



Strategic Thinking in a Complex World

**T. Irene Sanders
Washington Center
for Complexity
& Public Policy**

www.complexsys.org

© All Rights Reserved, 2003.
T. Irene Sanders



Figuring out
how to think
about the problem.

Complexity Science Provides a New Framework for Thinking About and Responding to the Challenges of the Future





Presentation Outline

- Overview of Chaos Theory + Complexity
- Emphasis on Concepts Most Relevant to Strategic Thinking and Foresight
- Questions and Discussion



Complexity

...arises when an increasing number of independent variables begin interacting in interdependent and unpredictable ways...

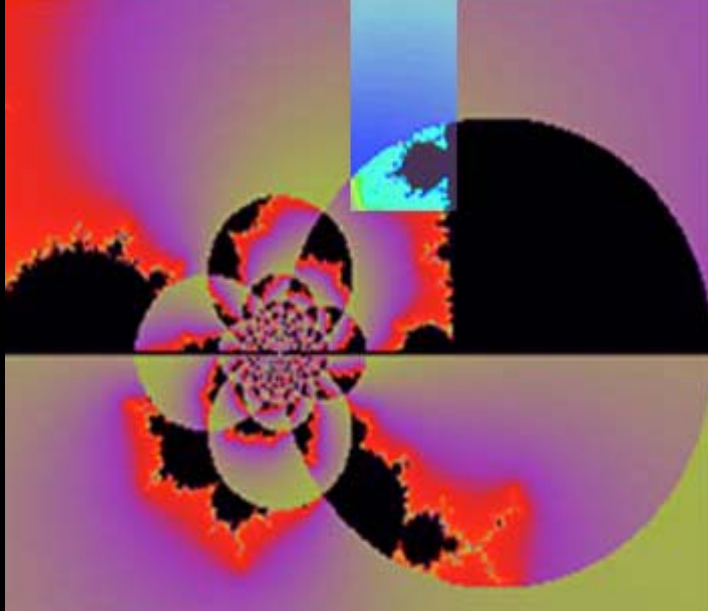
(traffic, weather, stock market, United Nations, or 2 dogs and a cat suddenly face-to-face through a hole in the fence)



Complexity Science

...a growing body of interdisciplinary
knowledge and a new vocabulary
about the structure, behavior
and dynamics of change in
complex adaptive systems...

Complex Adaptive Systems (CAS)



open evolutionary systems

--rain forest, our immune systems, World Wide Web, a business, a society or the rapidly globalizing world economy--

continuously processing & incorporating new information

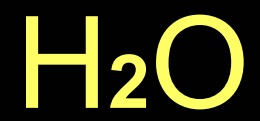
to survive, the *system* must adapt to change

I think the next century will
be the century of complexity.

Stephen Hawking
January 2000

The background is a deep blue with a grid of thin, light blue lines. A bright, glowing blue light source is positioned in the center, from which several lines radiate outwards, creating a sense of depth and perspective. The text is overlaid on this background in a bold, yellow, sans-serif font.

**Rapid advances in high speed computing,
computer graphics and computer modeling
technologies gave scientists powerful
new tools of insight.**



What do Complex Physical, Biological and Social Systems in Nature.....



have to teach us about
complex
socio-techno-political
human systems?



Complex Systems

Deterministic

chaos theory (physics, math)

moves toward predictable
fixed outcome or end-state

Adaptive

complexity (biology)

continuously evolving,
adapting, never settles

subcategory – driven threshold systems
(earthquakes, avalanches)

Complex Adaptive *Sociopolitical* (human) Systems

(people, organizations, cultures, societies, politics,
commerce, economics, other issues)

notice background pattern on slide

Complex Systems

Deterministic

chaos theory (physics, math)

Adaptive

complexity (biology)

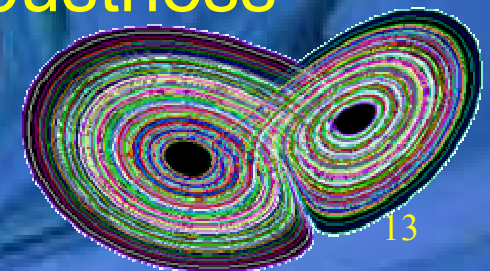


- nonlinear, feedback loops
- sensitive to initial conditions/Butterfly Effect (Jurassic Park)
- self-organization (patterns, shape, structure)
- attractors, strange attractors



- adaptation
- edge of chaos
- evolution (co, meta)
- simple rules
- networks
- emergence
- robustness

