PROMOTING LEADERSHIP IN THOUGHT
THAT LEADS TO ACTION

THE WEALTH OF NATIONS REVISITED

CADMUS

NEW PERSPECTIVES ON MAJOR GLOBAL ISSUES

Volume 3, Issue 2 | May 2017 | ISSN 2038-5242

UPCOMING EVENT

2nd Intl. Conference on Future Education: Effective Learning in an Age of Increasing Speed, Complexity & Uncertainty

Rome, Italy - Nov 16-18, 2017

Inside This Issue

ARTICLES

The CADMUS Journal

The acronym of the South-East European Division of The World Academy of Art & Science—SEED—prompted us to initiate a journal devoted to seed ideas—to leadership in thought that leads to action. Cadmus (or Kadmos in Greek and Phoenician mythology) was a son of King Agenor and Queen Telephassa of Tyre, and brother of Cilix, Phoenix and Europa. Cadmus is credited with introducing the original alphabet—the Phoenician alphabet, with "the invention" of agriculture, and with founding the city of Thebes. His marriage to Harmonia represents the symbolic coupling of Eastern learning and Western love of beauty. The youngest son of Cadmus and Harmonia was Illyrius. The city of Zagreb, which is the formal seat of SEED, was once part of Illyria, a region in what is today referred to as the Western Balkans. Cadmus will be a journal for fresh thinking and new perspectives that integrates knowledge from all fields of science, arts and humanities to address real-life issues, inform policy and decision-making, and enhance our collective response to the challenges and opportunities facing the world today.

Copyright: The Risk Institute – Istituto del Rischio
Via della Torretta 10, 34121, Trieste – Italy / Rue le Corbusier 12, 1208 Geneva – Switzerland

Editorial Office: The Mother's Service Society
5, Puduvai Sivam Street, Venkata Nagar – Pondicherry 605011 – India

Published under Open Access policy guidelines.
Visit http://cadmusjournal.org/content/editorial-policy for Editorial Policy.

Websites: www.cadmusjournal.org – www.worldacademy.org – www.newwelfare.org

E-mail: editor@cadmusjournal.org

Printed by: Akaram, Plot No.1, Nirmala Nagar, Thanjavur, India

PROMOTING LEADERSHIP IN THOUGHT
THAT LEADS TO ACTION

THE WEALTH OF NATIONS REVISITED

CADMUS

NEW PERSPECTIVES ON MAJOR GLOBAL ISSUES

Volume 3, Issue 2

May 2017

Published by
THE RISK INSTITUTE
GENEVA - PONDICHERRY - TRIESTE - ZAGREB

CADMUS VISION

The world is in need of guiding ideas, a vision, to more effectively direct our intellectual, moral and scientific capabilities for world peace, global security, human dignity and social justice. Today we face myriad challenges. Unprecedented material and technological achievements co-exist with unconscionable and in some cases increasing poverty, inequality and injustice. Advances in science have unleashed remarkable powers, yet these very powers as presently wielded threaten to undermine the very future of our planet. Rapidly rising expectations have increased frustrations and tensions that threaten the fabric of global society. Prosperity itself has become a source of instability and destruction when wantonly pursued without organizational safeguards for our collective well-being. No longer able to afford the luxury of competition and strife based primarily on national, ethnic or religious interests and prejudices, we need urgently to acquire the knowledge and fashion the institutions required for free, fair and effective global governance.

In recent centuries the world has been propelled by the battle cry of revolutionary ideas—freedom, equality, fraternity, universal education, workers of the world unite. Past revolutions have always brought vast upheaval and destruction in their wake, tumultuous and violent change that has torn societies asunder and precipitated devastating wars. Today the world needs evolutionary ideas that can spur our collective progress without the wake of destructive violence that threatens to undermine the huge but fragile political, social, financial and ecological infrastructures on which we depend and strive to build a better world.

Until recently, history has recorded the acts of creative individual thinkers and dynamic leaders who altered the path of human progress and left a lasting mark on society. Over the past half century, the role of pioneering individuals is increasingly being replaced by that of new and progressive organizations, including the international organizations of the UN system and NGOs such as the Club of Rome, Pugwash and the International Physicians for the Prevention of Nuclear War. These organizations stand out because they are inspired by high values and committed to the achievement of practical, but far-reaching goals. This was, no doubt, the intention of the founders of the World Academy of Art & Science when they established this institution in 1960 as a transnational association to explore the major concerns of humanity in a non-governmental context.

The founders of WAAS were motivated by a deep emotional commitment and sense of responsibility to work for the betterment of all humankind. Their overriding conviction was on the need for a united global effort to control the forces of science and technology and govern the peaceful evolution of human society. Inhibiting conditions limited their ability to translate these powerful motives into action, but they still retain their original power for realization. Today circumstances are more conducive, the international environment is more developed. No single organization can by itself harness the motive force needed to change the world, but a group of like-minded organizations founded with such powerful intentions can become a magnet and focal point to project creative ideas that possess the inherent dynamism for self-fulfillment.

Ivo Šlaus *Orio Giarini* *Garry Jacobs*

CADMUS
New Perspectives on Major Global Issues
Volume 3, Issue 2, May 2017

CONTENTS

Inside this Issue

Knowledge of the Whole

The mental world we live in today is infinitely divided into categories, subjects, disciplines, topics, and their more and more specialized subdivisions. As a result American universities now offer more than 1000 specialized subdisciplines. Specialization is a power of knowledge to uncover the intricate mysteries concealed in the infinitesimal. Many of the marvellous things we use and enjoy today are a result of this minute investigation. But no matter how much we try, our lives cannot be so readily divided into innumerable airtight compartments. The quest for right knowledge too often reduces to selecting some aspects of knowledge that fit neatly together into a conceptual framework and ignoring or rejecting those that do not. This process of acceptance and rejection may elevate our specialized knowledge of the part but it is likely to overlook profound truths about the whole. Thought is the power to link and relate two or more things together. Knowledge is the capacity to see each thing in right relationship to everything else.

The challenges confronting humanity today are very largely the result of this fragmentation of knowledge that views financial markets as separate and almost independent of the real economy, technological development as if it can be embraced without any regard for its impact on employment, markets as if they can function independent of law and regulation and regardless of their impact on society and the environment, social policy as if it can be divorced from human values, and education of the mind as if it can be separated from development of personality. The devastating impact of modern society on the natural environment is a direct consequence of this fragmentation of knowledge.

The knowledge humanity needs today to effectively address these challenges is a knowledge based on truths that complement and complete other truths rather than those that compete and oppose all other perspectives. Only then can our knowledge be fully rational. Every viewpoint that survives rational scrutiny possesses at least a grain of truth that can enhance our understanding of the whole. The need for more integrated knowledge is especially apparent today in the social sciences where humanity is confronted by problems that deny solution by piecemeal analysis and fragmented strategies. The real solution to the problem of climate change lies in healing this fractured image of reality and restoring a vision that reconnects us mentally and emotionally with each other and the world in which we live. A holistic understanding is the first essential condition for healing society and the planet.

The articles in this issue of *Cadmus* present perspectives that highlight linkages and relationships between different aspects of knowledge in diverse fields of life—economics, education, governance, history, law, security, science and technology—which are more often examined in isolation from one another. Taken individually these articles provide a rich variety of insights into specific fields. Taken together they sketch the outlines of a more integrated knowledge of society and human evolution.

We hope you enjoy this issue.

The Editors

CADMUS, Volume 3, No.2, May 2017, 1-9

Globalisation Trapped

João Caraça
Director, Calouste Gulbenkian Foundation, France;
Fellow, World Academy of Art & Science

Abstract

The promise of making society progress through the direct applications of science was finally fulfilled in the mid-20th century. Science progressed immensely, propelled by the effects of the two world wars. The first science-based technologies saw the daylight during the 1940s and their transformative power was such that neither the military, nor subsequently the markets, allowed science to return intact to its curiosity-driven nest. Technoscience was born then and (being progressively pulled away from curiosity-driven science) was able to grow enormously, erecting a formidable structure of networks of institutions that impacted decisively on the economy. It is a paradox, or maybe a trap, that the fulfillment of science's solemn promise of 'transforming nature' means seeing ourselves and our Western societies entangled in crises after crises with no clear outcome in view. A redistribution of geopolitical power is under way, along with the deployment of information and communication technologies, forcing dominant structures to oscillate, as knowledge about organization and methods, marketing, design, and software begins to challenge the role of technoscience as the main vector of economic growth and wealth accumulation. What ought to be done?

The most eventful invention of the dawn of Modernity was that of the Florentine masters of the Quattrocento: a new representation of the natural world. Linear perspective was a new way of looking at reality, the first step to initiate its transformation. Linear perspective separated clearly the subject, the observer, from the object which was observed. The size of any object relative to those of other objects depicted in a context depends only on its distance to the observer, the subject that is representing reality. Previously, divinities were no longer larger than men: in fact, their apparent magnitude was a function solely of their remoteness from the observer. That these representations came to be accepted as "objective" stems certainly from the fact that they could be assimilated to those obtained through the use of an instrument—the "camera obscura". It was this mental association that allowed conceptually the separation of light (a physical phenomenon) from vision (a physiological capacity).

1. From a Culture of Separation

The intellectual strength of modernity springs from the surprising capacity and robustness of "separation" as a method of analysis of natural phenomena. A new culture of critical tendency and experimental basis emerged, progressively validated by the flood of new discoveries pervading Europe—of new lands, new peoples, new skies and new stars. The old order was discredited and a new worldview took form. This worldview, of a "geometrical"

character, consisted in searching for symmetries in nature, which in themselves concealed principles of invariance that, in turn, led to the formulation of laws for the natural world. The laws are permanent, eternal and absolute, describing the behavior of bodies in the universe since time immemorial extending to infinity. They are formulated in mathematical language since Galileo declared that the Book of Nature was written in mathematical language, separating it from the other holy book, the Bible, which was written in the natural language. The objectivity of the laws of nature was assured by the use of instruments and their validity by the publication of observations and measurements.

"Instead of the economy being embedded in social relations, as in the past, now it was social relations that became embedded in the economic system."

The legitimacy of this separation was granted by the sheer strength of the Reformation in the Protestant nations in which the new churches—separated from the secular forces that were building the State—were also in construction. The general climate of growing trade and business related to ocean navigation supported a further separation: that of a private sphere within what until then was the (public) domain of an agrarian society. Cities were the beacons of this spirit of modernity. And new Academies of Sciences were created to enshrine and nurture that spirit. The force of this geometrical worldview was still echoing loudly in the 19th century: Cézanne asserted conclusively that all forms of nature could be reverted to the sphere, the cone and the cylinder.

The triumph of modernity was the victory of this culture of trade, military power, navigation, finance, private appropriation and new knowledge. It came as no surprise that the first conflict in the disciplines of knowledge was the separation of philosophy from theology, as philosophers started to give priority to the empirical analysis of reality.

This was the first serious challenge to the millenarian affirmation of religious authorities who thought that they were the sole owners of the way to truth. Philosophers claimed that philosophical intuition was as legitimate a source of truth as divine revelation! The separation of mind from matter was then established, as expected.

A subsequent separation was that of natural philosophy (which adopted the designation of "science") from philosophy. Scientists, pursuing a way of theorization based on induction, supported by empirical, replicable and verifiable observation, opposed metaphysical deduction as a speculation which could not contain elements of truth. This rift was not without consequences: separated from philosophy and the humanities, scientists developed an a-historical and cumulative conception of scientific knowledge and its progresses, which supported a claim of neutrality in social terms.

Science started out as physics, and physics for Galileo was mechanics. The "mechanical" impetus of modernity through the advances in engineering, warfare and navigation was so strong that mathematics—which until the 16th century had been the way we dealt with nature

(through counting and numbers [arithmetic], forms and measurement [geometry], proportions and harmony [music], and positions and motions of heavenly bodies [astronomy])—was abstracted from nature to become only its language; physics (mechanics) became nature. This helped and enhanced the conception of mathematics as a symbolic language, enabling the separation of natural beings from natural rules, i.e., of objects from models, of ontology from epistemology. This scheme was met with an astonishing success—as overwhelming as the victories that modern European nations were experiencing in their expansion throughout the world. Who could doubt what one's eyes were seeing?

"If we think that crises are terrible and destructive, we better be prepared for the next wave of structural change in the 2030s."

The new world of modernity—the terrestrial globe, not the territories around the Mediterranean Sea—was nurtured by the separation of space from time, and by the new concepts derived from the empire of the laws of nature. Space became appropriable till infinity and time became linear.

No wonder that the new social organizations that were able to fully interpret and conjugate these notions—the new companies or enterprises—provided the economic success of modernity. The new wealth they generated warranted their existence and proliferation. They became aware of the importance of technology in the mastering of time through the invention of machines. No wonder also that the Industrial Revolution was intrinsically a revolution in mechanical force and artifacts. The mastery of space was warranted by the development of market economies, through the incorporation and development of cities' economies (first at the national level and subsequently overseas).

Modernity allowed capitalism to flourish. Capitalism is a regime of societal power based on the rights to private ownership of the means of production (which have been dramatically extended to all domains of human life during the course of the last hundred years) and on the wealth generated by this appropriation. Its principle is the maximization of the accumulation of capital, which is limited solely by the "scarcity" of resources or by the "ignorance" of the knowledge that allows its further accumulation. Capitalism also needs an inter-state system that guarantees the legal property of accumulated capital—a fact that is sometimes forgotten. Modernity provided the adequate framework for the endeavor of capital: a powerful engine (the modern enterprise); a search for technological inventions to fuel the engine; a progressive de-materialization of money through financial innovations; and, an interstate system that progressively expanded in the world. Capital accumulation became indefinite.

The growth of economic activity and wealth associated with the industrial revolution had an enormous impact on society. A new vector of capital accumulation emerged and the control of economic system by the markets (i.e., the meeting places of long-distance exchanges) was established. The transformation of society was also deep and full of consequences. It brought about further separations in daily life. Industrial societies saw an inversion in the relation

between the economic and the social spheres: instead of the economy being embedded in social relations, as in the past, now it was social relations that became embedded in the economic system. The economy was separated from society and, further, home became separated from work. The concept of employment was born.

"That a major crisis is developing in Western societies in the first decade of the 21st century is probably not a random coincidence. History does not repeat itself; it is rather human mistakes that tend to repeat themselves, over and over again, creating cycles, not of economic development but of human behaviour."

But the system was intrinsically prone to crises, namely crises of structural adjustment due to evolving production structures and infrastructures. Infrastructures are difficult to transform: they require voluminous investments and costly adaptations to the new basic conditions of economic activity. Every two generations, at least since the dawn of the industrial revolution, we have witnessed a crisis of this type. The technical infrastructure of production was transformed accordingly (through the 1830s) from water-powered mechanization to steam-powered mechanization, then through electrification (from the 1880s onwards) to full motorization (from the 1930s onwards) through cheap oil and mass production. The present situation, which can be described as a computerization of the entire economy, emerged in the 1980s. If we think that crises are terrible and destructive, we better be prepared for the next wave of structural change in the 2030s.

