

2nd Biophysical Economics Conference Oct 16-18 2009

Conference Room, Moon Library, SUNY-ESF, Syracuse, New York

October 16, 2009 Friday Morning

Text in [brackets] indicates PFH questions or side comments to raise in discussion if possible

I. 9:00 Friday AM

A. Welcome Remarks and Introduction (by Charles Hall)

1. Students now prof's at other places, china oil inst., Book, quantifying sustainable develop. –David at Springer
2. SD Book – making the world work
3. ASPO – conf. peak even as prices going up, minerals at peak too, 10-20 years

B. Why econ a soc. Sci when about stuff.

1. How does stuff enter the econ & how constrained by energy
2. ASPO a sea of rationality in an ocean of irrationality & denial - think the world will be very different, why no other departments – 1 post doc \$1k/mo – NSF grants for other things

II. Session 1: Energy Return on Investment – Go Mobus moderator

**A. 9:15- Review on Energy Return on Investment (by David Murphy)
– slides from ASPO**

1. EROI – discretionary energy, hard to define boundary for cost issues, operating, development, transport to user, the labor support, the environ costs
2. Tupi field – big big big... (&costly) but how much at a profit?
3. Net energy decreases with more investment & oper cost
4. Gushers, pumps, off shore, deep off shore, ultra deep
5. Paper in Annals of Sci in Jan Recent work in EROI
 - a) Review, Corn-based Ethanol, min to sust a society
 - b) Est's <1 two studies , > 1 , but 1.6 is irrelevant when you need 3+ figure on eroi's
 - c) Water usage and other factors a huge deal
 - d) Petrol cost as % of GDP
 - e) What to call the downslope... defeatism, efficiency, ??
6. Energy for sust sci

[People not doing the system totals – trying to duplicate the accounting that nature already does but not knowing how or comparing her totals and ours]

- a) Net energy cliff between 3 & 8
- b) Don't have good individual well costs

B. 9:45- EROI of Barnett and Marcellus Oil Shale (by Bryan Sell)

1. Peak Gas new wells depleted in 10 years, the peaks decline and deplete faster.
2. Indiana County PA – less gas per well, 9 residents / well, 3700 feet deep
 - a) Energy cost blip, 20mcf/yr, decay –
3. Whole gas reserve declining
 - a) Est of peak at present whole sys TROI (price)
 - b) Unconventional much steeper decline, because you're using

[The shape of the Hubbert curve is for success of constant technique, missing the three related development curves, 1) resource condition, 2) technology development and 3) user demand.]

[downside for whole system will have long 'fat tail' because of the shape of 2 & 3, not bell curve like individual well or field generally representing as fixed technology driven by a fixed price system]

[downside levels off at price level high productivity users can sustain, not the whole economy, as the data show the curve levels off on rt.]

[for reducing CO2 for global warming need 1/5 the econ in the short term, then slow recovery on sustainable tech].

C. 10:15 - 30 minutes discussion

1. Pres – carbon neutral by 2015, pv arrays, fuel cells, bio diesel – on the road to talk to the money people
2. Debt increasing as fast as gas supplies, gas as a Ponzi scheme
3. On farm use of bio-ethanol
4. WROI – water – shale oil water use
5. Barnett to be mature in 15 years

[What about the opportunity cost of depletion!!! Everyone points to how very expensive oil and oil pollution costs will be, but still calculates EROI in terms of short term pricing that ignores that. Ever curve really needs to be two curves, showing the fake future (with pricing on current) and the real futur]

III. Session 2: Theoretical discourse and current debates on neoclassical and biophysical economics

A. 10:45 - Epistemological comparative analysis of neoclassical and biophysical economics (by Jae Young-Ko)

1. Texas A&M u. – resources –
 - a) try to communicate outsiders To survive in tough econ environ
2. Econ's price det value of all goods
3. Anthropogenic v Biocentric
 - a) Discipline, Value, concepts, principles, view of tech, of soc. Growth factor
 - b) Econ v Biophys, utility v accum energy, market v energy quality & return, substitution v thermodynamics, tech pos v tech neutral, bargaining v web, human cap, natural cap
4. Energy flow diagram – BioPhys Econ
 - a) Measure NPP net primary prod at standard point
 - b) Process “controlled by nat resource quantities”

Do your energy costs include the cost of the employees doing the work, and do your energy costs include the energy consumed to sustain their lifestyles?