--Visual Thinking--



self-organization adaptation emergence simple rules “edge of chaos”





self-organizing patterns, shapes and structures



self-organizing beliefs, culture & societies



Complex Systems

Deterministic

chaos theory (physics, math)

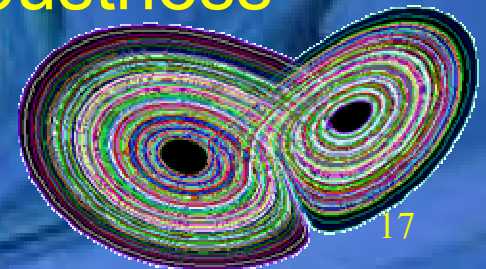
- nonlinear, feedback loops
- sensitive to initial conditions/Butterfly Effect (Jurassic Park)
- self-organization (patterns, shape, structure)
- attractors, strange attractors

Adaptive

complexity (biology)

- adaptation
- edge of chaos
- evolution (co, meta)
- simple rules
- networks
- emergence
- robustness

--Visual Thinking--



simple rules emergent behavior



Complex Systems

Deterministic

chaos theory (physics, math)

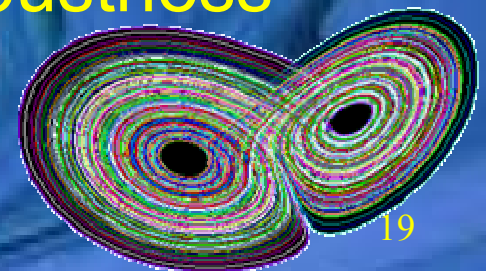
- nonlinear, feedback loops
- sensitive to initial conditions/Butterfly Effect (Jurassic Park)
- self-organization (patterns, shape, structure)
- attractors, strange attractors

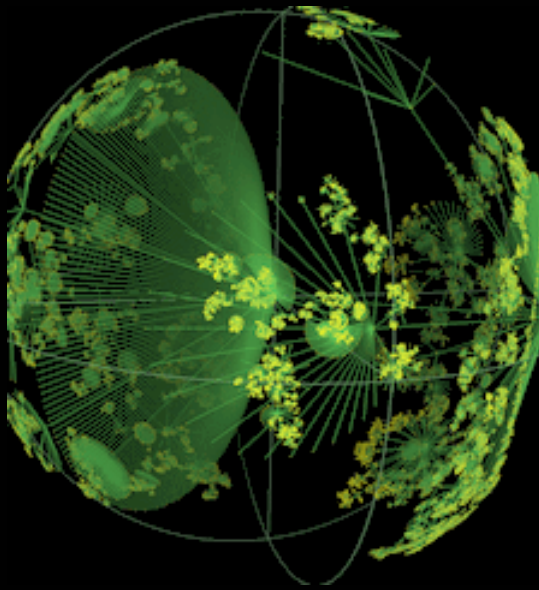
Adaptive

complexity (biology)

- adaptation
- edge of chaos
- evolution (co, meta)
- simple rules
- networks
- emergence
- robustness

