

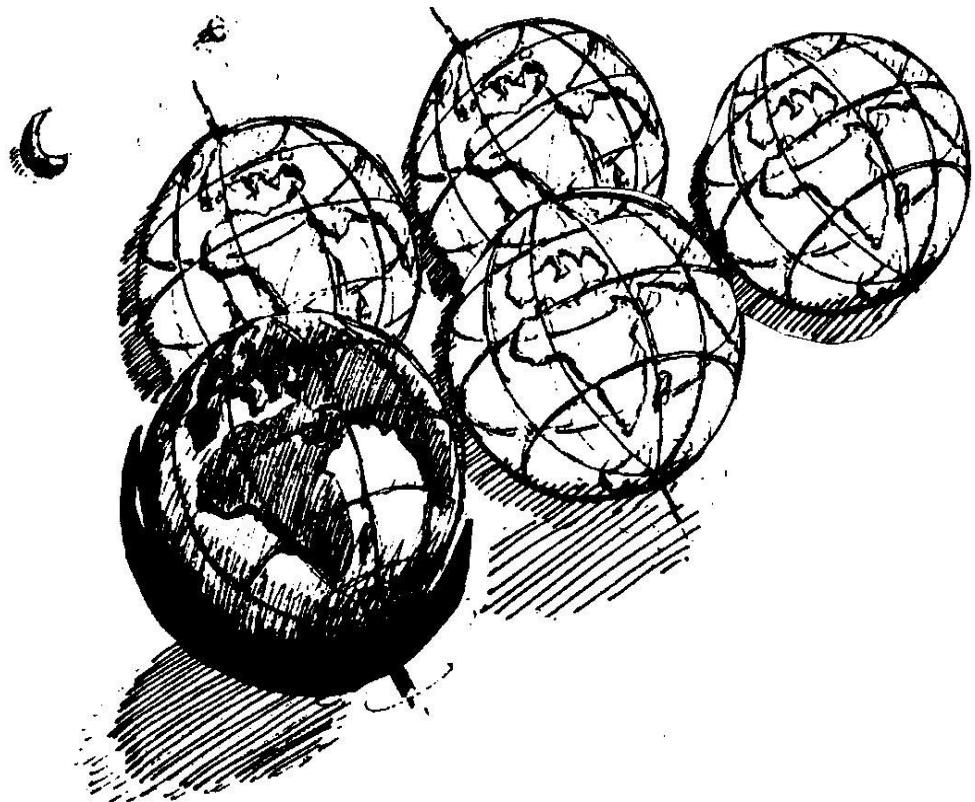
# Carrying Capacity, Cognition and Collapse: Reflections on the Human Prospect

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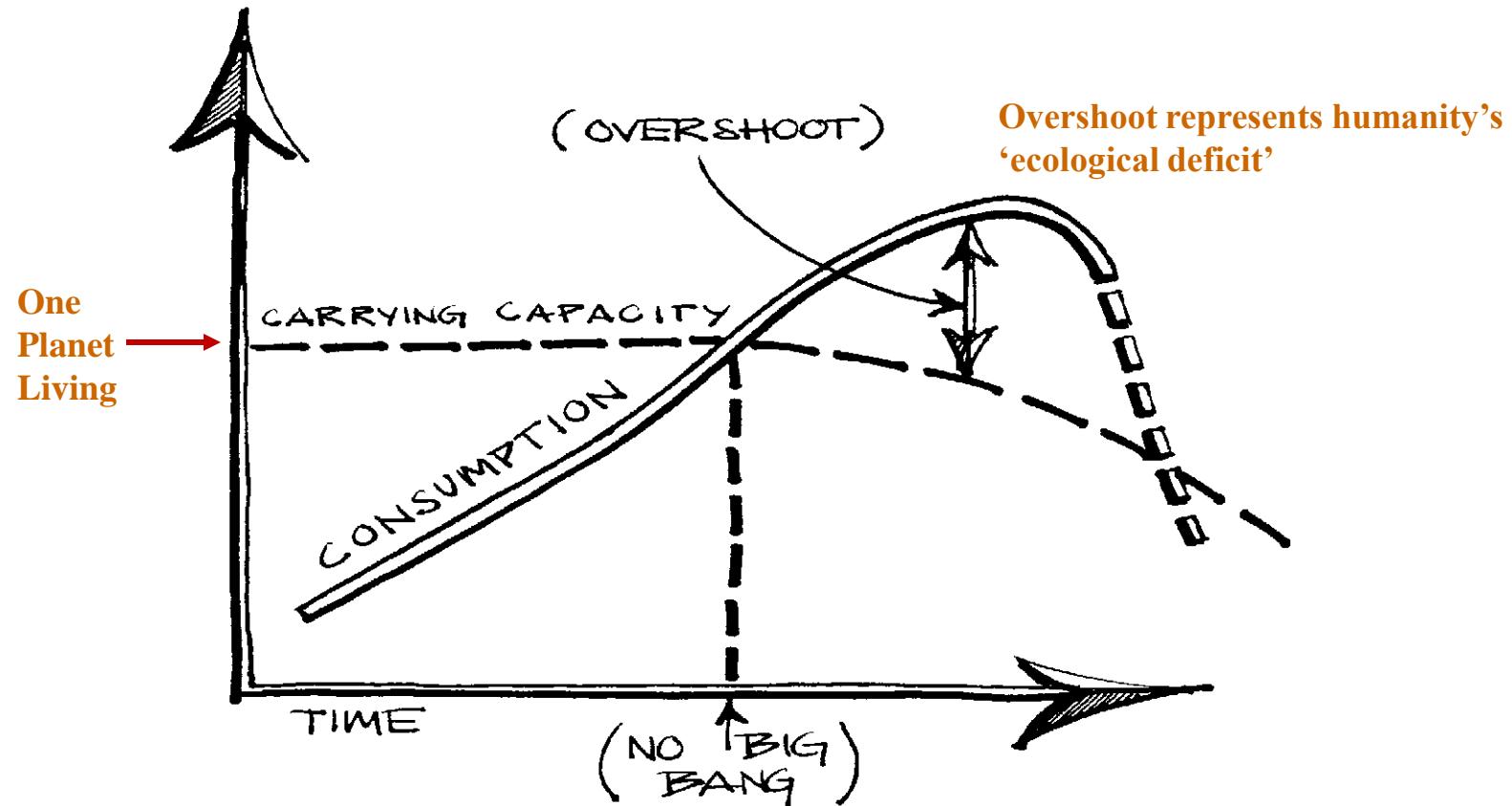
ISEE Annual Meeting  
Challenges and Contributions for a Green Economy  
Rio de Janeiro, Brazil ( June 2012)