5. NPP change is not marketable, good for environ – a way to communicate w/ outsiders

B. 11:15 - Financialization, Stagnation and Peak Oil (by Kent Klitgaard)

1. Ecological Econ meeting – all read Herman Daly and changed their lives – Kent had different vision & roots, Wells College
2. EE depends on idea, growing inside non growing space – the source of all social goods
 - a) Econ subject to limits – explore how it works at the limits

[Do growing parts come into conflict at the limits? And a choice of whether to limit investment in growth voluntarily or involuntarily?]

[Have you considered maturation as a limit to growth?]

3. Physical limits, political limits, protect the interests of wealth?
4. Stagnation thesis
 - a) Growth too fast & too slow at same time
 - b) F C Domar – dual theory of investment, rate of change of investment
 - c) Produce or consume or waste it
 - d) With rising surplus the normal state of monopoly capitalism is stagnation
 - e) How do you get people to buy more stuff with less money

[Curve of energy value-added as % of GDP, drop off coincides with US peak oil]

[note, limits for whole system come all at once because whole system allocates stress to equalize stress. (my ESP eq. stress principle)] [how to Decouple the need to grow from wellbeing]

C. 11:45 - 30 minutes discussion

IV. 12:15 Lunch

1:00 Friday Afternoon

A. 1:00 SUNY-ESF Climate Action Plan (by Michael Kelleher)

B. Campus zero carbon plan - Mainly forest sequestration

[by my calc., forest sequestration needed to permanently capture CO₂ from embodied carbon in average spending requires an added acre of mature climax forest for every \$150k spent, as a long time accumulating permanent set-aside]

V. Session 3: Energy-GDP correlation and implications

A. 1:30 - Straightforward empirical analysis for 131 countries – Global Efficiencies (by Ajay Gupta)

1. Econ Efficiency curves for many countries – numerous erratic
2. Idea of efficacy - grow the economy
3. Interested in the causality – what's going on

B. 1:50 - Hannes Kunz – economist kunz@??

1. GDP/human labor of food 7.2MJ/day - GDP/capita
2. Avg \$133/GJ

[How do you tell when “external energy” is external? Are country economies connected?][the EF method has a way to do that, the dollarshadow method does it more easily and probably better]

3. Differences are erased if you balance the imports & exports
4. Productivity increase – saves labor for 300kWh per cow/yr
 - a) Equip cost
5. Farm
 - a) 1800 hours @ \$3/hr = 5400
 - b) W/ machine human gets 4.56 /hr
 - c) Fully auto \$15/hr
6. Walk & Drive
7. Reality
 - a) Over decade decreasing EROI, rising cost

- b) Go back to model and increase energy cost the older models fail
- c) Benefits we got from India & China will evaporate if their energy cost goes up

[Energy costs don't factor in the predictable opportunity cost of finding another source of energy! That's a major factor that increases non-linearly in every sense. There will be resource allocation conflicts between high and low productivity sectors. What to do about the exploding disparities on the downslope???]

- 8. Where will the troubles
 - a) Process energy, heating & cooling, electricity more effect, transportation much more, agriculture massive impact
 - b) Speed vs energy intensity
 - c) Agg Most of the price is energy use.

[The large fraction of energy use hidden from our accounting method]

**C. 2:30 - The origins of value--How energy changes the terms of trade and why that matters (by Karl Seeley)
—very amazing....**

- 1. Dematerialization – efficiency & productivity
- 2. Phantom dematerialization – more from less
- 3. Exploring the household net worth as %GDP
 - a) Assets are claims on the future
 - b) Creation of money form loans
 - c) Where does the wealth come from
 - d) Wages of services need to increase if prod of labor increases
- 4. Phys prod. Stagnating Shares of value added per shares of employment
- 5. Production of value from a unit of resource input
- 6. Labor theory, tech theory, relative costs of prod, or ..[what you can get for it]

[Physical productivity relative to the historic value not future value of energy]

D. 3:00 - Nate Hagans - Abstract energy gain

- 1. Things separated from reality

[Is debt then a form of information a bout the physical value of wealth is a measure of a physical thing, the departure then misinformation could it be then corrected – tendency to diverge from true value – a process of accumulating misinformation]

- 2. Brain evolved from scarcity, value the recent past,
- 3. We get hijacked – beliefs in magic & abstract concepts feels as real as tangible things, brain response to sugar like angels

4. Treats energy as an input into the production function
5. Money is high velocity - money supply is debt
6. Virtual wealth is a large part – is phantom
7. Productivity (exp) v Real Wages (inflection pt at 1956)
8. Debt outstanding,
9. Debt as share of energy consumption

[how To correct the systemic misinformation? How to right the economy by relieving the burden of accumulated falsely obtained obligations?]

