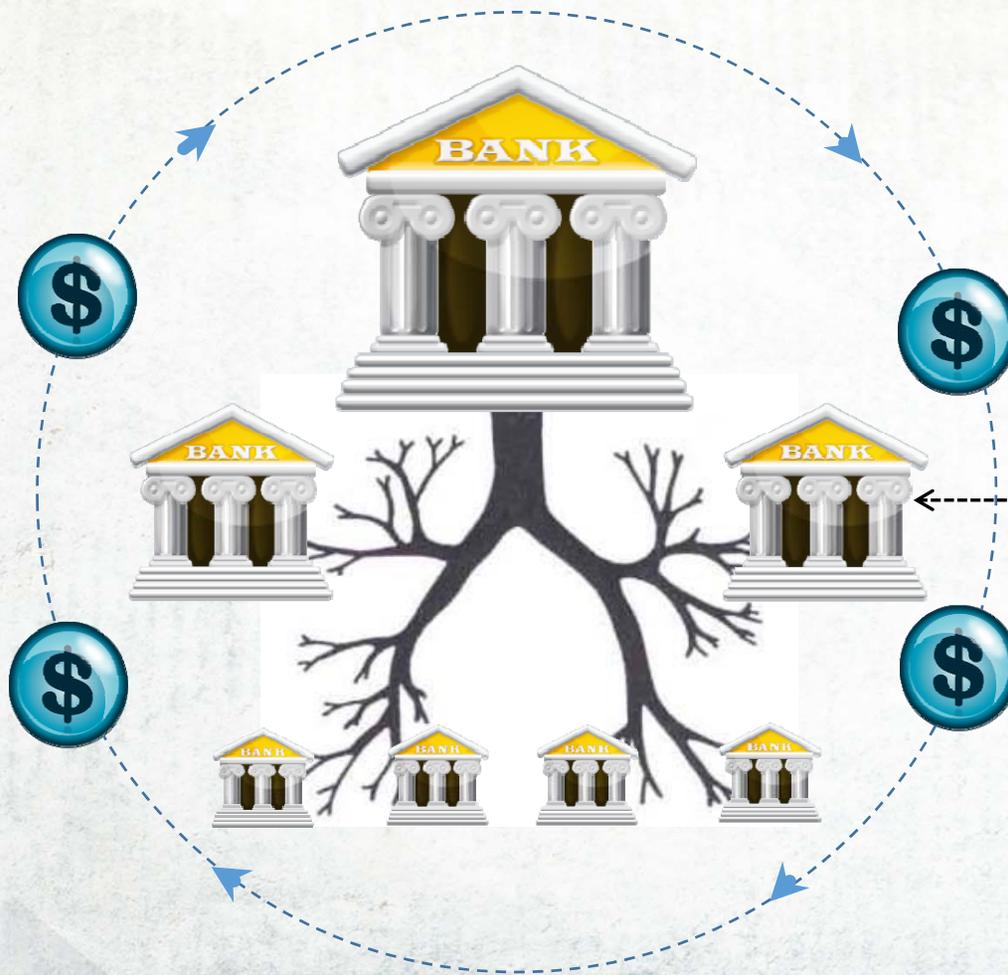
Scale-Appropriate Structures Help Catalyze Critical City Functions



A Fractal City

The Goldilocks Rule

Multi-scale Systems Requires A Proper Mix Of Organizations That Are "JUST RIGHT" For Each Scale



