What's Life got to do with it

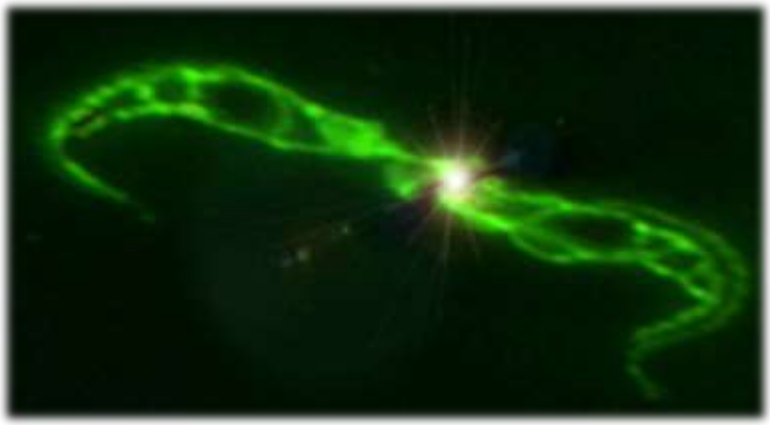
Tom Ransom 2015…

This remarkable miracle we call "life", insofar as the scientific evidence shows, got up and running as soon as it was able, meaning—of course, the *potential* for life was here first. Gradually coalescing from the hot spin-offs of a condensing star, the Earth started out as a molten mass of mostly rock and heavy metal. As it cooled water began to accumulate. The water was coming from the frequent impacts of icy meteors, the farthest flung remnants of the solar system still in pursuit of its gravitational center. In fact, we likely owe our very existence to having interrupted their transits of the Sun, for these ballistic intruders not only deposited water, infused within were a host of "organic" compounds.

Slowly rotating in the warm radiance of its parent star, fertilized with dirty ice raining from afar, the Earth was soon awash with all of life's requisite ingredients. And deep within these natural elements, in their innermost atomic arena, a dynamic affinity was at play: Matter was mixing it up. Matter spontaneously interacts because an "electrostatic force" *impels* it to do so. The negatively charged perimeter electrons of every atom are attracted to the positive nuclei of adjacent atoms, and thus, as a matter of course, incessantly seek to close the distance. Atoms aggregate whenever together is more stable—closer to dynamic equilibrium, than is their separate adjacency. Because equilibrium is their preferred state, more stable means longer lasting. This intrinsic propensity for matter to persistently combine meant ordered complexity, of ever longer duration, whenever possible, was for certain. It was *supposed* to happen.

Thus, whenever conditions are favorable, by proximal necessity, the natural elements engage in chemical synthesis forming "molecular" compounds, which likewise attract and interact, forming evermore stable assemblies. Moreover, when compounding molecules interact, bonding energies are discharged and exchanged producing electrical pathways that further enhance polyreaction potentials. Induced to expand along their electrical charge-gradients, these budding cascades test every available adjacency, proceeding to extend, wherever possible, into regions of ever greater stability. And with every extension, as the topological complexity expands, their combinatorial range of bonding possibilities expands as well, exponentially. They *grow*.

What we find, then, is that ordinary matter spontaneously imports from *within* a unitive affinity to organize into evermore stable, durable arrangements. But there's more. Oily organics don't mix with water, they form autonomous "cells", within which budding assemblies can evolve. And so it was, given a warm juicy planet hosting a growing number of possible combinations, just a matter of time before a miracle happened: Multiplication by division!



All that was required for the initiation of life was the division of an autonomous, "autopoietic"[1], self-sustaining assembly along a bilateral axis, such that its potential to do so—its *seminal symmetry*, is conserved in both. As this symmetry was coincident in its development, the one—now two, resume their autopoietic activities, whereupon, whenever this fission axis reoccurs, the cycle of division is repeated. The world, however, is a dynamic tumbler, deviation and variation forces present at every stage of development, and of the subsequent divisions, only the most resilient replicate. It followed that those cellular assemblies best able to reliably repeat—accurately encode, their regenerative successes, became the most successful reproducers. The result was that the most stable variations featuring the fastest reaction gradients, those demonstrating the greatest "dynamic kinetic stability",[2] became the most prolific dividing multipliers.

Mating, mutating, and multiplying, mixing it up, these various embryonic organelles naturally began to develop symbiotic relationships with one another. Each evolving "species" became a veritable experiment testing its longevity and powers of prolificacy. While most variations appeared briefly and faltered, the fittest remained, "selected" to continue its lineage. In conformal correspondence with its resource environment, leaving no opportunity untested, life proceeded to probe and occupy every habitable space. And with each new generation, as the competition for requisite resources became evermore challenging, the advantage soon went to those able to consume the production of *others*.

