Looking Beyond and Within to Steer the Future

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Introduction. "Where there is no vision, the people perish." *Proverbs 29:18.*

At this point in time on planet Earth, the task of steering humankind's future has become more critical. Earth is large and diverse, but its population (now just over 7 billion) is burgeoning and ecosystems under strain due to abuse and overuse. Earth and its people are literally assembled products of the evolving universe. As sentient products, we must act as trustees of Earth's future, keeping in mind that there is no future without survival. Presently, there is no world force with authority for such an important mission, one assuring a vibrant future. It should be put in the hands of people with knowledge and commitment to the task -- people with integrity.

Several hundred nations function somewhat autonomously, pursuing separate goals guided by their own survival needs in the context of their own physical and cultural environments. The logistical skills needed to guide world survival generally exist in the UN but without decision authority. Backed into a critical corner, perhaps each world community can choose representatives with the authority and the vision our fate requires. An objective scientific community can help guide the effort.

The past can be a teacher. In past civilizations, societies held learning and learned people in high regard. Earlier communities had a small environmental footprint, a relatively primitive scientific understanding and only tribal-like survival concerns. In contrast, our contemporary endeavors can impact a planet, making individual pursuits capable of a global impact.

Considering this truth, can we subscribe to the ethos of most scientists and philosophers, that scientific knowledge cannot resolve questions of value, only reveal what is, not what should or shouldn't be. In our most recent past this philosophy sinks in melting glaciers.

History reveals threats of ever-broadening bad outcomes – war, disasters, threat of nuclear annihilation, and potential environmental mayhem – with human agents at fault. Decision-making, too often short-sighted and predatory, desperately needs inputs from science and technology. But prudence also demands a role for all of us.

Our priorities should embody a joint effort somewhat like the swarm intelligence of ants, whose teamwork ethic has built colonies stretching over 4000 miles. Moreover, ants have survived for over 140 million years.

Elements in Ancient Greece. "Heaven cease this idle Humour in your honor."[i] *William Shakespeare.*

In the context of much simpler times, reason and inquiry characterized democratic city-states like Athens. Perception centered on exterior assessments of material classifications, a system of

identified categories which correlated elements of air, fire, earth, and water with seasons, humors, bodily functions, and personal qualities – an anthropocentric template for life. Empedocles, viewed in the classical Greek culture as a prophet, healer, magician and savior, combined the duality of the spiritual and the temporal and was credited with *element* discovery, even including corresponding deities. Simplistic yet comprehensive for the time, it fit a vision limited by a dearth of tools to study the material world, and what senses detected: the celestial, weather, and the human body. The internals of the body were not known directly but through analogy with animals, most hunted and butchered for food.

The Greek culture represented in philosophy, literature and theater, centered on the states of the individual. Explaining the episodic turmoil within the individual were humors, controlled by bodily fluids: blood, yellow bile, black bile, and phlegm. Up until the late 19th century – a period of almost 2000 years, medical practice often centered on the balance of these fluids, achieved through diet, herbs, wine, baths, and bleeding.

The four qualities, elements, seasons, & humours[ii]

Season	Element	Humour	Body Fluid	Location	Deities
Spring	Air	Sanguine	Blood	Heart	Zeus
Summer	Fire	Choleric	Yellow bile	Liver	Hades
Autumn	Earth	Melancholic	Black bile	Spleen	Hera
Winter	Water	Phlegmatic	Phlegm	(various)	Nestis (Persephone)

Such simplified perspectives affected Europe until well after the Renaissance, while daily lives were lived in unsanitary cities racked by deadly pandemics. The point is that dogma and orthodoxy, whether practical or spiritual, with cultures built around it and everyday survival needs, were dominating forces over hundreds of years in regional cultures that took control of steering a future, perhaps delayed for centuries a virtual escape from Earth's gravity. Such cultural systems of belief can freeze perspective as well as views of science and natural laws it is built on.