[Hmm... Well then there are the other choices... cause I could swear I just heard both you and Charlie say the way to correct the false debt information about future physical wealth is to let the economy collapse rather than the obligations to pay that were falsely generated. From a capital preservation view, of interest to everyone, and make adaptation more possible, you'd do it the other way. It takes a deeper understanding of exactly why ownership keeps growing even when the wealth doesn't, but I can show you.]

10. Biophysical gauntlet – oil accordion
11. Oil companies need \$50 \$90 collapses the econ

E. 3:30 - Delusions of finance (by Gail Tverberg)

1. Oil shortages – econ declines, also lots of debt defaults, and to troubled financial system – major debt unwind ahead.
2. Cascade of decreasing purchases
3. Lots of debt defaults – still have to pay back the loan with interest even when the economy disemploy's them
4. The squeeze
5. What would make the debt collapse without collapsing the businesses that don't pay it?
6. Wouldn't the forgiveness to correct the misinformation in the system need to be before rather than after?

[.. ownership system that naturally continues to multiply what it is owed even if real wealth isn't growing? If there was a way to correct that in literally everyone's interest, would it be worth exploring with an open mind?]

VI. 4:00 Plenary Lecture: Biophysical economics and the collapse of complex societies (by Joseph Tainter)

A. Charlie

1. – a new way to see economics – that you don't ever see in the news –
2. Joe Tainter, a historian, systems thinker Sante Cruse,, North Western, Arizona State, Utah State,

B. Joe

1. Thank the speakers, of the conference, as good as they come
2. Not all sources of energy are equal – EROEI
3. Sust. through ancient societies and collapse, opposite sides of the same kind of process. Net energy and complexity

C. Approach to complexity, how human soc. went from simple to advanced. Small and undifferentiated, to large and multifaceted

1. Only a few types of occupations to 20,000 occupations
2. Structure and organization. – drawing of a flow chart
3. Complexity is not complicatedness, the complexity actually simplifies, (i.e. an aspect of organization, many to one)
4. It develops because it can. – require surplus energy {everything actually does, complexity development, growth, is the use of surplus to multiply surplus, that's the main thing}
5. Complexity has a cost, how to calc
 - a) The metabolic cost
 - b) Time money, taxes, annoyance, etc. all are energy based
6. Need sources of energy that are high EROI.
 - a) Why does it grow, it grows because it solves problems. The evolution of technology for ex. Gov institutions too

[a self-help project]

- b) Response to 9/11 – proliferated structure and organization, with a cost

[but also a difference between complexity with multiplying returns and then diminishing returns]

7. Tends to be accumulative, and to evolve from ones that are increasingly productive to decreasingly productive.
 - a) Historical research allows you to see how that happens
8. The case of Rome
 - a) Expanded BC to max in 100 AD, high EROI expansion, examples. Captured a lot of gold captured

[but what about the high EROI of bringing business organization & engineering and justice to new lands??]

- b) Seized more wealth from everywhere, with great stories that end after first century.
- c) Conquered peoples considered loot, the phase of rape loot and pillage.
9. Seizing accumulated solar energy, to taxing agriculture, less prod. – tablespoon of gas a day in solar energy per meter, but owe most of it to the empire.

- a) Gov budget on taxes, Egypt a one time looting.
- b) Diluting of currency from 0 AD to 260 AD
- c) Civil wars between the armies wanting to be paid in first century, levels of lead pollution from that use???

10. Third Cent AD

- a) Invasions from the North & East
- b) Legitimate emperors who lived only 30 mo in office
- c) In 260's broke up, eastern part lived on though
- d) The cities had to build new walls in the 270's

11. Reform goals, sustain roman civ.

- a) Solution to greatly increase the complexity [like increasing intricacy of solutions as in 'sustainable design']
- b) Price controls, froze people into hereditary occupations and raised taxes to pay for it – doubling twice,
- c) Tax rates as fixed amounts. [missing what process the exorbitant taxes originated from]
- d) Trauma throughout the society, marginal lands went out of production for lack of yield.

12. Bronze coins also debased repeatedly, prices of grains inflated, but did it in terms of consuming their capital, their productive lands and citizens [evidently debt increasing faster than earnings, as earning capacity depleted !!] [that the social debt that the citizens owed the prelates.]

- a) Chopping up coins as a way of making money

13. Arab forces in 7th century, -- oblivion for striving emperors, then two centuries of holding out on defended coastal towns and islands.