# Eco-footprinting shows that:

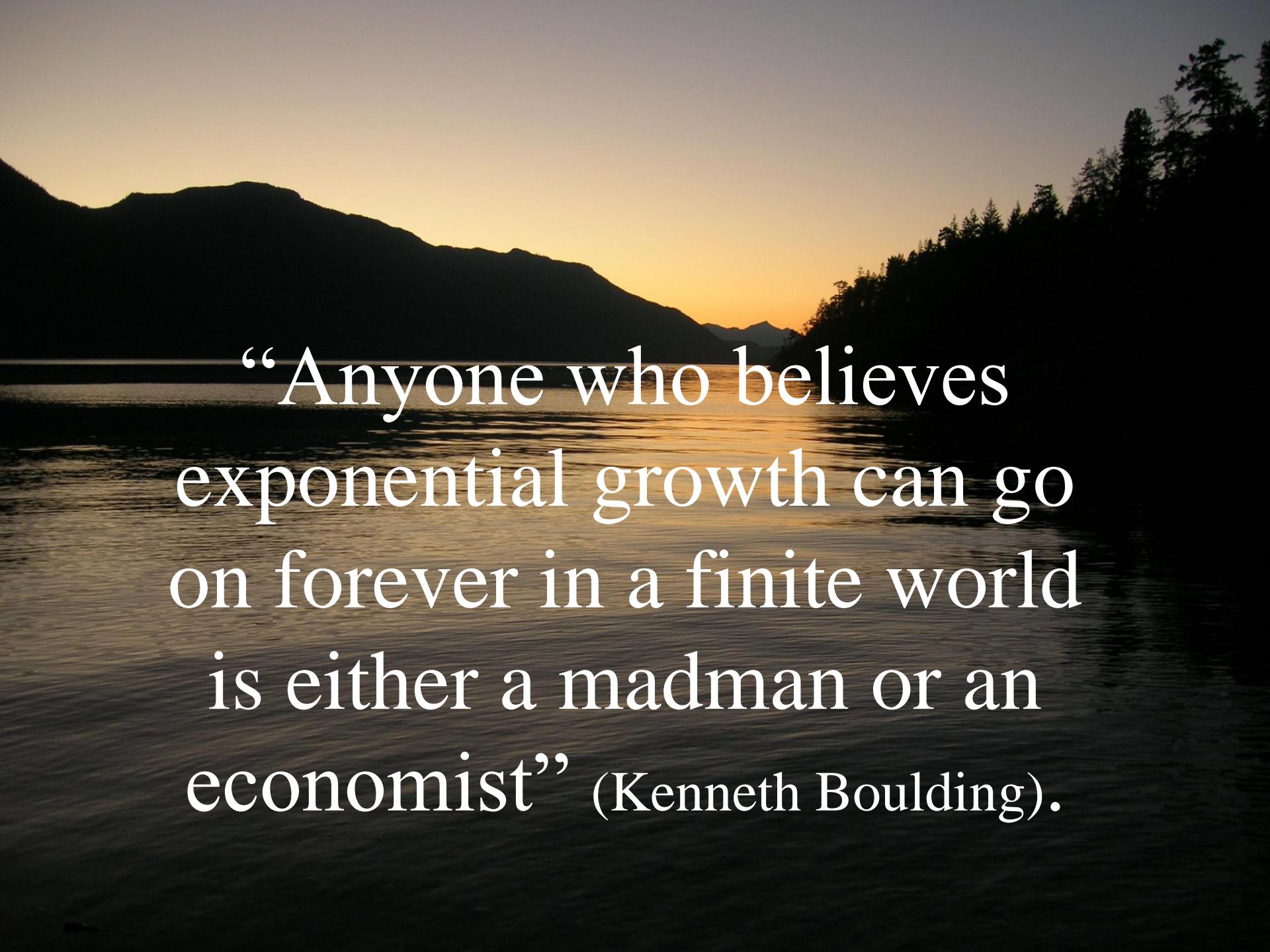
- The human enterprise has exceeded long-term global carrying capacity. This is a world in over-shoot.
- To ‘sustain’ just the present world population at the material standards enjoyed by North Americans, would require four plus Earth-like planets! **Regrettably** “Good planets are hard to find.”



# Societies in overshoot invite catastrophic collapse



Whenever a population grows beyond carrying capacity, the environment is degraded. Think: climate change, ozone depletion, sea level rise, deforestation, fisheries collapses, soil erosion, etc. These are consequences of “uneconomic growth” that makes us poorer, not richer (Daly, var.).

A photograph of a sunset over a body of water, likely a lake or river. The sky is a warm orange and yellow, transitioning to a darker blue at the top. In the background, there are dark silhouettes of mountains. On the right side, a forested hillside is visible, with trees silhouetted against the sky. The water in the foreground has a slight reflection of the sunset colors.

“Anyone who believes  
exponential growth can go  
on forever in a finite world  
is either a madman or an  
economist” (Kenneth Boulding).

# Premise #1: *H. Sapiens* has unique potential

- Four intellectual and emotional qualities distinguish humans from other advanced vertebrates:
  - unparalleled capacity for evidence-based reasoning and logical analysis;
  - unique capacity for forward planning, to shape our own future;
  - the capacity for moral judgment;
  - compassion for other individuals and other species.

# The sustainability conundrum

- So why has the world community, particularly rich, economically and technologically competent nations failed utterly to reverse or even substantially slow the degradation of the ecosphere, the widening income gap, biodiversity loss, etc.?
- On the contrary, the worst impacts of global change are the result of high intelligence:  
“...[the depletion and pollution of the planet] is not the work of ignorant people. Rather it is largely the result of work by people with BAs, BSSs, LLBs, MBAs and PhDs” (Orr 1994).

# Evidence: “The three conventions [of Rio ’92] have failed to achieve even a fraction of the promises...”

(Tollefson and Gilbert, Nature, 7 June 2012)

REPORT CARD	
<b>UN FRAMEWORK CONVENTION ON CLIMATE CHANGE</b>	
MAIN ASSIGNMENT	
STABILIZE GREENHOUSE-GAS EMISSIONS	<b>F</b>
OTHER ASSIGNMENTS	
TRACK GREENHOUSE-GAS EMISSIONS AND SINKS	<b>A</b>
<i>The climate convention has helped to create national inventories of greenhouse-gas emissions, land-use trends and carbon uptake by forests.</i>	
PROMOTE AND DISPERSE CLIMATE-FRIENDLY TECHNOLOGIES	<b>D</b>
<i>The Clean Development Mechanism allows industrialized countries to offset their emissions by paying for clean energy and other projects in developing countries, but the programme has been limited in both reach and effectiveness.</i>	
PROMOTE SUSTAINABLE LAND MANAGEMENT	<b>C</b>
<i>The climate talks have encouraged efforts to advance sustainable agriculture and reduce tropical deforestation.</i>	
PREPARE FOR THE IMPACTS OF CLIMATE CHANGE	<b>C</b>
<i>Many of the 194 countries that are party to the convention have only recently begun formulating plans to prepare for a warmer world.</i>	
ADVANCE CLIMATE RESEARCH AND POLICY ANALYSIS	<b>A</b>
<i>The UN process has encouraged investments in climate science, energy technologies and social sciences.</i>	
ESTABLISH A DIPLOMATIC PROCESS	<b>A</b>
<i>The annual ‘Conference of the Parties’ to the climate convention, or COP, has become an international roadshow for professional climate diplomats.</i>	

REPORT CARD	
<b>CONVENTION ON BIOLOGICAL DIVERSITY</b>	
MAIN ASSIGNMENT	
REDUCE THE RATE OF BIODIVERSITY LOSS	<b>F</b>
OTHER ASSIGNMENTS	
DEVELOP BIODIVERSITY TARGETS	<b>D</b>
<i>Nations have only just started to establish focused targets for biodiversity and ways to assess it.</i>	
PROTECT ECOSYSTEMS	<b>C</b>
<i>At least 10% of the world’s ecologically valuable regions on land was protected by 2010, but only about 1% of those in the oceans.</i>	
SHARE GENE WINDFALL	<b>E</b>
<i>The Nagoya Protocol on the sharing of commercial benefits derived from the collection and use of genetic material has been signed by 92 countries, but is not yet in force. Only a few companies so far have shared such benefits with the source country.</i>	
RECOGNIZE INDIGENOUS RIGHTS	<b>D</b>
<i>Nations are very variable in honouring the rights of indigenous people, especially in creating protected areas within their territory.</i>	
PROVIDE FUNDING	<b>F</b>
<i>Countries have made many commitments but honoured few of them.</i>	
REGULATE GENETICALLY MODIFIED ORGANISMS	<b>A</b>
<i>The Cartagena Protocol, signed by 103 countries, is designed to help regulate the movement of genetically modified organisms between countries, and came into force in 2003.</i>	

