# SUSTAINABLE HUMAN DEVELOPMENT IN THE TWENTY-FIRST CENTURY: AN EVOLUTIONARY PERSPECTIVE

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## Summary

Human development is a multidimensional and complex concept, partly a result of the complexity of human nature, the way humans interact with each other as individuals and social groups, and partly a result of how humans view their role in the ecosystem and the way they treat their environment. Over the course of time, humans have been gaining greatly in scientific knowledge, intellect, and material comfort, but not necessarily in the development of just institutions or in rational collective judgment. Human development requires more than scientific or material progress.

World development has been characterized by accelerated scientific and material progress combined with increased poverty, glaring inequity, and violence. These apparently contradictory developments could be clarified in the context of two paradigms. In the first, it is believed that unequal development and its associated ill effects are inevitable consequences of human nature, a "selfish gene." The second paradigm asserts that this prospect is not inevitable. Negative externalities of these "natural" evolutionary tendencies could be managed, with larger and more equitable gains to human society. Not all paradigms agree on human development objectives or strategies.

At the close of the twentieth century, four major forces were shaping human development and they will continue to influence its structure and sustainability through the twenty-first century. They are: scientific development, human capital formation, culture, and the globalization processes. Advances in science and technology proceeded

in two realms: the physical world and the living world. These scientific advances, although contributing significantly to human development, introduced puzzling questions, and many had negative consequences. The scientific revolution apparently generated a futile race between reduced natural immunity and increased exposure to the risk of disease, and the development of remedial measures to deal with these emerging consequences, an inefficient evolutionary process. Furthermore, recent advances in neuroscience and genetic engineering opened up possibilities of improving mental and physical human capabilities that are transmittable across generations, with social and environmental consequences that have not been fully examined. Technical decisions that influence the distribution of capabilities and opportunities require an ethical filter.

Human development in the present age is based on knowledge, its development and accumulation. In this knowledge environment, the role of *culture*, especially its diversity and adaptive capacity, is essential. However, the present phase of *globalization*, which institutionalizes open borders and unrestricted flows of information and foreign lifestyles without barriers to content, may deliver shocks that threaten the peaceful adaptive capacity of many indigenous cultures. Some societies may reject foreign ideas regardless of their potential social benefit, with great loss to human development.

Globalization is a cumulative process that started from the time civilizations began interacting and communicating. The present phase differs from previous phases. It is fueled by the accelerated pace of innovations that are cementing inter-dependence among states around the world, through the spread of information, finance capital, and regulatory institutions. Historically, periods of massive industrial consolidation and dramatic technological innovations have been followed by periods of political, social, and institutional reforms that come into conflict with democratic ideals. Sustainable human development in the twenty-first century is full of both promise and uncertainties.

## 1. Introduction to the Issues

> Order is not a pressure imposed upon society from without, but an equilibrium, which is set from within.
>
> (J. Ortega y Gasset, 1927, quoted in Hayek, 1955)

This essay examines the state and nature of human development and identifies factors that determine its enhancement for the twenty-first century. A general goal for human development is to enhance the quality of human life. However, the concept “quality of human life” is not well defined. It is determined by a set of interrelated factors that cut across many disciplines with varied perspectives and paradigms. These include the prevailing culture, health status, economic performance, political and social conditions, the building of human capacity and capabilities, and institutional development. For example, in an environment characterized by enhanced quality of human life, it is expected that people will be able to lead long and productive lives. They are also expected to enjoy good health, have access to knowledge and educational opportunities, and be treated by all with respect, in a socially equitable and dignified manner. In the sphere of political economy, they are expected to have the opportunity to participate in governance decisions that affect their lives and the community in which they live; and to have the potential to earn sufficient income to supply themselves with ample nutrition,

shelter, and other material and aesthetic needs. Meanwhile, people are expected to maintain a sustainable environment and equitable social contracts across generations. In the present evolutionary perspective, a prevailing "culture" is characterized as a "weighted sum" of these context-specific factors.

However, these factors are not independent in their effects, nor do they act in harmony. For example, advances in medical science have greatly improved survival and health status in the developing countries. But they have also resulted in high rates of population growth, raising difficult challenges to development in many of these countries. Medical advances lead to extension in life expectancy at old age. However, excesses in such extension result in significant changes in the age structure and in the efficacy of related socio-economic and health institutions. In biotechnology, advances that enhance yield through genetic engineering have established this technology in major crop production around the world without careful examination of its net social benefit. Recent studies indicate serious unintended consequences to biodiversity, as the leading biotech corporations are discovering at present. The positive impacts of scientific advances on health, nutritional status, and life expectancy are qualified as net gains in measures of human development, but their negative externalities do not enter into these calculations.

These examples, among others, illustrate the complexity of measuring human development and achievement in the absence of a well-defined system of ranking. Indices of human development are not necessarily optimal, and their elements and weights are not constant over time; they should be assessed periodically. The social welfare consequences of some components of a human development index (HDI) may be nonlinear, or new knowledge about unintended negative consequences may be discovered. At best, HDIs are quantifiable approximations of a subjective and qualitative concept, the quality of life. For example, the United Nations Development Programme has published annually, since 1990, the Human Development Report (HDR), which includes rich information as well as a human development index (HDI). The HDI is based on three indicators: longevity, as measured by life expectancy at birth; educational attainment, as measured by a combination of adult literacy and the combined gross primary, secondary, and tertiary enrollment; and standard of living, as measured by real gross domestic product (GDP) per capita. Although a crude measure, it does serve the important function of focusing policy and academic attention on the wider aspects of human welfare not included in the standard GDP per capita. But the HDI should not substitute for careful analysis of the rich information provided in the HDR, and both undergo periodical assessment since the nature of human development is not static. It is continuously evolving.

Human development does not proceed independently of its environment. As humans alter their environment, the altered environment alters human destiny as well. It is for science to indicate the consequences and provide remedial and preventive measures. It is for a democratic system of social choice that includes a philosophy of human development to define its scope, assess progress, balancing competing concerns, and make allocative decisions.

## 2. Toward a Philosophy for Human Development for the Twenty-First Century

An attempt to examine the conditions and framework for a human development strategy requires a guiding philosophy that harmonizes and rationalizes the three universes of human culture: faith, science, and the arts. It should explore the synergistic nature of these basic elements of human culture, provide a ranking system of achievements in the various spheres of human actions, and provide a "balance" between an idealistic vision of human nature and social organization (Plato/Hegel), and one based on an empirical understanding of the dynamic interactions of humans with their external environment (Locke/Hume). The goal of such a philosophy is to provide balance and harmony in human affairs, leading to enhancement of the quality of life as well as to effective institutions and a sustainable environment.

Human intellect has advanced greatly, since the era of the great Greek philosophers, toward a consistent philosophy of human development. But there are many unsettled issues that persist, even as we enter the twenty-first century. To put the present state of human development into perspective, let us consider a brief historical review of how cultural evolution, with unprecedented versatility and adaptive capacity, substituted for evolutionary anatomical changes, and in turn is being replaced by a technophysio evolution.

### 2.1. From Biological Evolution to Cultural Adaptation

For hundreds of millions of years, living organisms and animals have been adapting to new environments or to new strategies for exploiting existing environments by the slow process of hereditary modifications of their body structure. Some animal species, within their genetic endowments, extend their inherited physical powers by using elementary tools or by co-operating in hunting or in defense activities. Humans, in the initial stages of cultural adaptation, used similar mechanisms to extend the power of their bodies to cope with an unaltered environment. But that early rudimentary human adaptive capacity, which was linked in the early stages of its development to evolutionary self-selection, evolved independently from evolutionary anatomical change, into a complex and powerful social mechanism that is termed cultural adaptation or cultural evolution. "Cultural evolution" is a distinct human trait. It requires the use of intelligence and social organization. It allows humans to adapt more efficiently to their environments. It also empowers them to change these environments to make them more congenial to human needs and desires, thus achieving unprecedented control over their own destiny and the destinies of all other living species, as well as the physical environment itself. Once this cultural versatility had appeared, evolution through adaptive radiation with respect to anatomical structures and physiological functions became a far less efficient strategy for dealing with environmental challenges than cultural amplification through inventions and technological progress.

Three basic qualities, acquired by humans as they interacted with their environment, were necessary to evolve in the direction of cultural adaptation. These are artisanship (the evolution of tool making into complex manufacturing and construction activities), conscious time binding (the ability to plan ahead and develop social institutions while benefiting from present and past experiences), and imaginal thinking (the ability to go

beyond reality, essential for planned achievement). These three qualities are the foundations of the three principal realms of the present human knowledge. Natural science and engineering are the outgrowth of artisanship. Social sciences are fundamentally ways of directing social behavior to avoid disaster and to improve the material state of humankind. The humanities are extensions of imaginal thinking. Societies that used these capacities more efficiently could acquire more food and defend themselves better against predators, and thus improve their chances for survival and reproduction.

There are two fundamental differences between cultural evolution or selection and biological natural selection that make the former far more flexible. The first is the speed with which cultural evolution can adjust to the environment. Biological natural selection proceeds more slowly and gradually. An alteration of a species that is viewed as sudden may actually take millions of years. Within less than 15,000 years, since humans started to acquire the attributes of "symbolic cultural evolution," the second phase of the cultural evolution discussed below, they were able to evolve into masters of their environment with a speed that has been greatly accelerating over time. It would probably have taken hundreds of millions of years to achieve these same results through the process of biological natural selection.

The second difference is the importance of education in the transmission of knowledge as opposed to gene transmission in the preservation of the evolutionary process. Education of human offspring and the preservation of the stock of knowledge, independently of genetic transmission through the biology of birth and death, are the key ingredients in the preservation and continuity of cultural evolution. Now it seems feasible, through the mechanism of cultural adaptation, to achieve dramatic changes in human development within one generation; an awesome responsibility for every human generation.

The ability of cultural evolution to develop, by nongenetic transmission, complex patterns of behavior and social organization and institutions was made possible as a result of the human invention of symbolic language. The perfection of symbolism has lifted learning and scientific development to entirely new levels of complexity and continuity. That perfection led human evolution to take the decisive step away from the use of signs as the *modus operandi* for communication, which in turn led to the development of mathematical and logical structures essential for the development of science and human intellect on the global level. The experiences of Helen Keller and Laura Bridgman, at the beginning of the twentieth century, illustrate that symbolism has made possible advances in human development and culture independent of the quality of sensory function. With feeble human bodies and a lack of essential sensory functions, being blind and deaf-mute, they were able to reach a high degree of mental development and intellect, once they had captured the symbolic use of words. Armed with symbolic skills, *Homo sapiens* became a formidable competitive species, as the demise of *Homo neanderthalensis* illustrates, but not necessarily a rational one. The evolutionary process is not necessarily linear. The *Homo sapiens* species, far from being the pinnacle of the hominid evolutionary tree, could be one more of its many terminal twigs. However, as the discussion indicates, *Homo sapiens* is developing a robust evolutionary niche that could sustain its presence.

## 2.2. Cultural Evolution, Symbolism, and Globalization

Without the invention of symbolism and its perfection, artisanship, conscious time binding, and imaginal thinking could not have evolved beyond rudimentary levels. The effect of cultural evolution and symbolism on human development has been enormous. By its very nature, symbolism includes the embryo of globalization. Symbolic thought is not attached to sensory data. Humans can relate through thoughtful debate based on logical structures: a more universal communication media, without the limitations of sign language and sense-based data. It took more than 3 billion years for many-celled animals to evolve on Earth, another 500 million years for apes to evolve, and an equal time for *Homo sapiens* to evolve: about 300,000 years ago. During that long span of living history, evolution, including the early development of nonsymbolic cultural evolution, was basically opportunistic and epigenetic. It was not able to produce a pattern of recognized civilizations.

Symbolic cultural evolution, on the other hand, seems to have evolved as recently as 15,000 years ago. Within that short span, great civilizations and cultures flourished, starting with Sumeria, followed by Assyria, Babylon, Egypt, China, Greece, and Rome, up to the present "Western" civilization with its unprecedented progress in science and technology. Some 5,000 years ago in the Middle East, writing was invented and the first cities were established. Within 700 years of these momentous events, the Egyptian Pharaohs had built their famous pyramids and had established the earliest menageries and botanical gardens for pleasure, prestige, and to satisfy scientific curiosity. The evolution of these civilizations did not proceed in isolation. Although path dependent, the development of these civilizations was greatly influenced by mutual interactions through trade, migration, explorations, and conquest. Pre-Socratic philosophy, for example, which laid the foundation for Western civilization, evolved through interaction with and learning from previously established civilizations. It is well established that Western philosophy started in the sixth century B.C. at Miletus on the Ionian seaboard of Asia Minor. Ionia was the meeting place of East and West; it was also the land of Homer. The first Milesian philosophers, Thales, Anaximander, and Anaximenes, were open not only to oriental influences (Confucianism, 500 B.C.) and Homeric tradition (700 B.C.) but to the mathematics of Egypt and Babylon and to the ideas and information that flowed along the trade routes passing through Ionia from the far East. Thales of Miletus (624–546 B.C.), considered the founder of pre-Socratic philosophy, traveled to Egypt to learn astronomy, geometry, and practical skills to do with the measuring and management of land and water. It is remarkable that the five-pointed ancient Egyptian star, named "sba" by Egyptologists, is the same as that used in the American flag. It also has similar spiritual connotations in early Greek and later Masonic mythology. The history of civilizations indicates a continuity of learning processes among societies. Symbolism had a major influence in facilitating connectivity among civilizations, and in reconciling the anthropologists' diffusion hypothesis of the unity of civilizations with the empirical question of how isolated societies develop similar tools and modes of behavior.