- a) Siege of Constantinople 717, 718
- b) Peasants couldn't pay more, a radical form of simplification,
- c) With fewer coins hard to maintain a currency economy [??]

14. Byzantine Recovery

- a) Reduced to Thesolonica and Constantinople – deliberate simplification because their energy supply cut in half.
- b) Reestablished a small professional force
- c) In 10th century and extended again to the Danube – achieved by decreasing the complexity of problem solving.

15. Arms races are classic source of complexity and cost

- a) Can't withdraw, it invites defeat
- b) Europe a classic example. Always at war many years a century. In 17th century and 18th century only had few years of peace

- c) New forms of defensive fortifications, very costly, bigger offensive armies needed to match increasing defenses.
- d) Feudal feuding ?? was the norm though land warfare was stalemated, bought by anyone with money, so finance became the dominant warfare.

[What if there were examples of natural systems that had periods of using wealth to multiply wealth that turned that off to come to peace with themselves and their environments, rather than settling into constant war. Could we use the biomimicry concept to learn that design concept possibly?]

16. Euro warfare was key to Europe's economy. Still solar. How did it avoid a collapse. Ships, energy from other worlds, high return ventures,

D. Some lessons

- 1. Roman – diminishing returns
- 2. Byzantine – fiscal recovery and later expansion
- 3. Euro – increasing complexity in feudalism

E. Sustainability is not consuming less

- 1. It may not work, need success in solving problems
- 2. Complexity has benefits and costs with diminishing returns
- 3. Damage subtly, and accumulatively long term

F. Sustainability requires soc. to have reserve problem solving

G. Q&A

- 1. Were there those at the time – yes 'cyclic organic model' growth maturation automatic decline....
- 2. 5th century wealth concentration.
- 3. Can a soc like this come up with the right solutions? – for us the evidence of difficulty is the amazing ignorance of the subject
- 4.

Saturday October 17, 2009

VII. Session 4: EROI and implications for economic systems

A. 9:00 - Introduction: The Cheese Slicer (by Bobby Powers or Charles Hall) – search ESF Charles Hall

- 1. Bobbie not here – subst. standard talk
- 2. Peak oil, energy return on invest and your financial future
 - a) “Revisiting the limits to growth after peak oil”

- b) Odum, Club of Rome, Paul Ehrlich
 - c) Limits of growth conceptual accuracy
 - d) SERA example of “how wrong” Hubbard was
- 3. Laherrere 2009 oil supply – the global data
- 4. Laherrere 2004 – multi-fuel data – marginal contrib. solar
 - a) Just adding solar to the mix
- 5. Hubbert curve, where we evolved our financial models
- 6. CH 1981 paper in Science and in Wall Street Journal
 - a) CH 1986 “the Ecology of the Economic Process”
 - b) CH 2001 “The need to Reintegrate the Nat Sci w/ Econ”
- 7. Standard view
 - a) Energy inputs, material flows, outputs – no secret
 - b) Why don’t the other sciences speak up??
- 8. What’s happening on Wall St – 5 hypo
 - a) God’s Wrath High,
 - b) Bunch of Greedy Dirty SOB’s
 - c) Jump you “bleep”..
 - d) A Giant government Ponzi scheme- it worked for 200 yr
 - e) EROI is killing discretionary investment
- 9. Laherrere data – Sooner or later you’re going to drain the tank.
 - a) All the global oil data you can trust in John’s house!
 - b) All the Elephant’s headed sharply down
- 10. Dow v. Energy use for US 1965 to 2008
- 11. Youtube –“The Job” – screamingfrog.com
- 12. Start from migrating fish in SC
- 13. What’s going to happen – inputs sliced into investments & consumption
- 14. Investment grows to squeeze out discretionary
- 15. Conclusions
 - a) Our future is likely to be dominated by the effects of peak oil
 - b) Low EROI fuels need more investment
 - c) During time when people want to maintain their consumption

B. 9:15 - What is the minimum EROI that Society can have? (by Charles Hall)

- 1. EROI map; Boundaries
- 2. Min req’d for civilization

3. Invest \$1m in obtaining oil
 - a) Low est - 8MJ/\$ in US Econ or 14 or 20
 - b) Energy return on those rates of use as investment
(1) Decline 36 in 1990's 19 in 2006
 - c) US was 100 in 1930 25 in 1970's 20 today for old oil
4. Needs to sell 1.2m oil at \$70 is 28,500 barrels
 - a) Amount sold needs to be 4-6 times greater than the invest energy
 - b) [Trying to do the TROI model in words... need a map like mine different disciplines can refer to – and then translate into their languages...]
 - c) Reaching the point of vanishing returns [you can see these things coming][speculative price shocks and load shedding precede as you approach the natural hard limit of EROI]
5. George Woodwell – 1st job
 - a) Health check, safety glasses, rad safety training
 - b) Retirement plan – WHY do that!? On 1st day of work
 - c) Want A, B or C? TIAA or CREF, security or risky,
 - d) 1970, why when 2008 retire all in TIAA, that's when we'll be at peak oil and the market won't be worth much.