Now, recognizing that life selected to consume members of *itself* to advance its expansion, imports a profound implication. It means any professed Grand design thought to empower the synthesis of matter, and by extension the autopoietic processes of life, must be entirely indifferent regarding *which* individuals, and even which species, succeed. Each in every generation survives simply because, and only because, it proves to be as capable as the other competing candidates. This means that life isn't really about the players—us, at all. It's a *process*.

Inquire further and our comfort-zone sensibilities are soon challenged by an even greater apprehension. The planetary and cosmic contingencies that shaped the course of life on Earth have also been entirely indifferent—with regard to its very existence! Numerous cataclysmic volcanic and meteoric events, as evidenced in the sedimentary fossil records, have periodically reduced Earth's biological

complex to its most primitive forms, erasing nearly all that natural selection had so laboriously produced. If the emergence of life on this most hospitable planet was a 'given'—supposed to happen, then its success certainly wasn't selectively granted by Grand design. The implacable truth is that unconditional adversity, periodically and randomly applied, has been life's 'tool and die'.

So what are we left with? Everything! Apparently, billions of years of natural selection selected for *us*. We human beings represent the highest order of auto-poietic complexity on Earth because our species proved more capable and resourceful than any other. It wasn't because we were the biggest, strongest, fastest, or the most sensate; adaptation provided many other species with greater physical capabilities than ours. Nor did we reproduce fast enough to win over with numbers-of-kind like the microbes and insects did. The reason we out-performed all the other evolutionary candidates is because the nexus of our senses—our brain, multiplexed into a vastly superior processing organ.

It appears that well beyond the durable reproduction of biological complexity, even beyond the advance of sensate awareness, the processes of life have been selecting for *intelligence*. While all species acquired the intelligence required to respond to the challenges of their particular environments, our kind fast-tracked on the rapid path to even greater processing power. From within the neural networks of our neo-cortex emerged the capacity to not just download sensory perceptions into memory, but *reflect* upon them, fashioning over time a comprehensive understanding of our world. Humankind ascended because "con-scious cognition" conferred upon our species the winning adaptive advantage.

This aptitude for "insight" made it possible to learn from past experience and project into the future, visualize various options, and reduce risk by planning in advance. We envisioned the manufacture of tools to shape our environment and designed instruments to enhance and extend our senses. Most importantly we developed symbolic language to record and convey what we learned with one another. Over time this global network of shared knowledge and experience proved so enabling that human intelligence not only assumed dominion on Earth, but one day may be transcending it.

Have you ever observed a flock of birds and marveled at how they seemingly move as one 'super'organism? It appears our kind wasn't the only species to develop a demonstrative collective intelligence. In fact, long before we happened on the scene, animal herds, insect colonies, and even bacterial biofilms, were engaged in collaborative behaviors that enhanced their mutual success. Indeed, this unitive "organizing principle" may well be the defining impetus driving the evolution of life.

Such a unifying principle might suggest that "flocking" behaviors—bird clusters, schools of fish, animal stampedes—are somehow directed orchestrations, informed in some 'top-down' fashion. Slow motion analysis, however, reveals that nothing 'super'natural is involved. When slowed frame to frame these group expressions are seen to be the reactive recurrence of *individual* inputs.[3] Flocking behaviors manifest locally, bottom-up from within, when an initiating individual action—the tip of a wing, the flick of a fin, an animal's startle reflex—causes a wave of reactions to radiate across the population.

As these propagating reactions reinforce, resonate, and feedback on one another, second-generation harmonics are often produced that can both amplify and modify the waveform. These are "emergent" expressions, coherent outcomes no longer attributable to any specific initial actions. What gives a flock its superfluid appearance is that these secondary harmonics often propagate faster than the sum of the group's individual reaction times.[3] Such secondary "epiphenomenal" expressions, however, are *consequently* a synchronous collaboration. The illusion of a group agency at work is just that. The actual causal agents are those leading individuals comprising the group's "vanguard".

The characteristic traits exhibited by this leadership vanguard are not privileged to them, rather, they are genetic endowments belonging to the group as a whole, inherited more or less by all, and effectively expressed in a normal "bell-curve" distribution. Because the most successful expressions are more often the most productive, effective change agents tend to be the most well endowed. In fact, every adaptive advantage, innovation, or new idea, was expressly introduced into the collective mix by an extra-ordinary individual. Truly, the very survival of our species is the cumulative result of *their* every success.