REPORT CARD	
<b>UN CONVENTION TO COMBAT DESERTIFICATION</b>	
MAIN ASSIGNMENT	
REVERSE DESERTIFICATION AND LAND DEGRADATION	<b>F</b>
OTHER ASSIGNMENTS	
DEVELOP INDICATORS	<b>D</b>
<i>It took until 2009 for nations to agree on a set of metrics by which to measure progress.</i>	
BUILD SCIENCE CORPS	<b>F</b>
<i>Countries have lagged in training scientists on this issue, particularly in developing nations.</i>	
PROVIDE FUNDING FOR DEVELOPING NATIONS	<b>E</b>
<i>The United Nations Global Environment Facility fund has given less than \$400 million for efforts to reverse land and build scientific and technical capacity in poorer nations that are most affected by land degradation.</i>	

# Premise # 2

“Nothing in Biology  
Makes Sense Except in the  
Light of Evolution”

(Theodosius Dobzhansky)

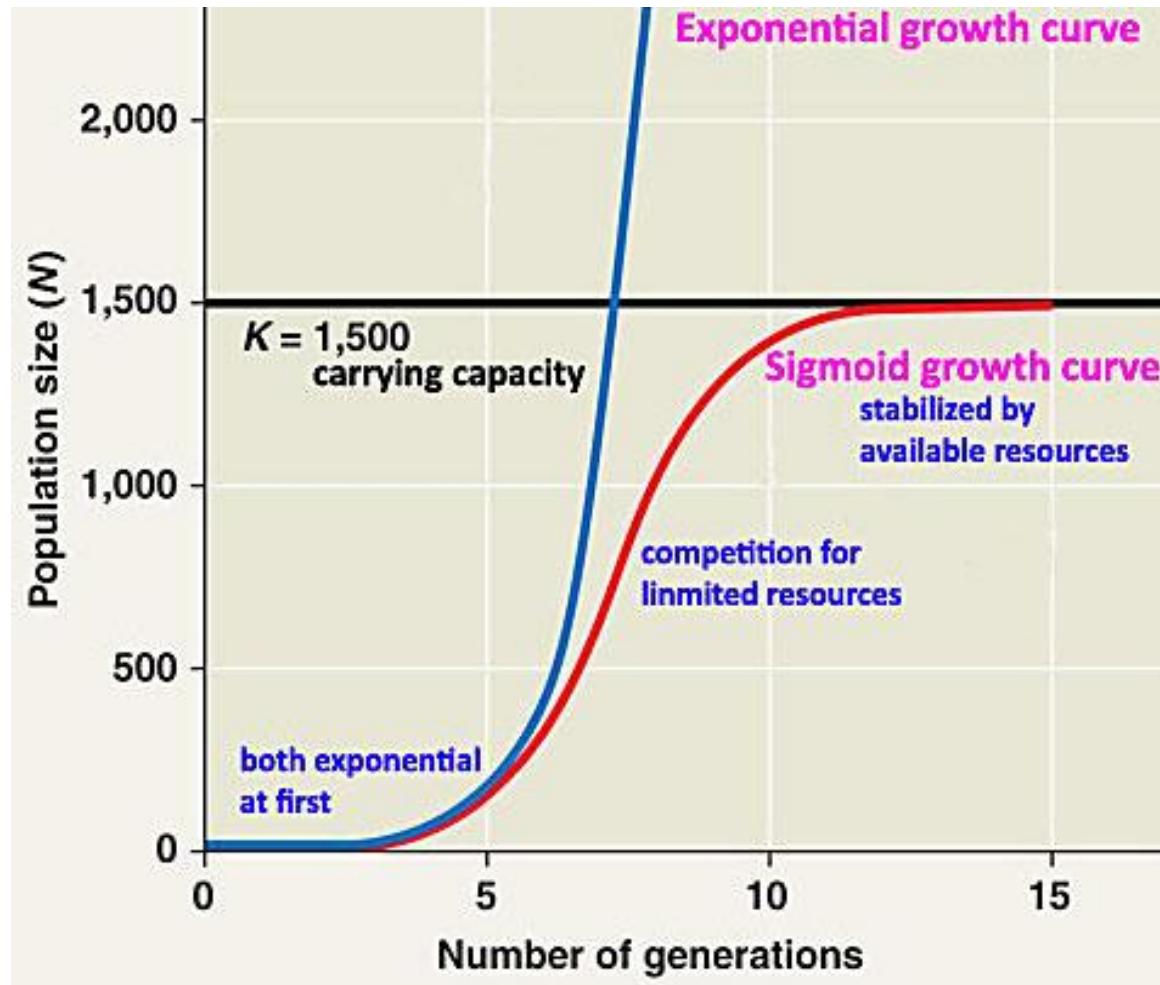
H. sapiens is a highly evolved species.  
Arguably, therefore, *nothing in human affairs makes sense except in light of evolution!*