MEGA BANKS

- Needed for large-scale needs
- Small-scale uneconomic

REGIONAL BANKS

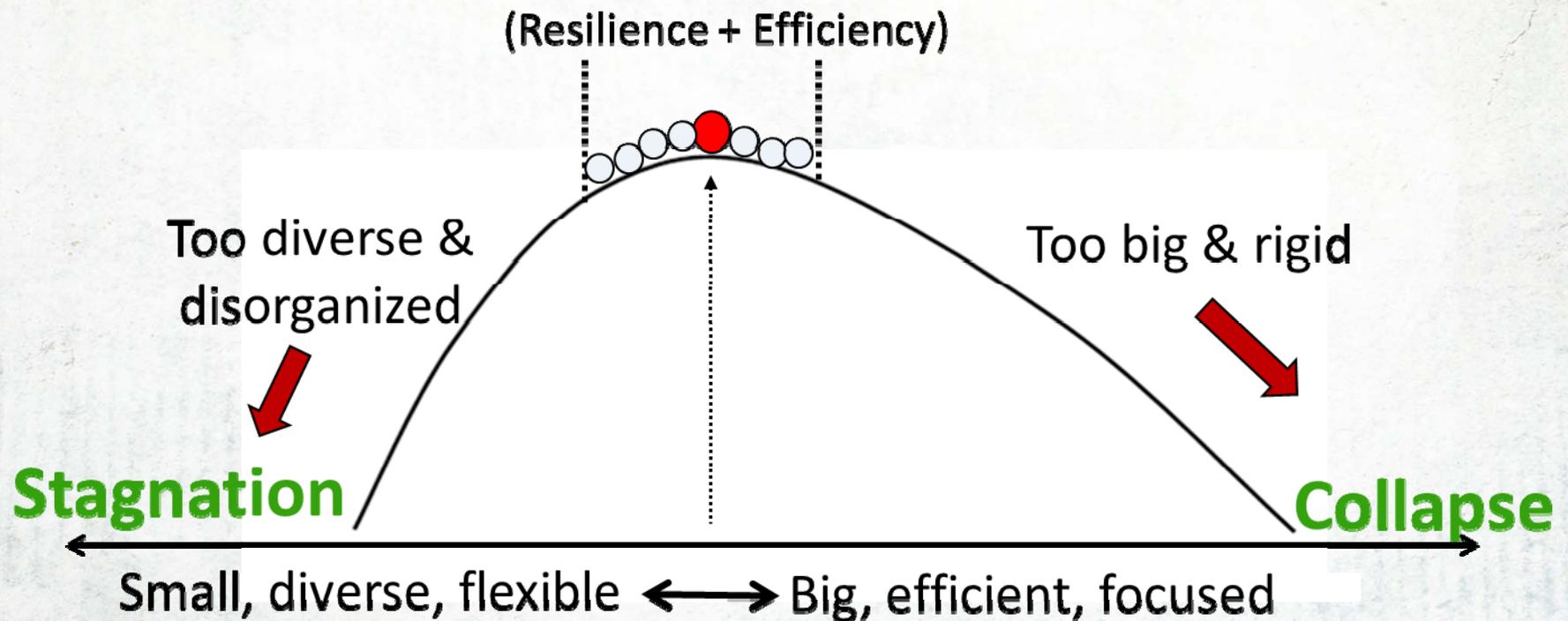
- Support regional networks

SMALL-SCALE BANKS

- Support small-scale commerce
- Know customer & community
- Invested in success of the loan

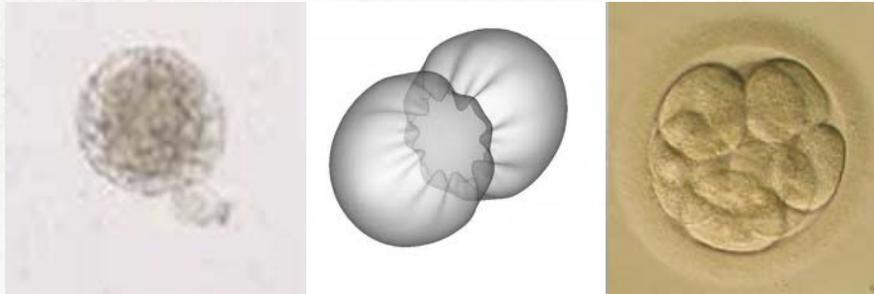
The Need For Small/Diverse & Big/Efficient Explains Why Resilience & Efficiency Must Be Balanced Too

The Window of Vitality



Robert Ulanowicz, 1996

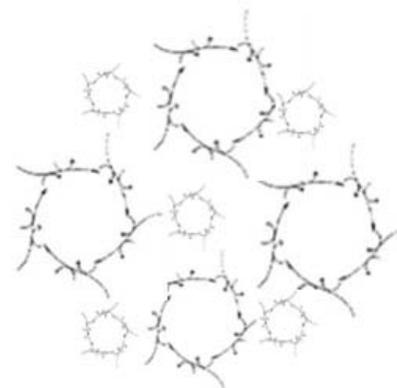
Its not how big you grow, Its HOW you grow big



