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Life's Hidden Resources for Learning

Conversations with a radical idea

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I. Introduction

A. The main thing wrong with Darwin's theory of evolution is that the organisms and communities we actually see in nature, the great masses and thriving communities of things that actually do survive, are not the ones that prevail in mortal conflict. The things that survive as the fittest in the contest of life, and that we directly see populating the earth, are the organisms and communities that are resourceful in using what is free and uncontested, and successfully avoid conflict. One can find lots of examples of both mortal conflict, and resourceful learning, but to tell which survival strategy is prevalent you need a kind of whole system measure of some critical difference. Once I point it out, I think, anyone with a love for and wonder in the rich beauty and complete integration of natural systems will, well hopefully, remark how completely obvious it is. It's a kind of evidence that has been hidden in sight for centuries, seemingly by a particular kind of obvious blind spot. In "making sense" we selectively represent the independent learning processes of a complex world with fixed and often culture laden images. So we become functionally unable to see the independent life happening all around us. It's a deep blind spot and central to our mistakes in trying to protect and develop the earth. It's a more developed view, but not at all unlike the one offered by the economist Friedrich von Hayek In his "The Pretence of Knowledge" Nobel lecture. (Heinrich 1974)

B. Looking carefully it appears the idea that the order of nature is a balance of conflict, provides a simplistic model that has prevented us fom wondering if living things might be resourcefully staying out of trouble too. This same substitution of simple rules for independently behaving things can also be found responsible for repeatedly leading us into serious environmental conflict. We get into deep trouble and we're naturally then also unaware of how it happens. When you think independent learning systems which adaptively exploring their own paths of change are following our own fixed rules and images for them, you're blind to their life.

C. A classic example of how not seeing the life in the world causes us to get in trouble is offered by how the world environmental movement spent 30 years promoting ethanol and other renewable resources only to belatedly discover that they consume ever growing amounts of arable land. Now the excess demand for food resources that partly caused has triggered a worldwide food price war and panic for many millions in low income communities and societies (Brown 2008). That's the antithesis of being resourceful in using what's free and staying out of trouble. That's walking blindly into trouble with other living things. There seems to be something in the magic of nature's design principles that we're missing. We get in trouble over and over by grabbing a great niche opportunity and treating it like an unlimited resource, completely failing to 'see the life' that the footprint of our choices is going to step on. Learning from mistakes is valuable. What makes this error particularly useful is that it represents the exact same conceptual error that the movement for 'renewable resources' was designed to correct. It is therefore clearly a cognitive mistake and not a matter of holding the wrong moral values.

D. I think that not seeing it and not using it in our relations with natural systems are the same problem. Because we fail to see the resourceful learning other things are involved in we fail to respect, the lines of conflict with it in the world around us. I'm not at all sure I can convey the whole picture I have of nature, that all kinds natural systems are themselves all individual self-organizing learning processes. I hope to outline a fairly convincing view of a particular cognitive deficit that might well hide that kind of reality if it were to actually exist. The blind spot is this: As much as we think about our world in a self-consistent way, we will not be able to see the behavior of its independent parts. Like a single equation, self-

consistent thinking can have no independent parts. Nature is mostly composed of physical systems that have both interdependencies and considerable independence, connected through a physical medium that that can accommodates a great many kinds of differently self-consistent behavior at once. If our thinking is self-consistent, we don't see that. Discussing this also gives me the somewhat tenuous task of making sense of why one would continually look for how the most meaningful parts of the world all make their own different sense.

E. If the systems of nature are all individually adaptively learning,, and our usual way of making sense of them can't have independent parts, we'd be physically living in the middle of something we don't see happening at all. There's a world of physical processes and a world of cultural ideas, and sometimes they really just don't connect. People have lots of different ways of thinking, of course, and not all are prone to being separated from reality. For the problem with 'making sense', the blind spot is more one of 'formal' thinking. It takes a fair amount of effort to fix up all the inconsistent observations we collect to make a single model of self consistent parts. It also strips away all the life. If nature is actually composed of lots of individual things engaged in individual learning, our process of "making sense" of them could indeed physically cause us to loose their individuality and separate ways of learning in our minds.