The historical development of symbolic cultural evolution was not smooth. There was both internal and external conflict. Internal conflict arose from a lack of harmony among the basic components of symbolic cultural evolution: natural sciences and

technology (artisanship), social sciences (conscience time binding), and the humanities (imaginal thinking). Initially, harmony was sought through faith. Major religions—Judaism, Christianity, Islam, Buddhism, Hinduism, Taoism, and Confucianism—appeared during that period of symbolic cultural evolution to rationalize the role and place of humans in society and in the cosmic order, and to provide cultural stability through harmony among the main elements of symbolic cultural evolution. For example, in recent history, a self-regulating, invisible-hand paradigm was developed by Adam Smith, following Newton's view of a harmonious cosmic order. It contended that micro behavior, when left to its own will, is guided by an inherent self-interest motive that converges atomistic behavior into optimal macro order. While providing the foundation for scientific economic analysis, the paradigm built a bridge between scientific development, market behavior, and established faith. However, advances in science and empirical knowledge, combined with "collective self-interest" that reduces individual mobility and motivation, have created tension in that synergy throughout the history of symbolic cultural evolution.

External conflict, partly a result of internal conflict, arose as a defense mechanism to safeguard as well as to diffuse what each culture viewed as superior elements of its way of life: its brand of socio-political organization and development path. Cultural diversity, instead of being viewed as offering human enrichment and progress, was viewed as a threat to the status quo and a call for socio-political alarm; a clash among civilizations seemed inevitable in this paradigm. However, the emergence and apparent inevitability of conflict seems to have been fueled more by changes in the internal dynamics of symbolic cultural evolution. Advances in science and technology led to the Industrial Revolution and the emergence of the present form of capitalism, in which material progress is the primary goal, progress that ultimately depends on the accumulation of resources. Global expansion became a necessity while opportunities were converging towards a zero-sum game status. Thus, although the past three centuries of symbolic cultural evolution have witnessed great advances in science, the arts, and material comfort, they have also witnessed great tension, wasteful wars, unemployed resources, and confused social priorities within and among nations and states.

As civilizations emerged, intellectual and religious leaders increased their efforts to inject human purposes and reason into the course of history, with varying degrees of success. There are optimists who believe that human societies are increasing their ability to chart and follow a purposeful course of change towards a better life for all. However, it seems that optimists are balanced by an equal number of pessimists. According to some authorities, "the inexorable laws of nature and evolution will eventually override purpose and cause the human species to decline and disappear, as other animal species have done in the past." In this pessimistic view, the future may not be secure, since as we begin to approach the limit of the earth's capacity we severely restrict our room to maneuver in response to change. It is true that many species, more than 90 percent, have disappeared over the course of life history. However, as a "generalist" species, not dependent on narrow specific niches, *Homo sapiens* should be a robust one. The history of symbolic cultural evolution, its *modus operandi* and its continuous search for harmony among its three fundamental elements indicate that it is a powerful, robust, and adaptive engine that should be able to guide humanity into a better future. To examine this survival potential, we attempt first to understand the

topography and course of that evolution. Every century seems to bequeath crises to the one that follows. What did the twentieth century inherit from the nineteenth century that affects human development and the quality of life? How did the twentieth century cope with its legacy, and what dilemma is it forwarding to the twenty-first?

### 2.2.1. The Inherited Burden of the Twentieth Century

The nineteenth century bequeathed to the twentieth an age of doubt and disharmony in established cultures. Without harmony among the three universes of the symbolic cultural evolution, the foundations of human philosophies and, by extension, those of culture and human development were shaken and their conclusions questioned. For example, in isolation, theological learning was seen as "lifeless embalmment of knowledge." Scientific knowledge, deprived of conscious time binding (social sciences) and imaginal thinking (faith, philosophy, or the arts), seemed incapable of providing a value system to steer individuals safely through the complexities of life and the negative externalities of technological change. Overall, old ideas were being challenged. New ideas were being born. Meanwhile, the growth of industry, technological invention, and the expansion of colonial power were altering the face of nations economically, socially, politically, and environmentally.

The nineteenth century was a period of contradictions: an age of hope and doubt, of culture and anarchy, of freedom and slavery, of democracy and exploitation, of nationalism and colonialism, and of the birth of seminal revolutions in thought on the one hand and the death of established ideas on the other. It was the century that spawned the likes of Bentham, Darwin, Hegel, Mill, Marx, Nietzsche, Einstein, and Russell, building on the works of Galileo, Descartes, Ibn Khaldun, Hume, Newton, Rousseau, Helvetius, Kant, Malthus, and Adam Smith, among others. On the one hand, it was a century of significant scientific discoveries, such as John Dalton's proof (1808) that matter consists of atoms, or James P. Joule's finding (1851) that energy is indeed conserved, or Charles Darwin's *Origin of Species* (1859). There were also significant inventions such as the telegraph, the automobile, the telephone, and electrification, among others. On the one hand, it was a marvelous century. On the other hand, it was one of chronic malnutrition, illiteracy, and poverty for the majority of humankind.

At the end of the nineteenth century, there were serious doubts about the viability and moral justification of the national and international socio-political order, as well as concerns about the economic and social conditions of the working class. Two crises in particular had been responsible for the skepticism about the nature of cultural evolution and the future of humanity: a crisis of "science and faith" and of "empiricism and rationalism." There had been earlier signs, even before the dissemination of Nietzsche's controversial philosophy, of a widespread decline in the belief in a divine creator whose authority could decide baffling questions of faith and morals (although Nietzsche wrote, apparently despairingly, that people would rather have the void as purpose, than the void of purpose). Natural sciences, geology, biology, and physics had a hand in this crisis. Rational scrutiny and empirical documentation discredited many claims regarding the age of the universe or the origin of humanity that had been accepted as matters of faith.

Empiricism is the view that knowledge of the world is based upon and derived from sensory experience. It claims that whatever is in the mind must be first in the senses. Empiricism is clearly the opposite of rationalism. The latter maintains that reason alone can provide knowledge of the existence and nature of things; reality is a unified, coherent, and explicable system. By the end of the nineteenth century, empiricism, as a philosophy, slowly supplanted rationalism to become the prevailing point of view. The *modus operandi* of empiricism has been characterized by its reliance on sensory data as the only source of knowledge, its refusal to accept anything but material reality, its subjective and relative stance on moral and psychological matters, and its skeptical perspective on the most essential issues underlying human existence. The result is that while "empiricism" loosened many dogmas and made room for diverse attitudes, it deprived many of a secure basis on which their culture, belief, and action rested.

Not all students of human culture adhere to the empiricist view. Some continue to hold that ideas are the foundation and the essence of all things. In their view, knowledge is based on the ideas we ourselves hold, as well as those held all around us. It is through these ideas that we discover our identities, the societies we create, the political and cultural institutions we construct, even the direction in which we take history itself. Just as faith, economics, or the subconscious functions are the means through which other phenomena must be explained in the systems of Aquinas, Marx, or Freud respectively, it is "ideas" that perform that function for "idealism."

### 2.3. From Cultural Evolution to Technophysio Evolution

By any account, the twentieth century was pivotal. It affected, in fundamental ways, the *modus operandi* of human cultural evolution, and will probably have lasting effects on the direction of human development. It witnessed, as had previous centuries, major social and political experiments and great advances in the natural sciences and technology that had significant socio-economic and political impacts. But the speed, scope, and diffusion of advances in science, technology, and regulatory institutions that took place during the twentieth century are unprecedented, and the process is accelerating with no end in sight. There were, in the course of that century, major conflicts and setbacks at high cost to human lives and welfare, including the two World Wars, costly regional, ethnic and religious conflicts, and a prolonged world economic depression.

There were also great technological and scientific developments and inventions; these have the potential either to wipe out the whole of human existence and civilization, or to improve the chances of human survival, material comfort, and knowledge base. There were, in the twentieth century, significant advances in economic techniques and political theory that affected the organization of government and governance, in which economic efficiency emerged as a main policy goal. The century witnessed the continual ascendance of reason and the control of atomic and biological warfare. There were great advances in disease control and health status, in food production, and in material comfort in general, through advances in biotechnology, communication, and space technology, among other scientific developments. The twentieth century witnessed the birth of worldwide regulatory institutions (although short of creating a true world government with full implementing power). These have been designed to

safeguard world health, labor rights, science, education and culture, world development and finance, and trade regulation, while other UN agencies and institutions were created to protect the world environment, human rights, and peace, among other purposes.

However, in spite of these scientific and organizational achievements, poverty persisted on a vast scale and the gap between the rich and poor, within and across countries, widened greatly at the close of the twentieth century. For example, a 1999 United Nations report indicated that of the 4.4 billion people in developing countries around the world, three-fifths live in communities lacking basic sanitation; one-third go without safe drinking water; one-quarter lack adequate housing; one-fifth are undernourished; and 1.3 billion live on less than US$1 a day. Nearly one-third of the people in the poorest countries, mostly in sub-Saharan Africa, can expect to die by the age of forty.

Accelerated advances in science and technology and in the knowledge base of the social sciences made classification, categorization, and specialization a necessity, thus reinforcing a propensity, inherited from Aristotle, for seeking definitions. Categorization of science tends to trade depth for understanding of synergies and to reduce interdisciplinary communication. This categorizing trend went beyond the sphere of science, especially in the first part of the twentieth century, to classifying people and societies into higher and lower orders depending on their color, beliefs, traditions, or economic status: a tendency that paved the way for the bane of racism compounded by injustice.

The nature of cultural evolution also changed qualitatively and quantitatively during the twentieth century. Of the three basic elements of symbolic cultural evolution, the universe of science asserted itself, especially in the second half of the century, as the dominant force setting the pace for the evolutionary process of humanity, and providing the necessary harmony. In one perspective, science is viewed as a power that transcends social forces and is driven more by its own internal logic and the objective facts of nature and less by social forces; it is transforming society into a global "technical" civilization. For others, advances in science and the direction they take are a reflection of the prevailing social system. Science is produced by scientists who "are neither saints nor devils but human beings sharing the common weakness of our species." In either perspective, human progress and development are being viewed increasingly as the self-generating outcomes of interactions between technological and biological development. This is a view that reduces the wider concept of symbolic cultural evolution into a technophysio evolution, a "form of human development that is biological but not genetic, rapid, culturally transmitted, and not necessarily stable."

Scientific development is moving the world closer to "one" human family. The concept of human races or groups differentiated by lags in anatomical evolutionary processes, which took hold at the end of the nineteenth century, was apparently buried as the twentieth century progressed. Around 1883 Francis Galton, a younger cousin of Darwin and noted mathematical biologist (biometry), coined the term "eugenics" upon reading the *Origin of Species*. The word served to describe the possibility of creating a perfect society, a "society in which human breeding would be taken as seriously as the breeding of domestic animals, a society in which the ideal of 'race improvement' would become the basis for a new ethics that would supplant Christianity." The eugenics movement

stimulated programs of research to establish its scientific basis; these were initiated by Karl Pearson and Ronald Fisher, both noted mathematical biologists. Fisher helped to establish a eugenics society at Cambridge University in 1911.

However, advances in anthropological research, the openness of Western education institutions to students from various social classes and races, and the emergence of a competitive global labor market, especially in the second part of the twentieth century, combined with advances in neuroscience, indicated that the premise of eugenics is unfounded. It is nurture rather than nature that accounts for most of the apparent "group" differentials in human achievement. Nietzsche's *Ubermensch* or "Superman" ("a new vast aristocracy based upon the most severe self-discipline, in which the will of philosophical men of power and artist-tyrants will be stamped upon for thousands of years" Russell, 1945, p. 764) is more universal and accessible to all *Homo sapiens*. In his acceptance speech for the prestigious Kyoto Prize, Mario R. Capecchi, the noted molecular biologist, reflecting on the struggles of his own life, tried to convey how genius springs from the most unlikely beginnings. Human society must find ways to recruit and nurture all its members regardless of social or economic background, since "unlikely beginnings can produce extraordinary lives." This is an essential perspective since, even as we enter the twenty-first century, there are some, especially in the policy field, who continue to adhere to the eugenics paradigm.

