We're Not Dumb Enough To Survive As A Species, But Are We Smart Enough?

Russell G. Derickson

The Innovation Affinity Group, LLC
381 Captains Court; Fort Collins CO 80524 USA
rgderick@msn.com
&
Presidio School of Management
Presidio Building 36, P.O. Box 29502; San Francisco CA 94129 USA
rderickson@PresidioMBA.org

Abstract

We as a species have been endowed by nature with an intelligence superior to all other species on Earth. With that intelligence, though, we have created technologies and engaged in enterprises that have allowed our populations to grow unchecked, at least temporarily, creating vast ecological damage that threatens our very survival as a species. If we were as "dumb" as non-human species, nature would keep us better in check. But are we smart enough to correct for our destructive ways, overriding certain behaviors encoded in our DNA that once served our survival, but now turn against us in our modern circumstances of planetary limits? A look at the collapse of ancient societies and at modern conditions of widespread environmental assault, suggests we indeed may not be smart enough to survive as a species. Thus, it would seem we are in a "zone of jeopardy" in our level of intelligence. The circumstance is tragic, because intelligence evolves slowly, much slower than the rate at which ecological destruction occurs by our own hands.

There is, however, hope. Technology has led to environmental harm but can also lead us out of the malaise. By a concerted process of widespread "informatization" on both local and global scales, we can construct the knowledge and wisdom to extend our intelligence and moderate our destructive behavioral traits. Novel "global groupware" is proposed and conceptualized for this purpose, based in part on GIS (geographical information system) technology within a WYSIWIS (What You See Is What I See) visual framework to capitalize on our highly visual nature as a species. The global groupware, tentatively named *EarthVisionware*, would be an actual Internet-based, technological product and would function to create a shared mental model between members of society on all its scales (from local to global), through visual images, critical data, computational tools, and compiled information that is readily comprehended by everyone. As with astronauts returning from the spectacular view in space with a new sense of Earth, its citizens, and themselves, the global groupware with its visual framework will serve to catalyze epiphany through dynamic images of Earth, but will also engender and direct positive action, and, through a watchdog feature, monitor exploitative or injurious behavior that springs up in our ranks. The global groupware will not be stand-alone. It will work in coordination with other ongoing and planned sustainability initiatives.

Keywords: species intelligence; DNA-driven behavior; global groupware; WYSIWIS framework; GIS; sustainability; evolutionary processes

Introduction

The title of this paper suggests, disturbingly, that our intelligence as a species may lie within a "zone of jeopardy" – somewhere between not so dumb and pretty smart in the scheme of things – that would tend to limit or preclude our survival. We concern ourselves here with species-level, or collective, intelligence, which is not the same as individual intelligence, but is certainly related. *The implication is that to survive we collectively have to be much smarter or much dumber.* The latter, of course, suggests an impossible return to a much earlier state in our evolutionary development. Because all non-human species are below a certain threshold of intelligence, they are limited in population growth by nature's checks and balances, hence in their ability to destroy the environment. A divine state? Perhaps. But it seems apparent that if they could wreak ecological damage, they would. They simply are not able to do so in any wholesale way.

Intelligence evolves slowly and ours has remained nearly constant since our hunter-gatherer days. It is ironic, but most likely consistent with evolutionary processes, that while nature has endowed us with a "superior" intelligence compared to other species, we have used that intelligence over an amazingly short span of historical time to create technologies and social structures that permit us to override, at least temporarily, nature's very guidance on population limits that works for "lesser" species. [1] But there's more to the story. Certain features of our DNA code compel behaviors that served our survival and growth as a species in earlier evolutionary times, but now conspire against us (e.g., self-interest, overeating, status seeking, aggression, short-sightedness) in our modern circumstances. [2] *A key point to be made in this paper is that these same behavioral*

traits manifest also at the level of the group, including institutions and corporations. So, it is far more than our intelligence, per se, that is crucial here, and our survival would seem to hinge also on the ultimate balance between opposing behavioral tendencies (e.g., altruism vs. selfishness) within each of us and our institutions. [3] We thus have an intriguing interplay and dichotomy between our intelligence and our behavior, two sides of the same coin, as individuals and as groups. Our genetic code cannot evolve quickly enough to adapt our intelligence or behavior to modern circumstances. Thus, we are at an interesting crossroads in our coevolutionary journey with and as a part of nature. The journey necessarily goes beyond genes. [4] So, where will we go from here? Where does our destination end, survival or extinction? [5]

To begin, we must not think of ourselves as separate from nature, nor that we are "bad" and that nature is "good." [6] Such schism in thought only serves to create barriers to understanding and solving our problems of survival and flourishing as a species among many on Earth. [7] Furthermore, the argument can be made that earlier humans (and modern day indigenous peoples), by virtue of immersion in their wild surroundings, understood systems to a high degree, probably more than we do in our comparative isolation from nature's processes and cycles. However, they were limited in their ability to imagine and understand events on larger scales of space and time that exceeded the extent of their immediate surroundings and lifespan. We generally share that limitation today, notwithstanding the "extenders" provided by our archives of knowledge and our science and technology. [8] Earlier humans were superstitious and bounded in their rationality, which is something that applies equally to us today and tends to limit our intelligence. [9] We also share the general inability to understand complex physical and biological systems with multiple links and interactions. [10]

In the face of our growing populations and declining environment, all of this sums to a "zone of jeopardy" in intelligence level and in behavioral traits that threatens our very existence. [11] There are no easy solutions. Three guiding questions launched and catalyzed this paper:

1) How much smarter collectively do we need to be to survive and how do we get there?
2) Beyond the question of intelligence, how do we deal with behavioral traits and other constraints imposed by our ancient genetics that may burden our path to "successful" intelligence and survival in these modern times?
3) Should we be smart enough to act dumb in certain ways in order to survive?