Nature builds intricate social fabric
(small & connected = strength & speed)



A Bubble Economy
(Drains grassroots)



An Intricate Economy
(Recirculates robustly)

We can use circulation speed to gauge healthy development

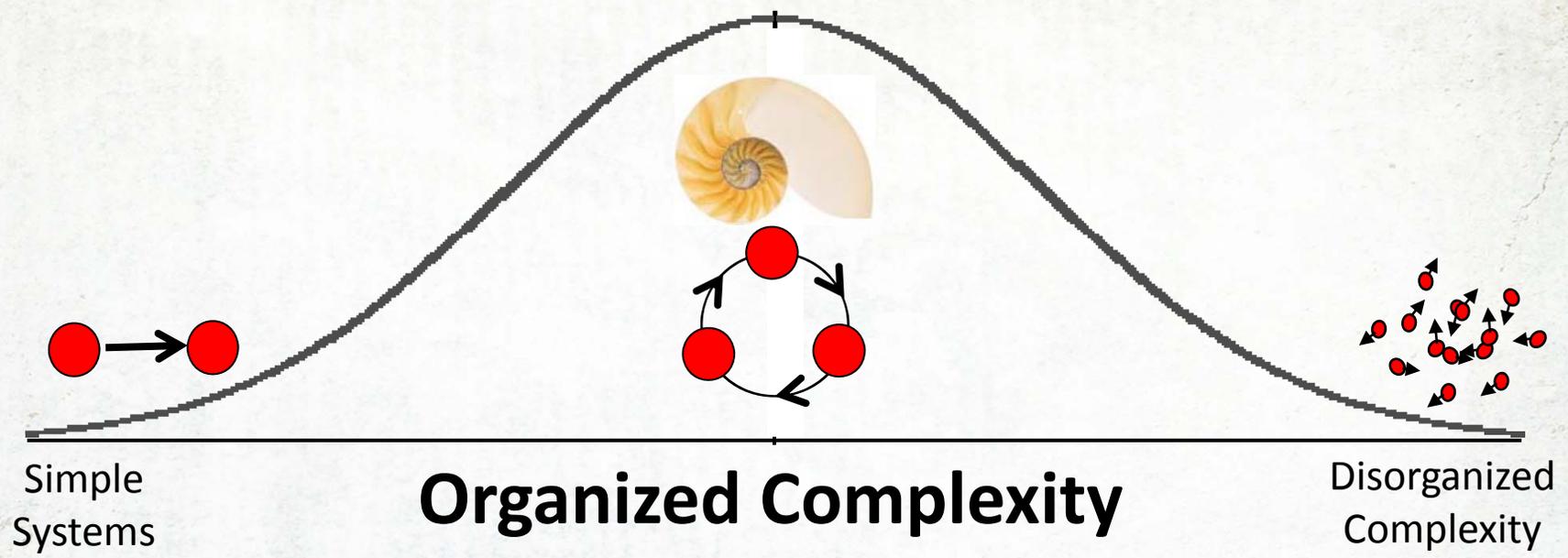
Structure	Energy Cycling (in F units)
Modern civilization	300,000
Agriculturalist (5000 BC)	10,000 per person
Hunter gatherers	1,000
Human brain	150,000
Human body	17,000

F = Flux Density = energy cycling per unit time/density = ergs per sec⁻¹ gm⁻¹

Eric Chaisson, *The Rise of Complexity*, 2002

The Snowflake-Science Solution

Precise Patterns Provide Effective Measures Of Systemic Health



Warren Weaver, 1948

Take-away #1

There Are Better Ways to Understand & Measure Systemic Health



Take-away #2

Understanding Nature's Laws Of Healthy Development Can Help Us Build Better Networks

We are called to be the architects of the future, not its victims.