Nietzsche's *Ubermensch*, however, is not necessarily the ultimate goal of the evolutionary process, although, in some of his writings, Darwin seems to imply it: "all corporal and mental endowments will tend to progress towards perfection." But Darwin's view of "progress," like that of Malthus, was based on "the uncertain outcome of daily struggle, not the predetermined unfolding of a progressive tendency." There are other views of the evolution of life. For example, there are authorities such as Berlin, Popper, or Gould who doubt that progress defines the historical evolution of life processes. In their essentially atomistic view, history is not directional. It is rather a set of random processes, a "random walk" shaped by exogenous boundaries. Others believe in the directionality of history, a purposeful and predetermined chain of events that culminates in the whole of human society approaching a perfect organism, partly a result of underlying Hegelian processes. These are basic divergences. They reflect fundamental developments in the history of the philosophy of science. It was Aristotle who classified "causes" into four categories: material, formal, efficient, and the unmoved mover (or final cause, which played a pivotal role in his system). Aristotle believed in "the scientific importance of final causes, and this implies that purpose governs the course of development in the universe." That view has a "teleological" as opposed to an atomistic or mechanistic perspective, a perspective that evidently supports the thesis of the directionality of history mentioned above. But the term "teleological" has been applied indiscriminately to highly diverse phenomena ranging from the biological to inanimate phenomena, raising unproductive controversies in the development of a consistent philosophy of human development that persisted through the twentieth century. Bertrand Russell (1945) summarizes the controversy as follows:

> When we ask "why?" concerning an event, we may mean either of two things. We may mean: "What purpose did this event serve?" or we may mean: "What earlier circumstances caused this event?" The answer to the former question is

> a teleological explanation, or an explanation by final cause; the answer to the latter question is a mechanistic explanation. I do not see how it could have been known in advance which of these two questions science ought to ask, or whether it ought to ask both. But experience has shown that the mechanistic question leads to scientific knowledge, while the teleological question does not. The atomists asked the mechanistic question, and gave a mechanistic answer. Their successors, until the Renaissance, were more interested in the teleological question, and thus led science up a blind alley.

Recent analysis has indicated that the controversy is partly a result of inadequate scientific knowledge of biological processes, and partly a lack of clarity about the concept of teleology. The application of teleology to biological phenomena must be distinguished from its application to inanimate phenomena. Aristotle's teleological explanations relate more to biological phenomena. Similarly, Kant, although a strict mechanist with respect to inanimate nature, adopted a teleological explanation for living processes, a result of inadequate biological knowledge at the time, as Ernst Mayr indicated.

There is also a middle ground that views "human development" as the outcome of a process of maximizing survival probabilities subject to environmental and resource constraints. Survival probabilities lack certainty and predictive power, and do not necessarily reflect progress in human development. Scientific advances provide better understanding of the physical structure and thinking machinery of the brain, but not necessarily of the motivational forces of the mind that *run* its programs. However, there are signs of progress in understanding the brain–mind association. Evidently, the field of "nature–nurture" research has gone beyond biological determinism or the debate of biological potentiality versus biological determinism, towards genetic determination. But, given the enormous number of brain neurons and synapses that provide contacts between neurons, combined with the complexity of subjective and qualitative psychological phenomena, a scientific view of how the brain–mind works is difficult to attain, especially if approached through reductionism. There are limits to reduction; even in mathematics, the whole is always greater than the parts. Proceeding with "partial constructs" is more productive when dealing with complex systems. Many scientists accept parallelism in psychophysiological analysis as a workable assumption: the belief that there is one-to-one correlation (equivalence) between one's mental states and brain states. An assumption lacking empirical verification, at present, it (parallelism) is no more than an unjustifiable assumption of current science rather than a probable conclusion consciously based on empirical evidence. The gap between present scientific knowledge about the physical world (the brain) and the mental phenomena (the mind) is fundamental and dynamic since, as Gödel observed, "the mind, in its use, is not static, but constantly developing."

Others believe that advances in modern neuroscience could benefit from intertheoretic reductionism where the function of the brain and that of the mind could be better understood in the context of a "global" theoretical framework that encompasses the domains of both the brain and the mind. The two main problems facing those who seek the biological basis for the *conscious* mind, namely that the mind is observable only to its owner and, second, the conflict between observer and observed, are not unsolvable.

Biology in general and neuroscience in particular have been so remarkably successful at unraveling a great many of life's secrets, the current description of neurobiological phenomena is far from being complete. Consequently, it cannot be declared that the conscious-mind problem is insoluble because the brain has been comprehensively studied without finding the mind. Neither neurobiology nor its related physics have been fully studied. Some neurologists are confident that the gap between the mental states and the brain states will be bridged in the coming decades. The biological processes now presumed to correspond to mind processes *in fact are* mind processes and will be seen to be so when understood in sufficient detail.

Advances are forthcoming, however. Controlled experiments on the mammalian brain seem to be moving genetic engineering beyond plant and animal breeding towards genetic transmission of selective health and intelligence attributes in human development. These advances are certain to accelerate as findings from the Human Genome Project unfold. These findings are expected to open a new era of research opportunities in neuroscience with significant philosophical and policy consequences to human development. They open the door for an unending, built-in catalytic growth of interdisciplinary scientific knowledge. These findings also provide information waiting to be abused by unscrupulous insurers, employers, eugenicists, or social Darwinists.

There is also evidence from recent research on neural networks that the unprecedented power of present computers could be increased further through the development of bio-computers controlled by hybrid chips. These hybrid computers could approach the versatility of the human mind, while retaining the speed and discipline of electronic mechanism. Hybrid chips combine living nerve cells (e.g. neurons from leaches, lampreys, or spiny lobsters) with silicon circuits. Computing with neurons or DNA could be commercial reality in the first decade of the twenty-first century. The twenty-first century may witness advances in biotechnology that focus not only on disease control but also on learning processes and personality traits. The potential for scientific progress seems boundless. But the stability of the system and its long-term consequences for human welfare are uncertain. As Einstein, one of the great scientists of the twentieth century, reminds us, the rational calculus of techniques "may not be enough to solve the problems of our social life. The intellect has a sharp eye for the methods and tools but is blind to the ends and values." Over the course of history, there has been a conflict between science and ethics. Science treats people as material objects, and its rules are the physical processes that cause behavior through natural selection and neurophysiology. Ethics, on the other hand, treats people as equivalent, sentient, rational, free-willed agents, and its rules are the calculus that assigns moral value to behavior through the behavior's inherent nature or its consequences. History indicates that the dominance of the natural sciences over faith and imaginal thinking created human suffering as well as their own contradictions (the Marxist revolutions of the twentieth century).

If as a consequence of the emerging technophysio evolution, the sphere of science ends up encompassing conscious time binding and imaginal thinking, then faith and the arts, for example, have to adjust to scientific advances and discoveries. Such adjustment is illustrated by the apparently continuing tension between science and theism in the United States. In such a state of human affairs, "either scientists must be prepared to

fudge their data or all of us must be prepared to give up our values." However, "to give up" implies a thesis of discontinuity and radical heterogeneity of human culture. Such a thesis is not necessary to understand the historical course of symbolic cultural evolution, a course, as we emphasized earlier, that was never free from internal or external conflicts. Development itself, including advances in science, implies changes in established values (value endogeneity) in contrast to value heterogeneity (a socially tolerated variance around an established value system). Value endogeneity may not proceed without resistance, especially since scientific change has been proceeding rapidly, while change in values proceeds slowly, since the latter safeguard the established socio-political order and scheme of things in society.

The evolution towards a global scientific technical civilization would have been predicted *a priori* as an outgrowth of the very nature of symbolic cultural evolution. Symbolism provided the foundation for cumulative advances in the basic domains of cultural evolution, especially in the case of science and technology. It provided a universal medium for science and technology to advance, and to disseminate its accomplishments. Advances in the sciences, especially in communication and information technology, combined with changes in the international power structure, have accelerated the "globalization" process in the last part of the twentieth century.

The century started with doubt and skepticism, but ended with increasing certainty or belief in the power of science: in its ability to provide not only new and exciting opportunities for human development and enjoyment but also workable solutions that minimize negative externalities. But, in the absence of advances in the other domain of symbolic cultural evolution, certainty in the power of science is a lop-sided belief that is bound to destroy the internal equilibrating mechanism of cultural evolution whose internal multi-universe dynamics provides purpose and richness to human destiny. It is probably a major socio-political challenge for the twenty-first century, to develop a universal democratic system based on the principle of the rule of law (isonomy) that is able to evolve and be operational in the context of the emerging globalization environment with its economic and political power structure.



## 3. Human Progress and Prospects at the End of the Twentieth Century

Our review of the nature of symbolic cultural evolution, especially as it adapts to a technophysio evolution, illustrates that there have been, in the twentieth century, fundamental changes in its structural dynamics, with significant consequences for human development. Advances in science, especially in information, communication and biotechnology, and its emergence as the major force in symbolic cultural evolution, have influenced the main forces determining human development prospects in the twenty-first century. Main determinants include the evolution and diversity of cultures, demographic change and socio-economic development, education and learning innovations, the globalization of labor and financial markets, equity, gender, and sustainable environment. These seven sets of factors are examined briefly in the remainder of the paper, using the evolutionary perspective adopted in the present discussion.

### 3.1. Culture: Evolution and Diversity

In the present discussion, we make a distinction between "symbolic cultural evolution" and "culture." Symbolic cultural evolution is a dynamic process that continually attempts to maximize the survival probabilities of humankind using the fundamental domains of artisanship, conscious time binding, and imaginal thinking. Culture, in contrast, is a transient concept defined in space and time. It is the outcome of the complex and dynamic processes of the cultural evolution that, although uniform in general form, have produced different patterns of cultures depending on the constraints of artisan development and environmental endowment. The distinction between "culture" and the "symbolic cultural evolution" is essential, especially when attempts to infer moral conduct from observed cultural experiences are divorced from historical context. For example, for millennia, African societies developed a system of gender roles essential for survival: men specialized as game hunters for food and as warriors for defense; women, on the other hand, specialized as home keepers and as subsistence cultivators of small plots of land. The system evolved as optimal given the prevailing technology and resource endowments. However, when these societies were colonized, the colonial power needed labor to work in gold mines or in cash-crop cultivation (cocoa or cotton). The authorities prohibited hunting and introduced policies that made defense at the family and tribal levels obsolete. Men's time-honored vocations were dismantled, while women continued their traditional vocations with their roles becoming more visible and vital for family survival. It is tempting for post-colonial observers, unaware of the historical and anthropological background, to conclude that African men are exploiting women; the system represents unjust gender roles that are culturally set. Nothing could be further from the truth. What is being observed is a snapshot of a "culture in transition," of a society attempting to maximize its survival chances while adjusting to a changing set of exogenous shocks.

Analogous to Pinker's computational theory of the mind, symbolic cultural evolution provides humans with a powerful and flexible "software" program that, combined with their developed anatomical endowments that include sufficient redundancy (i.e. enough unutilized cells that can be engaged in additional activities), is able to provide varied solutions to complex survival challenges. There have been hunting/gathering, nomadic, agrarian, early and late industrial societies, with varied cultures. Cultures are not static. They are the outcome of the dynamics of symbolic cultural evolution and the unique and changing environment of each society, and as societies interact with each other. The plurality of "culture" is a natural outcome of human evolution. Plurality is embedded in the UNESCO definition of culture as "the whole complex of *distinctive* spiritual, material, intellectual, and emotional features that characterize a society."

Furthermore, like genetic diversity, plurality is an important factor for the vitality and sustainability of the global symbolic cultural evolution. As Arnold Toynbee indicated, civilizations in decline are consistently characterized by a tendency toward standardization and uniformity. Conversely, during the growth stage of civilization, the "tendency is toward differentiation and diversity." The vitality of the global symbolic cultural evolution and its potential contribution to human welfare may be enhanced when diverse cultures are allowed, not only to coexist, but also to interact freely and peacefully, discovering common values and heritage. The altruistic behavior that is

apparent in many cultures illustrates that cultures are not necessarily based on competitive behavior. They include co-operation as a basic element. However, not all altruistic behavior is derived from a system of ethics based on reasoning; most is based on instinctive behavior based on inclusive fitness. As Darwin emphasized, the social instincts never extend to all the individuals of the same species. The inclusive nature of co-operative behavior presents a challenge as to how an ethical system based on co-operation could evolve globally, especially in the present environment of global market competition. It is true that the shift from an instinctive altruism based on inclusive fitness to an ethics based on decision-making was perhaps the most important step in humanization. It is equally true that if we jointly prefer a co-operative approach to a competitive one, we have the ability to modify our society for the good of all. But can culture be engineered? Is such engineering desirable?

There is a revival of interest in the role of culture as a pillar and vehicle for human development. However, culture should not be viewed as a commodity, similar to other marketed commodities. The production and marketing of cultures go beyond the ancient Chinese debate in which Xunzi (298–230 B.C.) believed that goodness is not an innate faculty as Confucianism asserts. Humans had to be taught goodness, a theme followed by some social scientists more than two millennia later. Evidently, although Xunzi emphasized the social benefit of teaching (producing) goodness, he did not assign a market value for such learning. Attempts to engineer cultures have been costly. Witness the experience of the Chinese Cultural Revolution in the second half of the twentieth century. The commercial or authoritative view of culture seems to contradict the nature and origin of its dynamic evolution, while introducing difficult policy challenges in the arena of human development. It is one thing to understand the factors that promote freedom of thought and expression in the arts, faith, and the sciences and "invest" in the enhancement of that freedom. It is a different matter to use such knowledge to restrict imaginal thinking and enforce corporate "truth." Education and creative thinking should go hand in hand. However, the present globalization era, with its pervasive technical civilization, presents new challenges to the role of culture in human development. At present, according to social observers, the future of human development and its sustainability is being shaped by the conflicting trends of globalization and identity. The information technology revolution, and the restructuring of capitalism, have induced a new form of society: the network society. This new form of social organization, in its pervasive globality, is diffusing throughout the world, as industrial capitalism and its twin enemy, industrial statism, did in the twentieth century, shaking institutions, transforming cultures, creating wealth and inducing poverty, spurring greed, innovation, and hope, while simultaneously imposing hardship and instilling despair.