--Visual Thinking--

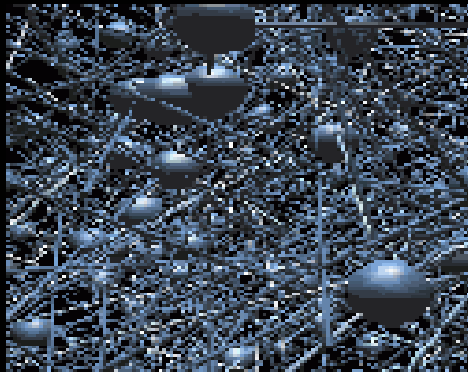




www.cybergeography.com

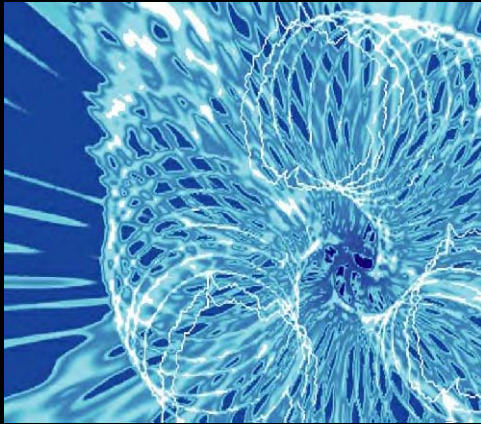
Cyber Networks

imagining local & global features



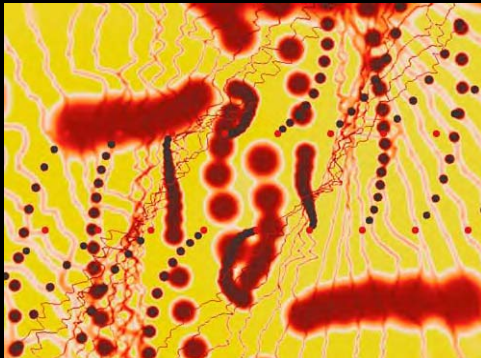
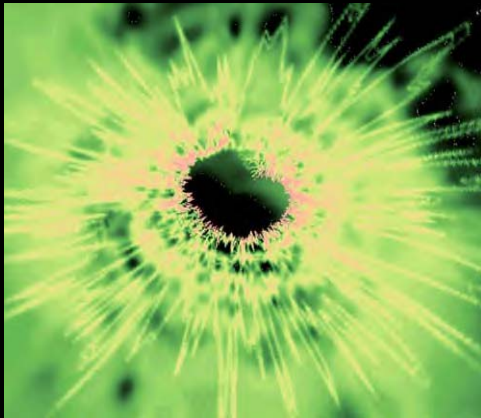
Social Networks

Stephen G. Erick



Music for Your Eyes

www.peacockmaps.com



Summary

from linear, mechanical —————> nonlinear, dynamical systems

from machines, clocks —————> living organisms, ecosystems

open, adaptive, self-organizing, evolving system of networks

wide-spread information flow, feedback loops

pattern-forming “underlying order”


sensitive to changes in initial conditions = what’s perking?

simple rules, complex behavior

best understood by observing the whole system over time

emergent qualities, behavior

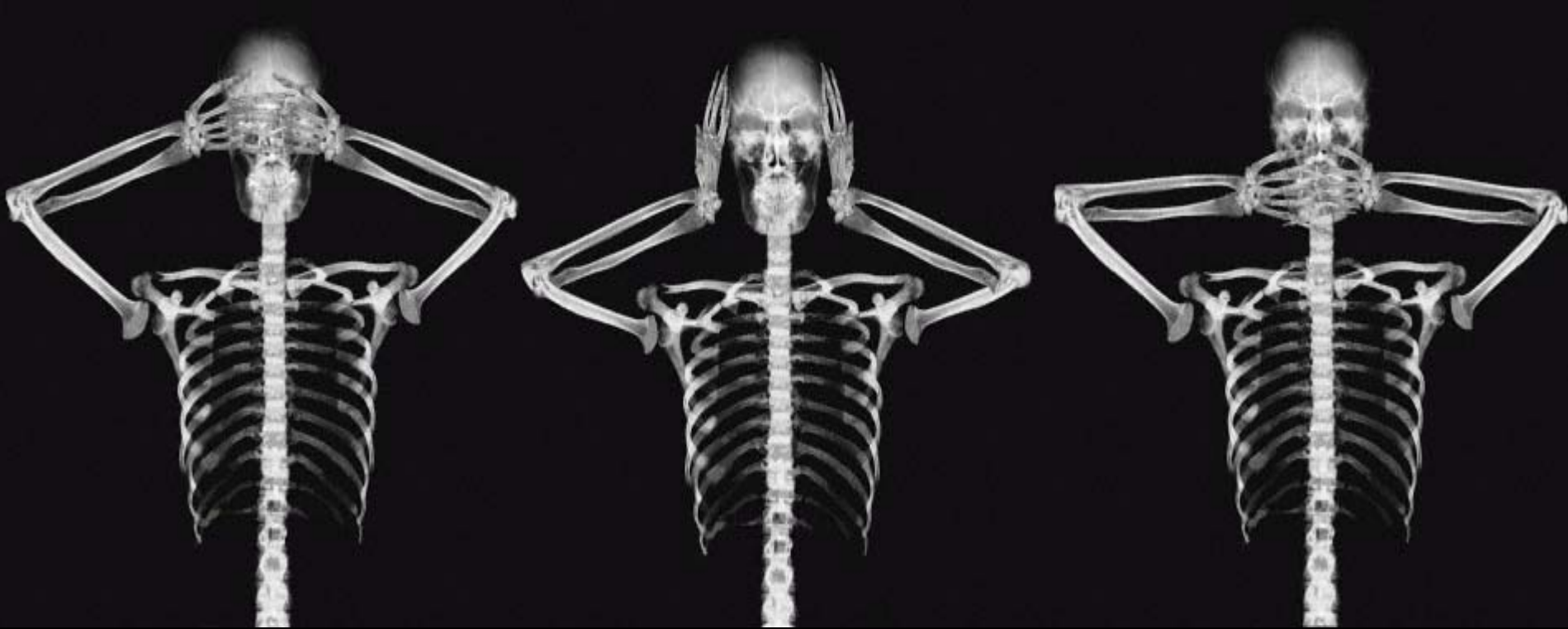
healthiest at the “edge of chaos”



old beliefs often shatter
on the rocks of historical
events, and new thinking
emerges from the wreckage.

