

The Tip of the Spear

By George Gantz

The day will come when, after harnessing space, the winds, the waves, the tides and gravity, we shall harness for God the energies of love. And on that day, for the second time in the history of the world, man will have discovered fire.ⁱ

Pierre Teilhard de Chardin

Introduction:

Human civilization began when humans learned to control fire.ⁱⁱ The technology of fire gave early humans a level of mastery and control over their environment and enabled subsequent biological, cultural, economic and technological developments. Humanity flourished, extending its dominion across the globe. The exclusive authority of environmental factors to shape the future ceded to human influences. The Pleistocene ended and the Anthropocene began.

We are again facing a transition. In the past few decades, technology has enabled increasingly complex networks to develop among the eight billion humans on earth. Individual human behaviors are now subsumed within a complex interplay of institutions (networks of humans) – the resulting dynamics of which drive global outcomes. The human civilization that is emerging from this new evolutionary process, operating at the institutional level, will exhibit behaviors that we may not be able to predict or control. The power of human agents to shape the future may be ceded to global institutions that have evolved beyond our ability to manage. The Anthropocene may end soon after it began.

The rapid acceleration of technological change in the last century has allowed us to penetrate into space and to explore the very largest and the very smallest structures in the universe, while vastly improving the quality of life for most humansⁱⁱⁱ. But there have been negative consequences as well, including human exploitation, institutional failures and unanticipated consequences, all facilitated by increasingly potent technology. There continue to be serious concerns that such consequences could include the extinction of the human race. Indeed, according to Sir Martin Rees, “I think the odds are no better than fifty-fifty that our present civilization on Earth will survive to the end of the present century.”^{iv} Some might say that humans, having evolved in primeval forests and savannahs, may not be up to the challenge of managing modern technology.

Evidence also suggests that technology has released the human race from the constraints of evolution by natural selection. Certainly, selection pressures applicable to human reproduction have changed – technology has significantly altered the human fitness landscape. In 2007, Freeman Dyson speculated that human cultural evolution replaced biological evolution about 10,000 years ago, and he further noted, “in the last 30 years, Homo sapiens has revived the ancient pre-Darwinian practice of horizontal gene transfer... blurring the boundaries between species.”^v We may be moving into an era when human

reproduction and genetics will largely be functions of personal preferences amidst shifting cultural norms, economic incentives and technological capabilities – an entirely novel set of selection pressures.

In the context of accelerating institutional complexities, increasing technological threat and the re-writing of human evolutionary dynamics, steering the future of humanity is a considerable challenge.

Emergence

Over the last century, observational science, mathematical theory and computational capabilities made significant advances that have opened up our understanding of complex systems and their emergence from the behaviors of individual component units.^{vi vii} One key revelation is that our universe, including life itself, has evolved through a series of successive states, from low entropic, homogeneous conditions at the Big Bang, through increasingly complex states of higher entropy. The transition to each subsequent state involves a loss of symmetry, an increase in complexity and the emergence of novel structures and behaviors.

The process by which new structures emerge at each stage of the process is not uniformly well understood. Theories regarding the phase changes early in the history of our universe, leading to the emergence of the fundamental physical forces and the particles comprising the Standard Model, have a strong consensus, although major theoretical problems remain.^{viii ix} Similarly, the theory of evolution through natural selection has a strong consensus in the scientific community, but debates continue on some of the specifics.^x

In his theory of evolution by natural selection, Darwin hypothesized the first modern emergence theory. Genetic mutations are introduced in individuals within a species and subjected to environmental selection pressures influencing reproduction, e.g. they compete for reproductive success. If a mutation is advantageous the individual will have a higher likelihood of reproducing, resulting in the spread of the mutation. The end result is an adaptive change in the population. Over time, diverse new behaviors and structures, including new species, arise. Analogous evolutionary processes in economics^{xi} and cultural behavior^{xii} also demonstrate evolution through innovation, competition/selection and reproduction, resulting in adaptive changes in the respective populations.

Discussions are now taking place, under various labels such as universal, quantum or cosmic Darwinism, speculating that each level of emergence exhibits a kind of mutation and selection, with the emergent solution settling on “attractors” or “pointer states” with stable properties. The structures that survive this evolutionary process in a given environment are the ones that are optimally suited to the fitness landscape. One can visualize this process in the behavior of fluid flowing down a drain. Opening the drain initiates a flow that creates turbulence, during which a series of small structures may form spontaneously and be tested for fitness, quickly evolving to the efficient vorticular flow with which we are all familiar.