In seeking a solution to limits in our intelligence and the burdens of certain of our ancestral behavioral traits, we propose a novel "global groupware," based in part on GIS (geographical information system) technology, for empowering and guiding our intelligence, and for controlling aspects of our behavior that conspire against us. The proposed global groupware is more than a concept. We envision the development, incrementally over time, of an actual technological product for wide-scale, global use through Internet connection. [12] However, the groupware will be at most a partial solution and it must work flexibly in conjunction with other sustainability efforts currently underway, those planned for the future, and those not yet imagined. With our "global groupware," we strive to empower and guide human actions at individual, societal, and global levels, using the analog of business software for teams in pursuing a sustainable world for all species including our own. *The crux will be the widespread dissemination of critical and comprehensive information to "societal teams" on local and global scales.* [13]

In conceptualizing our global groupware, we employ and expand, beyond the individual to the group and entire species, Sternburg's concept of "successful intelligence" for survival in a given environment, while also taking a broader view of "environment" to include the built environment and its evolution. All of these ideas potentially tie into a sustainable world, manifested as a benevolent complex adaptive system (CAS) [14] of humans interacting with other humans and the environment, but it is recognized that such a CAS is both the consequence and driver of the sustainability.

The Three Guiding Questions

Questions 1 & 2: How much smarter do we need to be collectively to emerge out of the "zone of jeopardy" in our level of intelligence in order to survive, and how do we get there? A related question is how do we deal with behavioral traits and constraints imposed by our ancient genetics that may burden our path to "successful" intelligence and survival in these modern times?

We are in an awkward evolutionary phase in which it seems apparent that our genetically driven behavior overrides our deeper sensibilities, based on our intelligence, to ensure survival. It is particularly unsettling that this condition translates to our organizations and institutions, as well. E.O. Wilson (2002) claims that we are an environmentally abnormal species in that we were the wrong species for nature to select to endow with superior intelligence through its evolutionary processes. He then demurs and states: "Perhaps a law of evolution is that intelligence usually extinguishes itself." The implication is that any species that evolves to superior intelligence over other species would be in the same boat. To paraphrase Wilson, we fret over petty concerns, respond vehemently to any threats to our status and tribal security, but are often oblivious to, or in denial about, deeper threats posed by natural disasters and environmental destruction. We can act in terribly selfish, unkind ways to our fellow humans and to other species, and we can be self-destructive and irresponsible. As American comedian Flip Wilson's Geraldine would say: "The devil made me do it!" [15]

The race is indeed between growth in species intelligence and environmental degradation. The profound dilemma is that our technological prowess enabled population growth and unprecedented resource consumption to create environmental threats so suddenly that the resultant deleterious effects could not "kick in" evolutionary responses fast enough to produce a compensatory increase in species intelligence and modifications in obsolescent encoded behavior. *It seems a Greek or Shakespearean tragedy* (i.e., we have too much power and too little wisdom).

So, will we become smart enough before we commit collective suicide? Even if we could rid through genetic reengineering what have now become destructive traits encoded in our DNA, we would not survive then either. We would no longer be human, and the world would likely become a grotesque place. How can we possibly give up all those love songs and unrequited passions? How can we give up our emotional affairs and occasional barroom brawls? Our aspirations and wayward dreams? Our flights of fancy, joyous outbursts, acts of kindness, and tantrums? Our evolving rituals and myths? But we should and indeed must give up war. Not anger or certain aspects of hatred, though.

We do need to be smarter and we need to do that by means that accept our basic nature. Like Ulysses, we must embrace but put some restraints on our inner nature by having ourselves tied to the mast while leaving our ears unplugged. We must indulge ourselves sparingly and in moderation, but indulge we will and must. We need to get smarter, but it will not likely be through evolution of our basic genes, it will be through reengineering our technology, our social structures and networks, and our mental models and paradigms, on local and global scales. How much smarter is an open question.

Question 3: Should we be smart enough to act dumb in certain ways in order to survive?

What is suggested by this question is not that we give up our intelligence, but rather that we look at what it actually is and how we wield it. There are various definitions offered for intelligence. Robert Sternberg's view of intelligence (Sternberg, 1996a), specifically what he terms "successful intelligence," seems the most relevant and useful, and, quite frankly, the most consistent in characterizing human mental savvy and skill for surviving and flourishing in a given environment. The three ingredients that make up successful intelligence are 1) analytical, 2) creative, and 3) practical. Concisely paraphrased from Sternberg, with some augmentation, the analytic component of intelligence allows us to discover and understand a problem as a whole from its interactive parts, and to find good solutions; the creative component allows us to find good problems; and the practical component allows us to make solutions work. All three components work in concert to form total intelligence. Sternberg's theory of intelligence pertains to the individual, and any given individual has varying proportions of the three components. There are individuals who are strong in one component and relatively weak in the other two. Some are strong in two and weak in the third. Far fewer individuals are strong in all three. Success, then, usually requires that we team with others that compensate for our weaknesses. But sometimes we find that we have to work alone as individuals in making decisions or solving problems.

Although Sternberg's model of intelligence was developed for explaining intelligence in the individual, we can extend its meaning and utility to social groups or even our species as a whole. Psychologists talk of the transactive memory of groups, and it is not a great leap to speak of transactive intelligence. We argue that Sternberg's triarchic model of intelligence lends itself to a collective intelligence. Thus, as a species we have all three components of intelligence. As already stated in this paper, however, our species-level intelligence, in and of itself, may not be sufficient to ensure our survival. Behavior encoded in our DNA that has now become maladaptive in our evolutionary present seems capable of overwhelming our intelligence in a race for survival. But, perhaps there are ways to be successfully "dumb" with our intelligence and behavior.