C. 10:15 - Biophysical economics for the upland Philippines: A participatory approach to depicting material and energy flows (by Sarah Herbst)

1. participatory approach
2. What is sust., traditional model, use better tech
3. Use Brundtland Comm. def.

[but that includes our way of slowing things down that speeds them up]

4. Model is only as good as the data – but data alone not sufficient
 - a) Need participatory knowledge – learning / teaching mutual growth
 - b) Time consuming, expensive, conflicts, language barriers
5. Philippine mining –
 - a) Participatory tools, stakeholder prob, mining issues, establish a work relationship
 - b) Phase 1 to 6
 - c) Understanding of flows, ability to look into the future

[The high risk strategies that might work or the low risk strategy that diversifies your future choice]

D. Peak oil in China Prof. Lianyong Feng

1. Weng model, Chen gen model

[Symmetric model ignores the sustainable fraction of users able to pay high price for resource – who are the high efficiency user & producer pairs that can survive the downslope??- and what path do you take there, to maximize survivors or the comfort the winners...]

[periods of resource use growth and decline as periods of producer/consumer technology “radiation & selection”]

[during rise speculators set price as low as possible to be part of the fastest growing sectors of the system, then at climax the speculator switches, and sets the price for the highest people are willing to pay. Switching to maximizing profit not from growth but from squeezing the most durable necessities. Pricing shifts from production cost norm to scarcity norm and the marginal difficulty of adapting to use future supplies.]

2. Oil prod in China – criticize Hubbert model, but not Weng model
3. Critics & Opponents – oil company – want to debate
4. Book to be pub soon – when price rise the media calls, not when decline
5. China econ tables – sectors, farm decline & indust rise, growth rate many in the 10-20% rate – heavy energy using
6. Prod rate of resources decline – recebt decline in \$ value of coal gas oil & metals mining

E. Laura Schmitt Olaboiso – Univ of Minn EcoSys Sci & Sust.

1. Cash 2003 – info needs credible, salient, & legitimate

[but... incredible, irrelevant and heretical is where truth as often lies]

[‘good’ ‘confirmed’ information often completely wrong??]

- a) Sci should co-produce w/ people on the ground

2. The world is complex – not what you think all the time

[how people don’t know how to test their model till it fails catastrophically]

[acting to patch it up till that happens]

[working to sustain the model rather than use it to track how the environment is changing]

3. Community – Invited to regional sustainability workshops
4. Need a process of deeply thinking about the future
5. Came up with wild ideas
 - a) Regional self-reliance, Pandemic collapse, green indust. Minn.
6. Conceptual feedback for “Regional self-reliance”
 - a) Travel/yr grows
7. Model – land allocation for each
 - a) Resource efficiency stable, etc

- b) Post collapse scenario, self-reliance – [become sust after collapse – is that a good idea, to have a sudden rapid drop in societal complexity?]
- c) Transport fuel, Would need to burn much more wood – most of the state
- d) Water use – these are the consequences of the scenario

[but he doesn't mention the std. model of doubling real product every 20 years, why not?] – [is it just because it's impossible?] [all our investment market plans are presently committed to it though]

- e) Archibald Bush Foundation & U. Minn Inst of the Environ

F. 10:45 - 30 minutes discussion

VIII. 11:15 Lunch

A. 9:45 - Peak Oil, EROI and Net Energy (by George Mobus)

1. Univ of Wash Tacoma
2. Modeling contraction in the flow of net energy and its impact – at Charlie's group on sabbatical
3. Modeling neurons – first principles
 - a) All dynamic systems – work process at a gradient
 - b) Raw matl & energy, yield product, waste
4. Need process to create the useable energy, w/ losses leading to a work process, making tools and products
5. Diagram of energy flow in biology

[all the flow diagrams omit the true story of “chicken and egg” that invents them...and determine their designs by accumulative innovation]