A deep insight is that attractors are formed in a process where the individual component units of the system, while behaving autonomously, are influenced by signals from other units. This results in changes, or mutations, in the local state of the system, which are then subject to selection pressures by the fitness landscape. The signaling and response between individual units is the basis for the self-organizing feature of the emergent process, and it is fundamentally a cooperative behavior. Innovations that exhibit greater cooperation among the units, for example by providing greater efficiency or stability, will out-perform those that do not. Debates continue on the degree to which such cooperative behavior exists in some, or all, emergent processes, and the extent to which it is consistent with reductionism or requires some form of top-down causation. In any event, the practical implications are clear. Successive emergent states are formed, in many if not all cases, through mutual interactions between component units of a system.

Cooperation

One of the historic criticisms of evolutionary theory is that it could not account adequately for the development of empathy and other moral qualities in human beings. After all, it seems counter-intuitive to suggest that a theory, colloquially referred to as “survival of the fittest,” would result in cooperative rather than exclusively competitive behaviors. Recent research seems to have largely resolved these criticisms through models of multi-level individual and group selection processes^{xiii} that demonstrate the evolutionary value of cooperative behaviors. Researchers have also suggested that evolution can account for the development of human morality^{xiv} and human religions.^{xv} It no longer seems far-fetched to suggest that the higher moral and aspirational qualities of humanity have roots in the evolutionary heritage of our species. Moreover, the evolution of consensual moral frameworks and cooperative enterprise grounded in human empathy has been critically instrumental in our adaptation and subsequent success as a species.

Human adaption and advancement also required increasingly sophisticated forms of cooperation. As hunter-gatherer tribes were replaced by settled communities and the division of labor increased, the size and complexity of human networks increased. These networks became institutions as the underlying cooperative practices and behaviors were formalized. Governments, religions, markets, cultural and educational practices and organizations developed and evolved. Competition and innovation, within the landscape of the collective needs and aspirations of human individuals and groups, shaped the evolution of these institutions. Those bringing greater success in the accumulation of resources and the satisfaction of wants flourished and grew.

Among the successful institutional threads was the enterprise of natural philosophy. Greater empirical understanding of the world in which humans lived yielded significant benefits, and those who acquired and articulated such knowledge were highly valued, as were the libraries in which such knowledge was contained. In recent centuries, empirical science, the outgrowth of natural philosophy, has been the engine powering the technological change that has brought us to our present state. Through the cooperative

efforts of scientists from all parts of the globe, knowledge of the world has increased and technology has flourished.

At the same time, many of our other institutions have also evolved, growing in size and sophistication, enabled by new technologies for communication, trade, travel, computation and manufacturing. This growth has brought profound benefits to the human species, but has also increased complexity and uncertainty. This complexity has given rise to novel behaviors, demonstrating emergence of higher-level structures.^{xvi} These behaviors are not necessarily benevolent. According to Nassim Taleb, "...the world in which we live has an increasing number of feedback loops, ... thus generating snowballs and arbitrary and unpredictable planet-wide winner-take-all effects."^{xvii} The daily news is headlined by the equally unpredictable behaviors of weather, stock markets and politics. The first is a complex phenomenon of nature, albeit increasingly influenced by human behavior. The other two are complex human institutional phenomena.

Cooperative enterprise is a hallmark of humanity's success. Humans consistently demonstrate trust in fellow humans, enabling our species to solve the Prisoner's dilemma, a game theory scenario that pits a rational betrayal against a more risky decision involving trust – if reciprocated, trust leads to a maximally beneficial outcome. Moreover, the institutions of human civilization all arose as networks of cooperating (or at least compliant) individuals. This cooperation provided the institutional foundation for the building of cathedrals, castles, commerce, computers and super-colliders. However, if the human evolutionary process that imbued humans with trust and facilitated the development of consensual moral frameworks has now been dismantled, how do we insure the continued selection and reinforcement of these qualities?

It is no small concern that the formative selection pressures of the fitness landscape that produced humans with immense cognitive strengths and powerfully cooperative behaviors may no longer be operating. Increasingly, we are faced with the challenge and responsibility for shaping humanity's future through intentional human design. We must create fitness landscapes that select for cooperative individual and institutional behaviors. Do we have the technical tools, the creative ideas and, most importantly, the collective will to do so?

Confrontation

Humanity has breached the earth's atmospheric barrier, first with man-made patterns in electromagnetic frequencies and later with exploratory artifacts and even vehicles. While this is a spectacular technical achievement, it also presages another concern for humanity. Has life evolved elsewhere? If it has, what will happen when we make contact?