How can we be successfully "dumb" to good purposes? For one, we can own up to the fact that our fundamentally superstitious nature, our limitations in comprehending large and small scales in space and time, and our flaws in understanding probabilities often lead us to shortsightedness and wrong decisions. The ideas of Gigerenzer et al. (1999), Gigerenzer (2002), and Taleb (2001) give us insights, guidance, and thinking tools in dealing with these shortcomings. Sternberg (1996b) also points out that one can know either too much or too little in solving a problem. So, while we must guard against our superstition, we should not be overly analytical and drive ourselves into "analysis paralysis" or "over fit" the data and information around us in assessing risks and making our decisions. There are times when ignorance is bliss. We also should not put our trust entirely in experts and those overly specialized. There is a collective wisdom (and sometimes foolishness) in groups of people in society and we should have more people trained as generalists (Naess, 1993; Wilson, 1999).

Another way to be successfully "dumb" is to look at "wild" nature from which we sprang as a source of ideas in how to do things. For example, Seeley et al. (2006) suggest that group decision-making in humans can possibly benefit from the group decision processes in honeybees. Vital points in honey bee success as a group include: 1) an open competition of ideas, 2) promotion of diversity of knowledge and independence of opinions, and 3) aggregating opinions in a manner that exploits breath of knowledge within a group, but within a reasonable time constraint (a time to decision that is neither too long or short). Seeley and colleagues present evidence that this structure leads to group wisdom rather than group folly. Groupthink, described by Janis

(1972), is an example of how group folly can occur in humans. As we learn more about "swarm intelligence" and complex adaptive systems (CAS) based on models in wild nature, we can apply this knowledge successfully to our human enterprises.

Yet another way to act "dumb" is to embrace Wilson's (2000) explanation of why we should honor nature's whole-systems expertise and wisdom over our own when it comes to the complexity of ecosystems. In doing so, we certainly can continue to engage in our human activities and in creating our built environment, but we should let wild nature do its own thing in which we learn to harmonize better with nature and accept our role in it. Our built environment indeed has validity. It is a rich, vital source and reflection of who we are as a species. It cannot be denied and it will continue to evolve. Tsui (2000) provides one perspective in how we can engage in more purposeful architecture in a built environment that blends and works with nature's principles. But regardless of how much knowledge and capability we gather, we could never be able to successfully take on the tasks required to build and maintain ecosystems. Only wild nature is capable of that. To quote E.O. Wilson:

> *Each species occupies a precise niche, demanding a certain place, an exact microclimate, particular nutrients and temperature and humidity cycles with specific timing to trigger phases of the life cycle. Many, perhaps most, of the species are locked in symbiosis with other species; they cannot survive and reproduce unless arrayed with their partners in the correct, idiosyncratic configurations.*
>
> *Even if the biologists pulled off the taxonomic equivalent of the Manhattan Project, sorting and preserving cultures of all species, they could not put the community back together again. It would be like unscrambling an egg with a pair of spoons. The biology of the microorganisms needed to reanimate the soil would be mostly unknown. The pollinators of most of the flowers and the correct timing of their appearance could only be guessed. The "assembly rules," the sequence in which species must be allowed to colonize in order to coexist indefinitely, would remain in the realm of theory.*

But all of this does not suggest that we give up the mind's quests and flights of fancy into art and science. Again, we have to honor our own nature, as well. It simply means that we have to understand the limits of our intelligence, [16] our place in nature, and our responsibility to it.

Global Groupware and Successful Intelligence

The Proposed Global Groupware and Its Visual Framework

In our "global groupware", we incorporate such mechanisms as "cognitive templates," [17] using a WYSIWIS (whiz-ee-whiz: what you see is what I see) [18] visual framework, to accommodate our highly visual nature and to engender more cohesive shared mental models at the community, national, and global levels in our quest to harmonize better with wild nature and survive. We tentatively call our groupware *EarthVisionware*. A form of GIS (geographical information system), coupled to the Internet, is conceptualized for the global groupware. We must be mindful, however, that demons lurk in the shadows of our goals of providing essential information to the world community: information saboteurs, pirates, and hoarders. One example is transnational corporations that, in the name of free trade, exploit workforces and the environment in countries all over the globe and maintain their power by controlling, concealing, and distorting information. [19] We must find a way to defeat such information terrorists. Thus, we propose to incorporate a watchdog function in our GIS-based global groupware application. [20]

The GIS-based groupware, still at the conceptual stage, will be comprehensive and vast in its structure and will be designed to allow access to all global citizens, not just the technologically elite. Its purposes will be to enable a broad-based visual context to events and activities on Earth; to bring awareness of the state of social, geopolitical, economic, and ecological environments on multiple levels; to formulate templates for visualizing and comprehending complex physical, biological, and social systems; to provide valuable data and knowledge for analysis; to compensate for deficits inherent in human perceptions with respect to time and spatial scales (thus it also will include insightful time-lapse information of the past and multiple future scenarios); to help with limitations due to "bounded rationality" in assessing risks and making decisions; to orchestrate team and group actions; and to provide a roadmap for "successful intelligence" to achieve a sustainable future within nature.

Our Visual and Social Natures

We are a visual species, so we do best with what we can see, and on spatial scales that are within our range of eyesight and perceptual acuity. In our ancestral times, we drew pictures on cave walls, told graphic narratives, and performed group rituals to communicate between ourselves and create meaning and understanding. We preferred to live on savannas with their open views for surveillance that afforded us our deepest sense of security and success in survival. We also were social and worked in teams, as we do today, not that we didn't and don't engage in solitary activities, as well. But our triumph as a species hinged, and continues to hinge, on our social, group coherence. In our team endeavors, it is best when we are collocated (i.e., in proximity of each

other). Hunting squads that ventured forth in "teams" of 5-6 in our hunter-gatherer days remained in close contact, operating visually and with calls and whistles when the view between team members was obstructed by foliage or terrain.