II. When tradition rules

A. Learning to understand natural systems as being different from our cultural ideas of them is difficult. Oddly it's like believing natural systems might have their own individual designs and behaviors, like what one naively sees in daily life. That is definitely a break with some of our dominant beliefs and traditions. Our rational traditions have mostly followed the lead of the most successful of the sciences, the idea that all behaviors are controlled by a single set of unchanging universal rules, even evolution. That no rule quite explains any individual instance, never seemed to be useful. The excuse for that that because some rules are useful, everything must follow rules we just don't know yet has been quite satisfying to most people. Unfortunately, it really does. That no individual behavior quite follows any deterministic law never seemed like an interesting subject to study. It was the part of behavior we couldn't find deterministic rules for! Now it seems we really need to understand that, and have not carefully studied why the almost well behaved systems of nature only 'almost' follow our rules.

B. For a very easy analogy that may help, we often talk about something being a 'bubble'. Bubbles are hard to see anyway, but it's really a problem when the bubbles in our minds are not at all the same as the ones in our world. Physical systems and mental systems have quite different ways of developing. The common aspect that allows the 'bubble' image some broad relevance is that all natural systems develop by growth and growth processes are naturally prone to become overinflated and 'bursting' if they exceed their limits. Nature does not tell us what to call these things exactly, so it's hoped that people will take the meanings from their own original observation of things happening around them.

C. That scientists were not interested in why every experiment misbehaves a little we are then left to discover the general flaw in our model by running into extreme cases where our models misbehave a lot. We still don't see quite how our fixation on wealth as endless multiplying surplus is disrupting our own life support system. Hopefully that can become visible and come home to us when we find that our best ideas for solving problems are not working. A lot of 'sustainable development' is in unexpectedly stepping on the life all around it just the same way the greed of the growth industry has. The sore case in point at the moment is the appearance that trying to make 'renewable energy' with ethanol triggered a price war putting the cost of basic foods out of reach of many millions of people. (Brown 2008)

D. On thinking it through, the real culprit in the food crisis seems not be specifically bio-fuels and ethanol. Perhaps they did trigger the price war that tipped the balance, but the 2007 purchases of corn for ethanol were of a scale the markets had previously absorbed by stimulating the excess capacity of the system as a whole. Large natural systems seem to have whole networks of 'buffers', where every individual part has reserve capacity that facilitates adjustments of the whole. Why the reaction to ethanol intruding on the food resources of the world was so sharp is the leading question. It appears other things were at root in draining the food system of all its excess capacities and the ability to absorb shocks. What looks like the underlying cause is a major relentless global trend that no one has paid much attention to in this connection. I think the main culprit is global 'urbanization' (the everywhere sprawl) that is relentlessly reducing the quantity and quality of land available for food production while also continually pumping up the demand. We should treat population growth and the loss of productive land like threats to an endangered species, us.

E. Nature has shown us her method of achieving rapid demand decline, raising the price of food out of reach of many millions of people, and destabilizing

many countries[1] . The limits of growth have been discussed for some time, (Meadows 2004). Why the connection would be missed may be that the other studies did not discuss how running out of uncontested resources would drive everyone's separate interests into conflict with each others, all at once. It happens all at once because the individuals in the system are so good at staying out of each other's way! They avoid conflict until there is no more room to maneuver, and every one runs into conflict with each other all at once. If the world's dominant food production system has indeed hit it's peak capacity, just buying food for starving people will just push world food prices higher. That would put even more people in danger while promoting further population growth and increasing demand. Only slow cures seem available, presenting us with the next profound and confusing moral dilemma of our time.

F. I grew up in a small north eastern dairy farm region, and most of those farms are now abandoned. The high productivity farming methods elsewhere have a monopoly on food production and squeezed out much of the whole infrastructure for modestly productive food production in the developed world. The problem is not just farming methods ruining good land and expanding cities that multiply the demand for food products. We've also been paving over the old farms, turning them into suburbs or scatter site housing. Some of those farms in the north east and elsewhere might possibly be returned to productivity, but the local traditions have all changed so some entirely new way of using the more segmented pieces of arable land will need to be invented to return them to use Those are slow solutions.