Modern World. "O amazement of things – even the least particle."[iii] *Walt Whitman*

Science, garnered through military technology and space exploration, has enabled commerce to capture the globe. Now science must intervene to help set responsible steps toward a hopeful future, through more imaginative macro and quantum applications.

Even now, over 65 years after atomic energy, scientific vision is more focused, now at molecular-level problems and solutions, but not always holistic. Pharmaceuticals often demonstrate our cosmetic priorities and limited precision in targeting ailments – treatments for ED, toenail fungus, and diabetes, for example -- most evidenced by TV ads that pitch drugs with ludicrous litanies of side effects, ending with rapidly-stated murmurs of possible death. In other realms, particle scientists do not observe below atom size. Subatomic particles are theorized through collider observations or just imagination. Great physicists like Albert Einstein could imagine what he

couldn't see. His ideas and his theories bumped into a war-time era, mainly steered by less devious minds in the West.

With the Cold War in the past, a corporate society now controls the steering, putting corporate interest ahead of common good, with political leaders, in effect, acting as corporate agents. Perhaps the results of such favoritism can be found in a recent global study. Eighty-five individuals own the wealth equivalent of what is owned by the bottom half of the world's seven billion people[iv].

Subsuming the common good, especially regarding climate change, most scientists tell us, will lead to our ultimate demise. As the global vision expands beyond the bounds of the Earth, knowledge of the immutable laws that guide all of us begs application and a perception that goes beyond the material to the universal.

Classical Greeks were bound to their own city-states, but modern humankind's activities span the globe. Likewise, our Standard Model and designation of the four forces of natural law are universal in application, beliefs gathered through observation and experimentation. The theoretical nature of many parts of the model and its forces do tend to leave openings that have yet to be filled. Dark matter, dark energy, gravity and a unified model covering the four forces leave gaps as well. Yet it serves as a rubric, or a starting point for most scientific thinking.

An overwhelming percentage of contemporary scientists are steadfast in the Standard Model's support, no doubt an attitude many scientists of the past proclaimed for contemporary solutions as well. Nevertheless its current applications have changed human history, though much is still not understood.

The first natural force is gravity. Isaac Newton gave us an understanding of gravity's mechanics, explaining that objects moved through a force rather than mystical spirits and metaphysics. Though his ideas flew in the face of the dominant religion, the force of curiosity and learning progressed so that his concept of gravity helped pave the way for the Industrial Revolution, one vital discovery being steam power, which finally led to the locomotive and other steam-powered engines of commerce.

The three remaining forces are part of the Standard Model of particle physics. The second force is the electromagnetic, which lights up our cities and powers our applications. The third and fourth are the two nuclear forces, the weak and the strong. The latter holds the nucleus of every atom together, neutrons and protons, with a range of 10^{-15} meters, about the size of an average nucleus. The former can change one flavor of quark to another, necessary for a stars fusion and crucial to the structure of the universe.

The *Theory of Everything*, the Standard Model is not. It does not incorporate the full theory of gravitation, does not contain any viable dark matter particle, does not account for neutrino oscillations, and does not explain the expansion of the universe through dark energy.

With the Standard Model, the smallest theorized elements, quarks and electrons, cannot be seen. Atoms, we can scan and represent on video screens, utilizing a scanning tunneling microscope, a fine needle (the tip a single atom across) passing over atoms, distinguished by lasers or electrical charges. Though there are efforts centering on "designer electrons[v]," our center of study, though we are toying with the atom, is the molecule.

This anthropocentric view of the matter around us, coupled with a sort of ethnocentric bias does infect each culture, attributing life's answers to a human-centered convention which our conceit considers the normal, something which points to the answers for our future. It has never completely left us from the earliest civilizations. Many free-thinking individuals have the necessary openness to the non-orthodox, but are often summarily overruled by a convention enforced by a society with material motives.