However, this is not necessarily a predestined road. We should not underestimate the power of "identity" in human evolution. But the idea of "networking" and "identity" has an origin in the analysis of class development and class struggle, a controversial subject in sociology. It has been argued that Marxist class theory failed because it did not anticipate the institutionalization of class conflict in industrial societies, which tended to reduce the incidence of conflict. Marxist class struggle lost its worst sting in the twentieth century. It has been converted into a legitimate tension between power factors, which balance each other. Capital and labor continue to struggle with each other. But they come to compromises, negotiate solutions, and thereby determine wage levels,

working hours, and other conditions of work. How will the culture of conflict resolution, developed in the industrial era, hold or evolve in the information and globalization age? This is a critical question for the twenty-first century.

### 3.2. Global Demographic Transition: Socio-Economic Consequences and Potential

Demographic change is an integral part of the adaptive mechanism of the cultural evolution that has been accelerating in its latter symbolic and technophysio phases. The historical evidence suggests that throughout the history of *Homo sapiens*, the long-run birth rate was kept as low as possible consistent with survival: as low, that is, as the death rate. Why? The answer seems to be that the hominids were exploiting a unique evolutionary niche by relying on culture, learning, and social organization as their mode of adaptation. The twentieth century witnessed basic demographic transitions that affected population growth, structure, and spatial distribution. The demographic transition is simply a shift of the birth and death schedules (reproduction and health behavior), from high levels at the early stage of the transition to lower levels at the later stage. However, the timing and speed of the decline of the two schedules are dissimilar, with fertility decline lagging behind that of mortality. The transition implies that demographic behavior and the environment are interactive. The speed and pattern of demographic behavior during the transition will vary depending on the specific socio-economic, cultural, political, technological, medical, and public health status, and the environmental and resource endowment characteristics that prevail in society. In turn, these characteristics will change as a result of demographic change.

#### 3.2.1. Demographic Change: Alarm About Depopulation and Stagnation?

In the industrialized countries of Europe and North America both mortality and fertility, although initially not uniform across social groups, were declining early in the twentieth century, with fertility falling below replacement levels in some societies. In some European societies, fertility started a secular decline as early as the beginning of the nineteenth century, for example in France. These apparent secular declines raised policy and academic concerns about potential depopulation coupled with population aging leading to labor shortage, undesirable immigration, insolvency of social security systems, and economic stagnation.

In the second half of the twentieth century, negative population growth became evident in some industrialized countries. For example, in the mid-1980s, levels of fertility in West Germany implied a negative intrinsic annual rate of growth of –1.7 percent. If this negative rate were to be maintained for 200 years, it would shrink a population to one-thirtieth of its original size. As the realization of such a prospect sinks in, countermeasures will be put to work. In many developed societies, measures to increase the birth rate were introduced. However, some reviews of the causes and dynamics of below replacement fertility, and of the performance of pronatalist policies in industrial countries, concluded that some of these strategies amount to destroying the family in order to save it. Such concerns are probably an echo of those of Rousseau, Montesquieu, and Hume about the effect of modernity and its civil institutions on the robustness of natural institutions, including that of the family. There is, however, recent evidence

indicating that marriage and childbearing are being viewed as social capital, the demand for which is not declining with modernity.

The concept of "social capital" had its origin as early as 1916. However, it was only recently that it was given its wider use in the sociological and economic literature. Put simply, social capital may be defined as a set of informal values shared by members of a group that permits mutual co-operation and organizational efficiency with minimum transaction cost. Although apparently simple, the definition cuts across many disciplines. For example, a group could vary from a family, a social group, a country, to the global society, while co-operation may entail the enforcement of social contracts or rules for economic exchange. There are recent extensive surveys and critical reviews of the concept of social capital and its use in sociological and economic analysis. Some economists are concerned that the concept of social capital encompasses too much to be defined adequately for economic measurement and analysis. Some examined in depth the concept of "trust," an important component of social capital, and concluded that although important for market performance, it is difficult to interpret its evolution and stability in the context of economic thought and analysis; they questioned the economic investigation of trust: given that for the economist comparative advantage does not lie in discerning duty and morality—in seeing right or wrong—are there subjects that should be closed to us, subjects that simply do not allow an economic and game-theoretic analysis, are poisoned by it, and poison us in turn?

### 3.2.2. Demographic Change: A Window of Development Opportunities?

In contrast, in less-developed countries, where most of the world population resides, the pattern of demographic transition was different. Both fertility and mortality remained at high levels through the mid-twentieth century. Mortality started a relatively fast decline in the late 1950s, but fertility did not. As a result, population growth accelerated at high rates in the developing countries, raising concerns about imbalances between human needs and resource endowments. Many developing countries adopted stringent population policies to contain population growth, some with spectacular success, for example China and other countries in East Asia. By the mid-1980s, fertility started a sustained decline that accelerated in the 1990s, in almost all the developing countries. The nature of fertility decline varied across countries and social groups, and was affected by patterns of institutions and social organizations with different social implications. In some societies, the decline was led by delayed marriage. In others it was led by contraception techniques. These demographic patterns are shaping age structures across the developing countries well into the twenty-first century.

There are potential economic benefits for countries passing through the phase of delayed fertility decline. It presents a "one-time demographic gift": as the burden of dependency declines, potential saving increases and general health status improves, based on the biology of increased infant and maternal survival as a result of better birth spacing and reduced teen marriage. If these demographic benefits were to be combined with sound internal reform, the countries in question might enjoy a more educated labor force and the creation of productive employment to absorb the growing labor: a "quantity–quality" transition. The "quantity–quality" transition implies, over the longer term, a slower growth of the labor force with higher levels of human capital per worker.

It also implies a growing demand for skills. For these potential benefits to materialize, internal reform should include economic policies that pay closer attention to the efficiency and effectiveness of public organization and to the role of information in decision-making, and should direct savings to productive investments. Internal reform should also include socio-political policies that introduce transparency in governance, improve educational quality and relevance, and equalize opportunities.

There are other longer-term consequences of the demographic transition. The initial increase in the size of working age cohorts will translate, within a generation, into an increase in the elderly population, an increase that requires a larger transfer from a relatively declining pool of working cohorts. In the twenty-first century, population aging will be a worldwide phenomenon not confined to the developed countries. A failure by the developing countries to implement sound policies during this vital phase of the transition could have negative effects: since the population of working age will grow at high rates for at least a generation, lack of quality education will translate into non-competitiveness and inter-cohort conflict. Rapid fertility decline, combined with accelerated mobility and migration and the integration of societies into the global market of production, finance, and ideas, has significant consequences for family and community structure and behavior. Furthermore, advances in contraception technology have separated reproduction from sexual behavior with repercussions on family formation and stability, and the stability of social norms. The stability of established social contracts and intergeneration transfers is questioned, and, accordingly, the efficacy of national social policies. Meanwhile, the internal sovereignty of the state to implement social policies that reduce potential socio-political tensions is being diminished in the emerging globalization environment.

Most developing countries are not capturing the full potential of the demographic window of opportunity. Although some countries, especially in East and Southeast Asia, were able to take advantage of the demographic window of opportunity, many others have not done so. One reason is the lack of adequate internal reform, especially in education and in market and democratic institutions. The second reason is the volatility of the international finance capital markets in the emerging global environment, in which international regulatory institutions are in the process of experimental reform.

### 3.2.3. Migration and Human Development

Population movement is an integral part of symbolic cultural evolution processes. It is an outcome and cause of these processes. This section reviews briefly the various patterns of population movements. There may be exogenous changes in the environment, such as droughts, or humans may alter their environment as a consequence of negative externalities of their economic and social behavior. As a result, the carrying capacity changes relative to reproduction and some may leave their localities, sometimes on a mass scale, seeking better fortune. Conflict often arises as a result of human movements and settlements in new localities or countries, with adverse effects on both the environment and human development and welfare. Conflict generates additional movements. As mentioned earlier, the historical cultural evolution was not smooth. There were internal and external conflicts because of lack of harmony among its basic components. Major population movements occurred in the twentieth century as a result

of these age-old disharmonies, or of attempts by society or social groups to homogenize their own cultures or escape political or religious persecutions. There are also purposeful and positive population movements.

Part of the internal dynamics of symbolic cultural evolution is the emergence of the human drive for discovery and change. Humans seek new knowledge, attempt to extend their reach and improve their socio-economic status and welfare, with mobility and movement as a main mechanism. In this respect, voluntary human migration is viewed as investment in human capital and as a mechanism that provides for increased macro efficiency and welfare. The speed and extent of voluntary migration accelerated as a result of technological advances and the growth of industry and trade relative to agriculture. Rural–urban migration within countries accelerated, as did international migration, a result of the unequal pace of industrialization and development in different countries. At the close of the twentieth century, as the new globalization era evolved, there seems to be a tendency to reduce the aggregate scale of international population movements while changing its pattern towards skill selectivity, a return to the "brain drain." For example, in the United States, the potential for immigration of skilled workers was high, since ambitious, skilled young people from all over the world are frustrated by backward and inflexible economic and social systems. Immigrants are attracted by a dynamic economy and the possibility of upward mobility.

This tendency for skill migration is also partly a consequence of the enhanced and more secure movement of finance capital and trade, and partly a result of accelerated population aging, especially in the developed countries of Europe and North America. The full implications of these dynamics are yet to unfold, however.

### 3.3. Education, Learning Innovations, and Motivation

Symbolic cultural evolution depends on education and the accumulation and preservation of knowledge, rather than on genetic transmission, for its continuity. As Kenneth Boulding succinctly observed, it is knowledge that is evolving; humans are only agents in the evolutionary process. High levels of human capital are required to assure scientific progress and growth, maintain established knowledge across generations, and promote demand for the outputs of the technological establishment by generating skilled consumers able to purchase sophisticated products and services. The evolutionary perspective views the accumulation of human capital as necessary for the continuity of the scientific revolution. Education and human capital accumulation are also necessary for empowering the less-developed countries to catch up in the development process. However, as mentioned above, these are not sufficient conditions, especially in the context of the emerging global market. Two dimensions of human capital formation require attention. The first is the quantitative dimension of the quantity and quality of education. The second is more qualitative and psychological. It refers to the motivational aspects of human development.

#### 3.3.1. Education Quantity and Quality

The twentieth century has witnessed increased awareness of the socio-economic importance of education. A skilled labor force is viewed as necessary for integrating the

economies of the developing countries into an increasingly competitive global market. There have been purposeful attempts towards increased investment in education and training, and the development of quality assessment measures, in the developed and developing countries. School enrollments have increased in all the developing countries. However, there is a wide variance in enrollments and number of years of education. Although early studies indicated sizable returns to the quality of the education process, the emphasis on education planning and assessment of performance has been based on input measures: enrollment, years of education, teachers' qualification, curriculum, or educational technology, and not on performance. Recently, there has been a systematic effort to measure quality of education in terms of outcome, with UNESCO providing technical support to conduct such studies in various countries. The recent case of Kuwait is illustrative. The Kuwait Society for the Advancement of Arab Children (KSAAC), with technical support from UNESCO, conducted a major study to measure the performance of children in basic education. A special characteristic of the study is its attempt to go beyond the standard focus on science and mathematics, to include the social sciences, language, and culture in its coverage, an important focus on the wider role of education in human development. The methodology was comparable and consistent with international standards. The findings of the study indicated that although expenditure per student in basic education is one of the highest in the world, its returns in quality are lagging. This finding, among others, supports the general conclusion that there is significant variance in the quality of education within and across countries, especially in mathematics and the sciences, and in logical reasoning. Furthermore, other studies indicate that access to educational opportunities is unevenly distributed within and across countries by gender and by social groups. Attempts to reduce the gender gap in education seem not to give adequate attention to quality or content, or adopt an approach that integrates education and development.

On the other hand, advances in science and technology have lengthened the gestation period of basic and higher education, and on-the-job training. These changes have, in the context of a human capital framework, increased the opportunity cost to parents of providing quality education to their children, the opportunity cost of higher education to students, and the public cost of education and vocational training. Furthermore, lack of adequate knowledge about costs and returns to education leads to inefficient micro and macro allocative decisions, especially in less developed settings. In some areas, where fertility started a secular decline and the supply of labor has been growing, exerting downward pressure on returns to investment in human capital, the expected quantity–quality trade off has been faltering. The combination of increased cost, lower returns, and inadequate information raises a policy dilemma since the social benefit of education is increasing during the present phase of symbolic cultural evolution. On the supply side of human resources, public investment in quality basic education that focuses on mathematics and the sciences, and on innovative learning technologies, is necessary for economic growth, especially in the context of the demographic transition discussed above. On the demand side, public investments that increase the efficiency and effectiveness of labor markets, reduce social imperfections, and enhance the institutional framework to attract national and international investment are equally necessary. Since these investments enhance the demand for labor and accordingly increase the returns to education, they are necessary to increase parental commitment to quality versus quantity in childbearing and child-rearing behavior.