Conventional wisdom had been that humanity is unique in the universe, and to date all efforts to detect evidence of extraterrestrial civilizations have been fruitless.^{xviii} However, NASA has reported the discovery of organic materials on Mars,^{xix} and organic materials appear to be common throughout the universe.^{xx} New estimates of the number of

potentially habitable planets in the Milky Way galaxy and the universe at large also suggest a much higher probability that life may have developed on other planets than previously thought.^{xxi}

It is conceivable that we will soon confront one, and potentially many, intelligent species from elsewhere in the universe. In this event, the future of humanity will depend on its ability to negotiate within a new, galactic-level fitness landscape. It would seem reasonable to expect that any sentient civilization with the technology and institutional capacity for space exploration will have completed an evolutionary process on their home planet that likewise solved the Prisoner's Dilemma through trusting behaviors and shared moral frameworks. The nature of that extraterrestrial morality and the cooperative behaviors it inspires may, however, be quite exotic.

How will our global institutions respond to first contact? Will political, military and scientific institutions cooperate in offering a united response, or will fear and confusion predominate? Will we be able to communicate our shared moral framework and negotiate a mutually beneficial outcome, or will technological supremacy determine a victor, resulting in horrendous costs?

This possibility may seem hypothetical, but we ignore potential Black Swan events at our peril. The asteroid that caused the K/T (Cretaceous–Tertiary) Extinction was a low probability event, but when it struck the earth the consequences were cataclysmic. So might be first contact.

Steering The Future

Human civilization is being challenged from within by accelerating technological progress and complexity, and may be challenged from without by first contact with extraterrestrial life. Historically the human response to challenge was often violence – hoisting a spear or other weapon in combat or conquest. However, the spear has also served humanity for both hunting and defense. While recent military jargon may have trivialized the “tip of the spear” analogy, it may yet have some value in our consideration of humanity's global emergence and potential first contact. Indeed, it is appropriate to ask what powers the spear of human civilization towards its unknown future, and how should we arm the tip?

The driving force of humanity's remarkable advance from the Pleistocene to the Anthropocene, including the mastery of fire, was the collective and shared learning about the world and the adaptation of that knowledge to our needs and desires. The human species has a passion for knowing, derived from necessity and enabled by bodies and brains of immense complexity and sophistication. That passion has found its greatest outlet in the empirical scientific discoveries of recent centuries. Yet those discoveries would have remained unexplored or unexploited without a corresponding institutional framework supporting freedom of thought and expression, dissemination and critical review of ideas and market demonstration, development and deployment. Universities replaced palaces. Free states replaced city-states. Trade in goods and ideas became global.

The scientific community became a network of professionals that shared common goals and methods and achieved profound knowledge of the physical world. The foundation for all these achievements is the human empathic qualities that enable such cooperation.

It is essential that our human civilization remain committed to the pursuit of empirical knowledge. This will continue to be the power behind the spear. However, this pursuit is fundamentally dependent on maintaining institutional behaviors that support global cooperation. Trust, honesty, openness to criticism and new ideas, mutual respect and a passionate commitment to empirical truth have been essential to science and those qualities remain critical for sustained cooperation to exist within the scientific community. But is the fitness landscape for the scientific enterprise today selecting for these behaviors? Are the rewards and disincentives, the signaling and feedback loops, the administration and enforcement mechanisms within the enterprise properly aligned to achieve maximally cooperative behaviors? Or is the landscape of increasing specialization and fragmentation and increasingly steep incentives for being novel and being first, tending to undermine both cooperation and, ultimately, progress? Is the global institutional framework within which science does its work appropriately sympathetic and collaborative? Or is politicization and polarization undermining efficiency and fraying the shared moral framework under which it operates?

It may be difficult to answer these questions. Nevertheless, we must answer them. Humanity is the first species to have worked its way out of the confines of the natural fitness landscape - and we have the capability to design our own. This offers new degrees of freedom, and also brings with it responsibility for the consequences. For example, if we design, or fail to reform, institutions that do not engage in pro-social cooperation and that practice or enable cheating or defection, thereby undermining trust, then we risk having such institutions outrun their rivals in a winner-take-all competition. All of human civilization to this point would be in jeopardy, and we would have no one to blame but ourselves. However, if we embrace the centrality of cooperation to our evolutionary success and infuse it into our design of the fitness landscapes that determine future institutional success or failure, then we can take control of the future.

As we address this challenge, we must recognize that humanity is multi-dimensional and our interests extend beyond the material to include aesthetic, cultural, civic and spiritual aspirations. Institutions have evolved in all these dimensions, and their qualities, as in the case of science, have been shaped by human relationships. Institutions reflecting and reinforcing empathic qualities, whether families, tribes, cities, kingdoms, nations, religions, social movements or voluntary associations, benefit from cooperative behaviors, build social capital, and tend to thrive. (For example, efficient global markets are impossible to achieve without trusting relationships.^{xxii}) Those that do not, such as despotic autocracies, carry within a weakness in human bonding that undermines flexibility, responsiveness and information flow, all of which are essential for long term institutional success in satisfying human needs and aspirations.