# Hypothesis part ‘a’: *H.Sapiens* is potentially unsustainable by nature

## Base nature (genetic predisposition)

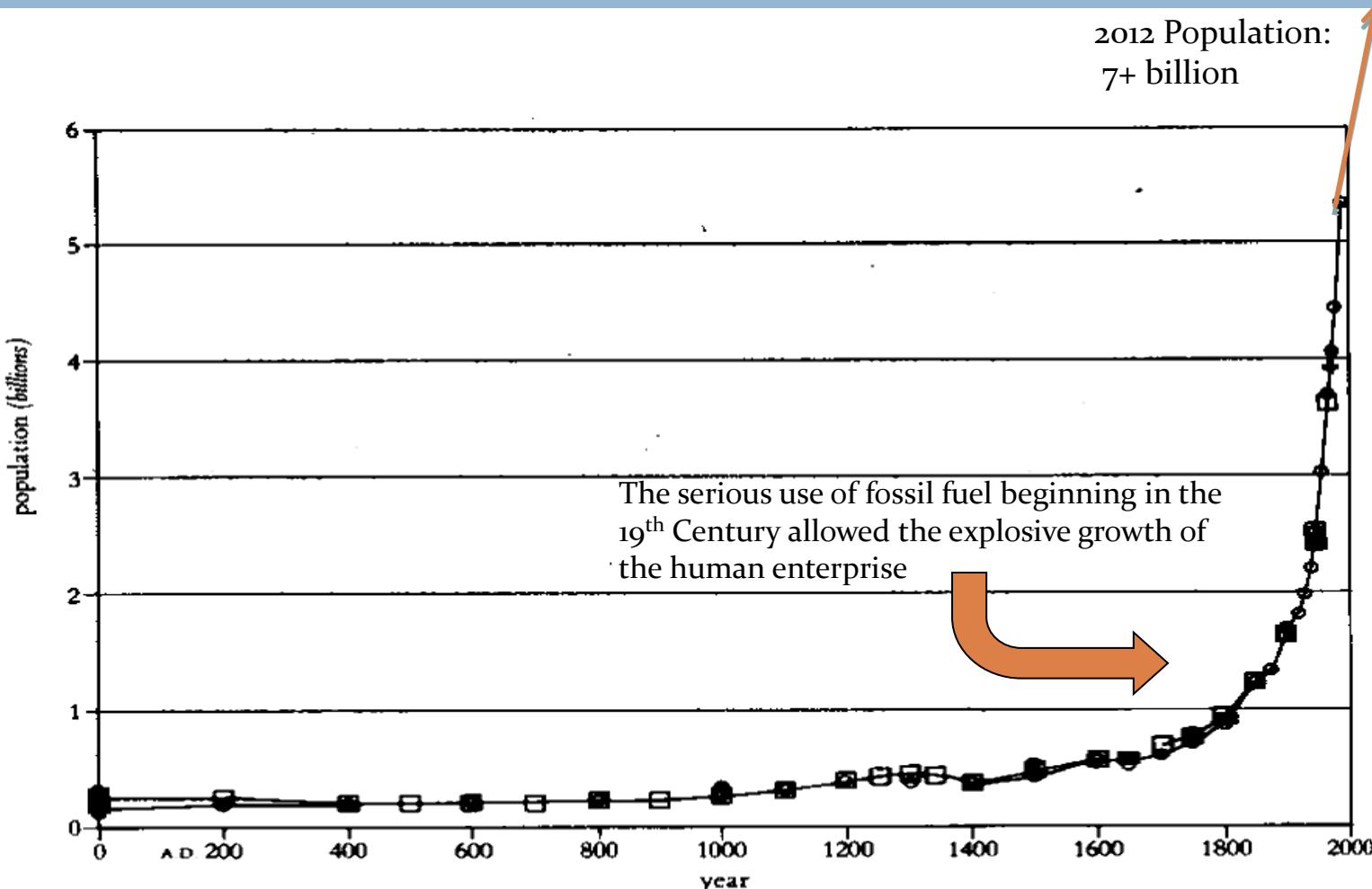
- Unless or until constrained by negative feedback, *H. sapiens*, like all other species/populations tend to:
  - *expand to fill all the ecological space accessible to them and*
  - *use all available resources (in the case of humans, to the limits of contemporary technology)* (Rees 2006).

# Human reproductive biology: Archetypal ‘K’-strategists (what Malthus knew)



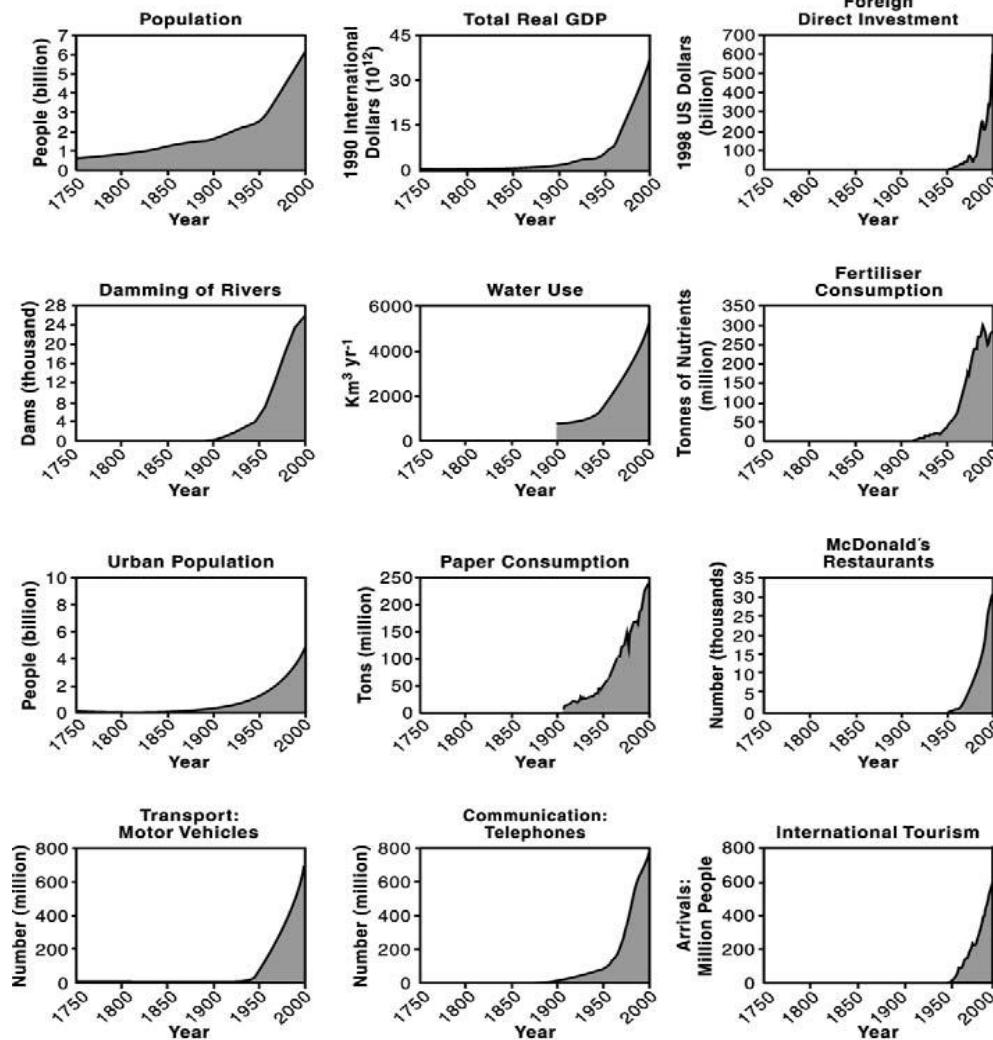
- **Typical ‘K’-Strategist**  
Large, long-lived, slowly reproducing, competitive organisms that usually express intensive parental care and high survival rates to maturity.
- Local populations tend to press up against carrying capacity.
- Humans are clearly ‘K-strategists, a distinction we share with other mammals ranging from tapirs through elephants to blue whales.

# Evidence: The anomalous, unsustainable oil-based expansion of the human enterprise



Continuous growth—population and economic—is an anomaly. The growth spurt that recent generations take to be normal is the single most abnormal period of human history.

# The ‘Great Acceleration’, post 1750: The exponential growth of consumption beyond carrying capacity



- “The Great Acceleration is clearly shown in every component of the human enterprise included in the figure. Either the component was not present before 1950 (e.g., foreign direct investment) or its rate of change increased sharply after 1950 (e.g., population)” (Steffen, Crutzen & McNeill 2007 [Ambio 36: 314-321])
- NB: This explosion of energy and material throughput (i.e., consumption and pollution) has occurred during a period of unprecedented technological and economic efficiency gains.