G. There's sure to be objection to upsetting the tradition that there are lots of things in the world that follow completely unchanging rules. Some parts of the world, the motion of planets for example, do seem to follow simple rules quite closely. Even if they seem to behave in such faithfully consistent ways and might never need to be watched to see, the better rule for natural systems might be to never quite trust that. You might have a habit of collecting original observations of a high enough quality to pick out the individuality of the behavior of things. That could be greatly assisted by comparing your observations to your rules. The alternative seems to be to trust your rules as long as you can and then only start making original observations when shocked by things entirely departing from them. Being rather surprised by change is going to happen sometimes anyway, but if you're in touch with the individuality of the environment you're in, adapting to surprise is far easier.

H. Of course, the other side of traditions and traditional ways of thinking is that we invest them with an enormous variety of emotional and cultural meanings. That means they develop with very diverse interconnections, like any complex natural system. They even cross connect our complex thinking and value systems and the complex physical networks of our physical habits. That complex integration makes them tend to be both very stable and hard to change, particularly in unfamiliar ways. That's sort of represented by why front yard vegetable gardens just don't go over well. These complex connections in our whole network of our traditions are another reason why endless growth plans fail. Changing things gets complicated, due to internal complications not just external ones. For the past 50 years the most profitable development in the US was to consume energy at ever accelerating rates, putting houses further and further apart and consuming more and more energy, for example. That went along with a whole cultural evolution of society. Both are now directly linked to our permanent physical settlement pattern for the continent. That's a major barrier to change.

I. One of the good observers of how economic development operates as a natural complex process is Jane Jacobs (1969, 2000). The city is really a key to nearly everything that humans do well. Multiplying city expansion to the point of threatening the world food supply is not one of them. Still, cities are like mankind's fresh water ponds, where we intensely thrive. We've let a conflict develop between the form of where mankind thrives and it's physical place though.

III. The natural balance

A. I recently discovered what I hope is the key to revealing a whole new side to Darwinian evolution in reading the writings of one of the earliest ecologists, and one of my ancestors, Stephen A. Forbes (1887). He was the first ecologist to describe the unusually densely thriving and stable living communities of fresh water ponds. His original paper is both quite readable,. What's interesting is the way he discussed one of the unsettled questions of that time as he summed up his conclusions, the puzzle of ecosystem stability. To clarify the quote, he refers to predator species also as "the dependent species". See if you can pick up the leap of faith that remains inadequately explained to this day:

a) I will bring this paper to a close, already too long postponed, by endeavoring to show how this beneficent

[1] The World Bank now believes that some 33 countries are in danger of being destabilized by food price inflation http://www.telegraph.co.uk/earth/main.jhtml?xml=/earth/2008/04/22/scifood122.xml 4/22/08

order is maintained in the midst of a conflict seemingly so lawless.

b) It is a self-evident proposition that a species cannot maintain itself continuously, year after year, unless its birth-rate at least equals its death-rate. If it is preyed upon by another species, it must produce regularly an excess of individuals for destruction, or else it must certainly dwindle and disappear. On the other hand, the dependent species evidently must not appropriate, on an average, any more than the surplus and excess of individuals upon which it preys, for if it does so, it will regularly diminish its own food supply, and thus indirectly, but surely, exterminate itself. The interests of both parties will therefore be best served by an adjustment of their respective rates of multiplication, such that the species devoured shall furnish an excess of numbers to supply the wants of the devourer, and that the latter shall confine its appropriations to the excess thus furnished.

c) We thus see that there is really a close community of interest between these two seemingly deadly foes.

