

Economies that become part of Nature

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Expanding the Circle
(out of reach)



Or

Completing the Circle ?

This is about a natural way to resolve the intrinsic problem of money, that how people use it often causes their environments to explode with prosperity and then collapse. As often as that has happened we don't learn from it. We don't learn from it, apparently, because we don't see the natural systems of stabilizers in the environment that our pension for exploding prosperity destabilizes, and we blame anything else we can find. That's a problem! Natural systems begin with much the same kind of multiplying prosperity but also tend to be responsive to their environments and bring it to an end quite differently. Their example can suggest how we might do so as well. It has to do with how they turn to completing their start-up explosions of growth, switching from growth to stabilizing and refining the designs of things instead of continuing toward increasingly instability.

Any kind of project people manage, from making dinner, to organizing a community project or building a career, begins with a small starting point, an idea, and then assembling the successively bigger pieces to put together. It's a search and creative assembly process. I response to how the start-up goes, and the limits of your time and resources, the effort turns toward searching for how to complete it.

The same pattern is found in discovering and developing a new resource to later get to it's point of diminishing returns and then completing its use when

it's exhausted. Ugo Bardi recently observed that starting and finishing things like exploiting resources can be viewed as a "mind sized problem"², as envisioned by Seymour Papert, a powerful idea in a simple "bite". That observation is even more powerful when recognized to be an instance of the universal sequence of changes in developmental direction³ for continuous processes, the "bite sized" general model for beginnings and endings.

What brings "peak oil" to our attention is the switch from our finding ever more to finding ever less, diminishing returns in response to increasing search. The economies are searching ever more widely for oil and new substitutes. As they run out of the cheap energy source they were built to use they're having to adapt to more expensive ones. Continued use of

cheap energy now pushes the economies to use more expensive energy, and undermines the existing capital of economic development that was built to use cheap energy. The pain of this is now evident, of course, but why didn't we foresee the turning point of that.

Considering the whole cycle of resource use as a "mind sized" "single whole event" of something coming and going, there are two major turning points that would be fairly easy to have had early warning about. There's the peak, and there's the preceding inflection point when the initial pattern of increasing reserves ended. The peak is the signal of decline and the inflection point is the signal of the peak. That means the pattern of diminishing returns for our primary energy source was visible a long time ago. It seems to have been in the 1950's (fig. 1)⁴ when

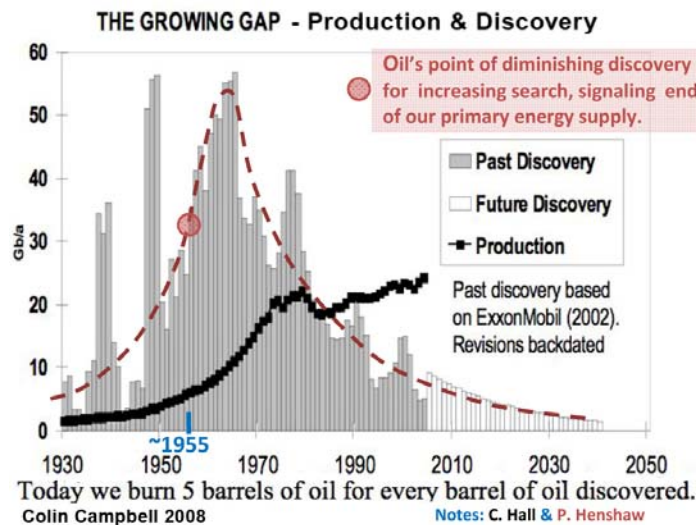


Fig. 1 History of oil discovery and production with projection

increases in the search for new oil reserves began to have declining results.

In our search for energy, failing to read that signal had another major effect, making us ever more dependent on systems using an energy source that was running out. It remains more profitable to use up shrinking supplies of cheap energy and sustain the growth of unsustainable systems. To convert the economies to sustainable resources the financial markets would need to invest in things that are relatively less profitable.

The general “[precautionary principle](#)”⁵ to avoid irreversible harm applies here, to making sure to reserve the time and resources needed to complete what you begin when it is harmful not to. In this case it’s starting up an economic system that would soon run out of its “seed energy” resource and not preparing for that. Our economic development steering mechanism is tuned only for maximum current profits, at present. Development both didn’t respond to the clear signals to invest in sustainable resources decades ago, and even after two major energy shocks still finds it relatively unprofitable to do so.

How both natural system economies and search & development projects people manage personally each solve that same sort of problem can be studied for insight. They display how even free market systems can be responsive to their own limits and adapt promptly, rather than too late, to limits on their search strategies. There’s a natural design principle that allows them to be both growth oriented and also gracefully complete their growth cycles to become sustainable. Then the question becomes how to teach our society to learn from nature’s example. It means learning from natural systems that are not equations, but search processes.