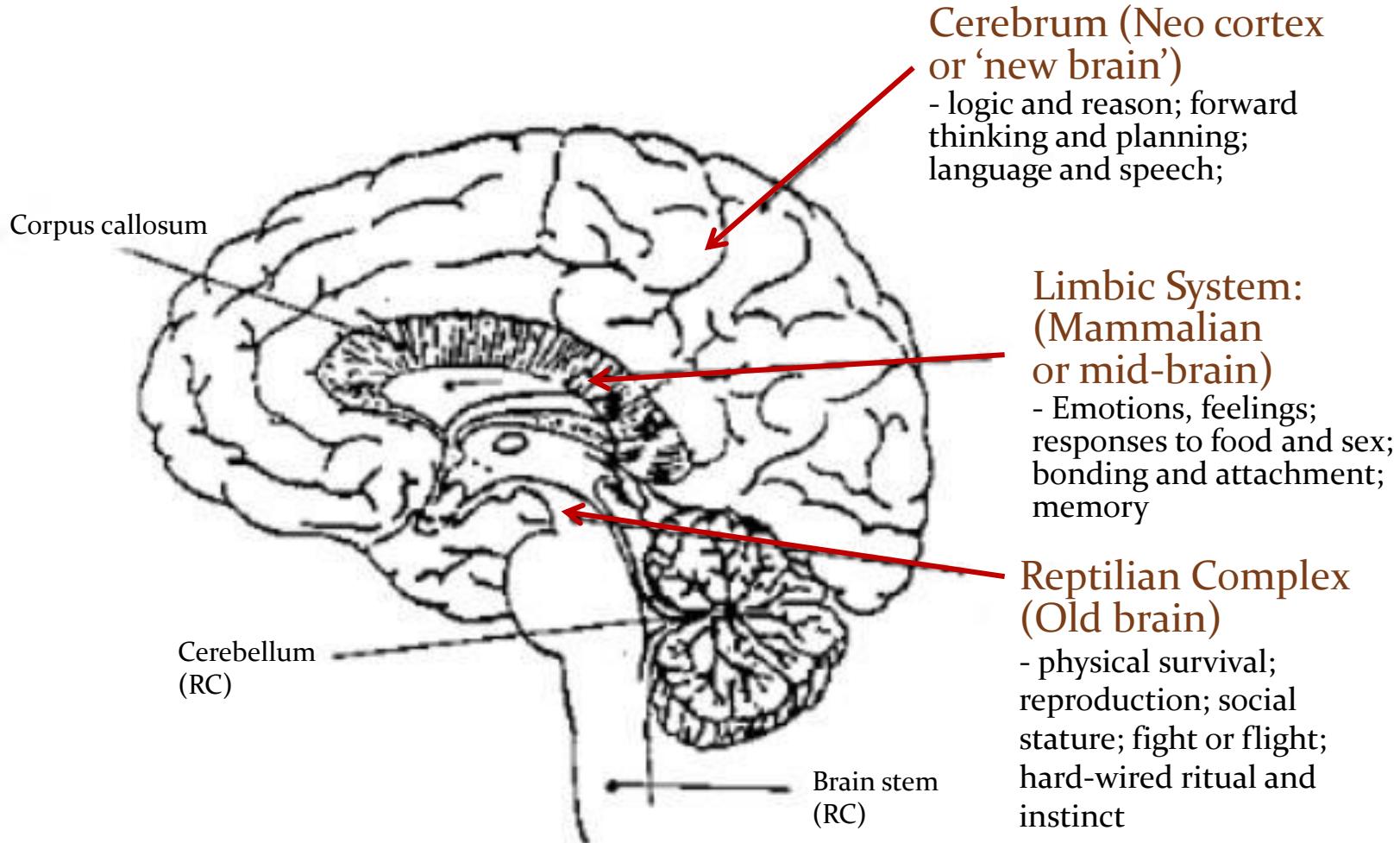
# Hypothesis part ‘b’: *H.Sapiens* is also unsustainable by nurture

Careless nurture: Cultural or ‘memetic’ predispositions (maladaptive paradigms, ideologies, and ‘pre-analytic visions’)

- Our socially-constructed myth of progress and continuous growth:
  - “*We have in our hands now... the technology to feed, clothe, and supply energy to an ever-growing population for the next seven billion years...*” (J. Simon 1995).
- The emergence of a socially-constructed new ‘age of unreason’
  - *E.g., politics dominated by neoliberal ideology, religious fundamentalism, climate-change denial, anti-intellectualism and other forms of ‘magical thinking’.*

# The cognitive connection:

## Starting with Paul MacLean's “triune brain” hypothesis



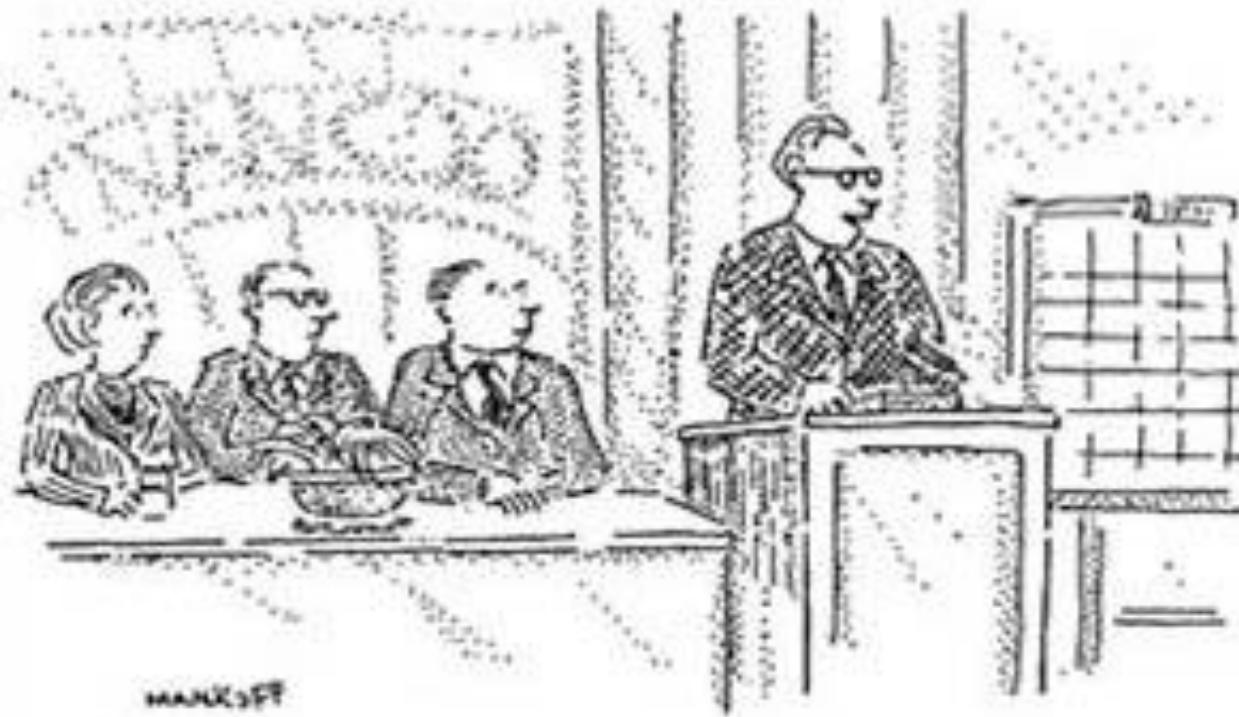
# Free will? We don't even know which sub-brain is calling the shots

- While MacLean erred about evolutionary sequences and anatomic details, he got the basic functional relationships and tensions about right.
- “A bevy of experiments in recent years suggest that the conscious mind is like a monkey riding a tiger of subconscious decisions and actions in progress, frantically making up stories about being in control” (Overbye 2007).