B. To me saying that "*the dependent species evidently must not appropriate, … more … and thus indirectly, but surely, exterminate itself*" describes why individual learning is required. It describes the real necessity for dominant competitors to not finish the job. The trick that alters the view, though, is that if self-constraint is conceivable for the predator, it could also be available to the prey. Individuals in a prey species would then be allowed the same general kind of local learning to avoid conflict or even other resourceful learning behavior, to avoid the hunting grounds of the big fish, for example. What they would need is a) a source of information about the approach of conflict and b) to prefer directions of exploration that avoid them. It wouldn't require advanced 'intelligence' per se, just exploration and avoidance. Individual learning by either predator or prey is needed for balance because unrestrained conflict is inherently unstable. It gives advantage to the strong so food chain relations would all be profoundly unstable. Well, when you look around, they're not.

C. This is an apparent proof that resourceful avoidance of conflict is the dominant behavior of stable natural systems. If it were to hold up one of the many wonderful implications that follows is that perhaps humanity's tendency the stumble into conflict with our environment is not inherent in nature. If organisms and various other kinds of systems with little or no brains at all can develop complex stable competitive systems in which the individual parts learn to get along, perhaps we are just missing the signals.

IV. Reductionism

A. There are a great many kinds of signals that people or other living things need to respond to in their lives, so one needs to narrow the question down a little, but not too much. As I've progressed with understanding our larger problem of misunderstanding nature, I found something very interesting. It appears that self-consistent models or explanations can only include nature's independent parts by replacing them with definitions. Self-consistent explanations can't have independent parts. Replacing complex independent things of our observation with definitions so they can fit in consistent explanations procedurally strips away all the independent parts of the world and their original behavior.

B. The tendency to over-simplify complex things is one of the best ways to miss the signals. In the case of traditional science the models we use are all self-consistent, and have no independently behaving parts[2]. They only reference separately organized systems by name or a substitute rule. That excludes all their individual behavior. If life is composed of individual learning systems, environments are then inconsistent with any self-consistent representation of them, as they would lack a place for questions. Representing the world with regular models then serves to 'hide the life' and our own real nature, providing a very good reason we miss the signals about crossing the lines of conflict with other life or our own stability. It's a possible natural cause for why we consistently fail to see the life around us that the footprints of our fixations step on.

C. I think there's a match between that explanation and many of the particular errors being made, like the error by the environmental movement of promoting the niche opportunity of ethanol as an unbounded resource it h global impacts on food. It was entirely inadvertent that it ran into the lives of poor people all over the world by displacing food production and triggering a price war. Even if other things contributed, it 's clear that the models that the environmentalists were following don't turn their attention to the life they would be stepping on. It was missing from the model. That makes it a cognitive problem rather than a values problem. Having models that 'hide the life' is a kind of 'functional fixation', similar to those studied in gestalt psychology, an inability to hold more than one thought at a time (Davidson 2005). As discussed above 'making sense' of things by constructing a self-consistent model or explanation removes any information about original behaviors in the same domain, unless the model also asks questions.

Environments are full of things that make different

[2] Agent Based Models are intended to build virtual independent behavior in a computer, If they were ever to develop truly original behavior though, we'd still need to study it with the same methods we have yet to develop for studying original behavior in physical systems.

sense at different times, so fixation prevents you from seeing them. For the parts of the world we treat that way it means we're almost never ready for change. It would seem to mean that a basic reason that life is so hard to make sense of is that it is composed of a large collection of individually different learning processes.

D. This way of misrepresenting nature that keeps us from seeing the life behind our models.is so common and clearly misleading it might account for much of the human cognitive deficit we call 'reductionism', A 'solution' to that would surely be a lot of work, of course, but there may be a fairly simple way to define one, at least. One half of the reductive step is adopting a self-consistent model to represent a complex world. That hides all the independent behavior of its named parts from view. The other half, though, is then turning off your own stream of original observations. If after you adopt your simple model you keep both your model and your original observations turned on, you could get the opposite effect. Then a self-consistent model becomes a sensitive detector of differences, and a way to highlight the behavior of the life around you. It would mean not ending the thought process when we 'make sense' of things. It would be continuing to observe the world with it to enhance the view and see the life outside the model. The downside, of course, is that in our traditions that sort of 'thinking forward' beyond making sense of things,… is sort of 'thinking backward'.