A capitalist market economy lives always in an intimate arrangement with an interstate political system. It needs a strong interstate system to enforce the property laws that allow capital accumulation, as stated before. Capital, in turn, feeds its partner, allowing it to survive. This is why only hegemons and not empires are permitted in interstate systems. Capital is allergic to caps. And hegemons do not live as such forever. They are not able to set the rules of the game indefinitely. Every fourth generation we have witnessed crises (another type of crises) which degenerate into wars where the hegemons are replaced by other hegemonic nations. We observed this in the decades following 1610 (the Thirty Years' War), then in the 1710s (the war of the Spanish succession), in the 1810s (the Napoleonic wars) and after 1910 (the two World Wars). With the present expansion of the world-system encompassing almost the whole of our planet we cannot rule out the current "oil wars" as signaling the possible demise of the American hegemon. That a major crisis is developing in Western societies in the first decade of the 21st century is probably not a random coincidence. History does not repeat itself; it is rather human mistakes that tend to repeat themselves, over and over again, creating cycles, not of economic development but of human behaviour.

Modernity was fashioned by means of a culture of separation. The power of this way of dealing with reality brought enormous wealth and prosperity to modern nations. By the end of the 19th century four values summarized the preeminence of modern culture: nature (an

infinite resource that could be transformed by the knowledge of its laws); science (the legitimate way to discover truth); universality (the values and perceptions of European peoples were imposed on and accepted in all corners of the world); and, sovereignty (each state was like an atom, indivisible and acting as a legitimate component in the interstate system).

The 20th century pushed forward these concepts under the joyous leadership of the new hegemon across the Atlantic. Further separations ensued, mainly stemming from the overspecialization promoted by the education system, which by that time was reorganized to respond to objectives of the market economy such as fierce competition and higher technological levels. Science progressed immensely, propelled by the World Wars' effect.

It was following this path that science met its defining point of separation. The first science-based technologies saw the light during the 1940s to never leave our world again. Their transformative power was such that neither the military, nor subsequently the markets, let science return intact to its curiosity-driven realm. Technoscience was born with the atom bomb. Progressively pulled away from curiosity-driven science, technoscience grew enormously and impacted strongly on the economy. This was not without problems, of course. The neutrality of science (read technoscience) was definitively dead. "We lost our innocence," uttered Oppenheimer at Alamogordo. He understood then that the long-term and well-established value of science was being lost. But he could not yet foresee its consequences.

2. To a Separation of Cultures

The world was transformed further in the 1950s under the Cold War regime. The "oil crises" of the 70s set the stage for the deployment of the first socially selected product of technoscience: the information and communication technologies. A new period of techno-economic structural development was initiated, a period in which we are living in, approaching the maturity of the solutions that those science-based technologies have provided for the time-span of one generation. But these solutions were naturally associated with a whole array of new issues. Information and communication exploded—a second revolution that has profoundly changed the perception of life in our planet. Terrestrial space has "shrunk" and knowledge travels around the world at the speed of light. Finance took increasing control of the economy and finally captured it, through further dematerialization of the monetarized system (another essential effect of the industrial revolution)—money is a convention. Finance has been the driving force since the initial stages of globalization: using the new technologies, finance extended the capacity of coordination at a distance (meaning: beyond political borders). The end of the Cold War further accelerated this tendency and, as a result, a multitude of new opportunities emerged and new networks were created to exploit them, challenging the existing mechanisms. Fierce competition between actors ensued and the expansion of market economies was fed by increasing inputs of new knowledge relevant for commercial operations: organization and methods, marketing, design, software, specialized training. New services and activities surged with high economic impact. And each of them developed its own culture.

Increasing growth and separation gave us much more than just two cultures (the transfer into the 20th century of the fierce debate of Enlightenment). We can now distinguish in our societies, besides the cultures of science and the humanities, a culture of social science (strengthened through the invention of post-modernism) and well-defined cultures in politics, business, media, military, religion, and education, as well as diverse cultures of risk, violence and individual autonomy.

> *"Complexity is the impossibility of separating a system from its context, a living being from its environment, an object from its measuring instrument."*

We evolved a full *macédoine* of cultures. But, worse, in this new Babel, the same individual person can switch from rationality (say, in politics) to the realms of the obscure, in just a click, making the resurgence of ignorance and mysticism seem a business like any other.

Therefore, the tremendous task placed on the shoulders of the coming generations is paradoxically very simple: strive for a new and novel integration of cultures. The reason is also very simple: modernity is exhausted. As argued below, modernity has been drained by financial capitalism; it was even led to transform the future (a founding value) into a mockery of itself, through short-sighted, sick and exclusive preoccupations centered on the present.

We live in a world of uncertainty. But we have never lived in an uncertain world! We were able in the past to generate mechanisms to reduce uncertainty by proposing order and classifying reality. But finally, all institutions evolve, i.e., adapt or disappear. Let us take three examples. First, the medieval Church. The church controlled ignorance through the invention of sin and repentance. Their method was based on confession. But religion is prone to fundamentalism and, so, is averse to diversity. The disregard of modernity towards the past and its ancestors quenched and sank the power of the Church of Rome. Second, the nation state. The control of ignorance was accomplished via the introduction of an education system and the creation of degrees. This system, which stimulated critical thinking and taught us how to judge the credibility of the sources of knowledge, was implemented together with a powerful method of examination. But the state is also prone to conflicts of interest, and globalization has been actively promoting its weakness, by destroying its timid impulses to resist financial discipline. Finally, the markets: market economies control ignorance through the emergence of a vigorous industry of consultants. The method of consultancy firms is based on the free use of advertising to achieve their objectives. But markets are intrinsically prone to crises: there goes confidence down the drain. Nobody is perfect!

We are living through a deep crisis that originated in a conjugation of different processes: geopolitical, techno-economic, cognitive. The separation of cultures has led us here, and we have let these crises entangle with one another like schoolchildren. Everything is connected today. We live in a complex world. We are surrounded by complexity. We know today that we are the products of complexity. This is what is new.

All the grand challenges we face today, from climate change to sustainable living, from innovation to the management of cities, are complex by nature. But what is complexity? Very simply, complexity is the impossibility of separating a system from its context, a living being from its environment, an object from its measuring instrument. Exit separation!

We can say that we live in (and are thermodynamically) open systems. The intellectual apparatus devised by the end of the 19th century, composed of determinism (i.e., information conservation), reductionism (i.e. the use of mathematical language) and dualism (i.e. the independence of the observer), is severely flawed with regard to the representation of reality. We know that the progressive substitution of human labour by machines—at first mechanical, and now communication-driven—has dramatically changed the condition of work and employment and the social structures in which they were in turn embedded. The effectiveness of advanced economies derives from their capacity for operating science-based innovation systems, but what matters most in their performance is the quality of their governance. But how do we understand the whole, especially in the absence of a culture of integration? Maybe we will have to define a new epistemic objective, different from that of "progress through the transformation of nature", the aim of modernity.

But before that, we have to understand how values have changed, to assess where and how a new culture is desperately needed.

We may discern four cognitive crises unfolding before our eyes (each corresponding to a well-established value of modernity): a crisis of nature; a crisis of science; a crisis of the universal; and, a crisis of sovereignty. In each of these crises, a new concept has emerged to perturb and displace the characteristic word of the culture of modernity (nature, science, universality, sovereignty)—respectively: the environment; knowledge (as in the "knowledge-economy"); the global; and, governance.

The notion of environment today has the relevance we attributed in the past to nature. But we then understood nature as a scenario—eternal—where phenomena were taking place. We could attempt at controlling or transforming nature, but nature would always be there, unharmed. Now, with the concept of environment, a big change occurs: the environment is no longer the permanent scenario, but the stage where the actors perform (in fact there is no scenario). And there is no author, nor a plot; the actors create their own narrative as they play and they are responsible for the outcomes, inclusively for the deterioration of the stage. An evil power is creeping in: it declares the future as worse than today, so the motto is: let us recentre our efforts on the present—the opposite of modernity. A feeling of anguish with respect to the future is being instilled.

The word 'knowledge' is being redefined so as to signify the set of fields (law, organization, marketing, design, software, training) that together with technoscience feed the success of the new services and the new economy in the globalised world. It has displaced science in all policy-oriented documents written after 1990. But science was not just a mere instrument of the economy, a straightforward source of new technologies. Science was for three centuries the main element of support of the worldview of modernity and the most important criterion in the search of truth. Its culture signified the constructive role of error and of objection,

one of the most important elements for establishing the concept of citizenship. Science aimed at eternity, offered a vision for the long-term.

"The world today is a computerized jungle."

The new word knowledge is a vassal of the markets and their daily operations. Markets welcome change but ignore the long-term effects. Their frenetic search for (economic) value makes them myopic. Consequently, knowledge is suffering from short-sightedness nowadays. The feeling of short-termism is rampant.

The notion of globalization has displaced that of universality. For two centuries we enjoyed the rule of the universal. We had permanent, sacred and eternal rights just because of the fact that we were born. These rights were introduced to protect the citizen from the powers of the state and to allow the free exercise of citizenship. Of course, the process of exercising one's rights has not been easy, nor linear. Social progress and welfare were the culmination of a lengthy fight, punctuated by eventful battles. But globalization has introduced a wicked twist in this framework. In the realm of globalization there are no acquired rights, but just contracts, where rights have to be negotiated and re-negotiated continuously. The place of the individual citizens has to be conquered in the markets, their performance optimized, their utility demonstrated. A systematic process of negotiation, profitability, competition is at work. People are dispensable, their importance resides in their function—as producers or as consumers—they were transformed, actually, into resources: human resources! They have to be recyclable (through life-long learning!), or otherwise they represent no value to the markets. They become a nuisance and can be eliminated if they are of no economic utility. The world today is a computerized jungle. There is a kind of hush all over the world. Oppression is back in town.

Governance has swiftly substituted sovereignty. For centuries, the states (and the balance of force) have been the cornerstones of the order that was established by Westphalia, which contributed to the political stabilization of Europe. The notion of the nation-state was tentatively exported to different continents of our planet with mitigated success. Governments have been recognized as legitimate representatives of nations and morally responsible for their internal security and welfare, and as the interlocutors in foreign affairs.

But the globalization of markets, with a rhetoric anchored in liberalization, deregulation and privatization, provoked national governments to recede progressively from the economic sphere. This recession motivated the surge in the national political spheres, of new actors (at a distance) with considerable (economic and political) power. Who governs now? Where are important decisions being taken? Who is accountable? Have we voted for them? Governance is now a popular word, pervading all fields of activity in advanced countries. No wonder people and institutions feel insecure.

The decline of strong values such as those of nature, science, universality and sovereignty has unfolded mixed senses of anguish, short-termism, oppression and insecurity. Tomorrow will be worse than today. And the markets make sure that today is the day. To consume immediately is the only certainty that is allowed. Marketing propaganda forces us to make instant decisions. The preeminence of financial capital—due to its intangibility and therefore infinite possibility of accumulation—accelerated this trend to a point of no return. The final

act has been the (self-) separation of finance from the economy, in the vain attempt of gaining full control over the accumulation processes. In trying to fly too high and unattended, finance lets its wings melt down. And the result has been the spiraling down of the assumptions regarding the future knowledge economy into a deep crisis that may unfold a new order. But whose? For the first time in centuries (except during the period of wars), we do not see the light at the end of the tunnel. We have become afraid of the future. This means, finally, that capitalism has killed modernity. For what purpose, we do not yet know: we can only recognize this as a tragic Oedipian moment of Western cultural evolution. Our states, heirs of the medieval tradition of divine power and omnipotence, no longer own the future. They are turning their eyes and actions away from it, concentrating on immediate solutions. The future has been privatized too. We are trapped.

"The way forward is therefore clear. We have to invent a new future."

3. Trapped?

The U.S. is drifting further away from Europe. The Internet has freed the Americans from their European birth complex. Will the U.S. be able to maintain its hegemonic status in the 21st century by forging new networks? Will the global 21st century look similar to the 18th century multipolar Europe? Nobody knows.

The Europe of Christendom was doomed by its local nature, for being unable to open up to new arrangements. It closed down. The way forward is therefore clear. We have to invent a new future.

We will have to nurture curiosity over and over again. And we will have to borrow from António Vieira his extraordinary vision—as valid and effective today as it was three hundred years ago, when he brightly stated that "to assess hope we have to measure the future".

Author contact information:
Email: jcaraca@gulbenkian.pt

References

1. Caraça, J., "Science et communication", Presses Univ. de France, Paris 1999.
2. Cippola, C., "Clocks and Culture", W.W. Norton & Co., New York 1978.
3. Freeman, C., "The Economics of Technical Change", Cambridge J E **18** (1994) 463.
4. Giddens, A., "The Consequences of Modernity", Blackwell, Oxford 1990.
5. Polanyi, K., "The great transformation", Beacon Press, Boston 1957.
6. Prigogine, I., "La fin des certitudes", Odile Jacob, Paris 1996.
7. Vieira, A., "História do Futuro" [1718], Imprensa Nacional, Lisboa 1982.
8. Wallerstein, I., "World-Systems Analysis", Duke University Press, Durham 2004.

CADMUS, Volume 3, No.2, May 2017, 10-44

Quest for a New Paradigm in Economics
A Synthesis of Views of the New Economics Working Group*

Garry Jacobs
Chief Executive Officer, World Academy of Art & Science;
Vice President, The Mother's Service Society

Mark Swilling
Distinguished Professor, School of Public Leadership, Stellenbosch University;
Fellow, World Academy of Art & Science

Winston P. Nagan
Chairman of the Board of Trustees, World Academy of Art & Science;
Sam T. Dell Research Scholar Professor of Law, University of Florida

Barry Gills
Professor, Department of Political & Economic Studies, University of Helsinki;
Fellow, World Academy of Art & Science

Jamie Morgan
Leeds Business School, UK

Abstract

The remarkable economic achievements of the past two centuries have cast an illusion of omniscience on the discipline of Economics, which even repeated catastrophic policy failures have still not entirely banished. The gap and disjuncture between prevailing economic wisdom and its effective application to promote human welfare and well-being are enormous and widening rapidly. The gap between current economic performance and the economic potential of global society has never been greater. Both have been aggravated by the rapid evolution of economy and society in recent decades. An ideology masquerading as scientific theory, mainstream theory fails to provide the necessary insights to guide us through the next phase of global social evolution. This paper summarizes major conclusions from a series of meetings organized by the World Academy of Art & Science over the past half-decade. It examines important premises and principles of a transdisciplinary framework for ecologically-sustainable, human-centered development founded on knowledge of the underlying social processes that govern human accomplishment and social evolution. It challenges the implicit values and assumptions on which current theory and practice are based. It exposes the central role played by social power in determining the operations of economy and the distribution of benefits in society. It seeks to construct a holistic paradigm to reunite and integrate thinking about economy with the political, legal, social, organizational, ecological and psychological dimensions of which economy has always been an inseparable part. It points to the need for a transnational theoretical framework as a unit of analysis

* See detailed acknowledgement of group member contributions at the end of the paper prior to the endnotes.

and emphasizes a global perspective, which aims to maximize the well-being of humanity as a whole. In recent times, growing awareness of the limitations of the present economic system and the real planetary boundaries and ecological constraints on unlimited growth has overshadowed exploration of the equally real social potential that lies unutilized due to limitations in current theory and policy. The central aim of the paper is to develop insights that will lead to formulation of a new paradigm of economics, which will generate effective public policies and solutions to existing crises; revolutionize textbooks and teaching of the discipline of Economics around the globe; unleash societal potential for meaningful transformations to benefit the welfare and well-being of all humanity; and safeguard the planetary environment for future generations.

1. Signals for Change

Humanity is confronted with multi-dimensional challenges of unparalleled scope, magnitude and complexity. They are global in extent and inextricably interconnected. They fail to respond to partial, piecemeal, sectoral solutions and uncoordinated national level initiatives. They ruthlessly expose the inadequacy of prevailing policies, institutions and social theory. These challenges encompass political, legal, technological, social, cultural and ecological issues, but economy lies at the heart of the matter. In recent decades, economy has supplanted war and politics as the primary field and engine for global social evolution.