There is another very crucial side to our visual nature that was manifested most deeply when our technology catapulted us into space. *It has profound implications.* Virtually every astronaut who has returned from space has spoken of experiencing an epiphany sparked by the view of Earth while orbiting around it. A quote from Edgar Mitchell, former American astronaut, summarizes the experience: "Each man comes back with a feeling that he is no longer an American citizen -- he is a planetary citizen." Russell ("Rusty") Schweickart, another former American astronaut, says it more expansively, in an effusive, palpably emotional tone, full of awe and deep appreciation: [21]

You realize that on that small spot, that little blue and white thing, is everything that means anything to you – all of history and music and poetry and art and death and birth and love, tears, joy, games, all of it on that little spot out there … You recognize that you are a piece of this total life … And when you come back there is a difference in that relationship between you and that planet and you and all those other forms of life on that planet, because you've had that kind of experience.

It can be certain that throughout history epiphanies have occurred while looking down from mountaintops or other high perches, in which the view is massively expansive in comparison to the scale of the human experiencing it. But it seems that the view from space is so overwhelming and total as to crystallize a greater experience than is possible from anywhere on Earth. Our visual nature enables such grand vistas to overpower our minds. Our imaginations go wild, our senses are overloaded, and our wiring is transformed forever in rather short order. The *Whole Earth Catalog*, which was created by Stewart Brand and colleagues, was inspired by the epiphanies of our astronauts. It is no longer published, but became the inspiration for Web search engines. (Go to: http://en.wikipedia.org/wiki/Whole_Earth_Catalog)

An important aspect of the proposed, visually oriented groupware is to provide images of Earth on multiple scales that can inspire the same sort of epiphany experienced by those who have traveled into space. It is understood, however, that epiphany is but the first step to action that can lead to sustainability on Earth.

Modern Day Teams and Groupware

Modern day teams can operate in "virtual" collocation through communication technology and software. But in many cases, absolute, physical collocation is the best bet for achievement because it retains visual connection and an essential real-time context. Think of airline flight crews and surgical teams. As the technology gets better, though, surgeries will be done with incredible precision and efficiency, despite great distances between key team members. Groupware, the term for software that connects members of "virtual" teams, keeps improving, and with advancements in such features as WYSIWIS (what you see is what I see), the ability to create a highly faithful, shared mental model through graphic and pictorial means is imminent. We have already experienced success with groupware in international business teams, in which geographically dispersed members with unique individual skills are not in the same physical space. This is done synchronously and asynchronously, as the case may require, and with various levels of visual connection. Likewise, in dealing with events that by their very nature are of wide geographical scope beyond human visual and audio range, and which require high synchronization among widely dispersed team members, such as in disaster response or air traffic control scenarios, groupware has been indispensable. The advent of highly advanced WYSIWIS technologies is enabling virtual teams to work at the highest levels of effectiveness. A next step will be the ability of teams of various scales, from local to global, to monitor and care for ecosystems, natural resources, and industrial processes in a whole-systems context.

What is GIS? And Why GIS for Global Groupware?

A Geographic Information System (GIS) is a computerized information system designed to gather, manage, analyze, and display multiple categories of geographically referenced information. *The crucial element in GIS is in the display, or visualization, of information*. This could mean satellite photographs, aerial photogrammetrics obtained by aircraft, streaming video, or annotated graphical representations of such things as ecosystems, air quality, water resources, agricultural products, and so forth. Also included are database management, statistical analysis, the ability to archive and display time-lapse data, and many other functions that amplify and clarify the meaning of information. Geographic information is a rather broad concept that encompasses virtually everything in the entire world of any spatial extent beyond an immediate neighborhood as defined by the scale of a human individual. It would seem certain that GIS would eventually find its way into dealing with the "geography" of the solar system and even the universe. The original intent of GIS applications has been vastly expanded to a remarkable encyclopedic extent. A non-exhaustive list of examples include modern cartography, ecological studies, emergency medical services, urban and regional planning, epidemiology, economic geography, forestry, wildlife management, fire fighting, natural resource management, cultural geography, and remote sensing (including satellite remote sensing).

There are some current web-based GIS applications that can be used by the average, computer literate person, but most GIS today is geared for highly specialized use by people in distinct disciplines in which they receive intensive training to deal with the GIS technology.

GIS is an excellent technology to start with in developing a global groupware application. The key will be to turn it into a groupware application with a strong WYSWIS framework to engender awareness and to orchestrate and synchronize actions on the team, group, and institutional levels globally. Its basic concept can be extended and adapted to be more all encompassing and unifying of multiple disciplines; it can be structured to require less specialized use and training; and it can be modified to include various forms of watchdog functions. It will be web-based for general access and utility. Users can zoom in and out to view Earth and its various ecological and social systems on all scales. Its users will range from communities to nations to global organizations. Clearly, though, there will be people in our own poverty-stricken areas and in villages in 3rd World nations who would not be able to access the global groupware. For those folks, access would have to be through envoys or agents. In time, we can manage to engage all of Earth's citizens.