### 3.3.2. Learning Innovations

The scientific and technology establishment is becoming increasingly complex, expensive, and globally competitive. Scientific development is mainly a result of investment in human and physical capital with education, training, and research and development (R&D) playing a pivotal role. Education is being increasingly viewed as input for technological and scientific progress. Innovations in learning are developed to enhance the efficiency and effectiveness of education and training systems in order to contribute to economic growth. Progress in learning technologies through advances in computer and information sciences and interactive software provided worldwide opportunities for learning and certification through the Internet. These learning innovations have enhanced the effectiveness of education and training around the world. However, access and utilization of learning innovations are highly uneven, and limited by the high cost of the necessary implements and required background. Students in poor countries or from poor families are at a disadvantage. For example, according to the United Nations Development Report 1999, the cost of transport and communication has declined dramatically since the 1960s. The cost of telephone calls fell from US$46 for three minutes in 1960 to US$3 in 1990 (in 1990 dollars), and the price index of computers fell from 12,500 in 1960 to 100 in 1990 (1990 = 100). However, the gap between the rich and poor in acquisition of new technologies and in their use has been growing. In 1996, for example, there were 204 personal computers per 1,000 people in countries ranked "high" on the human development index (mainly high-income countries), 7 per 1,000 in medium rank countries, and close to zero in the low rank. The case of Internet hosts indicates the same skewed pattern in 1998. There were, however, positive experiences in the last part of the twentieth century. Some countries in East and Southeast Asia—for example Singapore, Korea, China, Malaysia, and Thailand—achieved high rates of economic growth by investing in quality basic education, and by taking advantage of advanced learning technologies and of the demographic window of opportunity. Their investment in quality basic education was supported by a strong higher education system and effective R&D, and accordingly attracted domestic and international demand for their skilled human resources.

There are concerns about the effect of learning innovations other than their potential negative effect on equal opportunities. Some educators view the learning innovation process as an efficient and mechanistic process that is leading learning institutions towards structured curricula and narrower vocational focus, and increased privatization and commercialization of the education establishment, but not necessarily better quality or relevance to the wider concept of education. This process of learning innovation has been labeled the age of digital diploma mills. The wider role of education, as a promoter of imaginal thinking and cultural development, is being subjected to the calculus of market returns, although its social value may not be revealed in the marketplace. That wider role of education is essential for the attainment of the fuller dimension of human development as well as the very survival of symbolic cultural evolution. The challenge for human development policies in the twenty-first century is how to combine education and creative thinking in an environment driven by symbolic cultural evolution in its technophysio phase.

### 3.3.3. Motivation and Morals

Attempts to link motivation to human development have been part of the development literature for decades. Achievement motivation, the propensity to strive for success in situations involving an evaluation of one's performance in relation to some standard of excellence, vision of opportunities, discipline, work ethic, commitment, and self-esteem are essential qualities of human development that define a motivated and progressive society, qualities that have been recently labeled spiritual assets. These, however, are qualities that are not transmitted via school curricula alone. They require time-intensive investment by parents, schools, and community, as well as the larger systems of government and governance to assure their continuity across generations. The process of moral development raises some of the most hotly debated questions in philosophy and the social sciences. Is there a set of universal values that guide moral development everywhere? Are there levels or stages of moral judgment, for example from self-interest, to social approval, to abstract ideals? The questions are complex and have no clear answers. A review of psychological studies of children's moral development indicates that "moral identity—the key source of moral commitment throughout life—is fostered by multiple social influences that guide a child in the same general direction. Children must hear the message enough for it to stick. The challenge for pluralistic societies will be to find enough common ground to communicate the shared standards that the young need."

These conclusions support the view that transparency and accountability in governance and isonomy in the rule of law are prerequisites for the spread of moral conduct. (The ideal of "isonomy" refers to the certainty of being governed legally in accordance with known rules, as described by Hayek in 1955.) It is an essential foundation for democratic practice and raises challenging questions for sustainable human development, especially in the context of the emerging globalization environment. Some of these issues are examined briefly in Section 3.4.) For example, the Secretary of the Singapore Development of Planning made the point in his address to the Oman 2020-Development Vision Conference (May 1995) that equal opportunity is a basic ideal of Singapore development. Promotion of students or employees or the conduct of any other state affair is based on merit and merit alone. There are heavy civil penalties for lack of compliance with that system. What is more important is the high social penalty. Social penalties, however, are part of the moral code and can only develop when "the message is heard enough and implemented fairly with consistency." Although parents are the original source of moral guidance for most children, the education system should be able to supplement the inputs of parents and communities by providing, in the formative years of education, the basis for imaginal and independent thinking in its educational approach, in and outside the classroom. Transparency in governance, isonomy in the rule of law, and other democratic practices and institutions provide the necessary support and enforcement beyond the formative years.

### 3.4. Globalization and Human Development

(The influence of writers such as Hayek, Schumpeter, and Russell on the discussion in this section should be evident.)

Symbolism implies universality in scientific communication. It has been the nucleus of the present globalization process, a process based on the global spread of technology, finance capital, and a global labor market, rather than on military conquest. These processes are evidently leading human society towards a new global moral system, a global technical civilization, one in which efficiency is supreme. Adam Smith's "division and specialization of labor" and Marx's "workers of the world unite" are both operative, in the "new global environment," with unexpected consequences. The globalization processes are varied, complex, and evolving. They are affecting not only production and exchange relations but also established human values, roles, and relations. In this section we focus briefly on two issues: government and the rule of law in a global environment, and the equilibrating mechanism of a global market.

The "new global environment" differs significantly from that of the past. The past environment, excluding military conquest and occupation, was one of "inter-dependence" among states, regulated by international institutions such as the International Monetary Fund (IMF) or the General Agreement on Tariffs and Trade (GATT) that attempt to set rules for orderly co-operation as inter-dependence increases among sovereign states. Government sovereignty, especially internal, was not challenged by these regulations, taken mainly as safeguards, although by putting limits on levels of tariffs or by exchange rate manipulation, governments' external sovereignty was compromised. The effect of the "new globalization environment" on state sovereignty is subtler. It influences both the external and internal sovereignty of the state, while reducing the interest of national elites in local affairs. In the global environment, global corporate networks challenge a state's internal sovereignty by altering the relationship between the private and public sectors. By inducing corporations to fuse national markets, globalization creates an economic geography that subsumes multiple-geography. A government no longer has a monopoly of legitimate power over the territory within which corporations operate, as the rising incidence of regulation and arbitrage attests. This process does not imply that private sector actors are deliberately undermining internal sovereignty. Rather they follow a different organizational logic from that of states, whose legitimacy derives from their ability to maintain boundaries. Markets, however, do not depend on the presence of boundaries. While globalization integrates markets, it fragments politics.

The implications of these dynamics for human development are better understood by examining two questions. The first is related to insecurities introduced in labor markets as a consequence of the internal dynamics of the present globalization environment. The second is the influence of globalization on democratic practice and the rule of law.

As discussed earlier, the present globalization processes are not new. They are the inevitable consequence of the *modus operandi* of symbolic cultural evolution, which elevated the role of artisanship relative to that of conscious time binding and imaginal thinking. However, it is not intuitively evident whether the present phase of the globalization process is structurally different from past phases or differences are merely qualitative. Three major factors characterize the present globalization environment: innovation in communication and information technology, the dominant role of finance capital, and the emergence of global regulatory institutions. However, these characteristics have been present in various forms for many centuries. For example,

there were major technological breakthroughs in the late nineteenth century and in the 1920s that had significant socio-economic impact. There were also regulatory institutions, some acting through colonial powers that had extensive global reach combined with strict enforcement power. The significant role of global finance capital is not new. History indicates that following each major innovation, finance capital follows good economic principles but eventually it gives way to speculative ventures, economic facts give way to psychological fantasy, and share prices become independent of performance, leading to eventual stock market collapse and prolonged economic recessions. The result has been the recurrence of large economic and social losses.

The present globalization phase seems to have more than qualitative differences from the previous phases. The *modus operandi* of the present globalization environment is being fueled by the significant and accelerated pace of innovations in information and communication technology. These innovations facilitated the global spread of finance capital, while international regulatory institutions are being redesigned to provide the necessary security for capital movement. However, as in the past, the psychological element of finance capital takes over, creating greater worldwide volatility, in part because of the efficiency of the information technology itself. Workers' security and human development could suffer greatly as a result of investors' psychology and not necessarily because of weakness in economic facts. Indeed, economic reality takes hold in the final analysis since irrational increases in equity prices cannot be sustained for long without the support of real earnings. Similarly, irrational capital flight should eventually reverse its course once the economic facts override psychological and political forces. However, the loss to human development could be sizable and *selective* in the interim (and the interim could be of long duration), while, as discussed earlier, the social role of governments is being compromised in the global environment.

There is also historical evidence that periods of massive industrial consolidation and dramatic technological innovation have been followed by periods of political, social, and institutional reform. One eventually creates the need for the other, as the economic changes produce social conditions that come into conflict with democratic ideals. What does the globalization environment offer as a supplement or substitute, when the synergistic relations between "democracy," the "rule of law," and the "role of government and governance" erode as a consequence of the rules set by its *modus operandi*? Historically, the struggle for freedom has been a struggle between the power of government with arbitrary authority and the rule of law; according to Hume, it is the evolution from a "government of will to a government of law." A "government of law," "equality before the law," or "rule of law" are all terms that refer to the ancient Greek concept of "isonomy" which identifies a society of human freedom as opposed to an arbitrary government of tyrants. In ancient Athens, where isonomy was first established, Athenians were given not so much control of public policy, as the certainty of being governed legally in accordance with known rules.

At that time, the ideal of isonomy was used and practiced as a justification for the ideal of democracy, people's control over public policy. It was feared that democracy without the rule of law would eventually erode the ideal of isonomy from its true substance, and in turn, democracy. Democracy was viewed as the child of isonomy, not the other way round. In this view, the law should be obeyed so people could be *free* from arbitrary

rules set for some and not for others. However, although the rule of law provided for individual freedom and for creating and maintaining "trust" in the laws, it erected boundaries and set limits on the freedom of both government and subjects. As early as 1690, Locke defended this ideal in order to limit the power and moderate the dominion of every part and member of society. However, although the ideal of isonomy gave ample power to governments to deal with a wide range of actions to enhance human development, from safeguarding values and promoting equality to enhancing individual freedom, it has been on the decline for centuries in all countries of the world, including England. This has been the case although it has been established that the absence of isonomy erodes trust between governments and the governed, and accordingly reduces true democratic participation and practice, probably as a result of the power of interest groups. These processes lead to the decline of social capital at the various levels of society and lead to the erosion of institutions of conflict resolution that evolved during the Industrial Revolution to reduce class conflict within and outside industry, as discussed earlier.

The concern about the impact of globalization on government authority, discussed above, is well founded but these consequences should be evaluated as to their effect on governments of states as well as on the evolving global government. For the former, the impact on sustainable human development could be negative not only in authoritarian governments but equally in democratic ones, especially those lacking in the ideal of isonomy. For the latter, the adoption of the ideal of isonomy and the development of a global political citizenship seems to be of great urgency. As early as 1930, in his evaluation of the *Report of a Committee on Ministers' Powers*, Ivor Jennings argued that "this rule of law is either common to all nations or does not exist." Jennings' statement seems to be equally valid in today's globalization environment, although it requires additional qualification: global rules should be set in the context of democratic processes. In the absence of such processes, global rules may not be sustainable. Rules designed to benefit the few without compensating the losers will be resisted. The recent experience of the World Trade Organization (WTO) and the IMF is illustrative. The demonstrations that took place during their meetings in Seattle (November 1999) to protest against their mandates indicate weaknesses in the present international regulatory system. The focus on individual or state-level governments' behavior rather than on the behavior of the emerging global government has probably left a gap in analyses of human development. There are optimists who believe that the processes of globalization will eventually lead to a spontaneous rise of co-operative norms that enhance and reinforce the accumulation of social capital, without the support of an authoritarian hierarchy. Such optimistic views have not been substantiated as yet by theory or experience. There are many structural factors that tend to inhibit the realization of such hopes. These include size, boundaries, repeated interaction, established cultures, and lack of isonomy, justice, and transparency in national and global governance; all these make the spontaneous emergence of systems of co-operative norms unlikely without the helping hand of "rational hierarchical authority, in the form of government and formal law."

The internal logic of the "new globalization environment" includes a self-regulating mechanism that affects human development in various ways. Competition from foreign labor reduces labor power and acts as a check on wage hikes in the advanced economies,

while built-in high rates of labor growth keep wages in line in the developing part of the global economy. If relative wages increase or productivity falters, given the present phase of the demographic transition, financial and investment flight provide for market discipline. This will guarantee the control of inflation through unemployment and unemployed capacity, while government capacity to provide social safety nets or enforce trade union rights is being constrained. A main policy theme that has emerged in the globalization environment, supported by conceptual modeling and empirical findings, and adopted by the international regulatory agencies, is that the reduction of trade and finance barriers leads to higher growth and welfare levels. The robustness of the supporting evidence has been questioned recently. The relations between openness, growth, and welfare are far from simple. Even if trade policies that restrict international trade were to reduce economic growth "it does not follow that they would necessarily reduce the level of welfare."