# Tension in the Integrated Mind

- Humans seem uniquely self-conscious and rational –we ‘live’ in cerebral consciousness. However:
- When anything from simple comfort to safety or ‘survival’ (including personal prestige, socio-economic status, political power—i.e., the ‘*status quo*’) are threatened, innate behavioural propensities that operate *beneath consciousness* (in the mid-brain and reptilian brain-stem) override rational responses. That is:
- **Passion and instinct often trump reason.**

# *H. sapiens* is a deeply conflicted species



*"And so, while the end-of-the-world scenario will be  
rise with unimaginable horrors, we believe that the  
pre-end period will be filled with unprecedented  
opportunities for profit."*

# Neurological macro-anatomy

(genetic influences on how people process information)

For a good elaboration, see Chris Mooney's, *The Republican Brain* (2012)

## The 'conservative' brain

- Relatively closed-minded; uncomfortable with novelty; likely to oppose 'radical' new ideas; prefers 'black-and-white' certainty; less likely to alter foundational beliefs. I.e.,
- More likely to seek out ideas that reinforce existing beliefs, values; more prone to deny reality.
- More authoritarian, hierarchical, individualistic; people are on their own, responsible for themselves.

## The 'liberal' Brain

- More open-minded, flexible, curious; more comfortable with uncertainty; more nuanced in thinking; more likely to change beliefs and accept new realities. I.e.,
- More likely to be moved by evidence-based reasoning.
- More relaxed about authority and social order; more disposed to community and collective values; people are responsible for each other.

# Then there is socio-cultural imprinting: Soft-wiring the maturing brain

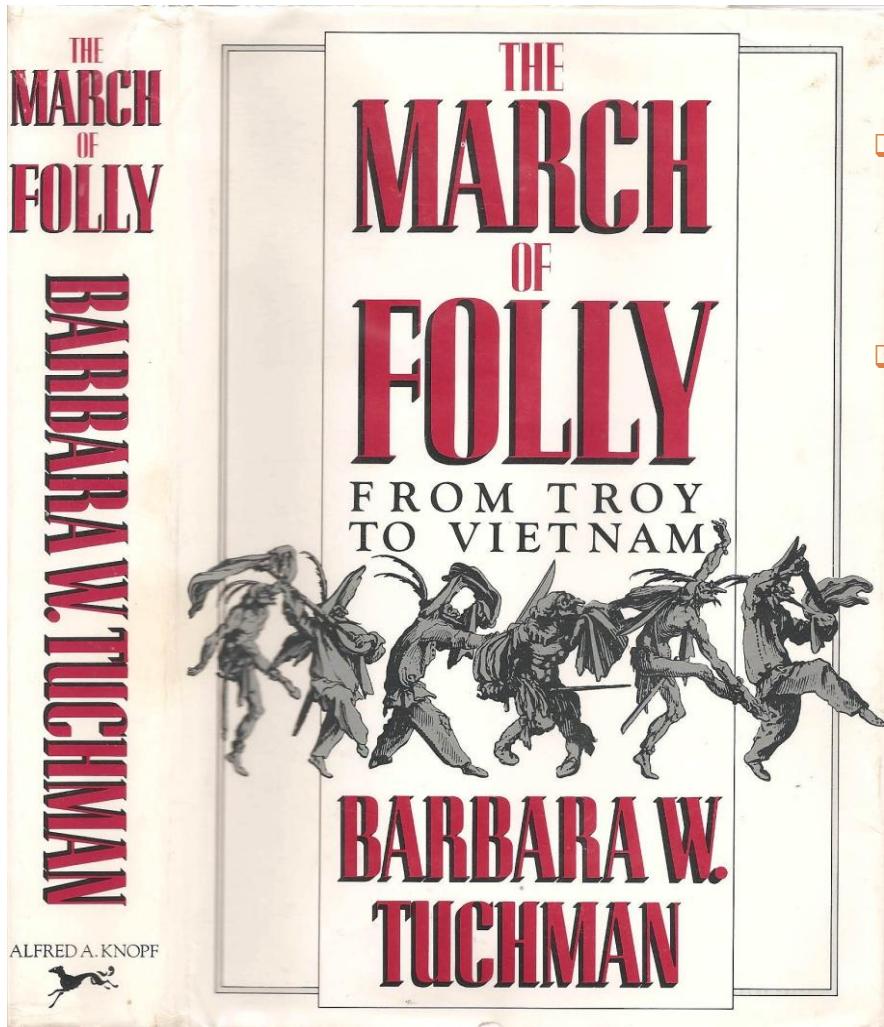


- During individual development, sensory experiences and cultural norms literally shape the human brain's synaptic circuitry in patterns that reflect and embed those experiences.
- Subsequently, people seek out *compatible* experiences and, **“when faced with information that does not agree with their [preformed] internal structures, they deny, discredit, reinterpret or forget that information”** (Wexler, 2006).

# Shared Illusions: Our collective shield against the harsh barbs of reality

- “The masses have never thirsted after truth. They turn aside from evidence that is not to their taste, preferring to deify error...”  
(Gustave le Bon 1896).
- “For us to maintain our way of living, we must... tell lies to each other, and especially to ourselves... [the lies] are necessary because without them many deplorable acts would become impossibilities” (Jensen 2000).

# The problem is universal and persistent (i.e., it's part of our fundamental nature)

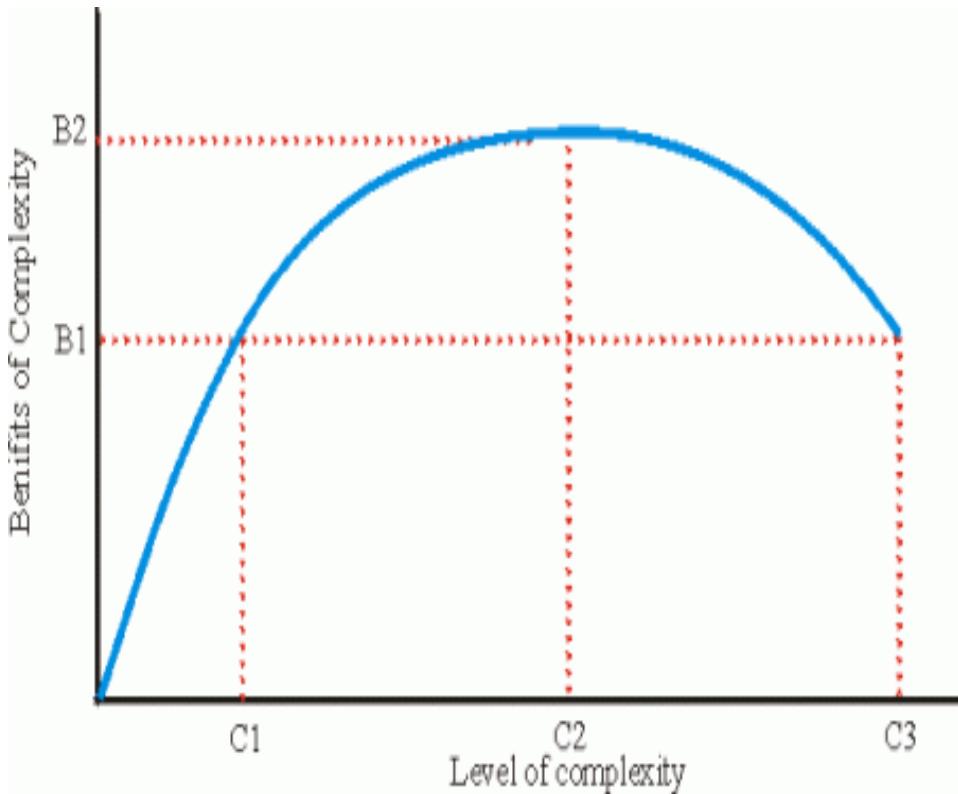


- “Not truth, but error has always been the chief factor in the evolution of nations...” (*Le Bon* 1895).
- “Wooden-headedness, the source of self deception ...plays a remarkably large role in government. It consists in assessing a situation in terms of preconceived fixed notions [i.e., ideology] while ignoring any contrary signs. It is acting according to wish while not allowing oneself to be deflected by the facts”  
(Tuchman 1984).