Ping Chen

How Do You Think About the Future?

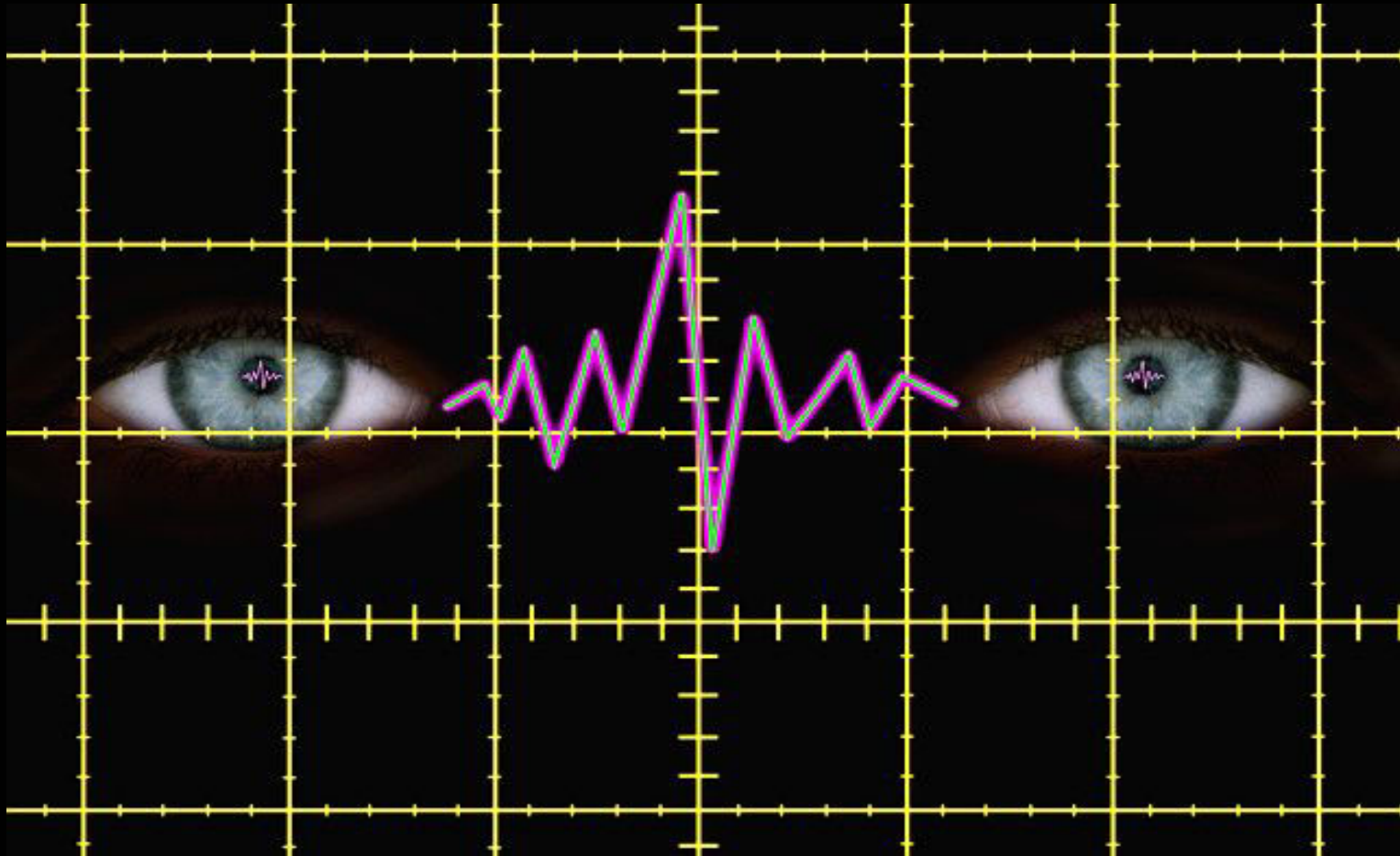


Complexity will help us understand more clearly the dynamics of the big picture context in which our decisions and strategies are being made.