That successful group outcomes are the cumulative expression of individual successes is a life lesson that provides a reasoned and principled approach to matters of governance and economics. Policy intentions would focus on equality of opportunity rather than outcomes, with the understanding that a variable outcome distribution is not only natural and nominal, but unavoidable—even necessary, in order for any success selecting evolutionary process to advance. It follows that meritocratic, free-enterprise societies amenable to the unencumbered success of the best among them, in every variety of productive endeavor, should over time prove the most prosperous for all. As the viability of a society is a function of the combined strength of all its members, strategies promoting personal initiative, resourcefulness, and responsibility benefit everyone.

In terms of governance it suggests that *less* is better. It suggests that to the extent the natural auspices of life's evolutionary process are permitted to exercise freely, from the bottom-up, will populations naturally tend to become more capable. Government command and control interventions, implemented from the top-down, constrain freedoms of function and redirect resources, causing collateral cascades of unpredictable consequences. Those who advocate for evermore centralization entertain the belief that the prerogatives of a remote group of select representatives can pull the bureaucratic levers of regulatory redirection fast and smart enough to out-perform the extemporaneous expression of life's evolutionary endowment trust. The truth is, our future is being secured moment to moment, as it always has been, by the innovative vanguard of extraordinary individuals emerging naturally from *within* the elemental impetus of life itself.

We previously observed that beyond biological complexity and sentient awareness life has been selecting for intelligence.[4] From metabolic pathways in a vesicle to the alliance of cells in an organism, from ants in a termite mound to complex human civilizations, this propensity to coherently "self-organize"[5,6] has been at life's leading edge. This intrinsic "synergy" is evidence to suggest that life's potential may import a teleologic trajectory.

Which might explain why with the advance of intelligence emerged a curious tropism toward *comprehension* that began expanding the depth and breadth of our awareness. Beyond simple sentience, well beyond biological necessity, conscious awareness has evolved into an abstract configuration space where intangible images, thoughts, and ideas take form. This transformative transition from terrestrial adaptation to a 'meta'physical world of mental imagery and symbolic reasoning enabled structured thought and creative thinking. With the insight of our 'mind's eye' we're able to visualize subjects far beyond the scope of our immediate senses. It's where the boundless domains of mathematics, theoretical physics, and the arts find residence, as do the more introspective subjects of religion, morality, and meaning. Some posit that these purely noetic features should be considered part and parcel of a 'meta'mind, the accrued entirety of the human cognitive enterprise, feeding back upon and exponentiating the evolution of each new generation of minds.

Just as biogenesis has direct attribution to a seminal potential within matter itself, the potential for conscious comprehension must also have been precedent within. So why might an intrinsic inclination toward ever greater awareness exist? Aside from the verity that greater awareness surely enhances survival, a grander pretense to consider is were it not for the likes of "us", none of this would ever be *known* to exist.

If so, we're in for a 'pre-Copernican' revival: The Earth *is* central. Rather than adrift on a lone outpost in the vastness of empty space, conscious beings may be an integral part of the cosmic expansion, perhaps even its leading edge. Rather than a random happenstance without direction, life may know full well what it's up to. And if so, insofar as purpose and meaning are concerned, we would do little better than learning to "dance with the one that brung us"...

Less the leaves

More the tree

Less about us

The Big picture

References

1) Margulis, Lynn; Sagan, Dorian *What is Life?* (Simon & Schuster: 1995)
autopoietic: the processes of continuous production. 23

2) Pross, Addy *What is Life? How Chemistry Becomes Biology* (Oxford U. Press: 2012)
dynamic kinetic stability: a characteristic attribute of self-replicating systems. 141

3) Potts, Wayne K. 1984. "The chorus-line hypothesis of coordination in avian flocks."
http://stormy.biology.utah.edu/publications/1984_Potts_Nature.pdf
http://www.straightdope.com/columns/read/2151/

4) Vertosick, Frank T.Jr. *The Genius Within* (Harcourt Books: 2002)

5) Wagner, Andreas *Arrival of the Fittest* (Current: 2014)

6) Kauffman, Stuart *At Home in the Universe* (Oxford U. Press: 1995)

7) Schrodinger, Erwin *What is Life?* (Cambridge U. Press: 1944 –'07)

8) Davies, Paul *The 5th Miracle* (Simon and Schuster: 1999)

9) Goodsell, David *The Machinery of Life* (Springer: 2010)

10) deDuve, Christian *Vital Dust* (Basic Books: 1995)

11) Deamer, David *First Life* (U. of California Press: 2011)

12) Ashcroft, Frances *The Spark of Life* (W.W.Norton: 2012)

13) Zimmer, Carl *At the Waters Edge* (The Free Press: 1998)

14) Sagan, Carl; Druyan, Ann *Shadows of Forgotten Ancestors* (Ballantine Books: 1992)

15) Scharf, Caleb; *The Copernicus Complex* (Scientific American: 2014)