# The US stance at Rio +20

- “The word ‘equitable’, the US insists, must be cleansed from the text. So must any mention of the right to food, water, health, the rule of law, gender equality and women’s empowerment. So must a clear target of preventing two degrees of global warming. So must a commitment to change ‘unsustainable consumption and production patterns’ and to decouple economic growth from the use of natural resources”  
(Monbiot. 18 Jn 2012).

# Consider now *The Collapse of Complex Societies* (Tainter 1988)



- Human societies are problem-solving systems. Each solution leads to greater societal complexity (e.g., division of labour, class structure, technological sophistication)
- But each such complexification increases the energy/material flows required to maintain the structural and functional integrity of the system.
- Eventually, “continued investment in complexity as a problem solving strategy yields a declining marginal return” (e.g., incomes stop rising). Tensions, adversity and dissatisfaction build up, resulting in ideological strife (e.g. between rich and poor, growth and no-growth).

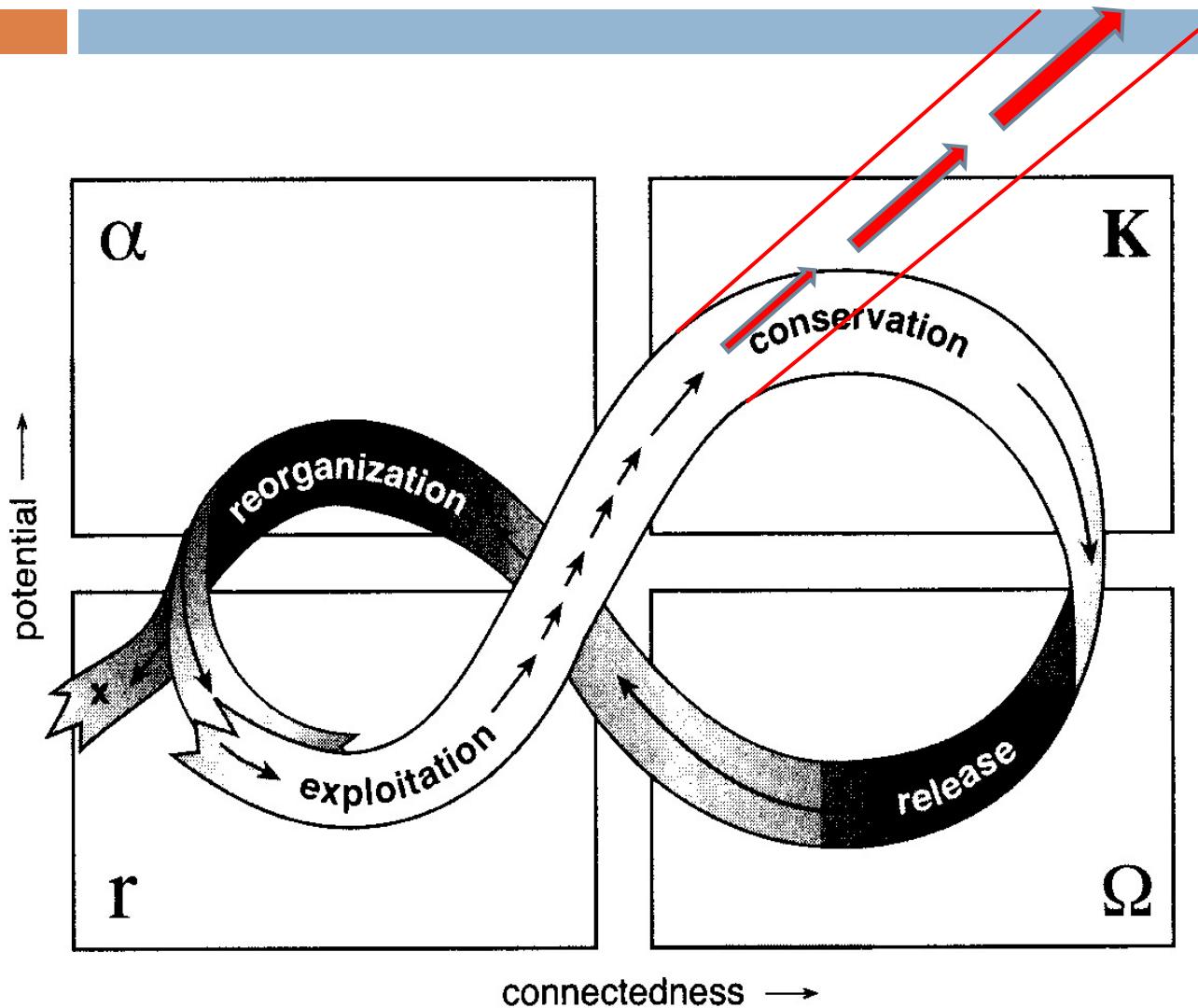
# Joseph Tainter on ‘collapse’

- ❑ Collapse is evident “...when an empire, chiefdom or tribe experiences a “significant loss of an established level of socio-political complexity...” (Tainter 1988).
- ❑ Increasingly radical attempts to save the system... cannot permanently reserve the trend towards... disequilibrium; eventually, everyone loses faith in the system and there is a severe collapse”  
(Karlin 2009, after Tainter 1988).
- ❑ Think: impossible indebtedness and financial bailouts; accelerating climate change and risky geo-engineering schemes.

# Collapse: Jared Diamond's version

- Collapse implies “a drastic decrease in human population size and/or political/economic/social complexity, over a considerable area for an extended time” (Diamond 2005).
- Diamond’s five classes of causal mechanisms:
  - damage that people inflict on their ecosystems,
  - climate change,
  - the actions of hostile neighbours
  - loss of contact with trading partners (friendly neighbours); and most importantly:
  - how a society responds to the other classes of problems as they arise.