While Earth's open territory is claimed for commerce, more wholesome pursuits are freely left to a portable, self-contained, and self-owned domain -- the individual mind. It is a universe in each of our heads, still not governed by bureaucracies, taxes or edicts. In our science fiction narratives we do explore the potential for autocratic control of the mind, but that would be a choice made by such power-driven leaders if we grant that dominion.

That is why we must join the effort to steer humanity toward a non-suicidal future. We must utilize the universe of our minds to create channels that fathom deep truths, and vectors probing ultimate bounds, looking to a vision that spans centuries not the quarterly profit margin. We must build a future that won't dissolve before even the youthful dreams of our descendents arrive.

Quite often the language of science is, in effect, heretical in the Bible of Free Enterprise. For some 40 years, this view has grown, beating back scientific studies, distorting established theories, and suppressing scientific progress. With consolidation of a corporate media, its mass has grown like a black hole, bending truth to suit a corporate agenda. Still, we must also guard against the arrogance of accepted scientific models.

Political agendas can help twist scientific effort as well. Climate change demands alternative sources of energy to replace fossil fuels that pump CO_2 into our atmosphere. In 2007 claiming a noble plan, Iowa Senator Chuck Grassley was a vociferous voice for Ethanol as an alternative fuel for gasoline.

The problem was that Ethanol production utilized more resources, used more energy and represented an agenda that a long-term Senator from a corn state would be drawn to. It was more than "scratch your head" corny. The whole production and conversion cycle has shown a net gain in greenhouse gases while corn foodstuff prices rise and subsidized farmers get richer, all illustrated below with information from a *Mother Jones* article.[vi]

A Noble Plan Supported by Sen. Chuck Grassley?

#	Events/Cause	Impacts	results
1	Ethanol increases demand for corn		7% of corn crop in 2002; 20% in 2007
2	Corn prices go up	Affects 7, 8, 9, & 10	2007 biggest year for corn since 1944
3	More corn is planted	Leads to 4, 5 & 6	
4	More petroleum is needed	Energy savings vanish	Acre of corn needs 110 gallons of gas to fertilize, harvest & transport
5	Ethanol profits shrink	Farmers lose	Refiners profit nosedives
6	Fewer other crops are planted		
7	Farmland prices go up		Good for landowners, tough for small farmers
8	Animal feed prices go up		Cost of feeding a hog up 85% in year
9	Food prices go up	Global hunger worsens	Prices for meat, dairy, & corn syrup up 20-25%. Riots in Mexico
10	Corn exports shrink		US in 2007 exports 2/3 of world's corn

It now represents a cautionary tale for stewards of our planet. We must look at the life cycle of heralded solutions, superficial appearances put aside and fresh perspectives energized.

Take the Rawlings, Wyoming wind farm where ever-present wind will turn 1000 giant turbines, sending electrical power 750 miles to the California grid[vii]. It will be the equivalent of three nuclear reactors. With conductor resistance in high tension lines – cars lose over 60% of chemical energy to friction, for example -- current will have to be amped up to higher voltages. Such is the convention to minimize friction for power generation. New ideas do explore superconductors but superconductors require super cooling. Rather than losing some 6.5% of energy and amping up costs, can we consider how to boost a conductor atom's ability to donate electrons? Or maybe there's a transformer application that uses charge density wave materials.

If the corporate culture of a monolithic company includes a priority for profit, questionable management ethics, a lack of accountability, disjointed engineering, and a resulting surfeit of teamwork, quality takes a back seat. The end product is a duality of the shiny and shoddy. The Pentagon's contract specs and Lockheed Martin's (LM) design produced the potential of a brilliant war machine in the Joint Strike Fighter (JSF). Unfulfilled, the shoddy includes cost overruns of $163 billion, 7 year schedule delays, tires you shouldn't kick, gaps in stealth coating, only daylight flying, and one system failure after the other[viii]. Its 24 million lines of embedded code (LOC) led to LM buying a quantum computer to test trillions of performance pathways for three versions of the fighter. Nevertheless, the military still plans to spend $400 billion for 2400 planes, nearly 60%

of the military's total 2012 spending, which in turn is more than 10 other major countries, combined.