The dismal science was founded during an age in which food, goods, money and information were scarce. Today we live in a world characterized by surplus global production capacity, unprecedented access to information, zero marginal cost products and services, the proliferation of complex and increasingly integrated networks operating at lightning speed, rapid growth of a sharing economy and collaborative production. These fundamental changes challenge many of the assumptions that underpin mainstream Economics. At the same time, we live in an age of increasingly unstable financial markets, huge corporate cash hoards, burgeoning capital surpluses playing the global casino for higher speculative returns, declining investment on Main Street, stagnant wages and a declining share of labor in national income in spite of rising labor productivity, rising levels of inequality, massive investments in automation and robotics aggravating already high levels of youth and chronic unemployment, fewer startups and IPOs, increasing concentration of global economic and financial power spurred by peak numbers of mergers and acquisitions and network effects, a huge boost in share buybacks generating windfall profits to investors and executives instead of investment in R&D, too-big-to-fail financial institutions thriving on moral hazard, massive offshore corporate tax evasion, and increasing power of money in politics.[*,†,‡] In addition, sustainability, efficient allocation and fair distribution are being seriously challenged by ecological limits with regard to freshwater, deforestation, land system change and climate

[*] Rana Faroohar reports that the number of new firms as a share of all businesses in USA shrank by 44% between 1978 and 2012 and six of the 10 biggest individual political donors in 2016 were hedge-fund barons. "American Capitalism's Great Crisis," *Time*, Mar. 12, 2016.

[†] Roc Armenter reports that the share of labor in US national income remained remarkably steady at 62% for almost 50 years before declining sharply in the new millennium. "A Bit of a Miracle No More: The Decline of the Labor Share", *Federal Reserve Bank of Philadelphia Research Department*, 3rd quarter 2015, 1.

[‡] According to ILO and OECD, between 1990 and 2014, 26 or 30 advanced countries reported a declining share of labor in national income ranging from about 6% in UK to over 10% in USA and more than 14% in Spain. Similar declines were reported in emerging countries including Turkey, South Africa and Mexico. ILO and OECD, "The Labour Share in G20 Economies", Feb. 15, 6.

change.[1] These positive and negative symptoms are both indicative of an economic system that has outgrown its intellectual foundations. They compel us to distinguish between positive and negative forms of development and to recognize that it is at least as important to discourage its negative expressions as it is to foster the positive.

Economics is in the midst of an identity crisis. Classical concepts and models no longer provide sufficient insight and guidance for navigating the complex nexus of forces evolving with ever increasing rapidity. Globalization has extended the boundaries of production, marketing, financial institutions and employment beyond effective reach, regulation and control by individual nation-states. The lightning speed of technological and social innovation has far outpaced the adaptive capacity of national level institutions, legislation and social attitudes. Existing economic theory struggles unsuccessfully to explain these developments and prescribe effective remedies within the existing conceptual system. Future economic prospects are characterized by increasing levels of volatility, instability and uncertainty. Public policy debate is marred by rising levels of doubt, confusion, pessimism, polarization, reactivity and extremism. The recent Stockholm Statement by thirteen eminent economists on principles of policymaking reflects the growing recognition that prevailing theory and policies are inadequate.[2]

Economics is no longer merely a battlefield for perpetual skirmishing between different social philosophies. It has become a field of confrontation between the past and the future. The stakes are too high and too urgent to be left to unstructured, leisurely academic debate or pious populist pronouncements. These symptoms point to the need for a fundamental, comprehensive reexamination of economic and social thought. They present a compelling call to transcend the limitations of existing knowledge and the prevailing conceptual systems in which it resides. They prompt us to seek a more inclusive and integrated framework within which current ideas complement and complete rather than compete with one another.

The reputation of Economics has benefited enormously from humanity's astounding economic progress over the past two centuries. Since 1800, real per capita living standards have multiplied approximately 12-fold in spite of a more than 7-fold growth in the world's population. That reflects an 84-fold growth of real world GDP in 200 years. By any standards, the progress has been phenomenal. Why, then, tamper with success? One obvious answer is that the rise in living standards for the vast majority of OECD countries has slowed dramatically in recent years and is no longer responding to conventional economic policy measures. Moreover, the major benefits of growth are accruing to an increasingly narrow portion of the population at the top. But a greater truth is that humanity's remarkable performance has been due to a great many factors outside the boundaries of conventional economic theory which have received inadequate recognition and attention. The 84-fold growth of GDP has been the result of the spread of democracy, unprecedented freedom of action, and soaring levels of education, which have combined to dramatically increase the aspirations, knowledge, skills, creativity and innovation of the workforce. It has been the product of massive advances in science and technology in fields such as transportation, communication, energy, mechanization, computation, and automation. Though less often recognized, it has equally been the consequence of strides in the technology of social organization, giving rise to countless new

types of institutions, systems and modes of interaction from the mail order catalog to e-commerce, from just-in-time inventory to global supply chain management, from franchising to outsourcing, from TV networks to social networks, and so on. And more significant than any of these, it has been the result of radical advances in human rights, dignity, freedom of thought, and social equality that have liberated human aspirations, energies and creativity from the shackles of all forms of discrimination, exploitation, injustice, slavery, apartheid, oppression, and persecution.

Greater understanding of the workings of economic systems has no doubt been a contributing factor, but one whose impact would have been severely limited were it not for these wider evolutionary changes. Today, the inadequacy of existing concepts acts more as a constraint than a catalyst because it focuses too narrowly on conventional economic instruments while neglecting the far more powerful social forces available for global progress. One of the aims of new economic and social theory must be to make conscious and explicit the full range of the forces that have supported the evolution of the global economy up to now and the full spectrum of policy instruments available to promote future progress. Moreover, it must seek to discover the creative social process by which these forces express themselves, the determinants that focus and direct their energies, the means by which these forces are channeled and transformed into power, and expressed through skilled execution of work.

Today Economics consists of a patchwork of premises, concepts, theories, models, measures and tools tenuously classified into several broad theoretical systems and grouped together—as opposed to truly integrated and unified—into myriad disciplines, schools, sub-disciplines and sub-schools. Many of the premises are based on acute observations of specific phenomena at least partially true at times in the past under certain circumstances and conditions, while others are theoretical postulates valid only under ideal conditions, largely non-existent in the real world. Many of the models are useful, though oversimplified, generalizations from specific events, often mistaken for reality itself. Many of the tools are useful for specific types of analysis. Some of the measures provide real insight into specific types of events, but lose much of their significance when aggregated or applied over extended periods of time. The superabundance of information available drowns serious theoretical debate in a sea of data and minute piecemeal analysis.[3] No matter how high-sounding, insightful or useful, they do not, all or in part, constitute an adequately coherent, cohesive, integrated framework of knowledge to understand, navigate and maximize human welfare and well-being during the complex, rapidly changing times in which we live. No matter how great the service they have provided along the way, there is an urgent need to move beyond.

New paradigms do not reject or invalidate existing truth. They place it in a wider context, as Relativity Theory and Quantum Mechanics established the boundaries within which the laws of Newtonian Physics remain fully valid. They revealed that the principles applicable to everyday phenomena on earth were insufficient to understand reality on a cosmic scale at velocities approaching the speed of light or at the infinitesimal scale of subatomic particles which constitute the foundation for the material world. Expanding the inquiry revealed unimagined physical powers and creative capabilities, which form the basis for recent advances in computing, biotechnology, lasers, nanotechnology and countless other fields. A potential

of even greater practical relevance to humanity awaits the development of new economic and social theory. Historically, such developments have tended to emerge out of obscurity on the periphery of prevailing thought, rather than by a reformulation at its intellectual center, due to the natural defensiveness of entrenched ideas. What is needed is not an all-out war to the finish between partial truths, but a new synthesis founded on a wider and deeper understanding of the principles, forces and processes governing social evolution.

1.1. Evolution of Economy

Intellectual paradigm shifts of this magnitude have occurred innumerable times in different fields of science. There are manifold signs that the time has come for another. The nature of economy has changed dramatically since the 18th century. Physiocrats pronounced agriculture as the true source of wealth and mercantilist policies enriched merchants and princes at the expense of the general public. Since then the concept of property has evolved from land and other types of material assets to include intangible technological, commercial and intellectual forms. The concept of capital has evolved to reflect the central role of individual and social relationships, capacities, organization, resourcefulness, creativity and innovation. The nature of economic goods and services and the relative contribution of agriculture, manufacturing and services have been radically altered. The non-material is no longer immaterial in economics. Information, intellectual property, social attitudes, public trust, brand loyalty, connectivity, organizational know-how, networks, human energy, vision and values have become powerful economic determinants. Values are a primary determinant of value in the 21st century.

The emergence of the knowledge-based service economy founded on a borderless communication and transportation network has transformed economy from relatively isolated and independent centers of mining, manufacturing, distribution and consumption into an increasingly interconnected, interdependent and unified global organization. The shift to services now pervades even agricultural and manufacturing activities and enterprises, where research, design, logistics, marketing and after-sales service have become the largest fields of employment. The enormous fixed capital investments involved in service delivery in transportation, communications, education and healthcare undermine the utility of conventional marginal cost economics. The marginal cost of an additional telecom customer, e-book reader, airline passenger, university student or hospital in-patient is approaching zero. The prolonged extension of utilization time from point of sale back five or ten years to the point of initial investments in basic research and forward many years to the point of final disposal and expiration of warranties makes the time dimension of product and service delivery an increasingly critical determinant of economic value.[4]

Economics can no longer afford to assume a positive relationship between economic activity, human welfare and well-being. The negative personal, social and ecological consequences of much of what we call growth increasingly offset its positive contribution. The boundaries between the monetarized and non-monetarized sectors of the economy are continuously changing, with significant impact on human welfare and well-being. Conventional economics measures a double income gain when a housewife takes a paid job

requiring a two-hour daily commute and hires another person to take care of the family and household, but it does not take into account the decline in quality of life, health, nutrition and well-being for the individual or the family or the environmental cost of two additional commuters in terms of higher fuel consumption and air pollution.

> *"A science of human welfare cannot legitimately hide behind claims of value-free, objective scientific neutrality."*

There is abounding evidence to show that the challenges and existential threats posed by ecological imbalances cannot be effectively managed by market mechanisms. The extraction cost and market price of raw materials are not reliable indices of their real value to present and future generations. Remedial responses to the impact of deteriorating air, soil and water quality are reflected in GDP as positive economic activity, when they actually result from degradation of natural capital and growing threats to human well-being. The global bottled water industry grew from $60 billion a decade earlier to nearly $170 billion by 2013 and it is expected to reach $280 billion by 2020.[5] But the gain in GDP is primarily due to a rising concern regarding the deterioration in water quality, hygiene and safety, rather than any real improvement in standards of living.

All these factors have influenced the development of economic thought in the 20th century, but almost exclusively within the framework of premises and boundaries established by conventional mainstream economic theory which are no longer sufficient to address the challenges and the opportunities of the 21st century.

1.2. Evolution of Society

Changes within the field of economy only partially reflect the wider evolutionary processes impacting on all fields of social life and their relationships and interdependencies with one another. Never before has the world been so intimately interconnected. Never before have the different sectors and aspects of social existence been so tightly integrated. It is somewhat startling to reflect that prior to the publication of *Limits to Growth* by the Club of Rome in 1972, economy and ecology were commonly perceived as independent spheres of existence subject to separate and largely unrelated forces. Climate change, politically instigated migration and rapid advances in robotics and artificial intelligence have radically and irrevocably demolished the naïve notion that political, legal, economic, social, cultural and ecological reality, theory and policy can be isolated and insulated from one another. In a world operating at the speed of light and evolving with astounding rapidity, static equilibrium models of reality packed in airtight containers are increasingly suspect.

The need for a new paradigm in Economics is only the most visible sign of a broader need for a radical reformulation of social science and the wider knowledge industry in general. Without a new paradigm in knowledge we cannot have a new paradigm in society.[6] Long after the natural sciences began to transcend the limitations of compartmentalized,

materialistic, mechanistic and reductionist modes of thinking, the social sciences have remained fragmented, isolated and largely independent of one another. In the absence of a comprehensive conceptual framework for the study of the individual and society, they operate based on different sets of assumptions, principles, social processes and human characteristics. A century after Physics evolved new paradigmatic thinking to reconcile Newtonian theory with the discoveries of Relativity and Quantum Mechanics, the social sciences remain grounded in static, fragmented, mechanistic Newtonian thinking. This is not surprising given the astounding complexity of human processes, which dwarf in magnitude the relative simplicity of purely physical and biological processes. They have developed in response to the growing recognition of the interrelatedness of all social phenomena and have had significant impact on the construction of economic models and projections. But, thus far, their impact on the foundations of mainstream Economic theory has been limited.

1.3. Modern Paradoxes

Other factors compel us to examine the need for a radical departure from conventional mainstream economic theory. We are confronted with a perplexing and disconcerting paradox of unmet needs and unutilized opportunities. We live in a world in which unprecedented abundance lives side by side with persistent and unmitigated poverty. Billions of people continue to live at subsistence levels, while global financial assets have multiplied twenty-fold, from $12 trillion in 1980 to upwards of $250 trillion in 2015, equivalent to nearly four times global GDP. Of this, a mere 15% goes to support the real economy and job creation.[7] The world possesses sufficient surplus capacity to produce every variety of goods to meet the needs of every human being on earth, yet billions lack the purchasing power to acquire them. Hundreds of millions of able-bodied, willing workers are without employment opportunities and more than a billion are underemployed, while urgent human needs remain unfulfilled for more and better food, clothing, housing, education, healthcare, communications, transportation, and other essentials of life. The most advanced technologies coexist alongside the most primitive living conditions. There is something perverse about a system with so much power and such visible incapacity to meet human needs. These apparent failures are sufficient confirmation that a better system must be possible and that the world urgently needs new thinking to make the new paradigm a reality.[8] There is the added irony that the world is spending nearly $1.7 trillion annually on military expenditure—25% more in constant dollars than the Cold War peak—rather than channeling even a fraction of this amount to remedy the economic root causes of violence and terrorism.

Economics is perplexed by a second paradox. At a time of unparalleled real-world interconnectivity, independence and integration, economic thought and policy in different fields have become increasingly fragmented and divorced. Financial markets, which originally evolved to pool capital for investment in the real economy of trade and industrial development, have become increasingly divorced from the real economy, a world unto themselves, an activity spinning its wheels without producing or providing goods or services that meet real world human needs, while generating turbulence and uncertainty that undermine the stability of the real economy and the security, welfare and well-being of countless human beings. Economic theory has become increasingly divorced from empirical

fact and common sense. Speculation masquerades as wealth creation, when in fact it destroys much more than it creates. Over $12 trillion in funds are tied up in unproductive national forex reserves as insurance against speculative raids on national currencies.[9] Investment banks channel trillions more into speculative investment in commodities with depositors' funds, while enjoying preferential domestic tax rates and offshore tax havens for their profiteering. The Tax Justice Network has estimated that between $20 and $30 trillion are presently held in "offshore" tax havens—thus not available for taxation to generate the much-needed revenue for public investment and global public goods. "Just taxation" on global scale is thus a central problem that needs to be addressed. The "fiscal crisis of the state" is a symptom and a consequence of this global scale of vast concentration of wealth outside the tax system. A new paradigm is needed that transcends the fundamental dichotomies that have characterized traditional or mainstream Economics by the separation of economy from politics, society and nature.