**Complexity provides a new framework
for developing a global or whole-system
perspective when addressing strategic
and organizational issues.**



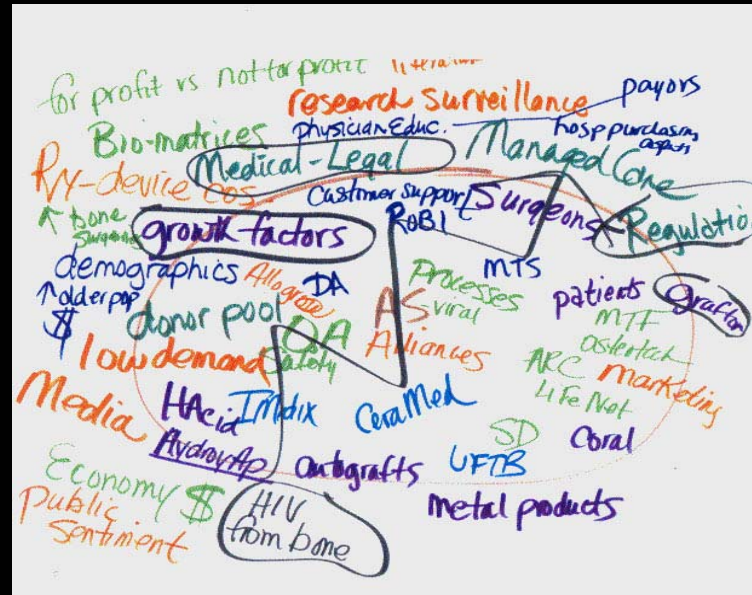
Data Visualization vs. Visual Thinking

Data Visualization Forecasting



Visual Thinking Tools

Insight-Foresight



A FutureScape®

a landscape of the future as it is beginning to take shape

a weather map of the larger environment

supports
nonlinear
thinking

helps
identify
emerging
conditions
and
opps

clusters
of issues,
questions

hindsight about the past

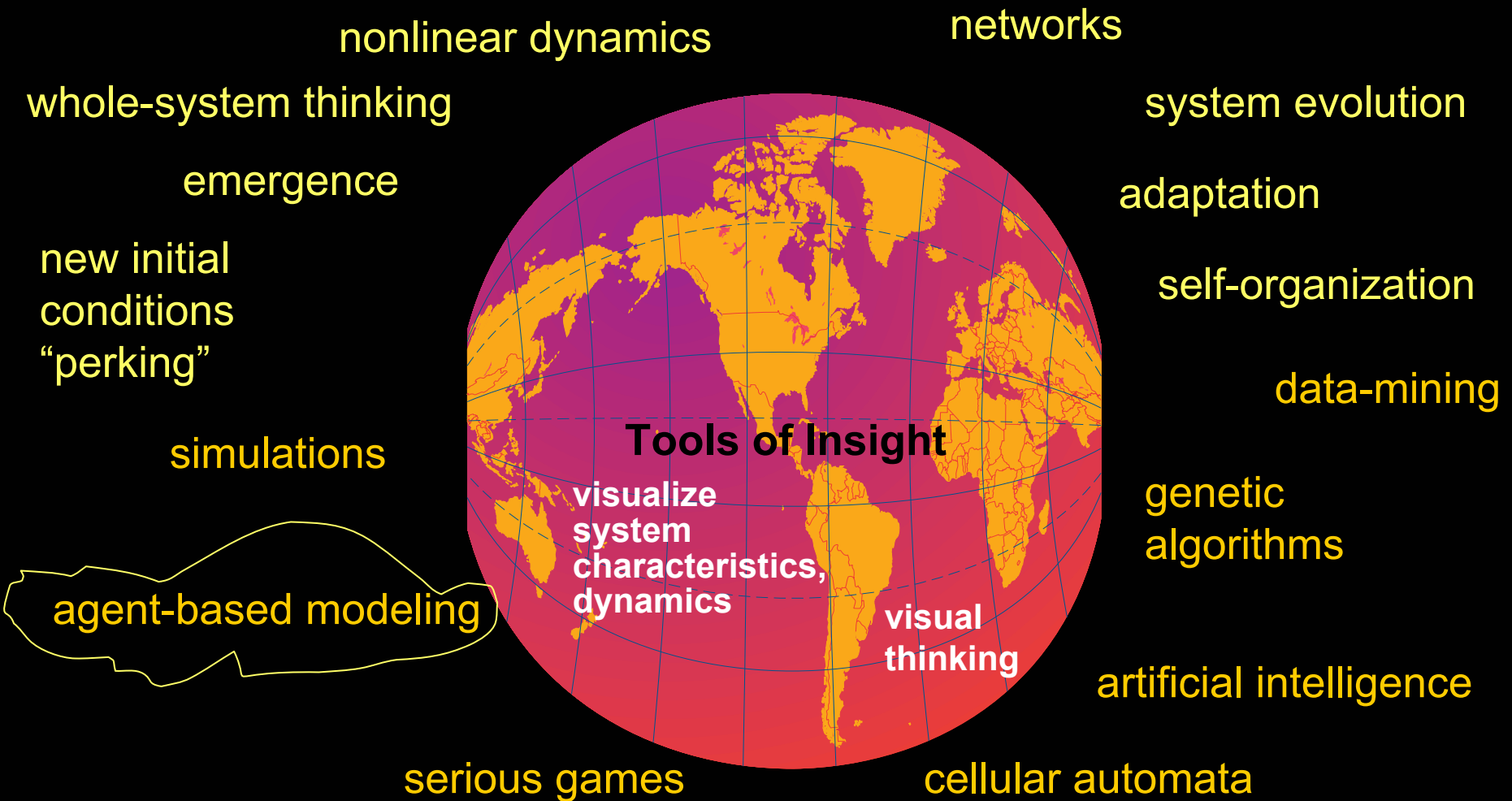
insight about
the present

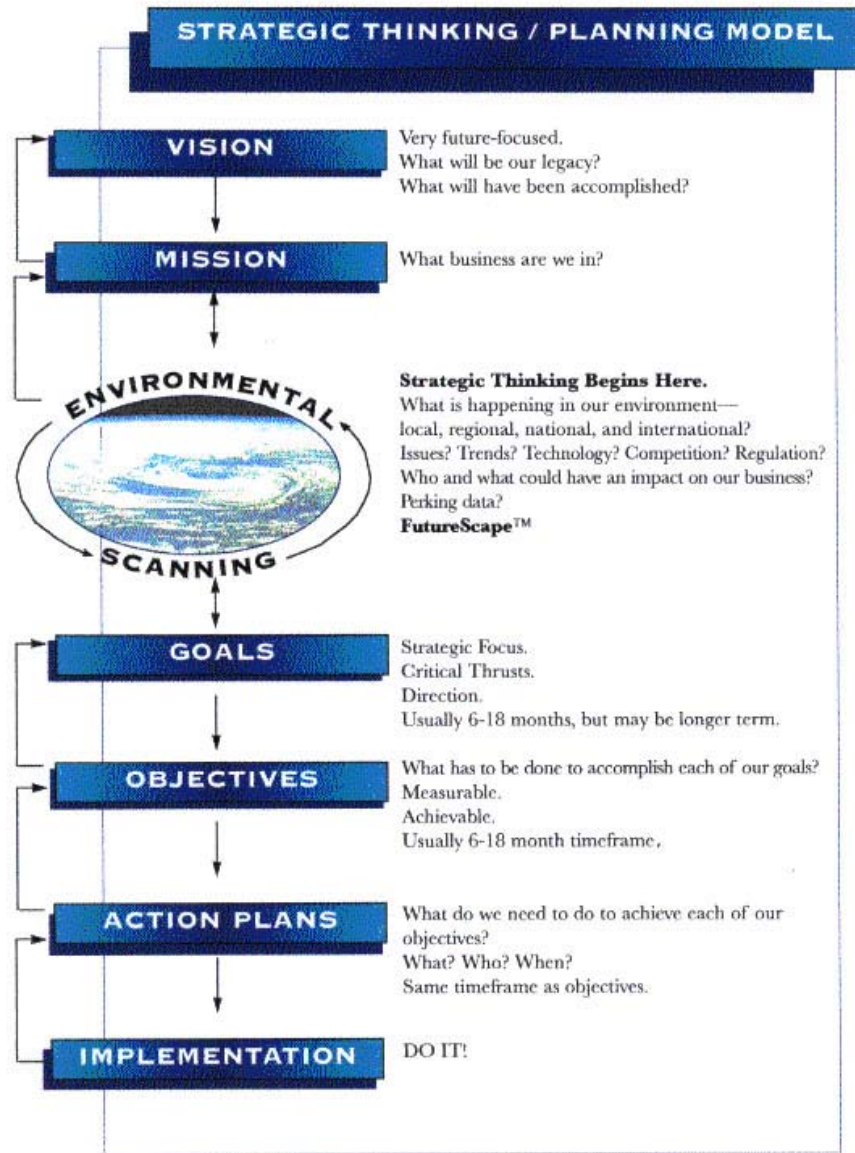
foresight about
the future



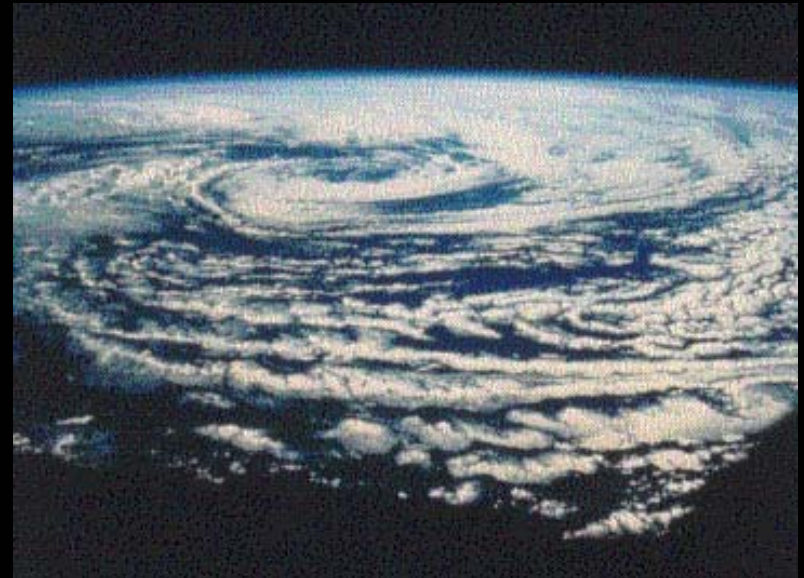
results in direction setting

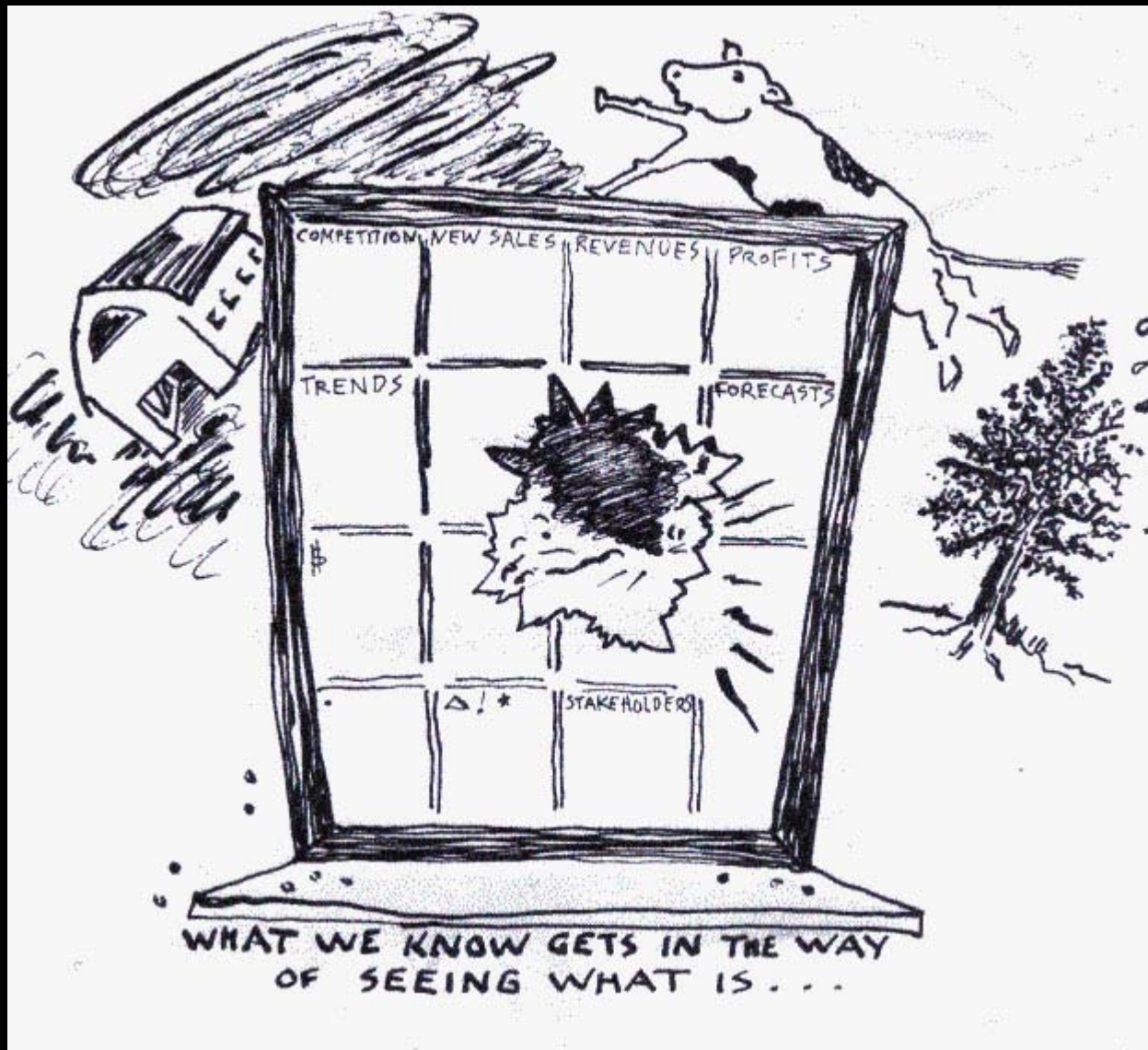
Complex Systems Concepts-Tools Map