As individuals we would never intend to search for solutions causing us to unwittingly cross lines of conflict with others and stumble into a war, or abuse credit and the search for profits to push our society into a global financial panic. Societies, however, very regularly get caught in these “search traps”. The key to why is hidden if how we also seemingly never learn from them. That puzzle is bound up with the deep mystery of why so many of mankind’s most advanced problem solving societies of the past ran into problems they couldn’t solve and then collapsed and vanished^{6,7}. In hindsight we may think we see exactly what happened, but still people seem unable to learn from it.

In building a sustainable world it’s very clear that we’re using up all our affordable resources as fast as possible for growth, for example. To our society’s choices for maximum profit that’s “logical”, despite having no plan for surviving on the expensive resources ahead. It’s a lot like in building a house, using up all the lumber you have before putting on the roof. It leaves you with a new home that is unlivable.

The blind spot of not preparing to finish what you start even extends to the popular alternative economic proposals for solving our erupting resource problems. They correct that symptom but still all seem to contain the main problem that led to it. They describe how mankind could live comfortably within its limits physically, but don’t change the economy’s deep seated practices of continually multiplying its search for greater short term schemes to start but never finish. Our dependence on maximizing the growth of profits keeps the system from completing what it starts. The big profits in any developmental process are naturally in its beginnings, inherent in how searches for profits start with multiplying returns and only finish with diminishing ones.

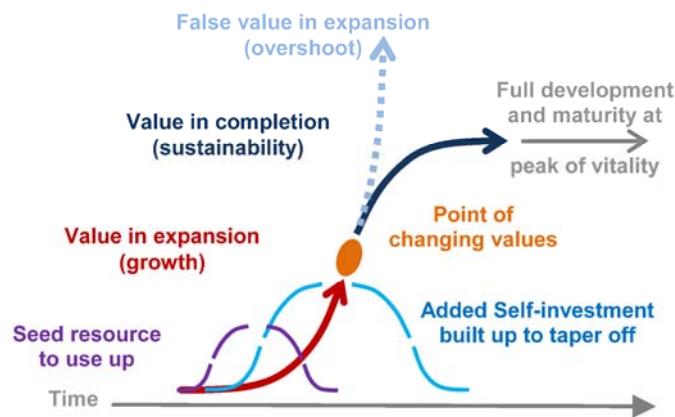


Fig. 2 – Developmental Search Plan, Whole System Business Model Starting Unfinished Things to then Perfect & Integrate Them

The solution lies in understanding that investment is both the economy’s natural search strategy for new directions, and what builds the new directions the economy takes. That makes investment decisions the economy’s natural steering mechanism. It’s what is physically responsible for steering the whole economic system. That carries a natural as well as a

legal fiduciary responsibility. How to understand what that means, and apply it, is a question, but that principle seems to be the key.

The larger story of the natural search & development sequence is shown in fig. 2. A successful search begins with a “seed resource” of some kind, and then expands by self-investment, using the profits of the search to expand the search. That “auto-catalytic” process is like a business using its profits to grow. The self-investment in growth tapers off at some point if the business (or economic system) is to stabilize. The turning point when changing values come into play is when changes in the scale of the process alter all it’s relationships with its environment, and the purpose of self-investment needs to change.

Some systems keep growing till they have no profits to reinvest, overshooting their environment. They go bankrupt by building creating more overhead costs than they can support. That's the big cost of putting all your resources into growth when facing natural diminishing returns, for example, multiplying the complexity of the effort, like running ever harder only to keep going backwards.

The opposite is like the mom & pop store, that finishes building the business at a point of satisfaction. It might be as they approach having enough to live comfortably and educate their kids. Then they stop expanding and only continue simplifying, developing a cushion for resilience and perfecting what they do. That's what some would call, "a stable ledge on the fitness landscape". Achieving that is also what a great variety of natural systems and personally managed projects do, grow but then stop to perfect themselves at an achievable stable state.

What's extremely hard to turn toward a graceful climax is a whole complex society that spent hundreds of years organizing itself around a plan for permanent multiplying searches and growing self-investment. It would zoom right past the point where its whole universe of environmental relationships starts changing dramatically, ignoring the diminishing returns and erupting complications and conflicts, wondering where they all come from. At natural limits the options for its growing returns are running out so it seems rewarding to search ever harder for them, ignoring the other consequences. What it naturally finds, though, are ever shorter term strategies that create ever more complications and conflicts, making it search even harder. That actively turns the system away from the choices it should be switching to.