Lessons from *Collapse* and *The Clock of the Long Now* and the Role of Global Groupware (*EarthVisionware*)

In *Collapse*, Jared Diamond (2005) imparts insights into the various ways that numerous ancient societies experienced demise by their own hand and lack of vigilance. Increasingly, these insights apply in modern times to the global scale. His analysis validates the conceptual basis of a global groupware (*EarthVisionware*) and provides guidance to its features and scope. Here are some main points:

- Societies that lacked archived historical data and information on droughts, signs of environmental degradation, etc., particularly illiterate societies, had a built-in impediment against corrective action to preclude collapse. For example, the Anasazis in the second drought of that society were too young to know of the first drought and its devastating consequences. Not enough historic environmental information is archived throughout the globe in modern times and *EarthVisionware* can serve as a repository of such vital data.
- Tragically, even when we know about negative events, we soon forget. A few years after the 1973 oil embargo, we were back to gas-guzzling cars. The severe droughts in the 1950s in Tucson had only a temporary effect on water conservation until water-hogging golf courses were again built. *EarthVisonware's* data banks and annotated visuals can help to prevent our short-term memories from leading us down the wrong path.
- The Vikings applied a false analogy between their soil-rich homeland and the weak soil base of Greenland, and consequently did not handle the soil resource correctly. The lesson is that similar mistakes can be made in current and future times. *EarthVisionware* would house the knowledge in its databases to deal properly with resources at any global location.
- Managers at a distance cannot truly understand local circumstances and activities. This occurred in ancient times and goes on today. On-the-spot managers aware of and in visual contact with their environment can manage it well. This speaks to the utility of the WYSIWIS framework in *EarthVisionware* that provides a solid representation of events and conditions and glues together teams and managers, even if large distances separate them.
- Slow trends of decline are not noticed, such as with the Easter Islanders, Mayans, Mesopotamians, and other ancient societies. Such lack of awareness is a modern malady as well. *EarthVisionware* can correct this deficit with a "time-lapse" data feature. Likewise, time-lapse can warn of "creeping normalcy," in which members of a society think conditions are normal when they are not because of the slow, imperceptible change of the environment around them.
- Diamond argues that even when societies are aware of environmental decline they don't always act, for a variety of reasons, not just one. The vigilance of all the world's citizens through *EarthVisionware* can lead to outsiders warning those in danger and urging and assisting them in their corrective measures. We are all in this together and the demise of one geographical area can potentially affect neighboring regions or even the entire globe. The notion of a cohesive "Earth Team" resonates here, but not at the expense of local cultures and enterprises.
- Exploitation of "good" guys by "bad" guys (e.g., individuals and transnational companies that are "selfish") can lead to eventual collapse. "Bad" guys may even know they are acting immorally, but there is no law to curb their exploitative behaviors, hence the utility of *EarthVisionware's* watchdog and vigilance features.
- Societies may fail to respond to obvious decline because they are overwhelmed or lack ecological knowledge. This applied primarily to the past, but we now have that knowledge and can embed it in the *EarthVisionware* database.
- Diamond also speaks of how distorted "groupthink" in societies can lead to decline, if not collapse. Again, *EarthVisionware*, which connects all global citizens, provides checks and balances on potentially bad decisions and actions at local levels.

The Clock of the Long Now by Stewart Brand (1999) unveils a profound and enticing idea, based on a slow clock and comprehensive archival library (i.e., containing scientific studies, a record of policy decisions and long-term consequences, and a record of social responsibility). The Clock will be an actual full-scale device in

a specific geographical location for all to visit directly or to access through the Internet. It will evolve over time as knowledge on how to improve it grows. Brian Eno proposed the "long now" measured in centuries. Other team members added their own skills, designs, and insights. The purpose of the Clock is to provide, through myth and archived information, the "long view" in order to remedy the shortsightedness of humans. Through archived knowledge on the environment, the intent is to prevent humanity from blunders that lead to obsolescence and to embody deep time for humanity in a manner analogous to the epiphany sparked by the view from space. The Clock and Library will be connected to the Internet to provide publications and offered services.

The purpose of *EarthVisionware* is parallel to that of *The Clock of the Long Now*, but the two can be viewed as complementary, not in opposition. Perhaps *EarthVisionware* would be joined with the Clock/Library to augment its utility in an operational sense. Certainly, the ideas set forth in Brand's book can help catalyze the design and use of *EarthVisionware,* in terms of archived data and how to deal with time.

Here are some of the informative ideas to be found in *The Clock of the Long Now*:

- The Greeks distinguished two kinds of time, kairos (opportunity, cleverness, immediate) and chronos (ongoing time, the time of wisdom). We would do well as a species to look deeper at our "sense of time." *EarthVisionware* can augment the Clock in creating a deeper sense of time.
- There is the short "now" of youth and the longer "now" of elders. It is interesting that in his book *The Sibling Society*, Robert Bly (1996) describes America's current society as a citizenry of adolescents incapable of responsibility to its children or respect and caring for its elders. It would seem that many adults in our ranks may be caught in the short "now" of youth, putting society in an imbalanced state.
- The existence of a hierarchy of fast to slow time elements in a system makes it resilient and able to absorb shocks. In our civilization the time frames from shortest to longest are: 1) fashion/art, 2)commerce, 4) infrastructure, 4) governance, 5) culture, and 6) nature). Similarly, the time scale of the individual is in years, the family in decades, the nation in centuries, the culture in millennia, species in 10s of millennia, and the Earth in eons. The time hierarchy, while crucial to system stability, also creates divided loyalties within it. For example, the accounting system of commerce does not understand the investment in infrastructure, so governance and culture must lead the vision and garner the capital.
- Events are so fast in our current society that we are too burned out from dealing with our rapid present to imagine a future.
- The future is impossible to predict. Therefore it is imperative to do imaginative scenario planning, as also indicated by Taleb (2001), to compensate for an uncertain, unknowable future. Scenario planning leads to a longer sense of time and practical awareness, and thus a greater social responsibility on the part of national or transnational corporations. *EarthVisionware* could certainly be utilized to do scenario planning as regards the environment, but its watchdog function is likely to be as important as, or more important than, strict scenario planning.