E. Suggesting that people could actually use this kind of technique to develop the proverbial 'whole new way of thinking' a great many observers have thought needed is just a little preposterous on the face of it. There are so many many reasons why it can't make much of any kind of headway in a totally self-posessed world where virtually all the influential people seem to have just the opposite idea! So… take it as a thought experiment, a curious card game to play as the furniture we're sitting in slides off the edge of the decks of the Titanic, or something. Life isn't fair! We'd have to overcome so much. To learn to live in a world full of individually behaving systems we'd have to overcome our fear of everything being out of control.

F. Nature may yet provide us solutions though. One of the ways natural systems frequently avoid running into conflict is by responding to the approach of insoluable problems, by redefining the problem. It actually appears to be a rather common kind of crisis in natural systems, and not at all unlike ours. As individual learning processes, many natural systems begin with learning how to multiply, and develop by a process of run-away exponential growth. They may not try to strangle a whole planet, of course, but they all need to overcome that same learning crisis and change their whole way of changing as they run into limits. Natural growth systems that stabilize seem to do it by switching the way they use their surpluses, so at 'the signal' they change their expanding by successively bigger steps to completing their designs by successively smaller ones. It's a complete change in their whole way of changing, that lots of kinds of uncontrolled systems do, following some kind of internal trigger in response to environmental signals. Their whole distributed organizations switch from a set of insolvable problem definitions to solvable ones, with grace and ease. They seem to balance by yielding to the strains of growth and switching to refinement.

V. Individualism

A. Turning representational models that naturally hide the life of the world, into tools for seeing the life would take time and effort. It's not easy to continue making original observation after 'making sense' of something because the sense things seem to make colors your view. The fine difference is whether you treat your own explanations as being reliable representations. It's actually their unreliability that is the key to discovering what's real. Of course it conflicts with our common preference for 'solid answers' but the exchange is having a way to find 'better questions' instead. You can see the danger of our faith in 'solid answers' with ones that greatly mislead us. 'Renewable resources' seemed like such a solid answer, and that seems to have been why it was not questioned in the 30 years of high level organizing and research that went into it before it started running into trouble. Running the economies on renewable resources only switches one ever growing set of impacts for another, just alternating functional fixations. Renewable resources are typically quite good niche opportunities. We have not been asking what unseen living things their footprints will step on, though, and using them to solve an unlimitedly growing problem.

B. "Renewable resources" is a name for a trusted concept. The problem of unlimited expansion of them is not just that they convert increasing amounts of eco-culture land uses into mono-culture. They are also a completely new land use on earth that consumes land in an ever growing non-renewable way. It appears the 'trusted concept' hid the reality completely. We had an image of 'renewable resource' as automatically having no impact. We see something 'big' and without looking treat it as 'without limit'. The solar energy limit may not be clear, say using solar panels, but exponentials do very clearly disturbing things if you plan on following them very far. The earth receives roughly enough solar energy in an hour to serve the world's annual energy needs today and so 8760 times our annual needs in a year. If the economies were to grow to 8760 times their present size then, to collect that energy with solar panels the entire earth would

need to be covered in black panels. At the standard growth rates, turning the earth into that 'black ball' would then take about 250 years, one good three stage industrial revolution away!

C. What happens when your plan is to discover your limits by running into them is that you then can't avoid the damage. Any severe consequences will develop unseen and become firmly established before you find out what is coming, leaving you little or no way to respond. One of the main differences between our hitting 'peak oil' and 'peak food' this decade is that we paid relatively little attention to 'peak food' approaching. Now we are caught more off guard by it for not watching the fundamentals, compound the intensity of speculative trading in commodities exiting their positions in real estate. Within a climate of ever bigger crises, the ones you're too distracted to pay attention to catch you completely off guard. The ones you pay attention to are the ones for which you develop options.