Can we detect *common-good* goals here? A flawed war machine defines a failure caused by unworthy priorities while at the same time it highlights a failure to jointly define viable future goals. But curiously, it also shows a whole mechanism of failure in a culture with misplaced priorities and perhaps goals. For example, does pursuit of an invincible military weapon comport with more profound thoughts of a viable future?

The Very Small. "Three quarks for Muster Mark!"[ix] *James Joyce*

Our own senses can't detect an atom directly with any of humankind's instruments but they can view a tactile outline. The tiny is based on theory. Lab tests and mathematics fill in the blanks. Einstein, often shunned traditional learning methods, but was driven to use the creative side of the brain, for example, visualizing what the world would look like if you rode on a beam of light.

Our body's cells are composed of bonding atoms with great vacancies between nuclei and electronic shells, but because electrons – via quantum principles – repel one another, we can't walk through walls[x]. The world of the subatomic is strange: particles can be in two locations at once, particle spins can be screwy, there's always location uncertainty for particles. But these effects average out in the macro world of the material, each item having trillions of atoms.

But in the neural universe of the brain, perhaps a small percentage of the 100 billion neurons and the quadrillion connections can be apportioned to the task of thinking like a quark or imagining other quarks[xi] beyond the standard-model, or "sub quarks," tinier than 10^{-18} meters. It took a high-energy collision of the LHC, for example, to disengage three quarks in a proton.[xii] On a comparative larger scale, imagine your body hovering less than one nanometer above your chair's cushion, averaging out the quantum effects of 7 octillion atoms. Focus that creative side of your brain on how you would act if you were a single quark, a sub quark. Like genome mapping, perhaps we can map the brain using a quantum computer to categorize neuron networks and unleash the brain. Or there's UCLA Professor Jim Gimzewski's tiny "dust ball" on a silicon wafer the size of a quarter, demonstrating an ability to remember.[xiii]

Rather than going to – what I call -- defensive strategies, why not ponder more inherent solutions. A sojourn into the subatomic, of course, will take computing power like the D-Wave company's efforts. There is the Burnaby, with facilities near Vancouver. Though debunked as a fake by a few experts, it's a quantum computer with a super-cooled (supposedly the coldest place in the universe) niobium chip with 512 qubits, in theory able to perform 2^{512} operations at once[xiv]. Analyzing the atoms of a human body, or even a small part of it -- a red blood cell with some 3 trillion atoms would be a rather daunting effort, needing such computing power.

In the realm of space, our astronauts are subject to potentially deadly galactic cosmic rays (GCRs) in the ISS and will be for any long future space voyage. Rather than prohibitively heavy shielding

(aluminum, water, liquid hydrogen) or trying to mimic Earth's magnetic field, can we reconstitute the attacking hydrogen protons and the helium nuclei with electrons or somehow protectively compact the body's atoms, reducing the space that can be penetrated, thus making the electron orbital radius nearer the hydrogen proton radius of 10^{-15}m. Does that sound simplistic, even ludicrous, given the state of technology? It just introduces other perspectives, behaviors hard to envision, using the brain's creative side, like Einstein did.

When Size Escapes our Senses[xv]

approx scale of wavelength	wavelength in meters	radiation type	penetrates atmosphere
building	10^{3}	radio	Y
humans	~10^{-5}		P
butterflies	$10^{-2.5}$	microwave	N
needle point	~10^{-5}	infrared	P
protozoans	.5x10^{-6}	visible	Y
molecules	10^{-8}	ultraviolet	N
atoms	10^{-10}	x-ray	N
atomic nuclei	10^{-14}	Gamma ray	N
quarks	<10^{-20}	estimated	N
subquarks?	<10^{-22} ?	not known	N

Or what about the simple problem of removing snow on busy suburban streets. Salt is messy and destructive to vehicles, and is an after-the-fact solution. Can we stop snow from forming by eliminating dust or impurity at the source? Water usually begins freezing by forming an ice crystal around a particle of dust or some other impurity, and several form a snowflake, an aggregate of several tiny crystals.