Conclusions

If we can judge from the demise of the Rapa Nui (Easter Islanders), Mayans, and Mesopotamians, to name a few societies that collapsed essentially by their own hand, and if we look at the current global degradation of our ecosystems, we humans are not smart enough as a species to survive. The crux of the matter is that our intelligence on its own is not sufficient to compensate for the maladaptive, destructive behaviors encoded in our genes that once served us but now undermine our ability to survive. But with our social constructs and technology, we can circumnavigate our limitations, monitor our bad behaviors, and set ourselves on a survival path. The key lies in making available the right kind of information in the right form, within a pictorial/ graphical framework consistent with our highly visual nature, to provide all of us with a shared awareness of things both local and global, to catalyze and enable our decisions, to show us productive paths, and to guard us against exploitative elements in our ranks. The GIS-WYSIWIS global groupware proposed in this paper (tentatively called *EarthVisionware*), but yet to be developed, may well give us the information and knowledge we need, guide us from epiphany to action, serve to orchestrate our activities, and, along with other initiatives afoot, help us in our quest for sustainability and survival.

Notes

[1] Smart and dumb, and superior and lesser (inferior) are used intentionally as provocative terms here. It can be argued that while we humans may be a superior species in some senses, we certainly are not in other senses. Level of intelligence, or smartness, is one criterion, but even the notion of intelligence is relative and tied to an "environment", as explained by Sternberg (1996a) in his definition of, and treatise on, "successful" intelligence in the individual. We explore Sternberg's ideas to a level within the scope of this paper, taking a broader perspective to include group, or species, intelligence.

[2] Wilson (2000), for example, coins the "juggernaut theory" of human nature in which genetic coding of behaviors that served us well in earlier evolutionary times now impede our global awareness, responsibility, and action in the face of modern, deteriorating ecological conditions, to the extent that it may become too late for corrective measures at a critical, as yet unknown, point in time.

[3] Clayton and Radcliffe (1996), among other thinkers, refer to the necessary roles of both selfishness and altruism, and elucidate these roles separately and in a systems context, seeking a proper balance between them. This argument applies at the group level, too, as with organizations, corporations, and institutions. Greed and selfishness are not "bad" in and of themselves; in fact they serve a useful purpose for survival, except when out of balance with such behaviors as philanthropy, kindness, and altruism. One can argue that what was the proper balance for survival of the human species in earlier evolutionary times is different from what would be required in today's circumstances.

[4] Salk (1983) explains how we humans have reached a point in our evolutionary path in which we need to become co-creators with nature of our evolutionary future if we are to survive. Again, we are part of nature, but a distinction is made between "wild" nature and humans for purposes of discussion. Salk speaks of "survival of the wisest", going beyond the Darwinian notion of survival of the fittest. Broswimmer (2002) states that culture, particularly by virtue of language, was always a stronger determinate of human success over non-human primates than biological evolution per se. Other thinkers, such as Ken Wilbur (2000), talk about "memes", the cultural counterpart of biological genes. It is argued that "memes" potentially can override any negative, destructive behavior encoded in our genes. However, it is also clear that certain "memes" throughout human cultural history have been of a counterproductive sort.

[5] Meadows et al. (1972, 1992) paint scenarios that suggest critical time lines in which humanity must act to counteract the currently declining global environment, lest we collapse as a species. Both Wilson (2000) and the Meadows and colleagues suggest that a positive outcome is certainly possible if humans rally their awareness and pursue certain corrective interventions, sooner rather than later. At the heart of Wilson's thesis is that we need to acknowledge nature's wisdom with ecological systems and to honor our own limitations in wisdom in pursuing our technological enterprises. For convenience, a distinction is made here between humans and nature, despite the fact that humans are truly part of nature.

[6] Too many authors to mention take the stance of humans as "bad" and separate from nature, in contrast to nature as whole and "good", and it would be unfair to single out and cite only a few such authors. On a related note, the interested reader may already know about or chose to research scholarly works on Manichean dualism, which in modern times often manifests as simplistic "black and white" thinking.

[7] Naess (1993) through his introduction of the concept of "deep ecology" creates a helpful bridge between humans and all other species in nature. He does not denigrate humans in favor of nature, seeing humans as part of nature's fabric; he recognizes that humans should tend toward being generalists (or generalist-specialists), making them more whole, rather than overly specialized and fragmented; he seeks to legitimize human activity by redefining rather than denying technological and social progress; he embraces science and mysticism and wonder; and he seeks life quality in humans instead of sheer materialism.

[8] Events and processes too large, too small, too slow, or too fast escaped our ancestors' immediate senses and comprehension. As a consequence, they created and embraced myths and rituals, which provided cohesion and guiding knowledge to their lives. Wilson (2002) informs us that we tend to think only one or two generations ahead. Some modern indigenous cultures have a perspective of seven generations beyond their own immediate lives. Our current technology lets us see and understand time and spatial scales much larger, smaller, slower, and faster than ourselves, which allows us to understand Earth's processes and systems better. The technology keeps improving, but we remain limited in our perceptions and have a tendency to revert to our ancestral tendencies of superstitious belief and behavior.

[9] Simon (1956) introduced the concept of "bounded rationality" in which he describes the reality that in making decisions humans have limited brainpower, limited data, and limited time. This notion contrasts with the philosophers of old that assumed infinite brainpower, all the data, and unlimited time in deciphering a problem and finding a solution, or processing a decision. Taleb (2001) explains our superstitious nature and our inherent inability as a species to comprehend probabilities, and shows illuminating examples of how we are fooled by randomness in our daily lives. Prospect Theory, developed by Daniel Kahneman and Amos Tversky and winning the Nobel Prize in Economics in 2002 for Kahneman (Tversky died several years prior), describes flaws in human decision making under uncertainty, and provides methods for improved decisions. Similarly, in the face of bounded rationality, Gigerenzer et al. (1999) and Gigerenzer (2002) explore an ecological rationality model, with simple heuristics, to yield better decisions under uncertainty. Prospect Theory and simple heuristics open a portal to powerful new ways to circumnavigate human superstition and bounded rationality.