VI. Thinking Things Through

A. There may be no method of predicting all the unexpected responses of the individual systems around you, but one unusually effective one is to always ask what will be the end of any particular direction of activity, and learn to think things through. Everything runs into something, and every direction of progress finds it's point of diminishing returns. That question and evidence are unusually effective for signaling otherwise remote and invisible behaviors of the environment that have a potential for conflict. When we don't think things through, but just put them off, we don't ask about the whole effect. It makes "clear the tracks" and "barrel ahead" your planning model. Then things like the explosive power of surpluses in multiplying the effect of your choices can be readily turned into a lasting tragedy, unless you think it through.

B. The place where people do have a high level awareness of life and approaching lines of conflict are the things we do well, but don't "make sense" of. That would include things like personal relationships, story telling and music, among others. They're things that become 'second nature' to us with the right kind of attention to detail, not a 'theory'. Still, in solving the real environmental crises of the world, importantly caused by misapplied science, the scientific models of change are completely essential. Since fixed models of rules have no individual parts, they don't show what is actually happening though. The question is then how to change them into models for showing us the life around us, even though by definition independent parts can't be included in a self-consistent model. Correcting the problem that our models generally represent nature as having no independent parts is a remarkable very hopeful challenge.

C. I think I should only very briefly mention a couple hopeful directions for that. I'll avoid the theory for how to tag deterministic models with open system questions, and focus on two new methods of scientific learning. One example of a whole type of new science is a network science application called 'product space' in which maps of commercial trade display links between different supply chains (Hidalgo 2007). Product communities help define knowledge communities of interrelated trade, and the economic learning paths of their development. The way aid was once designed it promoted the businesses that would make the most money. In a developing community that might only target businesses that devalue the learning path of the local industries an institutions and so disrupt the indigenous societies. Having scientific tools to help planners see what organically fits is extremely import for guiding the radical development strategies being proposed all over the world. What's so new about it is that it is an analytical exploration of the natural structure of complex systems themselves, and not theory. Instead of using theory, it builds models of natural systems directly from the behavior of the systems themselves.

D. Making our existing 'reductionist' models more useful for navigating a complex world is another matter, and perhaps hard to explain in sentence or two. To 'see the life' you use them to represent what nature is *not* doing. That begins to address the problem that scientists and non-expert decision makers both have highly useful information for the other, but little way to connect them. They both have a distracting fixations that make the real value of their perspectives difficult to communicate. Bridging these gaps is the job of collaborative learning, much of which is the shared task of 'finding the problem'. When decision makers can be helped to see the individual systems in their world that the scientists are referring to in their models, then both can benefit from the two different ways of seeing what will and won't work. Facilitated collaboration is not a new idea, but it's hard to communicate. That may be partly because it's intuitive and passed hand to hand though experience. It also conflicts with the idea that everything follows rules. Real learning from different points of view does take additional time too, of course, so that's another reason the methods are not widely applied.

E. Among perhaps a great many others two advanced complex systems theory methods are worth mentioning. One is my own 4D method of approaching choices as making parts for the living system in which they are immersed. It relies on the basic strategy of exploratory learning: start small,

search and find things to bring back, see how they combine, and leave the loose ends around. That's then used in a problem solving cycle of breaking away from the problem to 'look around' to see how it fits its environment, looking for long-shot connections and adding up the 'total balance' of effects (Henshaw 2008). Another model application for using advanced complex systems theory in problem solving is the practice of Gerald Migley (Migley 2007). His approach is to study the different boundaries of the problem defined by the expression of the problem and the resources and ideas of people involved with it. As that develops a more complete understanding of the whole environment, an intervention that would be manageable, have multiple positive effects and cross the boundaries, is then identified.

F. The best sustainability scientists still tend to only think about 'solving the problem' instead of 'questioning the problem'. Otherwise they would see in short order how many of their tricky solutions are too complex, and even if they could be implemented would not hold for long. Collaborative learning to 'find the problem' is treated as a nuisance to be avoided and barreling ahead with an assumed problem that will run into trouble as the 'short cut'. Still, lots of organizations have major programs in sustainability science. Some that attend to the learning process itself are the EPA, AAAS and the National Academies of Science. (EPA 2000)(AAAS 2008)(NAS 2008).

G. So, what is life? Well, if you're any good at it you can't avoid needing an awareness of the life all around you and being immersed in its learning!

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