"A true science of economy must be founded on an integrated science of society."

So too, the development and application of technology, which originally evolved to enhance the productivity, comfort and convenience of human beings, have become increasingly an aim and end in themselves, proliferating without consideration for their impact on human beings. The preference for technology over labor is not always beneficial, even in narrow economic terms. The wholesale rush toward mechanization and automation is thrown into overdrive by a policy bias toward capital and technology-intensive investments over investments in human capital, welfare and well-being. Economics has developed innumerable tools and measures to aid and assess the impact of technology investment decisions, but it refuses to come to terms with their enormous social consequences. Sensitive to the bogey of communism even a quarter century after the collapse of the Soviet system, economists persist in dealing with the economics of production and the economics of consumption as independent of one another. Additional expenditure on automation does not necessarily promote greater human welfare, unless it is accompanied by appropriate policies to ensure the distribution of benefits to the wider population. A science of human welfare cannot legitimately hide behind claims of value-free, objective scientific neutrality. Technological advances are the result of the cumulative progress of humanity over centuries and the benefits must necessarily accrue to the society at large. A science that refuses to take a position on this seminal issue lacks integrity, credibility and humanity.

A similar divorce pervades the relationship between economy and ecology, where life-supporting air and water have been reduced to tradeable economic goods and the impact of pollution on human health and quality of life has been reduced to unavoidable collateral damage in the war between unbridled, conspicuous consumption and sustainable well-being. Based on prevailing theory, we are called upon to entrust the fate of future generations and the planet we live on to the blind wisdom of a marketplace, whose very rules and functioning are framed to preserve and enhance the concentration of advantage among powerful vested interests.

And finally, there is the grand divorce between economy and society, an intellectual delusion masquerading as legitimate scientific theory. Classical economics views economy as a closed system. This viewpoint enabled economists to develop theories and models that ignore the impact of factors that have not been classified as strictly economic. This approach is no longer useful or tenable given the increasing complexity, integration and rapid transformation of social existence. The US subprime mortgage crisis and resulting global financial crisis have impacted every field of social life around the world. Economy is a subset of society, just as finance is a subsystem of economy. Their only rationale and claim to legitimacy are based on the service they provide to the wider society of which they are a part. Money and markets are instruments for social progress. *Economy exists to serve, not to dictate or dominate humanity.* Economic rules are man-made and intended to promote the stability, security, welfare and well-being of all human beings. All wealth is a social creation and has social consequences.

The notion of economy as separate from politics, administration and law is illusory. The perennial public debate over the role of government in regulating markets is misplaced. Markets depend for their effective functioning on an infrastructure of law to protect property and contract rights, a judicial system to enforce those rights, public institutions to prevent collusion and control monopoly. Property is a legal concept defined and enforced by law and government. Before property, there was only physical possession backed by force. Without law and government, exchange is reduced to the law of the jungle. Primitive forms of money may have preceded government-issued varieties of coin and currency, but the money we utilize today is founded on the productivity, strength, stability and integrity of the entire global political-legal-economic system.

A new paradigm in economic thinking must be founded on a broader, more inclusive perspective. Economy does not exist separate from the social aspirations, cultural values and psychological expectations of human beings. The real source, foundation and determinant of economic activity is the society as a whole. Economic capacity is founded on and determined by political, legal, organizational, educational, social, psychological, cultural and ecological factors and can only be understood when viewed from this wider perspective. Just as human health depends on the functioning of every organ, tissue and system in the body, economic systems depend on the functioning of the society as a whole. Prevailing economic theory, like much of modern medicine, cuts up reality into tiny specialized areas and attempts to deal with them piecemeal. In Medicine, it frequently leads to side effects of treatment more serious than the disease being treated. In Economics it can lead to unintended consequences of enormous magnitude for global society.

Reality is multidimensional and integrated. To be effective, knowledge of that reality must be too. It is always shaped by a multitude of aspects, perspectives, and forces. *Economy, politics, society, and culture are inseparable dimensions of a single integrated reality.* The tendency to condense and compress reality into simplistic formulas is a form of willful ignorance that facilitates quantification, calculation and multiple choice examinations. In the process it conditions the mind to a reductionist mode of thinking blind to the complexity and integral nature of life.

Under the reigning economics paradigm, economy is regarded as being "disembedded" from society, whereas it should be regarded as being an integral and inseparable component of society, which does not and cannot exist outside of a social context. The economy exists to serve the needs of society; society does not exist to serve the needs of the economy as master over society and individuals. A new paradigm in economic thinking needs to be founded on this wider view of the social whole. A true science of economy must be founded on an integrated science of society. Development of a real science of economy will only be possible when economics is viewed as a subset and integral aspect of the larger society of which it is a part.

1.4. Social Potential and Effective Power

The world is beset with problems that appear insoluble largely because we are unconscious of the true extent of the social capacity that has been created and the social potential still waiting to be developed. The limitations of present theory prevent us from seeing the incredible power society has generated for accomplishment in all fields. A new paradigm in thought can provide the intellectual foundations for achieving a fuller and richer social life for humanity than anything now imaginable, if only we are willing to discard the self-imposed limitations of outmoded conceptions, vested interests and dead conventions.[10]

Economics was founded as the dismal science at a time of scarcity. Its mentality and underlying assumptions are still powerfully influenced by social conditions of that period. In spite of the remarkable achievements of the past two centuries, the idea that society has the power to meet the material and social needs of all its citizens has not displaced the earlier idea of scarcity. We still tend to think of economy largely as a win-lose, zero sum game. If the magnitude of the untapped social potential were more widely recognized, then the public would clamor for and demand a better system far more vehemently than it does today. Prevailing economic thought is founded on the Newtonian misconception that economy is a closed physical system consisting of finite resources and limited potential. Conservation of energy and momentum may be valid for the movement of inanimate physical objects, but it is insufficient to circumscribe the limits of living systems and conscious human communities.

The historical record refutes a Malthusian view of economy. Malthus was one of the first to perceive the importance of biophysical constraints. Two hundred years ago, he rightly perceived the threat that rapid population growth would overreach the capacity for food supply based on the system of production and the technology prevalent at that time. The awareness generated by his controversial assertions may well have served as a conscious or subconscious impetus for action. His perception of the problem did not take into account the opening up of vast areas of land in the New World, the application of steam power in agriculture, the adoption of farm machinery to raise land productivity, the spread of irrigation systems, advances in soil agronomy, crop genetics, agricultural research, farmer education and extension services, post-harvest technology and innumerable other innovations. Since then the world's population has multiplied more than seven-fold, but per capita availability and consumption of food have grown even faster. Malthus was not mistaken about the importance of environmental constraints, but he lacked

a wider understanding of the complex factors governing the interaction and interdependence between the human and physical ecologies. The supply of many of the earth's physical resources is limited, but the capacity for improving productivity and effective utilization of those resources through application of knowledge, technology and organization is not. Material substances are limited, but human resourcefulness is not.

> *"It is no longer acceptable for economics to ignore the issue of social power which underlies the entire workings of the economic system."*

Our very conception of what constitutes a resource depends on the application of human intelligence, knowledge and resourcefulness. Human consciousness is the ultimate resource, though it is poorly utilized in its present fragmented state. It is human consciousness that recognizes and adopts material substance and energy for productive purposes. Thus, the second-most common element in the Earth's crust, silicon, was once regarded only as raw material for brick- and glass-making. A few millennia later it became the foundation for semiconductors and fiber optics. Now it is key to building renewable energy infrastructures. Mindless growth fueled by wasteful consumption of material resources already poses existential threats to society and certainly has its limits, but improvements in human welfare and well-being do not. Social progress founded on the continuous development and application of human consciousness and capacity shifts the paradigm from limits to economic growth to unlimited development of human welfare and well-being.

At the same time, it is essential to recognize that the conventional conception in Economics that "value" exists only in relation to human utility is deeply problematic. Human awareness and perception may be needed in order for humanity to consciously harness the powers of nature, but the value of nature can never be adequately captured by the limited perspective of human understanding at any point in time. A new perspective is needed which recognizes that much of what exists and occurs within the biosphere has intrinsic "value" regardless of human intervention or activity. To damage and destroy the biospheric systems and life within them is to destroy the most fundamental source of "value" underpinning human existence.

The physical world and material resources constitute the physical foundation for economy, but new economic value creation in the 21st century is very largely driven by non-material resources—knowledge, information, technology, skill, social energy and social organization—that are not subject to finite limitations. Education, healthcare, financial services, retailing, tourism, transportation and communication and other major components of the tertiary sector now represent 74% of economic activity in OECD countries and 68.5% worldwide.* Even in manufacturing, services such as R&D, accounting, HRD, sales, marketing, product service and disposal often represent more than 50% of the total. Material resources and energy certainly constitute essential inputs for the service sector as they do for others, but

* World Bank database, http://data.worldbank.org/indicator/NV.SRV.TETC.ZS

continuous economic advancement is not strictly or proportionately limited in the manner that Newton's principle of conservation limits the performance of closed physical systems.

The application of mainstream economic theory and policy taps only a small portion of the productive potential of society. Psychologists have found that the average human being utilizes only a small portion of his or her intellectual capacity. More and better education increases the effective utilization of mental capacity. At the same time it broadens mental horizons, raises expectations and fosters creative initiative. It develops and increases the effective utilization of psychological capacity as well. Similarly, new economic thinking has the potential to vastly enhance the security, welfare and well-being generated by economic activity. Any economic system can be enhanced by improving access to affordable, quality education, opportunities for employment, a conducive environment for entrepreneurship, a transparent and fair legal system, access to information and credit, a level playing field in the market, unbiased public policies, equitable income distribution, appropriate pricing and taxation of natural resources and pollution, protection for the global commons, and a wide range of other social variables. Reducing prosperity to a set of econometric equilibrium formulas blinds us to the vast untapped social potential. Can anyone seriously doubt that redirecting the world's 250 trillion plus financial resources from speculative to productive purposes could vastly enhance human welfare in an environmentally sustainable manner? According to recent projections, the world needs to invest about $5–7 trillion per year in sustainable technologies and infrastructure facilities. That is less than the annual reinvestment by the world's largest pension and insurance companies. What better way could these firms invest their resources to reduce uncertainty and ensure security for their shareholders?

Society is an immeasurable reservoir of social potential enriched by developed and undeveloped human endowments and organizational capabilities. Wealth creation, welfare and well-being are a function of human relationships. The greater the development of the individual and the greater the ease, speed, accessibility and facility of coordinated, cooperative harmonious relationships between people and organizations, the greater the productivity, prosperity and cultural enrichment of society as a whole.

Social energy determines the potential, but that potential is rarely approached, except perhaps in times of extreme crisis or highest idealism and solidarity, characteristic of the greatest moments of history. Under normal conditions, society harnesses only a small portion of its energies for productive purposes. Social power is the capacity of the society to direct, organize and utilize that energy for effective action by means of laws, social systems, institutions, knowledge and skills to accomplish social objectives. The wartime mobilization of production gives an indication of how large is the gap between normal social performance and the social potential.

Nor is human and social potential limited to these few factors. Anything that increases the aspiration, freedom, dignity, self-respect, self-confidence, knowledge, skills, values, independent thinking, creativity, innovation and dynamism of the individual is a potential catalyst for greater wealth creation. Anything that fosters greater contact, relationship, trust, confidence, equality, organization and innovation within and between communities is a potential

catalyst for greater wealth creation. At a time when 'buyer beware' was the dominant motto in business, more than a century ago Sears introduced its famed 'satisfaction guaranteed or your money back' as a means to win the trust of suspicious rural mail order customers. Within a decade it grew to become the largest retailer in the world, a position it retained for more than seven decades. Amazon is repeating that feat today by creating a global system that maximizes transparency, choice and confidence.

"The objective of New Economic Theory (NET) is to formulate theoretical and practical knowledge required to maximize economic security, human welfare and individual well-being of all humanity in a manner consistent with universal human rights, cultural diversity and civilizational values."

Today global society possesses unprecedented and ever-expanding power in innumerable forms. But the results generated by that power depend on the actual way in which that power is exercised and distributed in society. The wider the distribution of power, the greater the total power generated and the greater the overall social benefits. Monarchs and autocrats possess greater individual authority than elected officers in modern democracies, but the overall power for accomplishment of the societies they govern is severely limited, because they harness only a miniscule portion of the energy and initiative from their members. Democracy distributes political power widely, so the power of any individual is limited, but the total capacity of the society is very much greater. The same principle applies to the concentration and distribution of economic power. *Extreme concentration of wealth, whether by legal or illegal means, imparts enormous power to a few individuals, but substantially abridges the overall power of the society.*

It is no longer acceptable for economics to ignore the issue of social power which underlies the entire workings of the economic system. Until recently the distribution of power has been regarded by most economists as an issue for study by political scientists and sociologists. The exclusion of power from economic discourse was largely the effort of positivists to insulate mainstream economic thought from contamination by Marxist analysis. This was achieved by strengthening the intellectual boundaries between economics as understood in the capitalistic world and distancing economic analysis from the influence of power processes. Popper's trenchant attack on the non-scientific nature of Marxist thought further aided the narrowing of economics to meet the requirements of scientific rigor. The recent work of economists such as Thomas Piketty on economic inequality, growing awareness of the inextricable relationship between politics and economics, highly visible attention to the influence of money and corporations on elections and public procurement, the legal and political basis for the expanding definition of intellectual property rights, and the impact of regulatory capture on public policy and markets in fields such as finance, energy and pharmaceuticals necessitates restoring the issue of social power to a central place in economic theory.

1.5. Restoring the Subjective Dimension

Modern economies are conscious living systems increasingly fueled by human and social resources that are not subject to inherent material limits. Material resources are consumed in the process of utilization. Non-material resources such as information, knowledge, technology, skill and organization multiply in the very process of being utilized. Human capital and social capital grow in quality, utility and value through usage and experience.

Imitating the 19th century preoccupation of the natural sciences with the objective study of external reality, Economics tends to neglect the subjective dimension of reality which plays such a central role in human life. During the 20th century physicists and biologists largely abandoned this view, but it still remains the guiding philosophy of Economics even today. The argument that subjective factors are too difficult to measure is increasingly challenged by the development of alternative measures and justifies much more serious efforts by mainstream economists to evolve new methods, rather than ignore this essential dimension of reality.

New paradigm thinking in the social sciences can no longer deny the central importance of the subjective dimension of reality nor seek to reduce it to its chemical and nervous physiological constituents. Every great leader knows the enormous importance of subjective factors in human accomplishment, which Tolstoy referred to as the intangible but very powerful 'spirit of the army'. Every great political leader knows that the faith, confidence and determination of a nation's people are a more powerful force for victory than a huge army and modern weaponry, as Washington, Napoleon, Churchill and Gandhi demonstrated by their astonishing achievements against impossible military odds. Every great business leader knows that aspiration, confidence and determination are more important determinants of business success than a company's balance sheet, as Lee Iacocca demonstrated so dramatically by bringing back Chrysler from the brink of bankruptcy in the early 1980s. Every thoughtful student of economics knows the same thing, as US President Roosevelt demonstrated in 1933 when he stopped America's greatest banking crisis by appealing to the American people to redeposit their hard-earned life savings to save a fast-failing financial system.[11] The rapid rise of East Asia after the Second World War, Japan's failure to recover peak economic performance after the asset bubble burst in 1988, and Korea's rapid recovery after the 1998 East Asian Crisis are only explicable when subjective factors of national aspiration are taken into account. Economic theory that does not fully recognize and reflect the central role of subjective factors in economic performance is a relic of 18th century materialistic, mechanistic thinking in an age when the human being is the single most important driver of a more equitable and sustainable future.