The globalization process, on the one hand, seems to present broader opportunities for economic growth to many countries, while seeming to deepen inequalities between social groups and within and between states, on the other hand. The high mobility of international finance capital and its volatility, combined with the accelerated speed of technological development, introduced uncertainties and insecurities into labor markets and to the processes of human development in general. In an evolutionary perspective, the present globalization process may be presented schematically as follows:

> Symbolic cultural evolution (SCE) → increased advances in science and technology → increased complexity and longer and more costly learning requirements → increased inequalities in acquired capabilities → more government and less isonomy → global inter-dependence in trade, finance capital, and information flows → development of global rules to govern trade and finance (e.g. WTO) → more collaboration in global production processes and R&D → higher rates of economic growth accompanied with increased income and wealth inequalities → increased economic shocks as a result of speculative finance capital flight → emergence of unemployment, poverty, inequality, and political unrest → more international rules and regulation without global government adhering to the ideal of isonomy → strict enforcement of market efficiency rules as designed, for example, by WTO, IMF, or by the disciplinary rules of international finance capital, and less by social objectives → more political and social unrest → new domestic and international revisionist arrangements.

The emerging globalization environment may not lead to the vicious circle implied above. It may, with enhanced democratic participation, and the evolution of effective global governance and regulatory agencies that are more sensitive to human and environmental needs, lead to higher and equitable global welfare. However, that path is neither necessarily a natural outcome of the emerging technophysio evolution nor a policy option without cost to the major economic and political powers in the present global environment. This is evidently the case since, as Binmore (1998) has pointed out, it is only in "a *well-ordered* society, [that] each citizen honors the social contract because it is in his own self-interest to do so, *provided* that enough of his fellow citizens

do the same." These conditions are not as yet satisfied in the present globalization environment, an environment lacking in both self-order and isonomy. The struggle for a decent, democratic, and humane society has little to do with scientific developments or the increase in the volume of international trade. It exists, according to some observers, in an entirely separate realm—the realm of democratic citizenship—that is now being undermined by trade. For pessimists, that realm is influenced by market behavior, a market that is the final step in a process that first leaches out the moral content of a culture and then erodes the autonomy of its citizens by shaping their personal preferences, while the evolving market cannot be corrupted because its institutions have been corrupted already. Whether the constituents in the emerging global society develop a collective long-term horizon based on "initial positions" of moral justice will depend to a large extent on the course of symbolic cultural evolution, whether its present technophysio *modus operandi* is balanced by conscious time binding and imaginal thinking.

### 3.5. The Income and Capability Gap: Unequal Opportunities and Poverty

It is not evident *a priori* whether the scientific revolution of the twentieth century combined with the *modus operandi* of symbolic cultural evolution is leading to more equality in opportunities and in returns to investment in human capital, regardless of color, gender, or location. Indicators at the close of the century, referred to earlier, are not optimistic. Such pessimism is enforced by uncertainties introduced by the emerging global environment. But, as mentioned earlier, the potential for narrowing the gap is evidently great. Human development in the age of symbolic cultural evolution is based on advances in the sciences and technology that continuously extend humans' outreach beyond their limited anatomical capabilities. Extension of human capabilities, as mentioned above, is a function of innovative learning techniques, advances in computer and information sciences, and in neuroscience. Present knowledge in neuroscience indicates that the anatomical structure of the brain is identical, in general form, in all members of *Homo sapiens*. They all have, given the normal distribution of populations by natural abilities, the same anatomical potential for learning. Even before the present advances in neuroscience, many educators of the nineteenth century were convinced that it is nurture, rather than nature, that is responsible for human development. It is differentials in health conditions, and in educational quality and opportunities, that account for most of the differentials in achievements. In his advice to his son, who had been showing signs of genius at a very young age and was heading for his first independent trip to Europe at the age of fourteen, James Mill told him:

> John: until this moment, mindful of the fact that over-estimation of one's own merits is a grievous defect, I have carefully concealed from you the extent to which your intellectual attainments surpass those of most boys of your age. Some may even be so thoughtless as to pay you compliments, and suggest to your mind the erroneous belief that you possess exceptional abilities. In fact, whatever you know more than others cannot be ascribed on any merit in you, but to the very unusual advantage, which has fallen to your lot, of having a father able to teach you, and willing to give the necessary trouble and time. That you know more than less fortunate boys is no matter of praise; it would be a disgrace if you did not.

(Quoted in Russell, 1934, p. 96)

James Mill's model of educating his son, John Stuart Mill, was influenced by the educational philosophy of Helvetius (1715–1771); he believed in the power of knowledge and education, and especially the impact of governance and customs: "The principal instructors of adolescence are the form of government and the consequent manners and customs. Men are born ignorant, not stupid; they are made stupid by education." James Mill's statement to his son, quoted above, indicates the potential for both equality and inequality in human development. The statement implies that, on average, the potential for learning is the same throughout *Homo sapiens*; controlling for the random dispersion of *native/natural* talents, John was most probably an exceptional child by nature, located on the extreme part of the *natural* ability curve.

Mill's statement also implies that learning depends on the quantity and quality of inputs including health and nutrition. If these are not distributed equally, then equality of socio-economic opportunities in the marketplace will not be highly correlated with earnings since the ability curves will diverge from their random nature. Health and nutritional status have improved across all developed and developing countries, but with significant differentials within and between countries in both access to and quality of services. There is evidence that health status and health utilization vary by education and socio-economic factors, while health utilization depends on health and nutritional status and socio-economic factors. Inequality in education and health status is both a cause and an effect of poverty and economic inequality. Furthermore, because of the role of parents as providers of critical learning, health, and nutritional inputs to their children, poverty and low levels of abilities are transmitted across generations. The nurture doctrine of Helvetius and James Mill becomes clearly operative.

On the macro level, there have been several attempts to link income inequality to economic growth. The best known is that of Kuznets and Myrdal, known as the Kuznets hypothesis. In this hypothesis the processes of industrialization and urbanization lead to a worsening of income distribution in developing countries because in the early stages growth is concentrated in the modern sectors. It is only at relatively high levels of income that technological progress affects the bulk of the economy and that redistribution through income transfers becomes significant.

The validity of the hypothesis has been questioned. Recent empirical studies and a survey of the theoretical evidence on the relation between inequality and economic growth find no systematic relation between inequality and the stage of economic development. An interesting observation that emerges from the survey is the importance of organizational change: "inequality heavily depends on the type of flexibility chosen by firms in the management of human resources." Firms in Germany and Japan, for example, choose to promote workers from the lower end of the occupational or skill structure to higher levels, whereas firms in the United States and United Kingdom tend to rely on external flexibility by hiring from outside and firing their unskilled workers. Wage inequality did not increase in the two former countries, whereas it increased sharply in the US and UK. The emerging globalization process seems to follow the external flexibility strategy and tends to produce results with similar patterns to those expected from the Kuznets and Myrdal hypothesis, although its dynamics and allocative

mechanism are different from those implied in the latter framework. Initially, global finance capital is attracted to the skilled and efficient segment of the labor force in developing countries, while the unskilled are left with low paid jobs and higher levels of unemployment. It is only when skills are dispersed more widely that inequality declines. That decline, as mentioned earlier, is conditional on successful internal reform, patterns of organization, and better understanding of the behavior of external economic and political forces. On the other hand, given a constant demand, a wider dispersion of skills will increase the supply of skills relative to that demand. Equality may improve at the cost of a decline in wages of the skilled and in returns to investment in higher education. These are complex dynamics, however. They require careful modeling and empirical verification.

More recently, convergence was introduced to growth models: the lower the initial levels of development indicators, other things being equal, the higher the speed of catching-up. The hypothesis provides hope for less-developed countries and poor communities in general. However, it does not illustrate how the catching-up process functions in the context of the globalization process, a context that, although promoting economic growth, does not necessarily provide for equality or poverty alleviation even in the advanced economies. For example, in the United States, poverty seems to persist in the face of a decade of unprecedented economic growth combined with innovative social policies. Furthermore, globalization "helps push down US wages [while] trade accounts for roughly one-quarter of the rise in US income inequality since 1970s, studies show." In the newly industrialized economies of East and Southeast Asia, the economic and financial crises that occurred in the late 1990s, partly as a result of volatility in finance capital and partly through inadequate diagnosis, had severe socio-economic and political repercussions with high costs to human development. The crises set back these economies, although their basic "internal" structural parameters, responsible for their previous spectacular success, did not change. There are many uncertainties and much volatility in the emerging global labor markets, which present challenges to the conventional wisdom of the determinants of poverty and socio-economic inequalities. These factors have an impact on human resource development and require innovative thought and policy analysis. However, the East and Southeast Asian crises seem to suggest that economies with robust human development systems, that is, competitive education quality, flexible labor markets, and isonomy in the rule of law, can withstand market shocks better, although the interim losses can be severe.

In a recent contribution with a wider perspective, Landes (1999) attempted to explain why some nations are so rich while others are so poor. The perspective is partly based on Ibn Khaldun's theory of the role of geography and organizations in the rise and fall of civilizations, partly on a social Darwinist framework in which the adaptive capacity of social organizations is pivotal, and partly on a neoclassical framework of market behavior. In this multidimensional framework, the evolution of human development seems unidirectional, with Western civilization, and in particular that of Western Europe, epitomized as the ideal. Joining the Western wagon, so to speak, is not open to all societies, a result of misfortune of geography or having a stagnant culture or religion. However, the role of the present phase of globalization in facilitating inter-society learning and the role of science in rehabilitating unfavorable geography are not adequately incorporated in this framework.

### 3.6. Gender

The previous discussion leads to the important issue of gender bias in human development, unequal opportunities, and role and status differentiation. There have been significant advances in the understanding of gender differentiation by opportunities, status, and life rewards, especially in the second half of the twentieth century. There have also been significant policy, technological, and behavioral changes that have not only the effect of bridging the "gender gap" but also the potential to change the patterns of long-established familial and social relations and organizations. Probably, changes in gender roles and status will be one of the most significant forces shaping human development in the twenty-first century.

It was the anthropologist Margaret Mead who first made the distinction between gender and sex. Sex is the biological category, whereas gender is the culturally shaped expression of sexual difference: the masculine way in which men should behave, and the feminine way in which women should behave. It is the "central aim of much feminist thought to uncover concealed asymmetries of power in differences of gender, and to work for a society in which the polarization of gender is abolished."

In the contemporary feminist ethical debate there are some who argue that biologically based gender differences exist in reasoning; women tend to value community, caring, and bonding more than men do. It is not evident that these apparent differences reflect innate faculties rather than the way in which men and women have been conditioned to emphasize different aspirations and ideals. There is some evidence that differences in behavior are outcomes of the combined effects of nature and nurture, although the former is based on a "social Darwinism" paradigm. The issue of gender roles is both complex and socially fundamental. It requires a perspective that integrates developmental, genetic, evolutionary, and cultural approaches. The result, according to Waal (1997), could be the "power of breaking down of old barriers between disciplines. Most likely what will happen in the next millennium is that evolutionary approaches to human behavior will become more and more sophisticated by explicitly taking cultural flexibility into account." Culture may cease to be viewed as the antithesis of nature.

Meanwhile, from a policy perspective, the argument for nature is not fully supported by scientific evidence, while that for nurture is subject to a reform in educational and social policies, thus focusing attention on the role of social organizations and market behavior as determinants of the gender gap. The power of the nurture paradigm is demonstrated by the significant change in women's roles and status in society, achieved in the second half of the twentieth century. Recent assessments indicate that women as a whole are gaining more control over their lives. They are able to control reproductive behavior as a result of more effective and accessible contraception technology. Furthermore, female labor-force participation has increased, in more occupations, and with higher earnings. Also, there are more women entering higher education than men in many developed and developing countries; women are becoming more active in politics, and more of them vote. These trends are fundamental. They are bound to affect the future structure of employment and labor markets, and the pattern of government and public dialogue around the world. Although these trends seem universal, there are significant variations; generalization is necessarily suspect.

There are significant differentials in the extent of the gender gap, and the rate at which it is being closed, within and across societies. A recent extensive review of gender and jobs documented the prevalence of high levels of occupational segregation by sex in today's world. In that review by Richard Anker, occupational segregation by gender was shown to be extensive in every region, at all economic development levels, in all political systems, and diverse religious, social, and cultural environments. In short, occupational segregation by sex is an important worldwide phenomenon. Furthermore, not all women have full control of reproductive behavior. Contraceptive use is not universal, especially in eastern and western Africa. In the 1990s, total fertility rates (TFR) in these two regions continued to exceed six children per woman while less than 13–17 percent of the women have access to modern contraception compared to over 40 percent in the rest of the world. The gender gap in education was not completely closed by the end of the twentieth century. Furthermore, there is a large female disadvantage in education in the countries of western and central Africa, North Africa, and South Asia. Wealth gaps are even more widespread in the developing countries and the interaction of gender and wealth results in large gaps in educational outcomes in these countries. In the socio-political domain, women's socio-economic status and political participation in many developing countries, although improving, are relatively low as indicated in the recent UN Human Development Report. Although the overall trends are positive, significant disparities persist, especially in Africa and rural South Asia.