[10] This is known as the dissipation effect, as described by White (1998), and relates to naïve ecology, that is, ordinary people's understanding of causal processes in nature. Through education and technological tools, however, limitations in understanding causal links and processes by humans can be ameliorated. Such a tool is proposed in this paper.

[11] Diamond (2005) and Broswimmer (2002) elucidate the collapse and extinction of human societies and of non-human species. There is a "natural" process by which species go extinct, but it is measured in very long

time frames. Many human societies such as the Rapa Nui (Easter Islanders), Mayans, Mesopotamians, and Anasazi collapsed in rather short order because of ecological damage perpetrated primarily at the hands of the people themselves in those societies. More often than not, the ruling elite contributed to the collapse by not responding to the signs of demise. In some cases, demise is slow enough that human's do not perceive the effects of the ecological damage they wreak until conditions are truly disastrous. The historical record reveals that in circumstances where the elite can isolate themselves from the immediate consequences of their behavior, there is little or no corrective action until it is too late, even when the oncoming demise is observed. Thus, the selfish, exploitative behaviors of humans, particularly of the social elite, are often a root cause of a society's collapse. (The ruling elite can take the form of corporations in modern times.). Intelligence seems insufficient to modify these destructive traits. Diamond suggests, though, that we moderns with our knowledge of history of past collapses and our enabling surveillance technology, perhaps can elevate ourselves out of the trends of the ancient past.

12 The global groupware proposed in this paper has resemblance to the concept of the *Digital Earth* introduced by Al Gore in 1998, but was independently conceived. Various similarities and differences between the two concepts will emerge more fully over time. One distinction is that *EarthVisionware* is conceived as a groupware platform in that it focuses on group communication and cohesion and allows team members to be aware of each other, either synchronously or asynchronously. The fourth *Digital Earth* symposium, the first with a specific focus on sustainability, will be held in August of this year in Auckland, New Zealand. (http://www.digitalearth06.org.nz). The following year, the fifth Digital Earth symposium will be held in San Francisco. (http://www.isde5.org).

13 Laszlo (1994) elaborates on the historical progression and critical importance of "informatization" in life and society, from primitive ancient times to computerized modern times to an even more daunting technological future, but emphasizes that it must be relevant and factual. A quote from Laszlo hits the mark squarely: "Creating worldwide access to relevant information is a sound recipe for updating today's cultures and overcoming the dinosaur syndrome. It is the best way to enhance the responsiveness of peoples and societies, so that they can gain control of their destiny." (*Note: the dinosaur syndrome is the condition in which societies that do not adapt to a changing environment become obsolete, extinguishing themselves.*) On another front, Wilson (1998) provides us a warning: "We are drowning in information and starving for wisdom." The solution in Wilson's mind is synthesis, so he suggests that the world will belong to the synthesizer of information. Thus, we need to be mindful of this fact and incorporate "smart agency" with the information we dispense. Evan Vlachos (2006) states that the proper progression is from information to knowledge to wisdom.

14 A complex adaptive system (CAS) is a nonlinear system of interacting parts that leads to complex behavior that is difficult to predict. A brief list of examples of CAS includes ant or termite colonies, cells, social networks, human or animal nervous systems, and human economies. A study of CAS principles has profound utility because so many phenomena on Earth are best described from a CAS framework. The diligent reader can discover more about CAS at http://en.wikipedia.org/wiki/Complex_system.

15 Flip Wilson, American comedian and influential cultural figure in the 1970s, spoke through various characters he created, using a whole series of provocative expressions to satirize human behavior and institutions. He had a unique way of making us look at ourselves and see both the folly and the beauty of our behavior. "The devil made me do it!" is one of his well-known utterances spoken through the voice of his character, Geraldine.

16 Socrates noted 2500 years ago that the beginning of wisdom is to acknowledge that we don't know as much as we think we do. This piece of wisdom remains true in these modern times of technological arrogance.

17 Cognitive psychology is revealing a deeper understanding of how the mind works, with many practical applications that can improve the way we engage in activities and relate to the world around us. Theories on "chunking" and cognitive templates that apply to individuals and groups, with their transactive memory, comprise one example. Exemplar theory and prototype theory, are other examples. The idea is that understanding how the mind perceives, learns, stores, and accesses information in memory can yield powerful tools to augment human performance as individuals and teams. Particular advantage is in providing graphical or visual contexts for people. An explanation of "chunking" can be found in Gobet et al. (2001) and Gobet (2005). Cognitive templates are described in Gobet and Simon (1996) and Gobet (1997). Prototype and exemplar theories are found, for example, in Zaki et al. (2003). The power of these ideas in groups is elucidated in Hayne and Smith (2005).

18 WYSIWIS (What You See Is What I See), an increasingly common term in groupware applications, means that members of a virtual team or group all see the same thing and coordinate well at all times. The idea is that on all levels from local communities to the global village we are all team members who can interface and function well through an appropriate form of global groupware. WYSIWIS is derivative of the well-known term WYSIWYG (What You See Is What You Get) that is employed in commercial technology products, such as in word processing devices and computer-aided design and drafting tools. Specifically, what you see on the computer screen is what you get in printout of documents created through high quality computer software. Flip

Wilson, American comedian and cultural icon, is credited for inspiring the term WYSIWYG, based on his character, Geraldine, who would exclaim about herself that "What you see is what you get!" in response to other characters with whom she was interacting.
(Go to http://en.wikipedia.org/wiki/Flip_Wilson)

[19] Ross (2006) provides a deep exposé of the selfish, exploitative acts of many transnational corporations that undermine the economic welfare and security of workers in all nations, not only in the United States. That is, the United States is not the only country victimized by the specter of manipulative job outsourcing and related tactics by unscrupulous corporations. This is an example of how the sort of selfish, shortsighted behavior that is encoded in our genes can manifest in our organizations. Specifically, it is the devious, self-serving manner in which many transnational corporations operate that is at issue. Again, corporations can do beneficial things and create wealth, but if only a select few individuals benefit at the expense of the rest of the work force, the system is out of balance.