-- Buckminster Fuller

The Rise Of A "Systemic" Worldview & A Human-network View Of Vitality

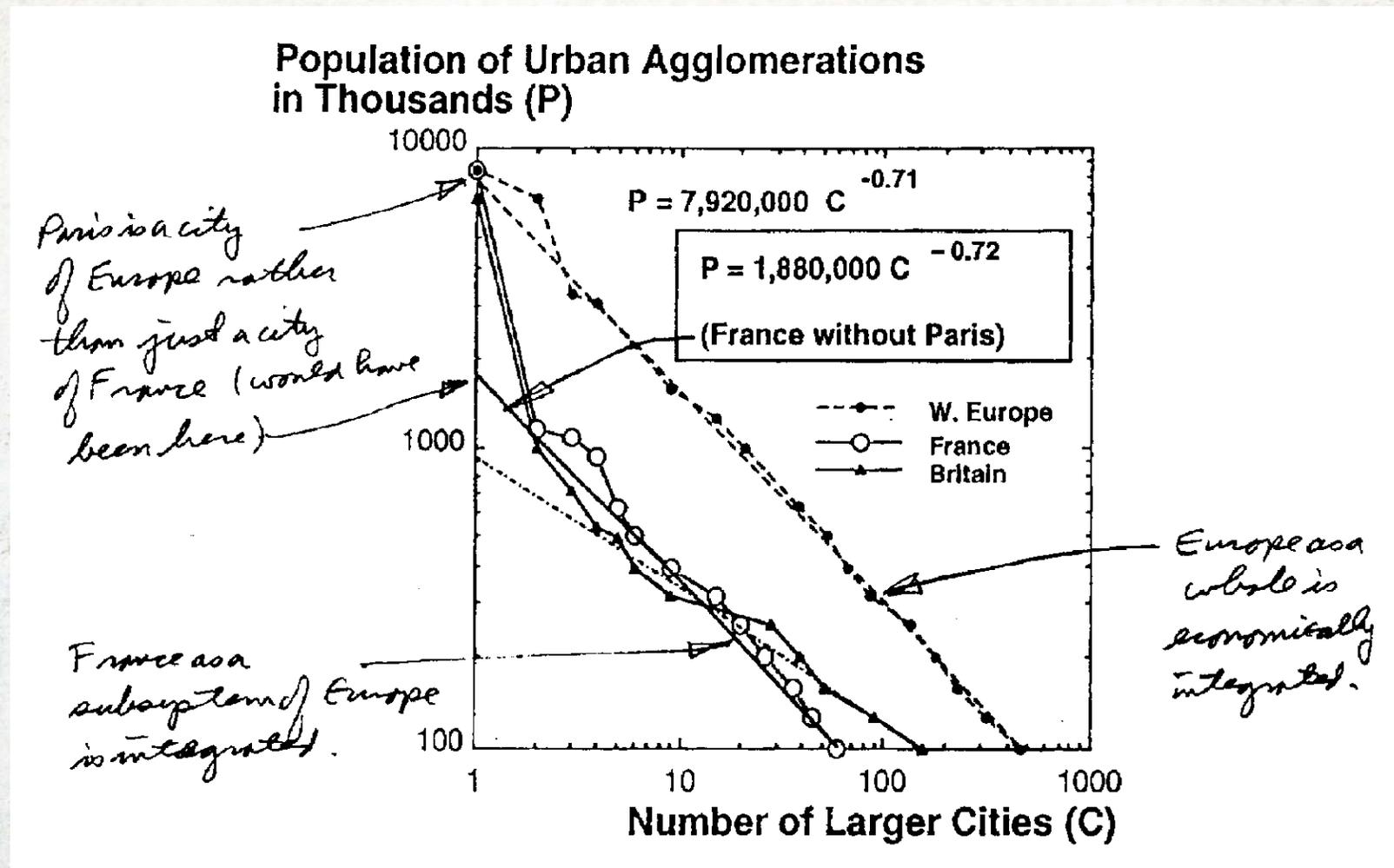
Money



Economy

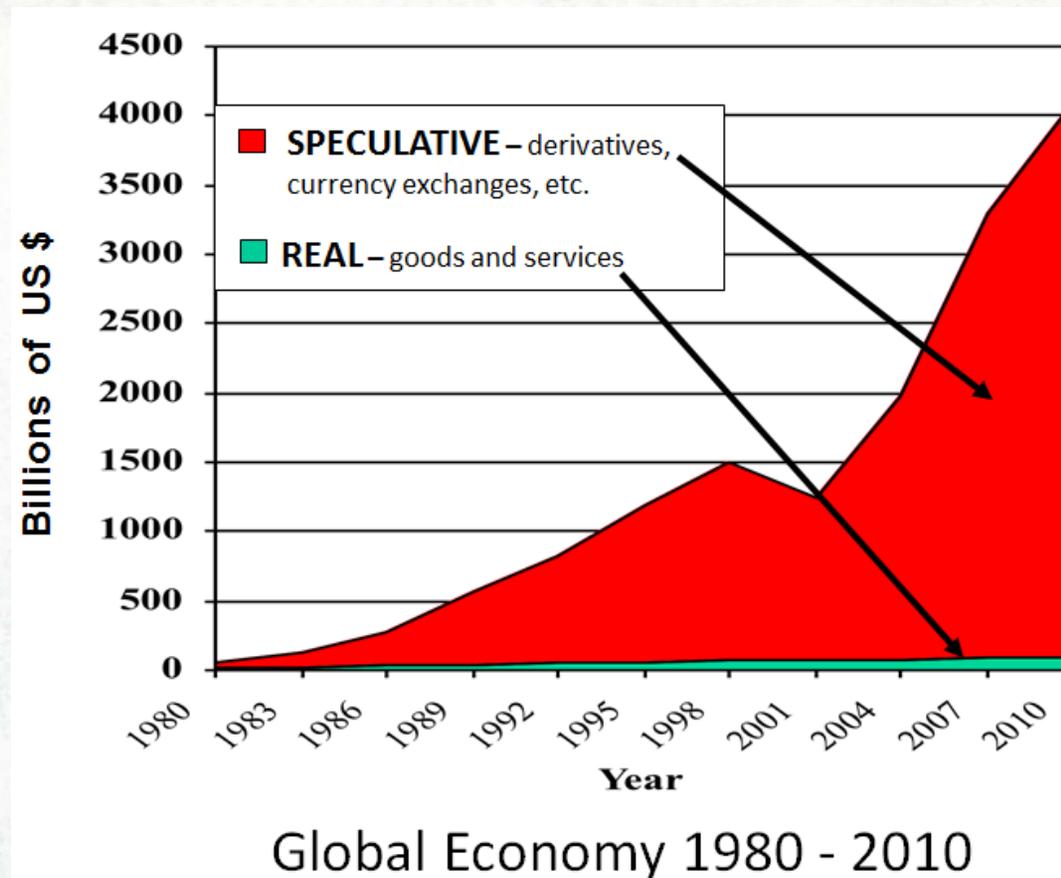


Power-law Patterns Help Us Identify & Assess Economic Networks



Robert Anthony, 1989

Running a Global Casino vs. Developing Durable Real-Economy Networks

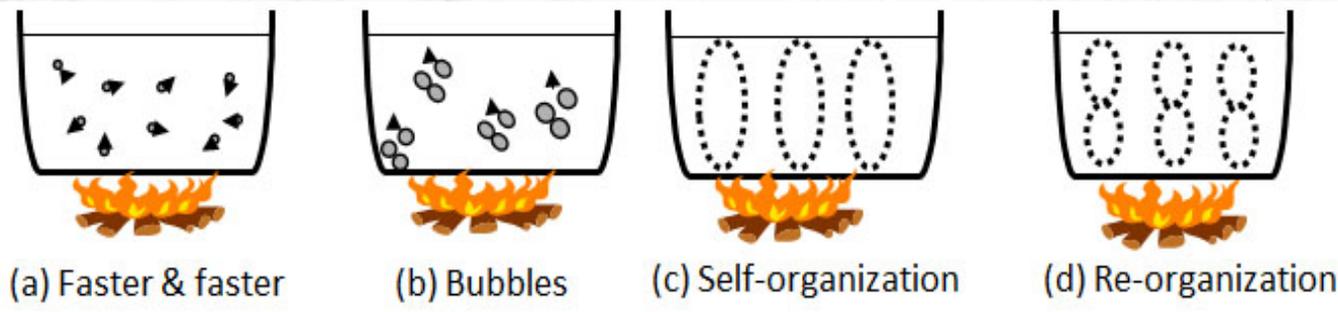
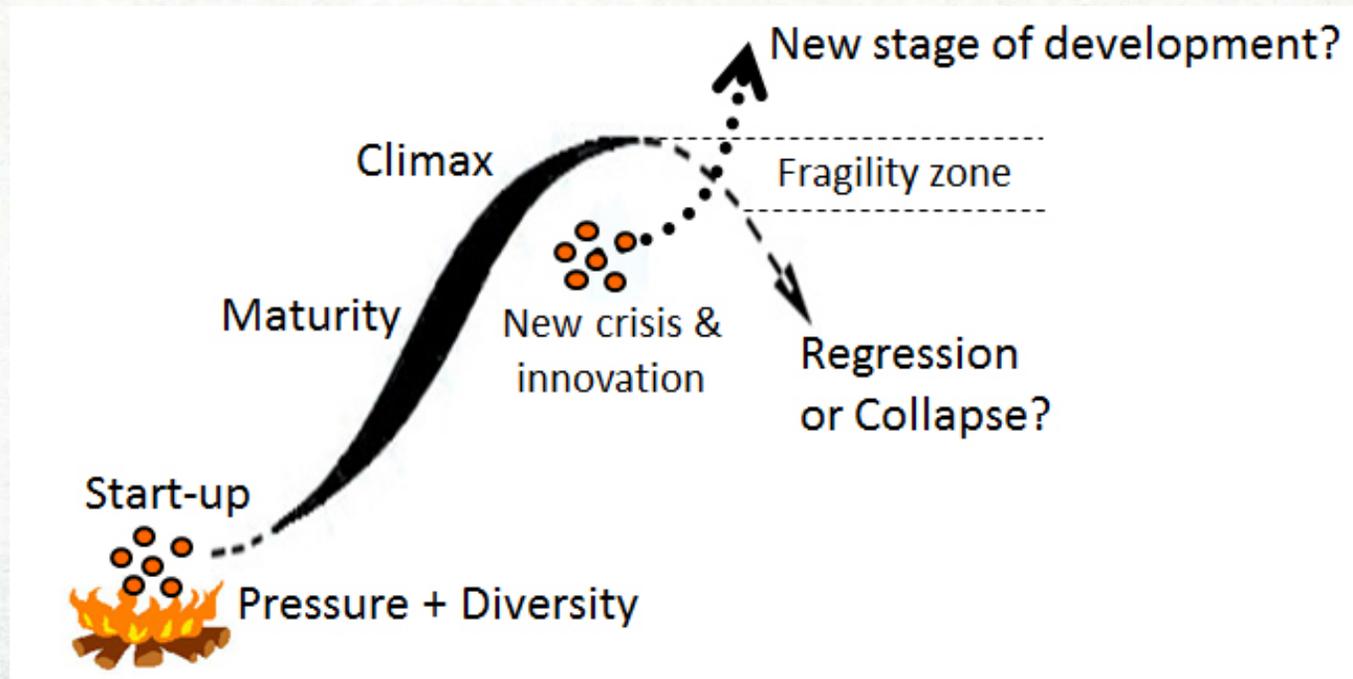


Since 1980, speculative transactions have come to dwarf real ones. For example, by 2004 foreign exchange transaction volumes routinely reached \$1.9 trillion *every working day*, a volume that was hundreds of times larger than the trading volumes of all stock markets in the world combined.

Sources: UNCTAD, *Handbook of Statistics* (New York and Geneva: UNCTAD, 2001); Bank of International Settlements (BIS), Quarterly Review, International Banking and Financial Market Developments (Basel, 2001); and BIS, Quarterly Review, Regular OTC Derivatives Market Statistics (Basel, different years); World Federation of Exchanges 2002. Total Value of Share Trading <<http://www.world-exchange.org/publications/Ts4%20Bond%20Market%20cap.pdf04.04.02>>;

Thermodynamics 101

Pressure & Energy Flow Drive Cycles Of Organization, Growth & Development



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