### 3.7. Environment

As symbolic cultural evolution proceeded and accelerated its outreach to alter the environment, three questions about the role and place of humans in society and the cosmic order have become increasingly pertinent:

> Is the earth, which is obviously a fit environment for [human] and other organic life, a purposefully made creation? Have its climate, its relief, the configuration of continents influenced the moral and social nature of individuals, and have they had an influence in modeling the character and nature of human culture? In his long tenure of the earth, in what manner [have humans] changed it from its hypothetical pristine condition?
>
> (Glacken, C. J., quoted in Goudie, 1993, p.1. Human and humans substituted for man and men)

The answer to the first question has been based on faith while the last two questions have not been fully answered. The symbolic evolution provided *Homo sapiens* with increasingly powerful tools to alter the environment but not to assess the long-term implications of such actions, whose consequences become more serious since, in their conscious or unconscious attempts to change their environment, human values and cultures are being equally changed. It seems that the "spiritual" notion that humans are set above and against nature has been formulated into a philosophy of science and progress.

The combination of accelerated technology, consumption, and population growth has increased awareness of the global nature of environmental sustainability. The first conference on environment and development—the United Nations Conference on the

Human Environment—was held in Stockholm in 1972. The Conference focused the international community on environmental protection, especially as it relates to economic development. It was followed by the seminal Report of the World Commission on Environment and Development (1987). In 1992, the World Bank published a special issue of the World Development Report dealing with development and the environment that, in the same year, paved the way for the United Nations "Earth Summit", which recommended several actions and programs to protect the human environment. The World Development Report 1992 provided a methodological framework for action. It outlined environmental priorities for development (water, air pollution, solid and hazardous wastes, land and habitat, and atmospheric changes) and the necessary data, institutional and information frameworks for policy analyses and action.

It became increasingly evident that the future of human development is contingent on a balanced coexistence between humans and their environment. Balanced coexistence depends to a large degree on understanding the synergistic nature of environment, technology, and population dynamics, and on the development of preventive and curative measures to preserve the integrity of the environment. That synergy is complex and there is a growing theoretical and empirical literature on the subject. These synergies are not examined in the present discussion. For details, the reader is referred to the World Commission on Environment and Development (1987) and the World Bank (1992, 1995), among others. Rather, this section attempts, in the context of the present evolutionary approach, to differentiate between two levels of environmental concerns, a dichotomy that has not been given adequate attention in environmental discussion. The first may be labeled internal environmental sustainability, internal that is, to human physiology and biochemistry, and the second, mentioned above, external environmental sustainability. As will become evident, these two levels of environmental concerns constitute a complex synergistic system.

One of the most fundamental developments in the survival of *Homo sapiens* is the evolution of its immune system against parasites, viruses, toxins, and other hazards that assert themselves by interacting with human biochemistry. This immune system seems to have developed much earlier than the estimated 300,000 years of the existence of the species in its present form, and probably evolved some hundred million years ago when the earliest vertebrates evolved from their invertebrate ancestors. This evolution was not a random process. Recent findings indicate that this endogenous evolution of the immune system has always served the sole purpose of defense against infection. The system that evolved in the genetic and anatomical structure of *Homo sapiens* is called here the "internal environmental mechanism."

This ongoing struggle between host and pathogen has been to a large extent accommodating in nature. But recent experience indicates that the mechanism is losing its preventive power, largely as a result of medical and social developments. The future may not be as comfortable or as certain. Changes in some key aspects of humanity's conditions of existence have created uncertainties. For perhaps a century, since the advent of the technophysio evolution—a trivial amount of time from an evolutionary perspective—a significant proportion of the human population has lived in an artificial environment of its own construction, largely freed from parasites and many pathogens

to which the immune system used to respond. The human defense system is becoming under-employed, while the microbes are not resting on their laurels, as illustrated for example by the global outbreak of human immunodeficiency virus (HIV) and, more recently, the Nipah virus outbreak in Malaysia in the spring of 1999. In their attempt to contain the spread of the Nipah virus, which killed more than 120 people in less than three weeks, the Malaysian authorities destroyed more than 900,000 hogs without being able to reach a full understanding of the nature of the virus. “The immune system won a battle but then lost the war. The virus next time may be even worse.”

Even in well-understood host–pathogen systems, such as the malaria parasite, the battle for malaria eradication is not won. After decades of defense against the mosquito host and the parasite itself, in the late 1990s, malaria caused an estimated million annual deaths aside from the sizable morbidity incidence and productivity loss, mainly in sub-Sahara Africa, according to the 1999 World Health Report of the World Health Organization (WHO). Measures such as the use of screens, draining wetlands, sewage systems, paved streets, “tight” housing (i.e. housing protected from the elements), and keeping animals away from human accommodation succeeded in banishing the host mosquitoes and virtually eliminated malaria in the well-to-do countries. This has not been the case where poverty and the environment are favorable for mosquito and parasite breeding, mainly in the region south of the Sahara in Africa, and in parts of India. Attempts to tackle the parasite itself through the use of drugs have not been effective in these regions, while attempts to develop effective vaccines are still in the experimental stage. It continues to be an active area of research in molecular biology and immunology. The reason for the elusive hunt is that the malaria parasite is a unicellular protozoan with great adaptive and maneuverable capacity, requiring researchers to work with dozens of new proteins to induce the complex mix of antibodies needed for the development of an effective malaria vaccine. The WHO is restarting a major anti-malaria campaign in those regions where malaria is resurgent, to halve its death toll, at an annual cost approaching one billion dollars.

Adding to the risk of an under-employed immune system are the growth of world population, the emergence of mega-cities and the widespread use of air travel. These developments, on the one hand, increase the ease with which people can become exposed to agents of disease, while adding to the complexity of tracing the causal host–pathogen chain, on the other hand. The case of *Pfiesteria* outbreaks, which have been killing millions of fish while posing direct and indirect health hazards for humans, is illustrative. It is being traced to human activities in animal husbandry, and residential location. Many of these factors are a result of accelerated developments in symbolic cultural evolution and its technophysio phase that increased both protection, which reduces natural immunity, and human mobility, which increases the degree of exposure. Part of the advantage of the technophysio evolution is its success in the development of countermeasures. Vaccination, for example, is a key development in the struggle against microbes. The basic theory of vaccination is simple. Stimulate the “under-employed” immune system by giving the body something that looks like an invading microbe. The process will put the immune system on guard again whenever an actual microbe invades. Experiments with HIV vaccines, although promising, have not been a total success. Part of the difficulty is the ability of HIV to evade the immune system. Furthermore, the cost of HIV vaccine developed thus far has been prohibitive, especially for populations that

have the highest rate of infection, for example those in sub-Sahara Africa. Pharmaceutical for-profit companies hesitate to take the risk of developing vaccines where the technical outcome is uncertain and economic returns are not positive. It is not evident, however, that losing the natural capacity for internal defense that took millions of years to acquire, while the risk of exposure has been increasing, is an optimal strategy.

The synergistic effects of technology, population dynamics, and affluence (consumption levels) on the external environment have been examined and debated extensively in the literature, with many unsettled questions, including the choice of an optimal strategy and policy to safeguard the environment: whether to use direct or indirect control policy approaches. In a 1991 analysis of the causes of rising pollution in the United States it was concluded by Commoner that the dominant contribution to the rising pollution levels during the 1950s and 1960s came from technology change rather than population growth or affluence. Others give a larger share of the blame to population growth, especially in the developing countries, while others blame consumption patterns and levels, especially in the developed countries, for the lion's share.

Perhaps, the words of John Stuart Mill (1848 [1965]), the young genius of James Mill, indicate a hopeful direction for symbolic cultural evolution to take in a harmonious coexistence with the environment:

> It is scarcely necessary to remark that a stationary condition of capital and population implies no stationary state of human improvement. There would be as much scope as ever for all kinds of mental culture, and moral and social progress; as much room for improving the Art of Living and much more likelihood of its being improved, when minds ceased to be engrossed by the art of getting on. Even the industrial arts might be as earnestly and as successfully cultivated, with this self sole difference, that instead of serving no purpose but the increase of wealth, industrial improvements would produce their legitimate effect, that of abridging labor. . . . Only when, in addition to just institutions, the increase of mankind shall be under the deliberate guidance of judicious foresight, can the conquests made from the powers of nature by the intellect and energy of scientific discoverers, become the common property of the species, and the means of improving it and elevating the universal lot.

J. S. Mill's statement illustrates the importance of collective judgment in the development of environmental policies. Such judgments depend on existing knowledge, the power of interest groups, and the presence of democratic institutions that allow participation in the decision processes. These are essential prerequisites especially since there are extreme views in the field. At one extreme, there are optimists who believe that the human–environment system is self-regulating; *laissez-faire* policy is optimal. At the other extreme, there are pessimists who believe that the continuation of present trends in population growth and resource use will lead the world to environmental collapse; active intervention is necessary. Both perspectives lack convincing analysis. Solid knowledge is required. But the knowledge base is not fixed. Institutions need to be adaptive to new knowledge as well as sensitive to the needs of human development with diverse levels of well-being.

## 4. Concluding Remarks: Opportunities and Challenges

The present phase of human development is unprecedented in mechanism and speed, with uncertain local and universal outcomes. The evolutionary approach of the present essay attempts to place the present phase of human development in historical perspective. For many millennia, the evolution of *Homo sapiens* has been based on extending human reach through the accelerated processes of symbolic cultural evolution rather than the slow processes of anatomical evolutionary change. The *modus operandi* of symbolic cultural evolution, in its present technophysio phase of scientific materialism, is knowledge-based; it helps to maintain and promote scientific and technological developments, their technical application and utilization, and the intergenerational preservation of such knowledge through advances in educational methods, content, and quality. These evolutionary developments open a new window of nurture–nature evolutionary processes that present opportunities and challenges to human development in the twenty-first century.

At present, human destiny is to know, if only because societies with knowledge dominate societies that lack it and there is, once reached, a threshold level, a built-in catalytic growth of learning. Scientific development, especially in biology and neuroscience, illustrates that the evolution of the anatomy of the human brain has rendered similar basic structures that, given a random distribution of disabilities, allows for equal *potential* of learning for all members of the family of *Homo sapiens*. The DNA of an individual is made up of about equal contributions from all ancestors that extend for hundreds of thousands of generations, of which present parents contribute an insignificant part. Diversity of the gene pool should be a cardinal value for the enrichment of symbolic cultural evolution. Furthermore, advances in communication and information technologies have facilitated and accelerated the speed of the flow of new knowledge and reduced the global cost of its acquisition. Apparently, the main constraints on acquiring and developing scientific knowledge are relative cost and benefit, the absence of necessary institutions, and the lack of unified goals at local and state levels. These are not simple hurdles for the majority of the world population to overcome. This is the case, given the persisting tendency of *Homo sapiens* for categorization. This tendency is illustrated by a recent discussion of the technophysio evolution: "Technophysio evolution implies that human beings now have so great a degree of control over their environment that they are *set apart* not only from all other species, but also *from all previous generations.*" Such an assertion could pave the way for a new round of injustice since it does not take into account the fact that large segments of present generations may not have the full privilege of the technophysio evolution, although not lacking in potential to contribute to its advancement. These are not the only challenges.

Symbolic cultural evolution implies a continuous search for a healthy synergy between scientific development (artisanship), social sciences (conscious time binding), and the humanities (imaginal thinking) that attempts to produce a humane and harmonious balance for the evolutionary process. However, acceleration in scientific development has left science, on the one hand, and the social sciences and humanities, on the other, heading towards separate worlds of discourse. The scientific bases of the social sciences and humanities have not developed at the same speed as those of science and

technology. The present methodologies of the social sciences and humanities seem to be more attached to older scientific and technological environments. However, efforts to develop strategies for human development continue to depend heavily on the methodologies and perspectives of the social sciences and humanities. Innovative social theories such as those of Marx, Adam Smith, Spencer, or Toynbee did not have their expected outcomes, partly because their underlying premises of human nature, as discussed earlier, had no scientific basis in biology or neuroscience. The invisible hand remained invisible because the sum of the actions of millions of poorly understood individual human beings, their anatomical and motivational behavior not fully determined in science, cannot be aggregated and computed with scientific authority.

The stated purpose of governments everywhere is to achieve levels of human fulfillment that are higher than those required for animal survival. The purpose is for their societies to join actively in the evolutionary process of symbolic cultural evolution, to be producers of science and technology and other knowledge, and not merely passive recipients. Without necessary knowledge, education, and health, humans are reduced to a sense-based survival status, a pre-symbolic status that is deprived of the rich emotional potential of cultural development, and one that is unfortunately prevalent among a sizable segment of the world population. Most programs for human development are based on the premise that education in science and technology is the key element in the goal of human fulfillment. But such a singular focus inevitably leads to the basic dilemma of the present phase of symbolic cultural evolution: the tension and widening gap between the sphere of the social sciences and humanities and that of science. Education should bridge this gap by probing deeper into the scientific foundations of the latter and the cultural consequences of the former. It should also be able to develop an environment that promotes understanding and mutual respect for cultural diversity, by being closely linked to the development of democratic institutions, isonomy in the rule of law, and transparency in governance.