1.6. Value-Based Science

The natural and social sciences differ in another significant respect. The quest of natural science is to discover the immutable natural laws governing the world around us. The role of the natural scientist is as impartial, objective observer free from value judgements. In contrast, the notion of immutable Newtonian laws of nature has no place in the social sciences.

The social sciences study the world and behavior of conscious human beings, whose habits and propensities are goal-oriented and at least partially subject to conscious choice. They change over time, undergo voluntary modification and conscious evolution. And yet, the most tenacious commitment to this idea today persists in the social sciences.

All scientific inquiry begins with a study of phenomena as they exist to understand their characteristics, structures and the processes by which they function. Yet this quest is informed by the values, mindsets and contexts of the scientists themselves—from their gender, to race, educational background and location in the world. A fundamental challenge in the social sciences is to discover the social processes by which people meet needs, fulfill aspirations and achieve goals. Impartial knowledge of what pertains is not sufficient. It must necessarily be examined in the light of the values and goals humanity seeks to realize.

Of all the social sciences, Economics has been most strongly influenced by the philosophy of positivism and the influence of Hume, who insisted that science would not retain its credibility if it confused the study of phenomena as they are with the study of what we think they should become. Hume's distinction was powerful: if economics were contaminated with the discourse on values, it could not qualify as science. In order to strengthen the scientific boundaries of the discipline, economics became partly an empirical science and partly a logical science influenced by applied mathematics. In doing so, it was compelled to adopt overly simplified and, in some cases, mythical assumptions and generalizations that lent themselves to quantitative analysis. Over time the distinction between premises and reality has become increasingly obscure, resulting in the illusion that the models actually represent the real world, an error akin to assuming that in vitro laboratory experiments on chemicals and microorganisms are a reliable proxy for human clinical trials in pharmacology.

Philosopher of science Karl Popper cautioned against *misguided naturalism* in the social sciences. He argued that practical impact, not just theoretical understanding, must be considered primary in the social sciences. He emphasized the ethical dimension of social sciences—and called on scientists to accept moral responsibility for social outcomes. It is noteworthy that Adam Smith regarded himself as a moral philosopher, not an economist. Smith was looking for ways to enhance human welfare, not seeking to formulate universal laws of economy true for all nations, all times and all people. While many social scientists have heeded Popper's caution, mainstream economic thinking still attempts to position itself as objective, value-free science while its basic premises are founded on implicit values which are rarely discussed.[12]

Economics needs to become value-conscious. It needs to make explicit the goals, values and premises on which its knowledge is based. The objective of New Economic Theory (NET) is to formulate theoretical and practical knowledge required to maximize economic security, human welfare and individual well-being of all humanity in a manner consistent with universal human rights, cultural diversity and civilizational values and what it will mean to live in harmony with nature. Economic security ensures minimum material needs. Human welfare encompasses a wider range of material and social needs related to safety, health, education, social security. Individual well-being encompasses higher level social,

cultural, psychological and spiritual aspirations for freedom of choice, respect, free association, enjoyment, creative self-expression, individual development and self-realization. And sustainability means achieving this in ways that restore the natural systems on which we depend. The objective of economics is not production for its own sake or economic growth for growth's sake. The goal is not to discover immutable, universal, natural laws of economy based on any existing precedent, model or theory, but to identify the laws and first principles of a social system suitable for promoting global human welfare and well-being.

2. Limitations of Mainstream Economics

The objective of this paper is not a critique of mainstream economic thinking but rather a call to evolve new theory that transcends its limitations. There have been innumerable critiques in recent years identifying the limitations, errors, omissions, flawed logic, inconsistencies and contradictions in prevailing mainstream economic theory.[13] Useful modifications have also been incorporated reflecting insights from sociology, psychology and ecology, but they do not question the core assumptions of mainstream economics.

The following is a partial summary of major problems, limitations and failures of mainstream economic theory:

- It fails to achieve vital social goals—access to essential needs, full employment, equitable income distribution, economic security and welfare for all, true freedom of choice, social justice, social stability and harmony.
- It regards growth as synonymous with rising levels of human welfare when it may actually be the very opposite.
- In an effort to simulate the scientific rigor founded in the natural sciences, it has adopted theoretical and methodological assumptions and overly simplified generalizations that do not conform to the way economies actually work, resulting in a radical gulf between theory and practice. Highly questionable assumptions and models about the functioning and neutrality of markets, rational choice, marginal costs and benefits, equal access to information, additive individual utility functions and profit-maximization are a few well-known examples.[14,15,16,17] In an open letter to the *New York Times*, Paul Krugman has cautioned against mistaking the beauty of mathematical equations for truth.[18]
- It regards society and the environment as externalities rather than as indispensable agents in every productive process.[19] It operates based on a false accounting system that both omits and misrepresents vital information regarding the social and environmental consequences of economic activity, including the economic and social costs of environmental degradation and the true replacement cost of non-renewable resources.
- It regards economic price as a proxy for the real value of transactions to human beings and human welfare.
- It is a-social in the sense that it ignores the existence of society and social processes, neglects the central role of cooperation and trust, and considers fair and just allocation and distribution as non-economic issues.

- It is based on static equilibrium models that are inadequate to describe and explain recurrent patterns of instability, frequent crisis and rapidly evolving social processes that characterize economic systems.
- It is so fixated on monetary values that the physical world becomes invisible and is neglected. Everything becomes substitutable, absolute scarcities do not exist, and the physical world has no impact on the economy. It is based on the implicit assumption of freely available resources and sinks for material and energy that are in conflict with the existence of biophysical constraints. As a result, it is unable to address the issue of biophysical constraints and reconcile the apparent conflict between economic growth and sustainability.[20]
- It fails to reflect the real impact of transactions on society and on the environment, such as the social costs of unemployment, pollution and climate change.
- It is still modeled on 19th century concepts applicable to local and national economies during the Industrial Revolution, disregarding fundamental changes in the principles governing the modern service economy.
- It is founded on invalid premises regarding the rationality of human decision-making that are in direct contradiction to psychological research and historical evidence.
- It is based on naïve assumptions regarding the relationship between the financial and the real economy which have resulted in a reckless, destabilizing and dangerous expansion of speculative financial markets based on tools aptly described by Warren Buffet as 'weapons of financial mass destruction'.
- It fails to properly account for the role of credit and private debt in the economy.[21]
- It is based on a narrow economic concept of efficiency that ignores the social implications and social costs of profit maximization. The efficiency of firms achieved by replacement of workers with machines is not synonymous with the efficiency of society that is faced with rising levels of unemployment, welfare costs, crime and violence.

2.1. Theoretical Problems

These shortcomings are the result of mental and social constructions, implicit assumptions and values which need to be consciously recognized and subject to examination, e.g. the assumption that pricing of resources at the cost of extraction reflects their real value to society or that extending intellectual property rights promotes social justice. These shortcomings arise as a result of more fundamental theoretical limitations:

- *Disciplinary Reductionism:* Economics shares shortcomings common to other disciplines in the social sciences. They are all the product of the attempt to reconstruct the unity of social life by the mechanical assemblage of independent concepts, factors, forces and components which in reality constitute an inseparable unity. Efforts to isolate and insulate the functioning of economic factors from political, legal, technological, social, psychological, cultural and ecological factors are an artificial

abstraction intended to reduce real-world complexity into terms that lend themselves to mathematical modeling. This disciplinary reductionism destroys essential knowledge and obscures underlying assumptions and premises on which prevalent theories are based. More importantly, it diverts attention and discussion away from critical factors that influence economic outcomes.

- *Mathematics:* In an effort to achieve the characteristics of a mathematical science, it resorts to inappropriate use of mathematics and statistical analysis, requiring that almost all types of economics be based on models and produce mathematical proofs in order to be taken seriously. The effort to reduce the rich variability and complexity of social reality into linear equations and relations, simple calculus and central limit theorems leads to conclusions that are logically coherent but most often widely divergent from the underlying social reality they seek to model. There is not a meaningful mathematical solution for all economic problems. Insistence on mathematical rendering as the default mode of expression distorts the selection of subjects for study, leads to the omission of important qualitative factors, and severely hampers the overall progress in economics.
- *Regulation:* Faith in the wisdom of self-regulated markets is a misapplication of principles from the natural sciences. Markets are not self-regulating mechanisms that optimally utilize all available factors of production to achieve full employment and price stability. Today's youth unemployment levels ranging from 25-50% or more are only one of the most conspicuous exceptions. Unregulated markets are neither free, nor fair, nor socially efficient. Left to themselves they tend toward disequilibrium, which is why institutions matter. Disequilibrium takes the form of recurrent systemic crises and systemic instability, which should be regarded as patterns of central concern for analysis in economic theory.
- *Globalization:* Economic theory founded on the primacy of national level markets and policies is inadequate to comprehend economic functioning in an increasingly interconnected and globalized economy. Thus, employment is still modeled at the national level in an age when international and global influences are of growing importance. For example, a truly global framework would necessarily take into account the net impact on global job creation and environmental pollution of shifting production to locations in other countries. The traditional nation-based perspective of employment fails to take into account the enormous positive impact of global economic growth on job creation, because many of those jobs are created in other countries. Jobless growth is a misnomer. When the impact of domestic growth on total employment is taken into account, the most economically advanced countries are actually running a net negative unemployment that is not immediately apparent, because we focus only on jobs created in the domestic economy. High income countries are net job exporters. These jobs, in turn, spur a rise in incomes, soaring levels of consumer demand and demand for more sophisticated technologies produced elsewhere. Thus, the generation of jobs in other countries is a powerful engine for both continuous expansion of the global economy as well as for continuous global job growth. The phenomenon of job exports helps

explain the remarkable fact that total global employment has more than kept pace with population growth and technological development during the past six decades.[22]

- *Social Power:* The mechanistic view of economic systems as a function of inputs and outputs ignores the immense importance of social factors that determine the exercise of power in society, access to resources and the distribution of economic benefits. One example is how social factors impact on economic outcomes, the extension of copyright and patent rights beyond the level needed to encourage innovation results in higher prices to consumers and higher entry barriers for competitors.
- *Evolution:* Rapid evolution is taking place simultaneously in fields such as science, technology, education, organization, law, governance, public awareness, social aspirations and social power. *Economy and society are continuously evolving*, so that static (non-evolutionary) concepts, theories and models based on the industrial economy are of decreasing relevance and utility in a knowledge-based service economy dominated by the financial sector.
- *Concept of Value:* Market prices are not objective, universal measures of value that lead to an optimal allocation of resources. The market accords equal value to life-saving and life-destroying activities, the essential and the trivial, the legal and the criminal, to $100,000 in food grains and $100,000 for a movie actress' dress. Market-determined wage rates do not reflect workers' productivity or generate an equitable distribution of income. Moreover, current theory regards all monetary values as positive, whereas a great many economic activities either result from or contribute to the generation of negative value-added (deducted value), as in the case of the destruction arising from war, industrial pollution and environmental degradation, rising rates of drug use and crime and higher healthcare costs due to chronic unemployment, etc.[23]
- *Rational Markets:* The premise that markets are rational is itself irrational. The recent collapse of global oil prices, the 2008 subprime mortgage crisis and the tripling of prices on NASDAQ before the dot com bubble burst in 2000 are glaring instances.[*]
- *Profit-Maximization:* Short-term profit-maximization by enterprises to create value for executives and shareholders is often at the expense of customers, employees, public welfare and the long-term viability of the firm itself. Profit maximization by financial institutions with depositors' money in the previous decade nearly bankrupted the US financial system and precipitated a global crisis.
- *Measurement of Growth and Human Welfare:* A change in economic measurement is essential in order to escape from the blind logic of insufficient concepts. The performance of the economy cannot be realistically assessed by measuring the rate of change of a few macroeconomic variables. All types of growth are not of equal value. Some types are actually negative in terms of their impact on society and human welfare. Rising incomes of the super-rich, growth resulting from war or a Fukushima-type industrial accident, growth in consumption of alcohol and antidepressants, growth

[*] According to Adair Turner NASDAQ rose from 1500 to around '4500 or 5000' before falling back to 1500 after the bust.

resulting from an upward spiraling of oil or speculative real estate prices, growth in public expenditure due to an increase in criminal prosecutions or rising levels of incarceration in prisons are not of equal economic, social or human value to growth that raises the poorest above the poverty line, growth in public or private investment in education and public health, growth in the construction of new homes and public facilities, or growth in the building of new factories to produce goods and create jobs that improve the quality of human life.

- *Non-Monetarized Sector:* Human welfare is a result of activities that take place in the monetarized sector by exchange of money and the non-monetarized sector. A great many of the most valuable sources of human welfare and well-being, especially those undertaken by families and communities in what is referred to as the core sphere, do not involve exchange of money. So too, many of the greatest threats to welfare and well-being, especially those undertaken by families and communities in what is referred to as the core sphere, are not accounted for in monetary terms. Moreover, the line between these sectors is constantly changing and is impacted by public policies.
- *Disconnecting economy from ecology:* Economics as the discipline of the industrial revolution emerged when there was no evidence that natural resources were finite and that the atmosphere could be altered by human activity. This is why economics has taken nature for granted, assuming that resources are unlimited and natural systems could absorb unlimited amounts of pollution. Once economies are recognized as embedded within ecologies that are themselves being degraded, then it will become necessary to accept that it will be impossible to improve well-being for all in more equitable economies if the costs of resource depletion and environmental degradation keep rising. Restoring the future may well become a driver of innovation and economic development—this is certainly true for the renewable energy revolution, with investments in renewables since 2009 greater every year than those in fossil fuels.
- *Ignoring space:* People live in particular spaces, from large cities to small towns and rural areas. Economic relationships and connections to natural systems are shaped by the way these spaces are configured. Sprawling American cities cost more per individual to keep going, which means they require more finance and resources. European cities are more efficient and equitable. Developing cities are largely divided between a small informal and a large formal sector. Economics has tended to ignore space, and yet has assumed that the large bulk of economic production and consumption in modern economies takes place in cities. Urbanization and industrialization have been seen as the indicators of modernization. However, cities can be designed appropriately or not: they can be inclusive or exclusive, more or less equitable, more or less sustainable, more or less safe, more or less functional for the right kinds of productive activities as opposed to property speculation.

Mainstream Economics consists of a few main theories supported by a patchwork of concepts, theorems and models lacking the common foundation, consistency and integration that

characterize knowledge in the natural sciences. However useful elements of the patchwork may be for shedding light on specific issues and fields of activity, they do not constitute in whole or in part a coherent theory of wealth creation, welfare and well-being. Moreover, they fail to address wider and more fundamental issues that need to be considered in order to place new economic theory on a sound basis.

One response to the inadequacy of mainstream economic theory has been the recent proliferation of alternative theories loosely grouped under the heading "heterodox economics". This group includes development, ecological, evolutionary, post-Keynesian, post-Marxist and numerous other schools of economic thought.[*] Each focuses attention on a dimension of economics that is neglected or misunderstood by mainstream theory. In spite of their legion numbers, mainstream theory entrenched in academic citadels continues to effectively drown out most dissenting viewpoints. This assemblage of alternative models and theories is an important development, but it is not sufficiently comprehensive to replace prevailing orthodoxy. We need theory that integrates complementary aspects of the truth, rather than ignoring or rejecting all dissent as superfluous. We need an integrated framework for the social sciences, similar to what we find in the natural sciences.