Having a functional fixation like that is like driving a car and seeing a right turn ahead, and realizing the steering wheel only goes left. Just leaning toward the right seems to be all the passengers can do, but it is not likely to help. It's the steering system that needs to change.

Something needs to change the steering mechanism so the system as a whole can complete its growth and stabilize. That would imitate what both growth oriented natural systems and the many kinds of search projects people manage personally, finishing what they begin while remaining open to change. It demonstrates that the end of growth can be managed profitably and gracefully. Natural systems and personally managed searches do take off with a run of success in expanding scale, a growth period. What lets them both be responsive to environmental change and seek to stabilize when there's no good opportunity for growth to come into balance with their environments, is not having an enforced rule that they have to grow.

Traditional economic theory and practice, to the contrary, serve to enforce a rule of continual multiplying investment. It holds that there will never be a growth turning point, or whole environments that become unresponsive. Ever expanding searches are expected to always discover new resources to replace those being used up. By maximizing the earnings for adding regular %'s to investment you add %'s to the resources you spend searching for more resources, so it all multiplies exponentially, for a while.

The theory works fine, in fact, and has been quite profitable for centuries, and would actually never fail in theory. The expectation that it would continue only fails in reality. It's based on hindsight not foresight, and ignores that all physical systems and environmental relationships have limits of scale.

Continually using more of your resources to increase your search for more resources, to use up ever faster..., does seem to be the most profitable choice even as it runs out⁸. It automatically results in a whole system "tragedy of the commons"⁹ though, as the economy becomes a "zero sum game" with ever more intense competition for declining resources.

It's very curious that people have hardly noticed that nature is simply full of systems that work quite like free market economies, but don't have this problem. Both populations of cells that cooperate as organisms and populations of organisms that cooperate as communities, develop systems of cooperation by linking their complementary differences, just like the parts of economies do. The common element is the parts organize around the exchange of products and services through a medium of free exchange, and the development of those links starting with a period of growth by self-investment.

When they don't climax that growth by letting it create destabilizing internal conflicts and environmental tragedies for their own niches they tend to stabilize. They somehow "form a system" and *stabilize at the peak of their vitality*, and become part of their environments. It seems possible that if we turned our search interests toward how they do that, it might provide us the escape from our present headlong rush in the opposite direction.

Scientists may often say "there are no systems, just pressures", and dismiss the idea. That might come from the reliance of science on using equations to represent natural systems with rules for a balance of pressures. The big difference between natural system economies and equations is that natural system economies have living parts, that are actively learning from their environments as they go.

Representing the parts of economies as numeric variables, controlled by theoretical pressures from

other variables, hides the behavior of the parts as living things. It hides their self-animated individual and group, learning and responses. The real parts of economies are largely self-animating, actively exploring their surroundings and responding to what each other learn. So local rules develop inside local communities of parts. Outside pressures would be unable to predict or control that. Because they have learning parts economies are opportunistic systems, not deterministic systems.

The dilemma for science has been its need to have its terms well defined. What learning systems might discover as they explore their environments is not definable. **Science can still start by learning how to identify where such learning systems are located and how to tell when they are taking new directions. Peak rates of learning and the time when rates of change reverse directions are often possible to locate quite precisely. That kind of information, hints and warnings of other things changing direction, is what one usually uses to guide steering activities anyway. It leads to better questions about the uncontrolled learning changes around you, some that can be answered with confidence, even while also displaying one's ignorance of them too.**

Fortunately one can study this in the successful search & learning systems you're part of and already quite familiar with. A freshwater pond economy uses the water to link populations of widely varying species that create their own niches and exchange complementary services. Each one benefits and contributes to the resource uses of the whole. They seem to do their parts by resourcefully using what the others create but find useless. In foraging and dodging, being resourceful with what the others leave untended, they also avoid lines of conflict. That active searching for advantages that fit makes the system and its parts fit each other and their environment.

An office workplace also houses a local natural system economy. It's where employees exchange their complementary needs and abilities. It a place where groups can sort out with each other how to do their jobs, and create an organization that works as a whole through mutual guidance. A manager may be able to tell if you're doing your job or not, but they rarely know how you do it themselves, since it's each individual's job to invent how to do it in cooperation with others.

Families are also natural system economies in their own right, organized around their own internal networks for exchanging complementary goods and services. They operate as a whole in backing up each member in their interactions with other environments.

These are examples of the kinds of uncontrolled natural system economies that are often very good at taking care of themselves. They're quick to take advantage of growth opportunities without letting blind pursuit of them destabilize themselves or their environments.