State authorities, in their attempts to implement programs for human development, are being increasingly constrained by the emerging globalization process, an outgrowth of symbolic cultural evolution, especially in its present phase of scientific materialism. The emerging global environment, although based on innovative scientific developments with unlimited potential for human welfare, seems to be governed more by a competitive ethic of an obsolete Darwinian anatomical evolutionary process, a pre-symbolic cultural evolution. There are attempts to reorganize the global society away from these selfish trajectories, apparently constrained by the ancient genetic rules of human nature. The institution of transparency in world governance, isonomy in the rule of international law, and the development of binding socio-economic and legal international institutions are necessary conditions for the evolution of a global human development system with higher and more equitable levels of welfare. Similarly, advances in analyses, methodologies and measurement techniques in economics, social accounting, management, demography, and epidemiology, among others, provided for better understanding of outcomes, mechanisms, and determinants of human development. However, these necessary conditions are not sufficient without national governments implementing internally oriented sustainable reform (IOSR), in which the education systems bridge the gap between the three spheres of symbolic cultural evolution. Such systems could allow future generations to combine scientific

development with imaginal thinking, breeding generations that rebel against outdated social and political constraints. As Dyson (1995) expressed it: "We should try to introduce our children to science today as a rebellion against poverty and ugliness and militarism and economic injustice."

Symbolic cultural evolution cannot be sustained for long if its outreach destroys its fundamental sustenance. Short-term gains in material benefits tend to produce interest groups that divert attention from negative environmental consequences that threaten the very foundation of human development. The synergy between the dynamics of built-in population growth, technology, and affluence, especially if associated with poverty and unequal development, inevitably leads to serious conflicts and detrimental environmental effects. International democratic institutions that develop and implement rules of conduct between production technology and social behavior on the one hand and the environment on the other are essential for sustained human development. The presence of such institutions requires development in both science and ethics.

There are two other environmental consequences of the present technophysio phase of symbolic cultural evolution that are "internal" to human development. The first relates to the effects of medical advances and public health measures, combined with urbanization and the increasing volume of travel across national and regional boundaries. These reduce the efficacy of natural immunity on the one hand, while increasing the risk of exposure to disease on the other. The result is that *Homo sapiens* must continually be on guard, providing new measures and countermeasures against emerging and old microbes, a process that is costly and not necessarily efficient from an evolutionary perspective. The second internal consequence is the aging of the global human population, as a result of the development and diffusion of efficient fertility control technologies that accelerated the final phase of the demographic transition, and of new medical advances that increase life expectancy at old ages. The inevitable result of the global aging process is the development of new patterns of intergeneration transfers and new local and global social and political arrangements, with significant distribution effects and patterns of investment that have impacts on both human development and our external environment in the twenty-first century.

The present phase of symbolic cultural evolution presents enormous opportunities for advances in human development and welfare. It also presents as many challenges. In formulating any satisfactory modern ethic of human relationships, it is valuable to remember Bertrand Russell's remark (1995) that it is essential to recognize the necessary limitations of humans' power over the nonhuman environment, and the desirable limitations of their power over each other. In the twentieth century, humans have been extending their reach at an accelerating speed, which seems to be leading the human symbolic cultural evolution into a new phase in uncharted territories. Humans are no longer adjusting to environmental conditions. They are changing their own capabilities and outreach in ways that require adjustments in both their environmental and their human conditions, adjustments that may lag behind the scope and tempo of the induced changes. Human development is becoming a continuum of self-generating processes and adjustments. These processes, however, require reflection and careful analysis as to their control, destination, and long-term consequences for the future of human development and welfare.

For example, advances in neuroscience combined with innovative electronics present curative and preventive opportunities in the medical field. They also extend to anatomical possibilities that have the potential to expand thought processes, as illustrated by recent experiments that modify the function of memory in small mammals. It is important that the latter possibilities be limited by existing knowledge, not only about the anatomy of the brain, but more essentially by how the "human mind" works. The development of the transistor towards miniaturization and complexity presents an illustrative example. Recently, Keyes, a pioneer in the physics of information processing systems, indicated that the future of transistors requires expanded knowledge of solid state physics since as chips grow more complex they require more fabrication steps, and each step can influence the next. For instance, when doping atoms are introduced into a crystal, they tend to attract, repel, or otherwise affect the motion of other dopants. Such effects of dopants on other dopants are not well understood; further experiments and theoretical investigations are therefore needed. The anatomy of transistors, which are at the heart of modern computers and the revolution in information technology, is not complicated by the presence of the enormous complexity of the "human mind" or by the expanded horizon and synergies presented by the evolving globalization environment. It is true that decoding the human genome has the potential of revolutionizing science and human health, but the road is neither simple nor straightforward. Computational biology indicates that the human genome comprises 3 billion bits of data, with each "bit" being one of four different nucleotide bases; not all are genes, the rest have supporting roles. It is not easy to identify genes. The process of identifying them is further complicated since they are not necessarily continuous, with portions scattered throughout the genome. Innovative computational and statistical techniques are applied for finding gene. However, locating genes is the easier task; it is a long way from understanding their functions.

As the world moves towards a "global village" environment, Casset's statement (in the opening quote of Section 1) becomes almost a tautology. In a global society, equilibrium is inevitably set from within. However, the present global environment is in an early evolutionary state of its institutions and global social values, a stage controlled by technology and finance capital whose allegiance is to shareholders of capital and not necessarily to equitable human development. The challenge is how to master the synergies of human nature and the global environment. To master the synergy of human nature, its anatomy and motivation, requires a highly complex and interdisciplinary knowledge base, while our knowledge about the global socio-economic and environmental consequences of human actions is still evolving. It is not sufficient to believe that human destiny is independent of past history as Berlin or Popper implied. Nor is it comfortable to believe that human destiny is a relentless progress towards an idealized social organism. The first paradigm implies a loss of conscious time binding in the process of symbolic cultural evolution, a loss that leads to regression in human development. The second may lead to instability and uncertainty about the meaning of human progress. More important, humans have developed a highly complex and artificial environment that, although meant as a defense against hostile environmental elements, has introduced a potentially unstable prospect. An experiment with highly developed social species from the insect world may provide a disquieting parable. The displacement of the "army ants," one of the most developed social organisms, from their environment in Central America to an artificial environment in an exhibit in a gallery in

New York, led to their death, all 2 million of them, in one day. There was no adequate explanation for the episode, especially since ants are known to be highly efficient and adaptive. The ants were located in a huge square bin, walled by high plastic sides and supplied with adequate food and sand, similar to that of their native environment. Thomas's (1974) description of the episode is apt:

> It is a melancholy parable. I am *unsure of the meaning*, but I do think it has something to do with all that plastic—that, and the distance from the earth. It is a long, long way from the earth of a Central American jungle to the ground floor of a gallery, especially when you consider that Manhattan itself is suspended on a kind of concrete platform, propped up by a meshwork of wires, pipes, and water mains. . . . I do not believe you can suspend army ants away from the earth, on plastic, for any length of time. They will lose touch, run out of energy, and die for lack of current. [Emphasis added]

The prospect for *Homo sapiens*, all 6 billion and counting, to survive as one large social organism could be equally uncertain, especially given the increasingly artificial environment they have created as their own habitat. What has been created mainly as defense against hostile environmental elements could end up presenting its own dangers. Although it might be true, that we, as *Homo sapiens*, have no adequate sense of where we are heading, the lessons of symbolic cultural evolution remind us that a good moral compass, combined with an intelligent use of scientific achievements, might keep us going, even prospering, for a long time. There is a need for more knowledge about these complex synergies combined with moral direction, especially in the present technophysio phase of symbolic cultural evolution.

Present knowledge about the determinants and consequences of human behavior is still at a far distance from the goal set in 1983 by Gell-Mann for the research program of the think tank of the Santa Fe Institute: to tackle the great, emerging syntheses in science: ones that involve many disciplines. That task was coined as the science of "complexity." The world and human evolution are neither linear nor orderly. This view of the world follows Heraclitus's (*c.* 500 B.C.) view that this world-order "always was and is and shall be: an ever-living fire, kindling in measure and going out in measure" (see Russell, 1945, pp. 38–47; Collinson, 1987, pp. 10–12; Waldrop, 1992, p. 335). Complexity does not view the world as being in a basic state of equilibrium in which the actors' job is to maintain its "natural" equilibrium status, whenever untidy forces push the system away from that Heavenly Newtonian equilibrium. Rather, it views the world as a continuous process of flow and change in which the exact patterns are not repeatable. The shift to a metaphor of "complexity" is fundamental. It is a different metaphor in which a simple system could give rise to immensely complicated and unpredictable consequences. Instead of relying on the Newtonian metaphor of clockwork predictability, complexity seems to be based on metaphors more akin to biological processes; messiness and the liveliness in the economy can grow out of incredibly simple, even elegant theory.

The rules and synergies of the new globalization system are not that simple and are growing in complexity, making it difficult to project future events. Attempts to forecast the future path of globalization, even by established students of world system analysis,

have proved to be elusive and mostly off the mark. Cost– benefit analysis techniques that assume perfect system knowledge are clearly inadequate to guide human development policies in the globalization era. Observing and understanding the evolution and emergence of institutions that govern and shape the direction of the globalization process is a prerequisite for the development of policies for sustainable human development in an environment in which North–South or East–West, or human–nature dualities are vanishing. The future of human development in the age of global technophysio evolution in the twenty-first century is full of promises and uncertainties.

Note: *The ideas and views presented in the essay are those of the author and not necessarily of the affiliated institutions.*

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**Glossary**

**Biological evolution:** The ability of living organisms and animals to adapt to new environments or to new strategies for exploiting existing environments by means of the slow process of hereditary modifications of their body structure.

**Capitalism:** Although there is no standard definition of capitalism, modern capitalism may be defined as an evolutionary socio-political order whose economies manifest three properties they are driven by a restless desire to accumulate capital, knit together by largely unregulated markets, and divided into two realms, one private, one public.

**Cultural evolution:** Cultural evolution or adaptation is a distinct human trait that evolved independently from evolutionary anatomical change into a complex and powerful social mechanism that is termed cultural adaptation or cultural evolution. See also, *culture*, *symbolic cultural evolution*, and *technophysio evolution*.

**Culture:** The whole complex of *distinctive* spiritual, material, intellectual, and emotional features that characterize a society. It should not be confused with the *process* of cultural evolution as defined above.

**Demographic transition:** The transition of a population from high levels of fertility and mortality to lower levels.

**Dependency ratio:** The ratio of the population defined as dependent—those under 15 and over 64—to the working age population, aged 15–64.

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| **Education quality measures:** | The use of international standardized measures of students' comprehension and logical thinking at a given level of education, especially in mathematics and the sciences, to compare students' achievement across time and countries. |
| **External environmental sustainability:** | The attempt to stop the process of degrading natural resources as a result of human activities. |
| **Globalization:** | A process of increased socio-economic, cultural, and political inter-dependence among countries and communities that has been a main characteristic of the evolution and spread of capitalism around the world for centuries. The present phase of the globalization process is characterized by the accelerated development and spread of innovative communication technologies that facilitate financial and information flows across borders. |
| **Human development index (HDI):** | The human development index has been constructed every year since 1990 as part of the Human Development Report to measure average achievements in basic human development in one simple composite index. |
| **Human genome:** | The complete set of genes contained in *Homo sapiens*' twenty-three pairs of chromosomes. The Genome Project has been developed for its decoding. |
| **Infant mortality rate (IMR):** | The probability of dying between birth and exactly one year of age times 1,000. IMR is used as an indicator of a population's health status. |
| **Internal environmental sustainability:** | Changes in human physiology and biochemistry as a result of changes in the human-made physical and social environment that reduce the efficacy of the natural immune system. |
| **Isonomy in the rule of law:** | The stability and certainty of the rule of law. The concept was initiated by ancient Greece and adopted in the early evolution of British democratic institutions. It has been viewed as a prerequisite for the presence of a viable democracy. |
| **Memes:** | Behaviors and ideas copied from person to person by imitation. Some psychologists argue that culture is a collection of memes and accordingly is subject to the evolutionary selection process. Others believe that culture is too complex a phenomenon to be explained by such simple processes. |
| **Neuroscience:** | The study of the anatomy and function of the brain and the mind. Its findings are having increasing impact on human health and mental development, with potentially fundamental consequences to human destiny. |
| **Random walk:** | A physical phenomenon in which the movements of elements are random but the movement of the whole seems orderly, a result of the presence of exogenous boundaries. The process is quoted to exemplify an atomistic view of historical events. |
| **Symbolic cultural evolution:** | The invention and mastering of symbolism has been a powerful tool in the development of science and technology and was the main force in initiating the globalization process thousands of |

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| | years ago. It made anatomical evolution obsolete. |
| **Technophysio evolution:** | A new phase of symbolic cultural evolution in which communication/computer technology and advances in physiology and neuroscience are combined to extend the reach of *Homo sapiens*, an evolutionary process that is biological but not genetic, rapid, culturally transmitted, and not necessarily stable. |
| **Total fertility rate:** | The average number of children that would be born alive to a woman during her lifetime if she were to bear children at each age of the mother in accord with prevailing age-specific fertility rates. |
| **Unemployment:** | All people above a specific age who are not in paid employment or self-employed, but are available and have taken specific steps to seek paid employment or self-employment. |

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