These institutions also form networks and interact with each other. The institution of science, for example, depends on supportive economic and political institutions, and it, in

turn, influences civic and cultural life. Ultimately, human civilization is the totality of human institutions and their collective behavior. As in other complex systems, institutions signal and respond, and the resulting behaviors are tested in a global fitness environment. Cooperative responses create synergies that lead to efficiencies and improved fitness - and therefore institutions that reinforce empathic behaviors should be respected as part of the global institutional framework that has also enabled science. Competitive or conflicting responses create frictions that can undermine or destroy – institutional conflicts should be subject to negative selection pressure.

The 20th century has clear examples of both collaboration and conflict. Autocratic government paired with communist ideology contributed to the rise of Stalinism. Parochial nationalism and secular idealism contributed to Nazism. Thankfully, both failed to achieve global conquest. However, the competitive conflicts of World War II and the Cold War that defeated them resulted in massive loss of human life and waste of global resources. On the other hand, collaborative global institutions have flourished. Science is a largely borderless enterprise that accumulated sufficient civic and economic support to build, among other things, the Hubble Telescope, the Human Genome Project and the Large Hadron Collider. In addition, market economies have thrived as global cooperation expanded – the flow of goods and services has evolved into an unrecognizably complex web of materials, components and services that defy efforts to comprehend it.^{xxiii} The United Nations is an example of a nascent synergism that continues to be tested in a fitness landscape that includes global political and economic conflicts.

Science does not always serve in an empathic capacity. Nuclear armament, with its potential for causing human extinction, is a clear example. Less clear is the role science may play in fostering particular ideologies such as determinism and materialism, metaphysical worldviews that arguably challenge the efficacy of human empathy and undermine the emotional and psychological foundation of other key human institutions - including religions – that promote empathy. Has science as an institution contributed to existential alienation, the rise of unfettered commercialism or declines in social capital and shared moral frameworks?

It is clear that the qualities that propelled humanity and its institutions forward are the empathic qualities of trust, honesty, mutual respect and shared commitment. To this list we should add the corollary attribute of humility. As Francis Bacon put it more than four hundred years ago, referring to both science and religion, “let men endeavor an endless progress or proficiency in both; only let men beware that they apply both to charity, and not to swelling.”^{xxiv}

Without these empathic qualities, the human race would never have advanced and likely would not have survived. Without them, it is unlikely that we will survive.

While the evolutionary theories cited in this essay may be new, the idea that empathy is the foundation of human civilization is not. Indeed, one formulation of the behavioral foundations for human cooperation was promulgated thousands of years ago, in the

Decalogue^{xxv}. Both the Buddhist and Christian traditions emphasize compassion and love, respectively. Christianity specifically commands, “Love your neighbor as yourself.”^{xxvi}

The advance of our human enterprise will be powered by empirical knowledge, but the tip of the spear should be armed with our empathic qualities, ensuring that it is a tool of advancement and not destruction, a probe rather than a weapon. As a civilization we must aspire to practice empathy and to build empathic qualities into our institutions. We must design the fitness landscape for humanity’s future in ways that reward cooperation and collaboration and discipline cheating, dishonesty and other moral defections – thereby reinforcing the qualities of trust, honesty, mutual respect, humility and shared commitment. In so doing we will ensure the success of our collective enterprise as a whole and an optimal outcome from interactions with civilizations we have yet to meet.

Conclusion

Human civilization is facing many challenges in the 21st century, and the most significant is learning how to steer a course towards a future that best meets the collective needs and aspirations of humanity. However, the process of building that future started eons ago. It is reflected in the genetic and ideational heritage of the human race, and in the life of the institutions that we have created. We are at a new stage of evolution – one that has transitioned from individual and group selection to institutional, global and potentially galactic. The fitness landscape is no longer determined by the natural world but by the human one. In order to survive and thrive we need to identify and promote institutional behaviors that satisfy our human needs and aspirations.

It is imperative that we continue the enterprise of scientific inquiry. Human civilization should remain committed to the pursuit of knowledge about our world and how to continue making it a better place for us and the generations that follow. This will power the spear of human civilization. However, we also have to foster institutions, the networks of human civilization, including science itself, that work effectively together and that embody human empathic qualities. We must design the fitness landscape for human institutions to reinforce the qualities of trust, honesty, mutual respect, humility and shared commitment. In short, we should arm the tip of the spear with love in its most universal form.

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