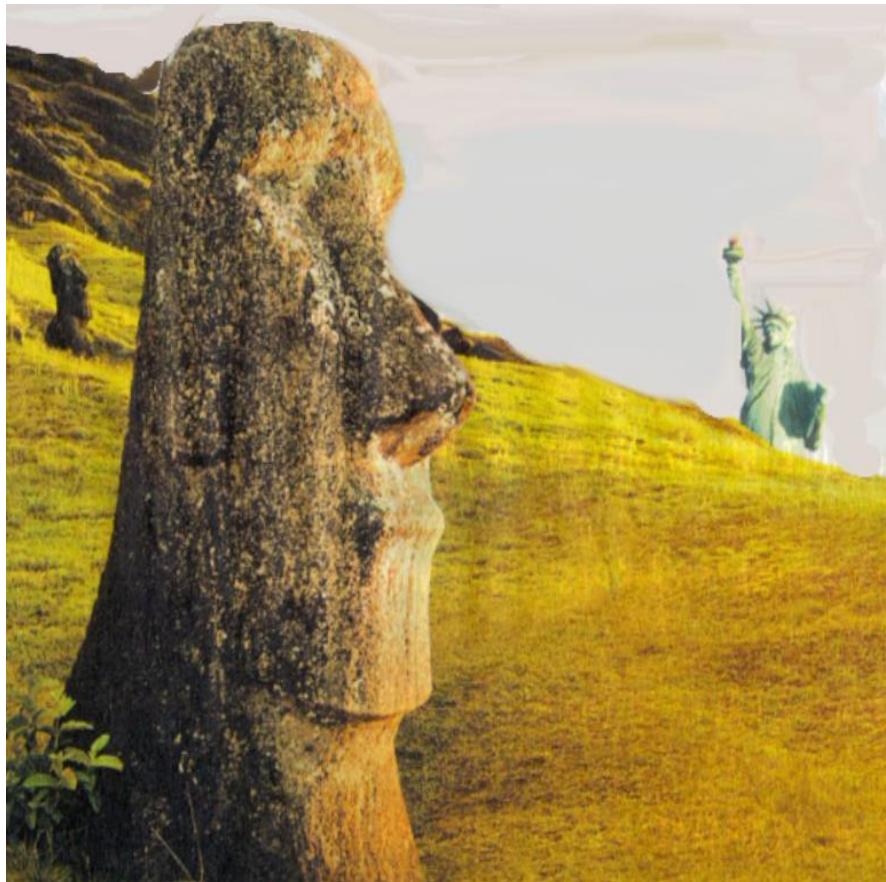
# The Mr Hyde of Human Resilience: Extending Eco-Dysfunction



- ❑ Human technological prowess and globalization are ‘adaptive’ responses to resource shortages that preserve the system’s structure and function (i.e., they embody “resilience”).
- ❑ These adaptations have greatly extended the ‘growth and conservation’ phase of humanity’s ‘adaptive’ cycle in time and space *at great potential long-term cost*.
- ❑ the bigger they are the harder they fall.

Base figure from Gunderson and Holling (2002)

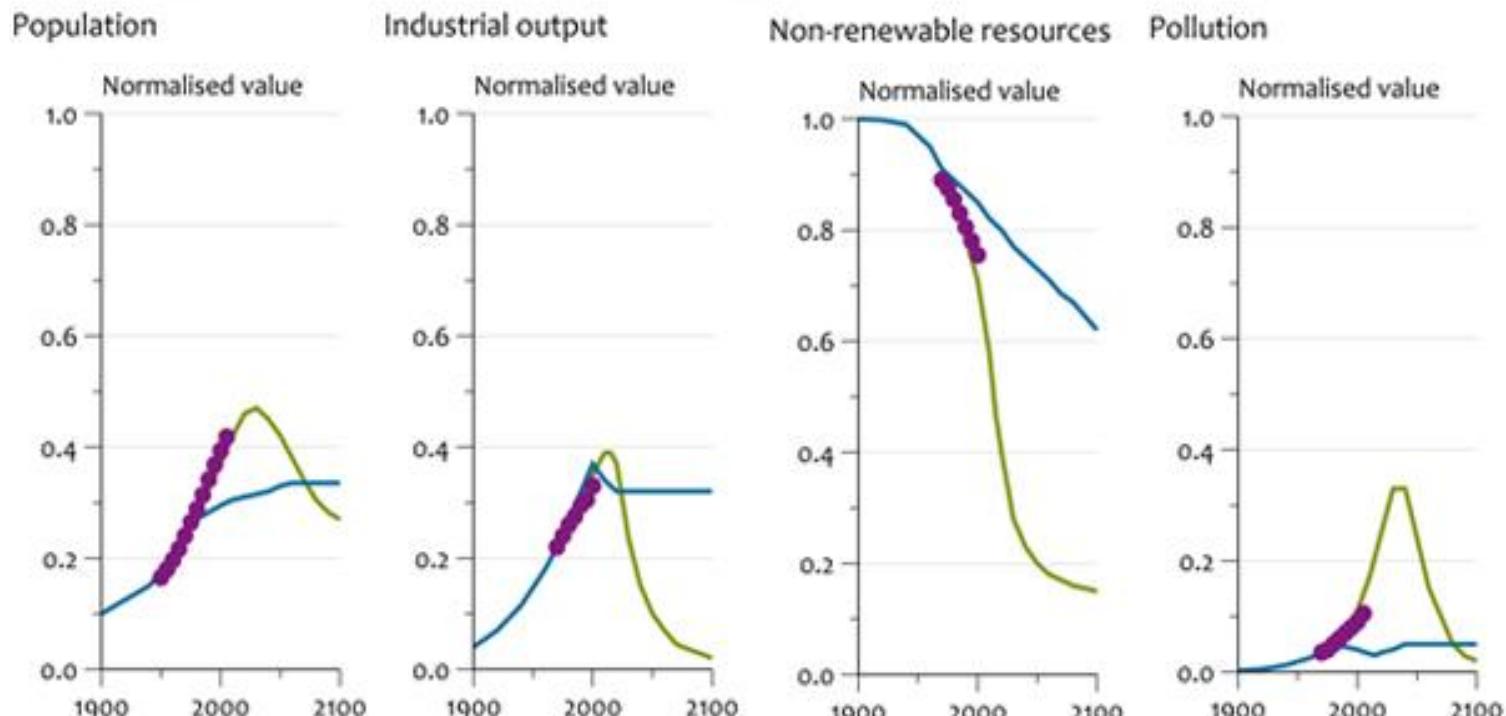
# On Failure: Could our now maladaptive genes and memes be ‘selected out’? (It wouldn’t be the first time!)



□ “...what is perhaps most intriguing in the evolution of human societies is the regularity with which the pattern of increasing complexity is interrupted by collapse...”  
(Tainter 1995).

# BAU: On course for collapse

Comparing 'Limit to Growth' scenarios to observed global data



'Limit to Growth' scenarios

— Standard run

— Stabilized world

● Observed data

Source: PBL Netherlands Environmental Assessment Agency

# If so, too bad: Civilization is a one-shot affair

- It has often been said that, if the human species fails to make a go of it,... some other species will take over the running. ...this is not correct. We have or soon will have, exhausted the necessary physical prerequisites so far as this planet is concerned. With coal gone, oil gone, high-grade metallic ores gone, no species however competent can make the long climb from primitive conditions to high-level technology. This is a one-shot affair. If we fail, this planetary system fails so far as intelligence is concerned. The same will be true of other planetary systems. On each of them there will be one chance, and one chance only.”

(Sir Fred Hoyle. 1964. *Of Men and Galaxies*)

# To break the cycle, global society must consciously script a new cultural narrative

- ❑ For sustainability, we must learn to override our innate expansionist tendencies and abandon our socially constructed perpetual growth myth.
- ❑ We need a new *global* cultural narrative that shifts the values of society from competitive individualism, greed, and narrow self-interest, toward community, cooperation, and our collective interest in repairing the earth for survival.
- ❑ Motivation: For the first time individual and national self-interests have converged with humanity's collective interests.
- ❑ To achieve this, we must 'mature' as a species and learn to exercise our uniquely human qualities—high intelligence, forward planning and moral judgement (aided by the more flexible character of the 'liberal' brain).

# Boulding gets the last word

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- “The troubles of the 20th century are not unlike those of adolescence – rapid growth beyond the ability of organizations to manage, uncontrollable emotion, and a desperate search for identity.
- Out of adolescence, however, comes maturity in which physical growth with all its attendant difficulties comes to an end, but in which growth continues in knowledge, in spirit, in community, and in love; it is to this that we look forward as a human race” (Boulding 1973).