There are, of course, also plenty of examples of individual or group development strategies, fed by excessive or ignorant ambition, that overshoot their own talents and resources. An overzealous suitor is a good example, responding too aggressively to openings for advance and getting rejected. Growth opportunities that ignore the environment they need to fit with generally fail, and so don't stay around for us to study. We all probably have vivid memories of being part of them, whether having a part in "blowing

the big account" at the office, or watching as someone else ignores all the warnings and gets in deep trouble. The general precautionary principle for searches is to watch your environment for lines of conflict. I've sometimes called it "the principal principle of cybernetics", the central idea of "steering". If you're aware of it, it's actually half the fun.



Fig. 3 The Sorcerer's Apprentice driven mad!

As mentioned above, the popular models for sustainable free market economies propose limiting our physical impacts on the earth, but omit a solution for our investment culture and procedures that rely on multiplying the search for quick profits.

The "economic democracy" idea proposed in World Watch this month by David Schweickart¹⁰, for example, has many interesting ideas. His model for democratically run businesses would still have them using the same rules for growing investment that cause private money choices to drive ever multiplying competition, though. Having that flaw also puts his scheme in very good company. The same omission mars seemingly all the popular alternate economic models, such as the "transformative technology" ideas of Paul Hawken and the Lovins's in *Natural Capitalism*¹¹, the "transformative governance" or "sustainable development" ideas behind the models of

Herman Daly¹² in *Beyond Growth* or Gus Speth in *The Bridge at the Edge of the World*¹³ or H.T Odum in *A Prosperous way down*¹⁴. It's even in the critically well-received *Prosperity without Growth*¹⁵ proposal, by Tim Jackson of the U.K.'s Sustainable Development Commission.

The problematic rule of financial accumulation is to assure a maximum regular return to continually add to future investments. The secret is that there is nothing wrong with either of those two steps in the rule, by themselves. The problem is connecting them. Doing both results in requiring all investments to contribute to ever multiplying investments. It creates an economy that pushes us to search for new resources and talents ever more frantically to survive.

Together those two parts of the rule of accumulation, to make fairly sure bets and then add your winnings to your bets, turns any system into something like a Ponzi scheme. It raises the stakes exponentially by multiplying competitive stimulus and searches for profits till something breaks. That kind of growth of competition in a steady-state economy would drive increasingly productive people to take ever more from everyone else, naturally. It's not the values of the people doing it, but the system they're unwittingly caught up in!

The historical "solution" to that for centuries was economic growth. With continual multiplying consumption of resources the unfair shares taken by some are more tolerable to others. Of course, using that growth solution as the economy runs into natural limits gives us ever intensifying competition over ever shrinking resources, a different story. That's what we're now doing. It's enough to drive any "well mannered" Sorcerer's Apprentice¹⁶ caught up in it completely crazy!

There's an elegant certainty that points to a solution. It was first discovered by JM Keynes and then further studied by Kenneth Boulding. It helps me point to the riddle of how natural-system economies can be both growth oriented and so good at taking care of themselves as part of nature too. Perhaps those who read chapter 16 in Keynes' *General Theory*¹⁷ or Boulding's last chapter in *A Reconstruction of Economics*¹⁸, or my papers, were embarrassed to not quite understand or hesitant to ask the noticeable

"dumb questions" raised. The question is how to arrive at "peak money", and plan for the natural end of automatic concentrating wealth. Money is what we use to measure the value of things and obtain permission to use them, so money needs to grow only as fast as sustainable physical wealth does.

The way Keynes put it (para.), if you accept that real wealth has natural limits the simple paradox is that either a) investment stops growing because conditions get so bad that returns on investments don't materialize, or b) healthy returns are earned by investments, but instead of being accumulated, they are recycled as spending. Either way serves to bring about "peak money" at the time of "peak wealth", and there is logically no other choice.

The default choice is (a), and there is no present mechanism for or likelihood of (b). In our economy money grows in proportion to money and real wealth in proportion to our resourcefulness with the earth. It appears that successful economies end their own self-investment growth cycles *as a precaution*. It appears to create resources for other things while avoiding the conflicts that would cause investments to fail. It

appears to be a "win win" capital preservation strategy. I hope this is a simpler way to say it, since clearly no one listened to Keynes or Boulding. Getting it right is indeed a question of life or death for our hopes for the earth.

When presented with an approaching certainty, the question is how to respond in a smooth and timely way. Steering problems are like that. If you see a necessity for a change in plans, a curve in the road, you do

two things. One is to start thinking about how to turn. The other is to start looking for when. I like to use the analogy of paddling a canoe, skiing down a mountain, or driving a race car. When you see a turn coming you first mentally prepare a move and then wait for the earliest opportunity to do it smoothly. That minimizes the energy and danger, and makes it fun. It also upstages nature's alternate solution for responding to a coming turn too late, fishtailing to capsize, tumble or crash.