Copyright © T. Irene Sanders





Cyber Security: Changing Big Picture Context

Hindsight

Insight

Foresight



National Cyber Defense Strategy

Through the Lens of Complexity

**Research
Agenda**

**International
Collaboration**

**Cyber
Intelligence
Needs**

**Management
& Leadership
Challenges**

**Ongoing
Design
Challenges**

**Public-Private
Collaboration
& Accountability**

**Education &
Training
Needs**

**Policy
Options,
Recommendations**

The Use of Complexity Science

A new report on the complexity science landscape in the United States
--requested by U.S. Secretary of Education Rod Paige

Since 9/11, Use of Complexity is Growing Rapidly

Research, Business, Education

10 of 15 Departments Involved in Complexity-based Research

Agent-based Modeling is Primary Research Tool

Few Using it Strategically

7 Principles of Strategic Thinking



Look at whole systems, not just their parts.
(The system is always bigger than you think.)



Complex adaptive systems are self-organizing
and pattern-forming.

(What are the attractors in the system?)




Small changes can create big results. (BE)
(What's perking at the edges, on the horizon?)



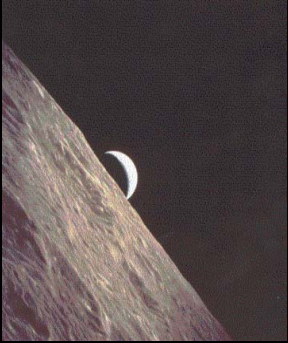
Maps, models and visual images make it easier to see connections, relationships, patterns of interaction.



Scanning across disciplines, forces, agencies etc...is the key to seeing subtle changes, emerging conditions.
(multiple perspectives, integration of knowledge)



Nonlinear thinking is critical to recognizing clues about changes in the environment.



Perspective is important. You have to know what you're looking at (local-global), place in context.