3. Objectives of New Economic Theory

The call for new economic theory is based on the premise that the persistence of poverty together with rising levels of unemployment, inequality and ecological degradation reflect the limits of the present conceptual system, rather the practical limits of sustainable human development. A new paradigm in economic thinking is needed to make conscious and explicit the underlying concepts that limit humanity's ability to promote rapid advances in welfare and well-being for all human beings.

Economic theory shapes society by shaping understandings, policies, institutions, values, aspirations and beliefs about what is possible. It also provides implicit justification for the application and distribution of social power and the explicit economic arrangements used to support it. It is still difficult to conceive of what precisely should be the shape of new economic theory, but some of its essential characteristics can certainly be identified.

Economics should be explicitly goal-oriented and value-based. It must shed the poise of ivory-tower scientific objectivity and accept responsibility for the wider social and political consequences of economic activity. The only legitimate goal of economic theory is to maximize the welfare and well-being of all human beings. The validity of theory should be judged based on its efficacy in achieving these goals. It should be based on recognition of the true value of human beings as the most precious and perishable of all resources and the source of all creativity and innovation. It should be founded on a global ethic that seeks to maximize the development of human capacities both for their contribution to human welfare and to our sense of fulfilment as productive human beings.

[*] Joanilio Rodolpho Teixeira, et al., presentation on "Foundations of Economics as a Science: Hetherodox View And Critical Approach" at XIII International Colloquium, organized by Centre for African, Asian and Latin American Studies (CEsA), Research in Social Sciences and Management (CSG) and Lisbon School of Economics and Management (ISEG) of the University of Lisbon, May 11-13, 2016.

The objective of economic activity should be sustainable security, welfare and well-being of all human beings, not merely growth and not merely prosperity for a minority of people or some countries.

- NET must include the generation of wealth as a stock which empowers and provides security, welfare as a flow, and well-being as a status which depends on the interaction between intrinsic and extrinsic factors.
- Human welfare and well-being are products of the whole society, of which security, governance, economy, and culture are inseparable parts. They are the product of both monetarized and non-monetarized activities. They are also closely related to the distribution of social power. Social power widely distributed is prosperity. Social power is the distribution system for prosperity.
- All human activity takes place within an environment which includes the action and interaction of physical, social, mental and cultural factors and this environment undergoes a continuous process of evolution. Therefore, the theory must take into account the impact, characteristics and evolution of the environment.

4. Axiological Foundations of NET

NET needs to replace the implicit values of current theory, which often favor specific classes and activities in the guise of freedom and impartiality, with explicit affirmation of values that promote the equitable development of all human beings. Among these, the implicit power exercised by money over public policies and the distribution of benefits in democratic society needs to be fully exposed. *As freedom is a sacred value according to current democratic political theory, equality should be explicitly recognized as a sacred value by new economic theory. The institution of democracy has been conceived as a means to promote individual freedom, though in practice it too often sacrifices real freedom to the tyranny of a majority, an electoral minority or a plutocratic elite. NET should provide the theoretical framework and environmental policies needed to make markets effective instruments for achieving real social equality. Political economy needs to be restored to its rightful position as the arbiter of economic outcomes.*

Values express intention and commitment, but they are not merely utopian ideals or ethical principles. They represent the highest abstract mental formulations of life principles with immense power for practical accomplishment. They represent the quintessence of humanity's acquired wisdom regarding the necessary foundations for human survival, growth, development and evolution.

NET will need to examine the fundamental values on which economic thought is based. It will need to make explicit the values it consciously seeks to promote. It will also need to recognize the tensions and apparent contradictions between values and explain how they can be reconciled in practice.

NET should be based on universally recognized human values, including

1. Respect for Humanity – the inestimable value and unlimited developmental potential of the human being. Human welfare and well-being are the central objective. The development of human capabilities, commonly referred to in economic jargon as Human Capital, is the most precious and indispensable resource for achieving it.
2. Freedom of choice – maximum individual freedom for initiative and choice compatible with the welfare and well-being of the entire collective.
3. Economic rights – the inherent right of every human being to economic security, welfare and well-being.
4. Equity & Fairness – equal protection of rights and equal opportunity for all.
5. Inclusiveness – economic security and welfare for all human beings.
6. Sustainability – protection of the environment, restoring the natural systems we depend on, and ensuring the equal rights of future generations. The gradual emergence of a consensus among countries supporting the UN's value-laden SDGs signifies a growing acceptance of the essentiality of values in economics and other fields of social life, especially the value of sustainability.
7. Peace and social stability – an economy that promotes peace, stability and social harmony.
8. Natural Rights – Natural systems must be seen as benefitting all human and non-human beings in the continuous creative unfolding of evolution.
9. Social Rights – So too, the past achievements of humanity belong to humanity as a whole and their benefits should accrue to all.

5. Epistemological Foundations of NET

New economic theory requires a change in conception regarding the nature of the reality we seek to understand and appropriate ways of knowing it. NET must be founded on an epistemology that more fully encompasses and accurately reflects the full spectrum, multi-dimensional complexity, organic vitality, and evolutionary character of social reality.

5.1. Transdisciplinarity

New theory should abandon the mechanistic, reductionist view of the economy as a machine and replace it with a conception of the economy as a complex, living, and continuously evolving social network of human relationships capable of endless development and enrichment. NET needs to be based on the premise that economy is an inseparable part of a greater whole that encompasses all fields of knowledge and social activity. The health and performance of each part depend on our knowledge and understanding of the principles and processes governing the performance of the whole social organism as well as the

interdependence of its parts. Economic theory and policy need to be founded on a knowledge of the principles and processes that guide and direct social awareness, aspirations and values; the release of social energies and initiative; the organization of social power that channels these energies; and the attitudes and skills which convert the organized energies into tangible benefits for society. Transdisciplinarity is a demanding form of knowledge integration that examines underlying social processes common to all fields as well as the capacity to reflect on reality from the perspectives of different stakeholders, generations and cultures, rather than a single, absolute, 'objective' standard.[24]

5.2. Multidisciplinarity

Great economic accomplishments have always been spurred by significant development of non-economic forces and factors. New theory must integrate economy with all other fields of social life. It must break down the arbitrary divisions that presently divide the social sciences and replace the concept of externalities with a growing awareness of the complex nexus of political, legal, commercial, organizational, technological, social, cultural, and psychological factors that determine economic performance and results. Rather than seeking to isolate and insulate economy from other social factors, NET needs to identify and make explicit all the factors which influence economic performance in order to identify the inherent weaknesses and limitations in political, legal, economic, educational and social policies that constrain the development of human welfare and well-being. The enabling and limiting conditions include geography and physical environment, peace and security, political and social freedom, stable democratic government, conducive and transparent legal framework and implementation, effective and dynamic public administration—rapid, transparent decision-making, public policies for ease of doing business, physical infrastructure for transport and communication, levels of education and training, social values and work ethic.

5.3. Complexity

Society is a complex living organism in which all its component elements are interlinked, interdependent and integrated. Systems thinking has made important contributions to our understanding of complex systems and functioning by providing insights into the dynamics and patterns of interaction between innumerable nodes of activity. A reductionist scientific method is inappropriate for holistic analysis of evolutionary systems of which humanity is an integral part.[25] Complex problems and systems result from networks of multiple interacting causes that cannot be individually distinguished. They must be addressed as entire systems, rather than as piecemeal. They are such that small inputs may result in disproportionate effects. The problems they present cannot be solved once and for ever, but require to be systematically managed and typically any intervention merges into new problems as a result of the interventions dealing with them.[26] Insight into the behavior of complex systems has helped unravel the wide fluctuations and unpredictability that characterize the performance of financial and other markets. It has helped decode the network effects that lead to the concentration of power among the largest nodes in a network. It has also enhanced our understanding of the impact of economic activity on the environment. At the same time, caution is required to

avoid the tendency of the material sciences to reduce our understanding of complex human processes to mechanistic algorithms capable of wreaking havoc on human social systems, as computer trading algorithms have done in recent times.

5.4. Subjective Dimension

Our conception of knowledge needs to fully recognize the central importance of subjective psychological and social factors in determining social outcomes. Human aspirations, perceptions, concepts, attitudes, beliefs and values are fundamental determinants of how people and social systems function. They govern the release and direction of human energies and its conversion into social power. The structure and functioning of social institutions are a product and expression of these subjective factors.

> *"There is no inherent limit to the potential of human resourcefulness and social organization. Thus, there is no inherent limit to human development."*

5.5. Uncertainty

Economics was founded at a time dominated by the search for Newtonian, deterministic principles governing a world ruled by immutable laws and equilibrium equations. Today it still clings to static concepts of equilibrium and certainty, while mainstream science has evolved towards a less deterministic, more creative perspective. New theory needs to reexamine the concepts of certainty and finite limitation implicit in prevailing theory. It needs to recognize the central quest of human beings for security, the inherent limits to certainty in a rapidly evolving society, and the relationship between uncertainty and creativity, which is the source of continuous innovation and potentially unlimited human development.[27]

6. Ontological Foundations of NET

New theory needs to challenge fundamental concepts and premises regarding the nature of social and economic reality.

6.1. Relationship is Wealth

Human accomplishment is the result of interactions, relationship and collaboration among individuals, organizations and groups. Wealth creation, knowledge generation, discovery, invention, and governance are a few of its expressions. The capacity for accomplishment is related to the number, speed, frequency, quality and intensity of these interactions. Wider geographic inclusion, greater speed of communication and transportation, systems and organizational mechanisms that facilitate and support, knowledge and skills that enhance quality and convenience, shared understanding and values, a sense of identification and belonging are among the many factors that increase the human social capacity for accomplishment. Each of these factors must find a place in NET.

6.2. Social Organization

Organization is an inherent capacity of the human mind to arrange people, objects, ideas, processes and activities in an orderly manner capable of multiplying their productivity and reducing waste. Organization of materials and processes is the basis for remarkable technological advances. Organization of people, groups and social processes is the basis for equally remarkable advances in all fields of social life—from trade, production and banking to franchising, just-in-time inventory, global supply chain management, credit cards, electronic banking, Internet, e-commerce, social networks, the sharing economy (e.g. Uber, Airbnb) and the emerging Internet of Things.

Society is a complex social organization capable of directing and converting that energy into effective power to maximize human welfare and well-being. The social organization is a physical arrangement or mechanical system. Society is a living system and its organization is alive, conscious, dynamic and evolving. It is capable of self-organization, self-multiplication and evolution. Our conception of society must recognize the dynamic, adaptive and creative powers of organization. The objectives of NET can best be met by a social organization that enables each individual human being to fully develop and express his individual capacities and endowments as members of a social system that promotes maximum synergy, cooperation and harmony between individuals, communities, nations and humanity as a whole.[28]

6.3. Role of the Individual

Society is the macrocosm. The individual is the microcosm. Society is not merely an aggregate of autonomous individuals. Economy is not merely an impersonal system operating mechanically according to universal laws. Economic performance is not merely the result of the average behavior of an economy's participating members. Society is populated with millions of conscious individuals capable of unique initiatives. The individual as leader, entrepreneur, explorer, pioneer, original thinker and creative artist is the catalyst and source of social innovation and creativity. The actions of a single individual can radically impact economic performance, as the return of Steve Jobs to an ailing Apple Computers in 1996 after a 12-year hiatus led within another dozen years to Apple's emergence as the most valuable company in the world. Social theory focused exclusively on the collective as an aggregate of individuals fails to take into account the creative role of the individual in the evolution of the collective as well as the role of the collective in the development of its individual members. Effective social theory must be founded on an understanding of the complementary roles played by the individual and the collective in social development and evolution and provide insights into how to reconcile individual freedom and collective well-being.[29]

6.4. Social Process

Society evolves by the growth of consciousness and organization. It releases Energy for accomplishment by seeking to continuously raise its level of awareness, understanding, decision-making, and determination to act. It converts that energy into a directed Force for accomplishment by means of the values, goals, objectives and plans it pursues. It transforms the force into Power through the continuous development and improvement of organizational

structures, systems and activities. The quality of the knowledge, skills and attitudes of its individual members determines the results achieved by its activity.

6.5. Human and Social Capabilities

The potential performance of the society ultimately depends on the level of development of its individual members and its social organization, i.e. human capital and social capital. Human capital depends on the knowledge, skills, attitudes, values, character and personality of individuals. Social capital refers to the development of relationships, institutions and networks that produce collaborative attitudes, shared norms, shared values, mutual understanding and trust. It includes the structures that distribute authority and coordinate specialized activities, the standards and systems applied for communication, execution and monitoring of performance, and the values that characterize the functioning of the organization at each level and in each field of its expression. Human and social capital are unique in that they possess the ability to mobilize and utilize the other forms of capital to enhance performance. There is no inherent limit to the potential of human resourcefulness and social organization. Thus, there is no inherent limit to human development.

6.6. Markets as Networking Device

Language is a networking device to facilitate communication between people. Similarly, markets are networking devices designed to facilitate contact and mutually beneficial transactions. Village gatherings and regional fairs have long since given way to national and global markets operating in physical space and cyberspace. Their size and speed have grown exponentially, but the principles governing their operations remain the same. The wider the market, the more the number of participants, the greater the capacity and diversity of the products and services it offers, the greater the trust, confidence, quality, ease and speed of the transactions it facilitates, the greater will be the overall contribution of the market to wealth creation. Like all social institutions, markets function on the basis of trust. The greater the trustworthiness of the parties, systems, products and services involved, the greater the productive power of the market.

6.7. Regulation

The efficacy of any social organization depends on its capacity to release and channel human energy for productive purposes. That is only possible when sufficient freedom and opportunity are provided to all members of society to develop and express their innate potential within a structured framework that harmonizes private self-interest with public good. Freedom for initiative and regulation to ensure cooperation and fairness go hand in hand. The notion that markets are primarily a field for competition is a social construction borrowed from biological evolutionary theory that grossly distorts the nature of markets by reducing economic activity to a zero-sum game. The reality is that economy is a collaborative enterprise of the entire society in which buyers and sellers, producers and suppliers, bankers and intermediaries all collaborate to achieve a power and efficiency that none can otherwise achieve. Law and regulation are intended to provide a level playing field for all parties to realize their maximum potential. Freedom and authority are complementary values. Both

individual freedom and good governance are essential conditions for effective markets. In the absence of freedom, markets are reduced to commercial monopolies or labyrinthine government bureaucracies that inhibit human initiative and creativity. In the absence of effective regulatory mechanisms, the functioning of markets is determined by the relative power of the parties involved. The larger, stronger, more informed and better organized dominate over the rest and pursue their individual benefit at the expense of others and the general welfare. Without effective regulation, economic power becomes increasingly concentrated, competition is reduced and the incentives for efficiency and innovation are reduced. Like other social institutions, the capacity of markets to serve social objectives depends on the values, laws, rules and procedures by which they function and the authority of the agencies responsible for their governance.