How to phase in workable rules to steer profitable investment toward becoming sustainable is a question. The end is easy to define conceptually, at natural

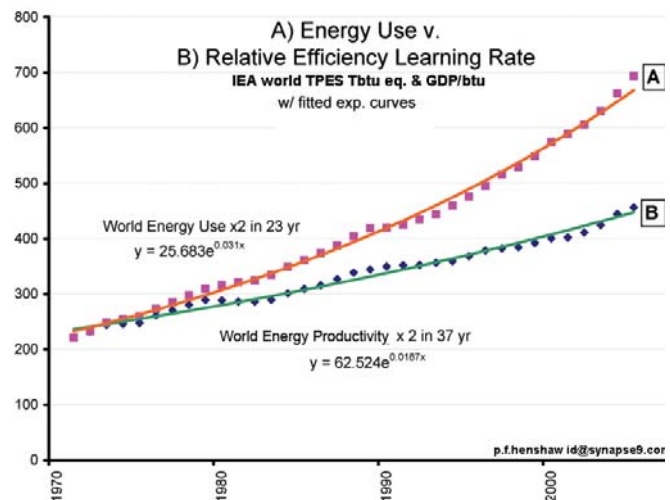


Fig. 4 Efficiency and energy use in a growth system.

limits assure that enough investment is spent to no longer multiply faster than real wealth. The first thing is for other people to explore the question of how to do it and when. One practical choice would be to qualify the tax status of investment earnings. Instead of taxing returns it could just require the divestment of returns. If good measures are available, that allow reinvestment of earnings from industries that are not driving the economy in unsustainable directions. You could begin with small fractions, guided by the use of whole system scientific measures of sustainability. As you feel your way along you'd keep in mind the other main "precautionary rule", that you'd allow exceptions only if they don't invalidate the main rule.

This is a kind of "biomimicry" for how natural systems prosper despite having limits to growth. It would be a learning process. The intent is to learn how to switch to the natural way of completing things that last and integrate with their environments. I think our long history of "being at war with nature" no longer seems profitable. Finding ourselves working ever harder at a clearly impossible task seems like a very good time to quit.

It's also an idea for how to avoid the fatal traps for modern civilization so well described by Joe Tainter in *The Collapse of Complex Societies*¹⁹ and Jared Diamond in *Collapse*²⁰. The long history of complex societies collapsing seems clearly associated with societies of proficient problem solvers running into diminishing returns for their own methods of solving problems, and becoming trapped. **It's a way for them to get tricked into turning their best solutions into their own worst problems. Diminishing returns for any direction of development is as reliable a principle as gravity. It's a passive cause, part of what lets it "sneak up on us", but apparently a very real hazard.**

One of the crazy things it has pushed us into is using efficiency to reduce resource use and also sustain growth at the same time. Efficiency stimulates whatever the whole system is doing as it makes a local savings. In a growth system it invariably multiplies the use of all *other* resources, all of which use more energy. That generally defeats the original purpose when impacts of all kinds are at their limits. It shows very clearly in Fig 4, the modern history of improving world energy efficiency continued multiplying energy use. What we really need is an environment that is searching for how to make things last, a maturing economy rather a perpetually an erupting economy. Then the efficiencies we devise would serve to make resilient and lasting things work ever more smoothly.

The main source of learning about the subject seems likely to be each individual's own original observations about how searches for lasting change in their own lives begin and end. That's where you can really begin to see how its the environment of the change that is first growing and then maturing, and the purposes and values of the searcher that follows them.

Every kind of project whether making dinner for family or friends, or building a career in business and rising to the top, begins with expanding your search and ends with perfecting it. They're two different kinds of accumulation that go along with starting and finishing things. They're periods of outward and then inward growth, generating a framework and then completing it with refinements, not an equation but a learning process. Some version of that pattern seems observable in all processes of lasting developmental change as they begin and end, whether planned or unplanned. Everyone knows a lot about it already, is really the point. It's very natural.

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¹⁴ H.T. Odum 2001 A Prosperous way down

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¹⁶ W. Disney 1973 The Sorcerer's Apprentice

¹⁷ J.M. Keynes 1935 The General Theory of Employment, Interest and Money

¹⁸ K. Boulding 1967 A Reconstruction of Economics

¹⁹ J.A. Tainter 1988 The Collapse of Complex Societies

²⁰ J. Diamond 2005 Collapse