[20] A watchdog function in our global groupware can be powerfully effective in stopping exploitative and injurious actions by governments, corporations, institutions, and various organization or groups, in general. Many of us remember the famous "tankman" of Tiananmen Square in 1989, a 19-year-old male student who stood in defiance before a row of military tanks. Western journalists filmed the event from 400 yards away from an upper floor in a nearby hotel and published the video to the world. It has been argued that the Chinese government did not harm the student, realizing that the entire world would have responded with outrage. Such is the power of watchdog information. However, the sad fact is that most young students in China today do not know about Tiananmen Square and "tankman." The Chinese government continues to practice strict censorship of information with its citizens.

[21] Both quotes are from the book *The Awakening Earth* by Russell (1982).

Acknowledgements

The author wishes to thank Joanna Blair, Cristina Butler, Leighton Cochran, Gerry Johnson, Les Kaplan, Josie Plaut, Tom Siller, Jack Shelley-Tremblay, Cap Smith, Bill Tremblay, Evan Vlachos, and Lindsay Wess for helpful discussions, sources of information, editing suggestions, critical feedback, and encouragement in the development of this paper. This paper was supported by the Innovation Affinity Group, LLC.

References

Bly, R. *The Sibling Society*. Vintage Books, New York.
Brand, S. (1999). *The Clock of the Long Now*. Basic Books, New York.
Broswimmer, F.J. (2002). *Ecocide*. Pluto Press, London, Sterling, Virginia.
Clayton, M.H., and Radcliffe, N.J. (1996). *Sustainability: A Systems Approach*. WestviewPress, Boulder, CO.
Diamond, J. (2005). *Collapse*. Penguin Books, London.
Gobet, F., and Simon, H.A. (1996). "Templates in chess memory: A mechanism for recalling several boards," *Cognitive Psychology*. 31: 1-40.
Gobet, F. (1997). "A pattern-recognition theory of search in expert problem solving," Thinking and Reasoning. 3 (4): 291-313.
Gobet, F., Lane, P.C.R., Crocker, S., Cheng, P.C-H., Jones, G., Oliver, I., and Pine, J.N. (2001). "Chunking mechanisms in human learning," *Trends in Cognitive Sciences*. 5 (6): 236-243.
Gobet, F. (2005). "Chunking models of expertise," *Applied Cognitive Psychology*. 19: 1-22.
Gigerenzer, G., Todd, P.M., and the ABC Research Group (1999). *Simple Heuristics That Make Us Smart*. Oxford University Press, New York.
Gigerenzer, G. (2002). *Calculated Risks*. Simon & Schuster, New York, London, Sydney, Singapore, Toronto.
Hayne, S.C., and Smith, C.A.P. (2005). "The relationship between e-collaboration and cognition," *International Journal of e-Collaboration*. 1(3): 17-34.
Janis, I.L. (1972). *Victims of Groupthink*. Houghton Mifflin, Boston.
Laszlo, E. (1994). *The Choice: Evolution or Extinction?* G.P. Putnam's Sons, New York.
Meadows, D.H. and D.L, Randers, J., and Behrens, W. (1972). *Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind*. Potomac Association, Washington, D.C., republished 1974 by Universe Books, New York.
Meadows, D.H. and D.L, and Randers, J. (1992). *Beyond the Limits*. Chelsea Green Publishing Company, Post Mills, VT.
Naess, A. (1993). *Is It Painful to Think?* University of Minnesota Press, Minneapolis, London.
Ross, A. (2006). *Fast Boat to China*. Pantheon Books, New York.
Russell, P. (1982). *The Awakening Earth*. Routledge & Kegan Paul, London, Melbourne and Henley.
Salk, J. (1983). *Anatomy of Reality: Merging of Intuition and Reason*. Columbia University Press, New York.
Seeley, T.D., Visscher, P.K., and Passino, K.M. (2006). "Group decision making in honey bees," *American Scientist*. May-June: 220-229.
Simon, H.A. (1956). "Rational choice and the structure of environments," *Psychological Review.* 63: 129-138.

Sternberg, R.J. (1996a). *Successful Intelligence*. Simon & Schuster, New York.
Sternberg, R.J. (1996b). *Cognitive Psychology*. Harcourt Brace College Publishers, Fort Worth.
Taleb, N.N. (2001). *Fooled By Randomness*. Texere, New York, London.
Tsui, E. (2000). *Evolutionary Architecture: Nature as a Basis for Design*. John Wiley, New York.
Vlachos, E.C. (2006). Private communication with the author. Dr. Vlachos is Professor of Sociology and Civil Engineering at Colorado State University in Fort Collins, Colorado.
White, P.A. (1998). "The dissipation effect: A general tendency in causal judgments about complex physical systems," *American Journal of Psychology*. 111(3): 379-410.Wilber, K. (2000). *A Theory of Everything*. Shambhala, New York.
Wilson, E.O. (1999). *Consilience*. Vantage Books, New York.
Wilson, E.O. (2000). "Is Humanity Suicidal?," in *The New Millennium Reader*, (S. Hirschberg and T. Hirschberg, eds.), Prentice Hall, Upper Saddle River, NJ.
Zaki, S.R., Nosofsky, R.M., Stanton, R.D., and Cohen, A.L. (2003). "Prototype and examplar accounts of category learning and attentional allocation: A reassessment," *Journal of Experimental Psychology: Learning, Memory, & Cognition*. 29(6): 1160-1173.