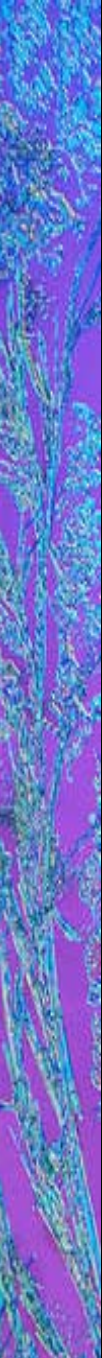
Earth rising
as seen from
the surface
of the moon.



Conclusions:

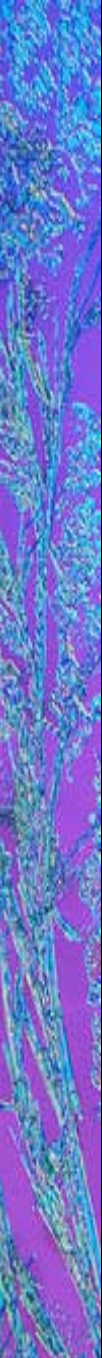
A fundamental shift in thinking,
a new worldview, a theory-driven
framework for thinking about the future.

To be an effective leader,
you must understand and develop
the skills of complexity thinking.



What everyone knows is what has
already happened or become obvious.

What the aware individual knows is
what has not yet taken shape, what
has not yet occurred.



Everyone says victory in battle is
good, but if you see the subtle and
notice the hidden so as to seize
victory where there is no form,
that is really good.

Sun Tzu
The Art of War

Washington Center for Complexity and Public Policy

T. Irene Sanders
202-429-3733
info@complexsys.org
www.complexsys.org