- a) Simple model $A_0 = A_1 + aNE_0 - dA_1$
6. Asset production less degradation
 - a) Inflection point where real assets exceed net energy
 - b) You can get used to borrowing against the future
 - c) Debt feasible – Franklin Roosevelt v Barack Obama
7. At the inflection point – net = gross-cost
 - a) Net peak before the peak of gross energy
 - b) Region of debt infeasible
 - c) The rules change

IX. Saturday Afternoon

X. Session 5: Communicating inconvenient realities

A. 12:00 - Economic prediction in non-linear domain (by Jack Alpert)

1. 200 slides – like animation
2. Hardness of loan payback – extrapolation
 - a) Approx of exp = linear vertical
3. Not enough stuff – conflict – more conflict
4. Generosity & compassion counter it, technology
 - a) No new behavior required
5. Something like an accident in our future
 - a) Conflict is non-linear
 - b) Things have changed
 - c) Pollution limits
 - d) Footprints overlap each day
6. Lilly pad growth over a pond
 - a) Mutual constraint
7. Carrying capacity, v global footprints
 - a) In free growth period – limits social conflict
 - b) How the mech. will work in the future
 - c) Subsistence – pop growth
 - d) “only reason pop growth limited is the death rate”
 - e) Total footprint meets carrying capacity
 - f) Resulting expanding conflict will hit like unexpected car crash [did that just occur]
8. All knew it was population, and now know it could
9. RPD – limiting pop to one child per family
 - a) Per cap FP increase, = multiply change on the curves = total decreases
 - b) Seems impossible, but people can be aware of risk.

[missing how learning systems learn to avoid pressure, notice the lack of positive return, for example]

B. 12:30 - Why efficiency improvement causes growing consumption (by Phil Henshaw)

1. Basic paradigm – economies as physical learning systems
 - a) Start from physics first principles ... like the conservation laws that imply transient complex system development processes are required for change

(1) Representing natural processes with equations

(a) neglects the complex development processes, by which they work.

(b) neglects their limits and possibilities,

(2) how to search for the great gaps in our models

(a) physical systems represented as statistical equations that might recur over and over

(b) opportunistic learning processes that occur only once

b) Start from what's naturally missing in the typical "S" curve of development. What's missing is the system's environmental learning process. Slide 14

(1) Make note of clear switch in kind and direction of learning at inflection point!!

(2) from multiplying returns to dividing returns

(3) from the past to the future,

(4) from pumping up to fitting in.

2. The data shows impacts growing faster than efficiency, as parts of a system working as a whole.

a) The popular assumption is that they should go in opposite directions, but they don't

(1) Efficiency building codes, creative innovation strategies, all seem to have the opposite of intended effect.

b) Economists have understood this all along, but it's mysterious why working with sustainability planners for years and years they don't mention that both groups are using the same solution for opposite effects.

c) From inside a learning system, each part learns two things, how to reduce their effort and how to provide more service.

(1) Efficiency as a measure of the "work it takes"

(2) Productivity as the same thing, but considered as the "service it provides"

(3) Difference in looking upstream or downstream in the flows of an opportunistic economic system

3. Efficiency doesn't steer systems.

a) What really steers the direction of whole system development is what the surplus generated by that learning is used for, with two main choices

(1) Using it to fit into the world,

- (2) *Using it to change the world to fit your image,*
- b) Efficiency can accelerate either,... so efficiency is more like “the gas” and does not work like a steering wheel
- (1) *presently accelerating our increasing control of nature and maximizing resource consumption*
- c) Our mental and cultural models of change are radically detached from the nature of physical processes
- (1) *Multiplying change is not a natural fixed state except in imagination, and nearly all discussion in our culture treats it as such.*
- (2) *We built our institutions around the cultural experience of the former” limitless growth” period*
- (3) *financial information model represents multiplying change as a constant, but accumulates misinformation after the inflection point ~ 1960*

C. 1:00 - Panel Discussion (Moderated by Hannes Kunz, George Mobus and ~~Nate Hagans~~) w/ Dave Murphy alt for Nate

D. 3:00 General Discussion

1. Hannes Kunz - How do we not get rejected, learn to communicate
2. Geo Mobus – we can leave our students depressed
3. Dave Murphy – OilDrum frustration w/ lack of pub attention to issue – lots happening not getting covered

[like the ‘non-linearity of change’ crises at unexpected limits]

October 18, 2009 Sunday

XI. Sunday AM Leaf viewing day trip to Skaneateles Lake

A. Charlie, Joe, George, Phil & ... brunch & lakeshore chats