6.8. Law

Law is an expression of the codified public conscience regarding the forms and norms of conduct that are deemed socially acceptable. Since law has evolved out of past precedent, it largely reflects the prevailing values and norms of society in the past, rather than the values and norms toward which it is evolving. Since law is the result of political processes, it largely reflects how power has been enjoyed and distributed in the past, rather than how it should be distributed based on constitutional rights. Law today is more largely a reflection of past values and the past distribution of social power, rather than that which is optimal for achievement of social objectives. The evolution of property law is one of the reasons for the increasing concentration of wealth in the USA and other countries. Neoclassical economics tends to accept prevailing property laws as given. NET should include the exploration of legal factors with the potential to modify the formal institutional frameworks in which economic agents operate.[30] Research reported by the *Economist* challenges the evidence that current patent laws promote investment and innovation as intended.[31] It cites evidence that prevailing copyright and patent laws constrain competition and artificially inflate prices and profits. Modification of law represents an important instrument for improving the outcomes of the economic system. A deeper understanding of private property rights will make it possible to establish more secure, equitable and prosperous foundations for the market economy.

6.9. Money

Like language and markets, money is fundamentally a networking tool which facilitates transactions between different people, organizations, points in time and places in space. *The value of money arises not from its intrinsic worth, but rather from its acceptance as a symbol of value by other people.* The more widely it is accepted, trusted and respected, the greater its value. Ultimately the value of money depends on the accumulated past achievements, present productive capacities and future productive potentials of the society in which it is used. Like the power of knowledge, the value of money also depends on its distribution in society. The wider the distribution, the greater the capacity of society to utilize it productively to enhance social capacity and social benefits. The higher the level of wealth and income inequality, the lower the utility of money for promoting the welfare and well-being of citizens. NET must

include the exploration of alternative forms of organization of property and money, as they are fluid and subject to human invention.

> *"Achieving full employment is not difficult. It is only difficult to achieve under the current theoretical framework that promotes mindless consumption, dissipation and wastefulness as economically sound."*

6.10. Price

Price is a creative organizational mechanism for assigning an economic value to dissimilar economic goods and services so they can be freely exchanged for one another through the medium of money. In the dismal ages before the capacity and responsibility of government for the welfare of people were widely recognized in the modern era, price served as an impersonal mechanism for the allocation of scarce economic goods. Today humanity no longer lacks the means to promote the welfare and well-being of all its members. Today government can no longer shirk the responsibility for maximizing that welfare. Long ago, microeconomic theorists defined the ideal conditions under which price would allocate scarce resources most effectively. Those conditions have rarely been met in practice either in the past or the present. It is the responsibility of government to create a policy environment that counters the tendency toward monopolistic control of markets on the one hand and the unjust allocation of economic goods without regard for human values on the other.

6.11. Measurement

New theory needs to be based on measures of value that more truly reflect the real and sustainable contribution of human activity to human welfare and well-being. It should also adopt measures of wealth that reflect the true contribution of activities to wealth generation and the net loss of wealth (negative value) resulting from depletion and pollution of the natural environment. It needs to distinguish between wealth as a stock and welfare as a flow.

6.12. Non-Monetarized Sector

More than half of all useful work undertaken is unpaid and falls outside the monetarized sector. Much of this work contributes to the bonding and stability of society and has far greater importance than its mere practical utility. New theory should broaden notions of wealth and well-being to incorporate the large non-monetarized sector, which is ignored by present theory but plays such a central role in determining our real freedom, comfort, social security, human relations, and the quality of life.[32]

6.13. Social Power

Economic theory is not merely about production, distribution and wealth creation. Economic conceptions contribute to and are impacted by the distribution of power in society.

NET must make explicit the impact of various forms of social power on the laws, institutions, public policies and private practices impacting economic activities and human welfare. All economics is really Political Economy, as the study of the economics of states was originally termed. Economics cannot be divorced or considered separately from politics. The functioning of economy is powerfully influenced by the exercise of political power and social influence and vice versa. Social power is the capacity to accomplish work in society.

Money, political influence, popularity, media research, transport, communication, knowledge, research capacity are all forms of social power which are interconvertible. The interrelationship between political and economic power is of particular relevance to the functioning of economies because it results in a skewing of policies in favor of some parties to the detriment of others and the general public, leading to monopolistic advantages and public corruption. Democracy today contains a large measure of plutocracy. Property rights, subsidies, tax rates, incentives, zoning laws, patent and copyright, corruption and crime are all strongly influenced by the exercise of social power. The debate regarding free markets and regulation is really a struggle for power—money power and political influence vs. power to promote social welfare. Human rights, law and public policy are powerful determinants of the distribution of social power and therefore of economic benefits.

Historical evidence confirms that the wider the distribution of power in society, the greater is the overall capacity of the society to achieve its objectives. The most powerful monarchs in history possessed far greater individual power than democratically elected leaders today, but no monarch in history can rival the overall capacity of modern societies to promote the welfare and well-being of their citizens. Universal education enhances the mental power of the people to take informed, effective decisions. Fair access to the use of social systems enhances the organizational capacity of the people. Access to remunerative employment ensures people the opportunity to exercise their talents and capacities for productive purposes and personal benefit. Deprivation in all its forms limits the power of the individual and by extension the overall power of society to accomplish. As freedom of choice is an essential condition for the fullest development and expression of individual potentials, equitable distribution of social power is the essential condition for the fullest development and expression of social potentials.

Money is a form of social power with a unique characteristic. It lends itself more readily than any other form to conversion from one form of power into another. Money generates access to political power through elections and political donations, to the best quality education and healthcare, to all forms of entertainment, to the most advanced forms of communication and transportation, etc. This characteristic makes money a very effective means for the wider distribution of social power. For the same reason, money also represents one of the greatest obstacles to the equitable distribution of social power. For those who possess wealth can utilize it to seize political power or social influence or convert them into greater wealth. The increasing domination of democratic politics by money through both legal and illegal means represents one of the greatest threats to democratic freedoms today.

6.14. Employment

NET needs to take an unequivocal position on the place of employment in economic theory. Employment in a market economy is the economic equivalent of the right to vote in a democratic polity. As universal suffrage is the basis for political democracy, employment is the basis for economic democracy. The principle of democratic rights was enshrined long ago, but the actual extension of democratic rights to women, blacks, the poor and minorities was achieved as the result of a long, difficult and violent struggle. They were not extended because they were possible or practical, but because they were deemed fundamental and inviolable. The same is true of the right to employment. It must be recognized as a fundamental human right. Then it becomes the responsibility of governments to ensure it is achieved. Democracies which protect the right to property have an equal obligation to protect the opportunity for the young to acquire gainful employment, which is essential for social survival in a modern economic system where government regulates and controls so many aspects of life. Achieving full employment is not difficult. It is only difficult to achieve under the current theoretical framework that promotes mindless consumption, dissipation and wastefulness as economically sound, while standing by helplessly in the face of social injustice and economic exploitation. The current policy framework which incentivizes capital investment while taxing payroll is a clear example of an in-built policy bias that undermines human security and well-being.

6.15. Public Goods

The most important failure of markets has been with respect to management of the domestic environment and global commons as a public good. A century ago, capitalism acquired a social conscience to meet the perceived threat of socialism and arrived at a balance between public and private good that resulted in unprecedented prosperity in OECD countries. The collapse of communism symbolized by the fall of the Berlin Wall in 1989 coincided with a resurgence of neo-liberal conceptions that have become a root cause of the current crises. New theory must restore the balance that optimizes the welfare and economic security of all, while giving scope for the creative contributions of each. There is a need to develop a whole range of hybrid goods which, like insurance, serve simultaneously the interests of both the private citizen and society-at-large.

6.16. Global Governance

The entire world economy is increasingly operating as a single, integrated market and world system. Yet economic theory is still largely predicated on concepts, theories, models, policies and actions for application at the national level. This has left a wild frontier of unregulated and often lawless activity at the international level. It has also led to a resurgence of a previously discredited neoliberalism, which serves as an obstacle both to effective global regulation and the development of effective economic thinking. The centering of theory on national level concepts, institutions and policies aggravates the division of humanity into competing nations playing a zero-sum game. Globally, relevant economic theory is needed as a foundation for the establishment of effective institutions and policies capable of maximizing

welfare and well-being for all humanity. NET should strive to encompass the full range of relevant perspectives from the local to the global level.

6.17. Evolution of Global Society

Human development throughout the ages has been mostly a subconscious process of experimentation and trial and error learning gradually organized, developed and refined into effective knowledge, skills, values, rules, strategies, systems, organizations, policies, processes and activities which then evolved over time. The aim of the social sciences is to make conscious the underlying evolutionary process that has governed human development up to now and to codify that knowledge in a form that will facilitate and accelerate the development of new institutions, policies and activities capable of enhancing the organization of global society for the betterment of all human beings. The effort to consciously formulate new economic theory represents an important step in that direction.

6.18. Ecology

The full development of human potential and social power is only possible and sustainable when humanity re-establishes a positive, harmonious relationship with all of life and the physical environment. The mindless overexploitation of resource, environmental degradation, pollution and climatic instability are rooted in the prevailing consciousness and mindset of modern society derived from a mechanistic, reductionist, utilitarian and egoistic viewpoint and values that increasingly isolate the individual from other people and society and isolate the human collective from the wider world in which we live. Relationship is the foundation for all forms of wealth creation—physical, social, economic, intellectual, artistic and spiritual. Reconnecting with other people, social purpose, the environment and our own spiritual being based on values of respect, harmony, beauty and self-giving are the means and precondition for achieving sustainable human welfare and well-being for all.

7. NET and Pedagogy

The rapidly expanding student movement demanding pluralism in economics education marks an important step beyond the prevailing orthodoxy towards a more open-minded, inclusive and integrated study of the subject.[33,*] A change in content is not enough. It must also be accompanied by a change in pedagogy and thinking. In order to realize and practice new theory, the paradigm must also be taught in an open way that encourages critical thinking and innovative problem-solving. It would be contradictory to claim that social reality is an open system and then continue to teach in the didactic prescriptive way that has been conducive to mainstream modelling. It would be counter-productive to the development of new theory and also to the creation of the kinds of citizens that express the best of what NET is seeking to achieve.

Beyond that, there must also be a shift in the modes of thinking developed through the educational system. Today the discipline of Economics is still dominated by analytic thinking that divides and subdivides reality into smaller parts and regards each part as a whole in

[*] See Rethinking Economics, http://www.rethinkeconomics.org/about/

itself. Specializations continue to proliferate, resulting in more and more experts who know less and less about the wider economic, political, social and ecological reality within which they operate. The growing adoption of systems thinking seeks to compensate for reductionism by focusing on the interconnections and interdependencies between the parts, but in practice it often reduces complex social reality to mechanistic models or, overwhelmed by the complexity it seeks to represent, it shifts the emphasis from theoretical understanding to analysis of data as the primary source of knowledge. New economic and social theory will require conscious efforts to develop more organic, integrated modes of thinking than those prevalent in education today.[34] This is a challenge not only for economics but one applicable to all the social sciences and higher education in general.

8. Conclusion

The purpose of any social system is to effectively release and channel the energies of the population to achieve socially desirable goals. Economy is one of the most fundamental and essential of those systems. No matter how great the achievements of modern society, the present system certainly does not fully utilize the energies and capabilities of its people to maximize the welfare and well-being of all citizens. In future we can and must do better.

A new conceptual framework is urgently needed to expose the fallacies in prevailing theory and project an alternative conception attuned to the realities of the 21st century and the welfare of all humanity. Alternative views on economic theory and practice have been surfacing for decades, but until recently they have been shut out, rejected or dismissed by mainstream orthodox economists of different schools, because they challenge the fundamental assumptions on which all mainstream economic thought and prevailing economic policy are based. Today the situation is different. Authoritative alternative views of economy based on hard facts and compelling arguments are now gaining serious attention, but they still remain largely off-campus, off-camera, and off the radar of public policy and decision-makers.

New thinking—new economic theory—has the power to affect a rapid and radical change to a new economy that

- Maximizes human welfare and well-being instead of limitless consumption and unregulated economic growth for their own sake;
- Perceives people as the most precious resource and development of all forms of human and social capacities as the most important form of productive capital;
- Ensures employment opportunities and meaningful occupation for all, including both youth and the increasingly healthy and active elderly populations;
- Regulates the global casino of financial speculation that currently destabilizes economies and impoverishes people;
- Manages the world's resources in a sustainable manner for both present and future generations;

- Promotes a more equitable distribution of income within the constraints imposed by the planet's resources;
- Resolves the apparent contradiction between human welfare and ecological sustainability by shifting the focus from unlimited, wasteful, material consumption based on energy and material-intensive technologies to maximum security, welfare, well-being and developmental opportunities for people.

9. Acknowledgements

This paper is an attempt to synthesize ideas that have emerged over the past seven years during more than 20 conferences and seminars organized by the World Academy of Art & Science and the World University Consortium, in more than 35 articles by 16 individual authors which have appeared in *Cadmus* Journal, and in email correspondence and personal discussions by the authors with many of the more than 50 members of the New Economic Theory Working Group.* While it would be extremely difficult to list all the contributions of individuals to this work in progress, the authors would like to especially acknowledge valuable contributions by Orio Giarini, Editor-in-Chief of *Cadmus* Journal, whose seminal work on new economic thinking formed a strong foundation and constant inspiration for this project; Ivo Šlaus, Honorary President of the World Academy of Art & Science, who first proposed formation of the working group; and Ian Johnson, former Vice President of World Bank and Secretary General of Club of Rome, who contributed important ideas during the initial phase of the project. In addition we would like to acknowledge specific contributions to this paper by Tomas Bjorkman, an economist, entrepreneur and former investment banker; Barry Gills, Professor, Department of Political and Economic Studies, University of Helsinki; Robert Hoffman, Co-founder and President of whatif? Technologies; Erich Hoedl, Vice-President of The European Academy for Sciences and Arts; Aldo Martinez, Vice President of Market Surveillance at the New York Stock Exchange; Michael Marien, Senior Principal, Security & Sustainability Guide; David Harries, Chair, Canadian Pugwash; Joachim Spangenberg, Research Coordinator and Vice President, Sustainable Europe Research Institute, Germany and Joanilio Rodolpho Teixeira, Emeritus Professor and Senior Researcher at the University of Brasilia, all of whom have either contributed important ideas and/or made valuable comments reflected in the text of the paper.

Authors Contact Information:
Garry Jacobs *– Email: garryjacobs@gmail.com*
Mark Swilling *– Email: mark.swilling@spl.sun.ac.za*
Winston P. Nagan *– Email: nagan@law.ufl.edu*
Jamie Morgan *– Email: jamiea.morgan@hotmail.co.uk*

Notes

1. Robert Costanza, *An Introduction to Ecological Economics* (Raton: CRC Press, Taylor and Francis Group, 2015).
2. Joseph Stiglitz et al., "Stockholm Statement: Toward a Consensus on the Principles of Policymaking for the Contemporary World" November 15, 2016 http://www.sida.se/globalassets/sida/eng/press/stockholm-statement.pdf.