Can we manipulate sub-elements of the water molecule, affecting its characteristics: polarity, hydrogen bonding, cohesion, or surface tension?[xvi] For example, can we change subatomic constituents, affecting the overall charge of zero for the H_2O molecule to dissolve the snow only on thoroughfares or driveways, for example? What about rain? The average time for atoms in an H_2O molecule to stay together is about a millisecond. Hydrogen atoms are constantly exchanging between water molecules through electrons. What can we do to retard this bonding if we want to eliminate rain somewhere? Are there fallacies in this thinking? Should we ridicule what appears simplistic for want of a fresh perspective?

While the $9 billion Large Hadron Collider (LHC) simulates conditions at some 10^{-10} seconds after the Big Bang, when the Higgs Boson emerged from the break of the electroweak symmetry, does the emergent electroweak condition actually take seven TeV of energy per beam to accomplish? Should we engage our neurons and their interconnections with thoughts of one

universal force, its meaning, and the behavior of the plasma that accompanies it? And now that we have discovered fleeting evidence of the Higgs Boson should we look into manipulating it so that the atoms of our bodies or the atoms constituting our spacecraft can be rendered without mass? Would that give us superluminal flight? It doesn't for neutrinos, which supposedly have some mass.

Behaviors of the macro and the subatomic worlds are too often behaviorally equivocated. Studies need to definitively differentiate them or painstakingly bring them together where possible. Quantum physics is the study of the very small, but sometimes its rules and energies can be seen in the large. Over a year ago, a quantum entanglement study created entangled photons. Using a beam splitter, it divided a laser beam into two twisted waves of angular momentum. Measuring the quantum state of one beam immediately told the team the quantum state of the other, no matter where it was. The importance was that entanglement effects can be seen at high energies and closer to the macro world[xvii]. Is there evidence that quantum entanglement could be the basis of teleporting? Lacking the imagination to see the tiny, get yourself a cloud chamber and place yourself near an alcoholic fog. In that fog you'll see fleeting paths of subatomic particles[xviii].

The Ancient and the Modern Meet. "The earth and every living thing are made of star-stuff."[xix] *Carl Sagan*.

Humankind and the material world around us is the stuff of stars. It is fitting that, like stars, living and dying, we recycle that stuff, giving more substance to those that follow. Our lives have always been a quest to find life's origins, a pursuit often sidestepped by hubris we collect on the way. We find a future by finding ourselves and understanding our world, a world that grows as we mature.

Real growth speaks to vision, to imagination, to working together, and to using resources wisely. For example, a comparative modicum of NASA funds ($446M) is earmarked for discovering Earth's birth process – and its parents, so to speak. The *Dawn* probe is looking for answers by studying the proto planet *Vesta* and the dwarf planet *Ceres.*[xx] Understanding Earth's origins and adding to our knowledge of the Universe can only embolden our commitment to preserving Earth's life lines.

In any era, there will be established forces wanting to market a future of consumption and pleasure. In our own critical time, will that pleasure be built out of the irreplaceable parts of a long-term workable future that humanity may never be destined to see? The Classical Greek World had no global consequences. Our world does.

In giving advice for learning, Albert Einstein often suggested opening the universe of the mind. On a beam of light, his mind helped inspire our future. Likewise, instead of raising the bar of consumption for more creature comforts or more war machines, can we keep dreams alive, peering at remnants of the past, and a hopeful future told by the stars, using the whole of the electro-magnetic spectrum? [xxi]

Some say that if the telling is not seen, it didn't happen.

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