* See http://neweconomictheory.org

3. Michael Marien, "Sustainability, Past and Future: Ten Propositions on the Emerging Organizational Macro-System," *Eruditio* 2, no.1 (2015-2016): 117-137.
4. Orio Giarini and Garry Jacobs, "The Evolution of Wealth & Human Security: The Paradox of Value and Uncertainty," *Cadmus* 1, no.3 (2011): 29-59.
5. "Global Bottled Water Market is Expected to Reach USD 279.65 billion in 2020. By Volume, Global Bottled Water Market is Expected to Reach 465.12 Billion Liters in 2020: Transparency Market Research," GlobeNewswire January 16, 2015.
6. Marien, "Sustainability, Past and Future".
7. Adair Turner cited by Rana Foroohar in *Makers and Takers: The Rise of Finance and the Fall of American Business* (New York: Crown Business, 2016), 6.
8. Ian Johnson and Garry Jacobs, "Crises and Opportunities: A Manifesto for Change," *Cadmus* 1, no. 5 (2012): 11-25.
9. Ye Xie and Andrea Wong, "Once Over $12 Trillion, the World's Currency Reserves Are Now Shrinking," *Bloomberg* April 7, 2015 http://www.bloomberg.com/news/articles/2015-04-05/once-over-12-trillion-the-world-s-reserves-are-now-shrinking.
10. Ashok Natarajan, "The Conscious Individual," *Cadmus* 2, no. 3 (2014): 50-54.
11. Garry Jacobs, "The Need for a New Paradigm in Economics," *Review of Keynesian Economics* 3, no.1 (2015): 2-8.
12. Gerald Gutenschwager, "Is Economics a Value-free Science?," *Eruditio* 1, no.2 (2013): 95-107.
13. Michael Marien, "New and Appropriate Economics for the 21st Century: A Survey of Critical Books, 1978-2013," *Cadmus* (2012): 86-102.
14. Tomas Bjorkman, "The Market Myth," *Cadmus* 2, no.1 (2016): 43-59.
15. Robert Hoffman, "On the Need for New Economic Foundations: A Critique on Mainstream Macroeconomics," *Cadmus* 1, no.5 (2012): 74-85.
16. Garry Jacobs and Ivo Slaus, "Indicators of Economic Progress: The Power of Measurement and Human Welfare," *Cadmus* 1, no.1 (2010): 55-58.
17. Steve Keen, *Debunking Economics: The Naked Emperor Dethroned* (London: Zed Books, 2011).
18. Paul Krugman, "How Did Economists Get It So Wrong?" *New York Times* Sep. 2, 2009 http://www.nytimes.com/2009/09/06/magazine/06Economic-t.html.
19. Neva R. Goodwin, "A New Economics for the 21st Century," *New Economy Coalition* 2010.
20. Hoffman, "New Economic Foundations".
21. Keen, Debunking Economics.
22. Garry Jacobs and Ivo Slaus, "Global Prospects for Full Employment," *Cadmus* 1, no.2 (2011): 60-89.
23. Orio Giarini, "New Paradigm in the Service Economy The Search of Economics for Scientific Credibility: In between Hard and Soft Sciences," *Cadmus* 2, no.3 (2014): 94-120.
24. Joachim H. Spangenberg, "Sustainability Science: a review, an analysis and some empirical lessons," *Environmental Conservation* 38, no.3 (2011): 275 - 287.
25. Robert Hoffman, "Concepts for a New Generation of Global Modelling Tools: Expanding our Capacity for Perception," *Cadmus* 2, no.5 (2015): 134-145.
26. Roberto Poli, "A Note on the Difference Between Complicated & Complex Social Systems," *Cadmus* 2, no.1 (2013): 142-147.
27. Giarini and Jacobs, "The Evolution of Wealth & Human Security".
28. Harlan Cleveland and Garry Jacobs, "Human Choice: The Genetic Code for Social Development," *Futures* 31, no. 9-10, (1999): 959-970.
29. Garry Jacobs, "Steve Jobs: Nobel Laureate," *Cadmus*, 1, no.6 (2013): 91-102.
30. Pascal van Griethuysen, "Bona diagnosis, bona curatio: How property economics clarifies the degrowth debate," *Ecological Economics* 84 (2012): 262-269.
31. "A Question of Utility", *Economist* Aug 8, 2015 http://www.economist.com/node/21660559.
32. Giarini and Jacobs, "The Evolution of Wealth & Human Security".
33. Jamie Morgan, "Is Economics Responding to Critique? What do the UK 2015 QAA Subject Benchmarks Indicate?," *Review of Political Economy* 27, no.4 (2015): 518-538.
34. Garry Jacobs, "A Brief History of Mind and Civilization," *Cadmus* 2, no.6 (2016):71-110.

CADMUS, Volume 3, No.2, May 2017, 45-57

Toward a New Theory of Sustainable Development:
Drawing on Insights from Developments in Modern Legal Theory*

Winston P. Nagan
Chairman of the Board of Trustees, World Academy of Art & Science;
Sam T. Dell Research Scholar Professor of Law, University of Florida

Craig Hammer
Program Manager and Senior Operations Officer, The World Bank;
Associate Fellow, World Academy of Art & Science

Maxat Akhmetkaliyeva
Professor of Chemistry,
Al Farabi Kazakh National University, Almaty, Kazakhstan

Abstract

In the light of the countless hours invested in the development of the Sustainable Development Goals—the set of targets and indicators relating to future international human and sustainable development, which replaced the Millennium Development Goals (MDGs) at the end of 2015 —by hundreds of the world's top minds, in addition to more than twenty-five years of analysis associated with the development, implementation, monitoring, and evaluation of the MDGs, international lawyers and economists may wonder whether there is room for a new theory of sustainable development. It might seem counterintuitive to presume that new light might be shed on this vastly over-analyzed concept. However, the goal of this article is indeed to bring a new understanding to this important idea by assaying the current dominant legal theory of neo-liberalism and the radical inequality it promotes, and unpacking processes and identifying insights from advanced legal theory for the development of a new theory of sustainable development, with a primary focus on counteracting radical inequality.

1. Introduction

From 2000 to 2015, the Millennium Development Goals (MDGs) were simultaneously an articulation of eight of the world's most pressing human development and environmental sustainability priorities and an effort to construct a tracking regime to ascertain progress against these goals.† More specifically, the MDGs were time-bound, quantitative actions to eradicate extreme poverty and hunger, improve health and education for all, and ensure

* The views expressed are those of the authors and do not represent those of The World Bank Group or its Board of Directors.

† See United Nations Millennium Development Goals, *available at* http://www.un.org/millenniumgoals/; see also, United Nations Millennium Declaration, G.A. Res 55/2, UN Doc. A/Res/55/2 (2000) (Sept 18, 2000), *available at* http://mdgs.un.org/unsd/mdg/; see also Kemal Dervis, *Bridging the Gap: How the Millennium Development Goals are Uniting the Fight Against Global Poverty*, 6 Sustainable Development Law & Policy 1, 2 (2005) ("[T]here is unprecedented global support for achieving the MDGs, the eight goals agreed to by all UN Member States in the year 2000...").

environmental sustainability, among related goals, which mutually reinforced each other.[*] Well before the end of 2015, it was clear that progress against the MDGs was at best uneven and that the MDGs insufficiently addressed—or entirely neglected—a range of existential challenges for humanity and the planet.[†] As a result, following the 2010 High-level Plenary Meeting of the General Assembly on the MDGs, former United Nations (UN) Secretary-General Ban Ki-Moon established the UN System Task Team in September 2011 to lead UN preparations for the post-2015 UN development agenda.[‡] The Sustainable Development Goals (SDGs)—the set of targets and indicators relating to future international human and sustainable development—thus replaced the Millennium Development Goals at the end of 2015.[§]

By way of a snapshot of the multi-year process in which hundreds of global experts weighed in to create the 17 SDGs, their 169 targets, and their 304 proposed indicators,[¶] the SDGs were first formally discussed at the United Nations Conference on Sustainable Development held in Rio de Janeiro in June 2012 ("Rio+20").[**] At Rio+20, UN Member States agreed to establish an intergovernmental process to develop a set of "action-oriented, concise and easy to communicate" Sustainable Development Goals (SDGs) to help drive the implementation of sustainable development.[††] The Rio+20 outcome document, *The Future We Want*, also calls for the goals to be coherent with the United Nations development agenda beyond 2015.[‡‡] A 30-member Open Working Group (OWG) of the General Assembly was tasked with preparing a proposal on the SDGs, as well as a concrete list of targets and measurable indicators to ensure that progress against the SDGs can be tracked.[§§] This Open Working Group thereafter proposed 17 goals covering a broad range of sustainable development

[*] See *Millennium Development Goals Indicators, available at*: http://mdgs.un.org/unsd/mdg/Host.aspx?Content=Indicators/OfficialList.htm (detailing the 8 MDGs, their 21 targets, and more than 60 indicators developed to track progress). *See also, Monitoring progress towards the achievement of the Millennium Development Goals, available at*: http://millenniumindicators.un.org/unsd/mi/mi_highlights.asp ("To help track progress, the United Nations Secretariat and the specialized agencies of the UN system, as well as representatives of IMF, the World Bank and OECD defined a set of time-bound and measurable goals and targets for combating poverty, hunger, disease, illiteracy, environmental degradation and discrimination against women"); UN General Assembly, *Road map towards the implementation of the United Nations Millennium Declaration: Report of the Secretary-General*, A/56/326 (2001), available at: https://documents-dds-ny.un.org/doc/UNDOC/GEN/N01/526/07/PDF/N0152607.pdf?OpenElement

[†] See, e.g., William Easterly, *How the Millennium Development Goals are Unfair to Africa*, 14 Global Economy & Development, Working Paper, Brookings (November 2007), *available at*: http://www.brookings.edu/~/media/research/files/papers/2007/11/poverty-easterly/11_poverty_easterly.pdf (arguing that the MDGs were designed in a poor and arbitrary way, which would inevitably put the continent of Africa at a disadvantage in tracking progress). This argument was validated by the final MDG report itself in 2015. *See* the *Millennium Development Goals Report 2015* at 8, *available at*: http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20(July%201).pdf ("...progress [against the MDGs] has been uneven across regions and countries, leaving significant gaps. Millions of people are being left behind, especially the poorest and those disadvantaged because of their sex, age, disability, ethnicity or geographic location.").

[‡] See United Nations Development Policy and Analysis Division, *Preparing for the Development Agenda Beyond 2015*, *available at* http://www.un.org/en/development/desa/policy/untaskteam_undf/.

[§] See *The Sustainable Development Agenda*, *available at*: http://www.un.org/sustainabledevelopment/development-agenda/ ("On 1 January 2016, the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development—adopted by world leaders in September 2015 at an historic UN Summit—officially came into force...The SDGs build on the success of the Millennium Development Goals (MDGs) and aim to go further to end all forms of poverty.")

[¶] These numbers of targets and indicators are current as of the time of this writing. *See Transforming our world: the 2030 Agenda for Sustainable Development*, G.A. RES/70/1, UN Doc A/RES/70/1 (Sep 25 2015), *available at*: http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E; *General Comments on the proposed goals, targets, and indicators for the sustainable development agenda*, at 2, *available at*: http://unstats.un.org/sdgs/files/open-consultation-iaeg/Assessment%20of%20proposed%20SDG%20indicators%20(priority%20and%20missing).pdf

[**] See *United Nations Conference on Sustainable Development*, Rio+20, *available at*: https://sustainabledevelopment.un.org/rio20.

[††] See *The Future We Want* at Para 247, G.A RES/66/288, UN Doc A/RES/66/288 (July 27, 2012), *available at*: http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/66/288&Lang=E.

[‡‡] See *id*. at Para 75.

[§§] *Id*. at Para 248.

issues.[*] On September 25, 2015, the United Nations General Assembly accepted that the Open Working Group's proposals would become the basis of the post-2015 development agenda, comprising the following 17 goals:

1. End poverty in all its forms everywhere
2. End hunger, achieve food security and improved nutrition, and promote sustainable agriculture
3. Ensure healthy lives and promote well-being for all at all ages
4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5. Achieve gender equality and empower all women and girls
6. Ensure availability and sustainable management of water and sanitation for all
7. Ensure access to affordable, reliable, sustainable and modern energy for all
8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
10. Reduce inequality within and among countries
11. Make cities and human settlements inclusive, safe, resilient and sustainable
12. Ensure sustainable consumption and production patterns
13. Take urgent action to combat climate change and its impacts
14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss
16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
17. Strengthen the means of implementation and revitalize the global partnership for sustainable development[†]

Under the auspices of the Inter-agency and Expert Group on the Sustainable Development Goal (IAEG-SDGs) Indicators, Member States emphasized that

[*] See *Open Working Group Proposal for Sustainable Development Goals*, *available at*: https://sustainabledevelopment.un.org/content/documents/1579SDGs%20Proposal.pdf; *Integrated and coordinated implementation of and follow-up to the outcomes of the major United Nations conferences and summits in the economic, social and related fields, Sustainable development: implementation of Agenda 21; the Programme for the Further Implementation of Agenda 21 and the outcomes of the World Summit on Sustainable Development and of the United Nations Conference on Sustainable Development; Follow-up to the outcome of the Millennium Summit*, G.A. RES/68/970, UN Doc A/68/970 (Aug 12 2014), *available at*: http://www.un.org/ga/search/view_doc.asp?symbol=A/68/970&Lang=E.

[†] See *Transforming our world: the 2030 Agenda for Sustainable Development*, G.A. RES/70/1, UN Doc A/RES/70/1 (Sep 25 2015), *available at*: http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E

> indicators must directly respond to the goals and targets agreed by the Open Working Group and to their level of ambition; must not undermine or reinterpret the targets; must cover all targets, including targets on means of implementation and give equal weight to all targets; must maintain the balance achieved,... should not introduce any new or contentious issues... [and] that global indicators should be limited in number and should include multi-purpose indicators that address several targets at the same time.[*]

"Market fundamentalism has tended to obscure salience of human choice as the critical factor in energizing human capital in the evolution of political economy and sustainable development."

With respect to the design of the indicator framework and the criteria of indicator selection, Member States agreed to take criteria into account which emerged from the Expert Group Meeting on the indicator framework for the post-2015 development agenda (in February 2015), and to follow a framework approach in its work. Member states further recognized that while the number of global indicators must be limited, some targets might require multiple indicators to measure their different aspects and recognized the need to systematically address the issue of disaggregation, with a primary goal of "leaving no one behind." Moreover, in line with its Terms of Reference, the IAEG-SDGs has developed a proposal for an indicator framework and a list of indicators for the monitoring of the goals and targets of the post-2015 development agenda at the global level—this proposal was considered for adoption by the Statistical Commission at its 47th session in March 2016 and later presented to the designated political inter-governmental process for its consideration. The IAEG-SDGs has also agreed to establish two discussion streams to which all its members are invited and encouraged to participate: the first one focusing on conceptual frameworks and indicator concepts and definitions, and the second one focusing on identifying linkages among indicators across goals and targets (to date, offers have been made by the Philippines to facilitate the first discussion stream, and by Italy to facilitate the second discussion stream).

In the light of the countless hours invested in the development of the SDGs by hundreds of the world's top minds, in addition to more than twenty-five years of analysis associated with the development, implementation, monitoring, and evaluation of the MDGs, international lawyers and economists may wonder whether there is room for a new theory of sustainable development. It might seem counterintuitive to presume that we might shed new light on the vastly over-analyzed concept. However, the goal of this article is indeed to bring a new understanding to this important idea.

Part II of this article assays the current dominant legal theory of neo-liberalism and the radical inequality it promotes. Part III unpacks processes and identifies insights from

[*] *See Inter-agency and Expert Group on the Sustainable Development Goal Indicators: Tentative timeline, work plan and organization of work* (July 7, 2015), *available at*: http://unstats.un.org/sdgs/files/IAEG-SDGs%20-%20timeline%20-%2020150707.pdf

advanced legal theory for the development of a new theory of sustainable development, with a primary focus on counteracting radical inequality. Part IV offers general conclusions.

2. The Neo-Liberal Economic Model and Radical Inequality

The private law aspect is a fundamental component of the conception of the rule of law. It stabilizes expectations about the value of goods and services without the cost of state intervention—which has economic value toward achieving a balance between public and private control over institutions and resources—and is thus critical for sustainable development. The ideological importance of the freedom of contract and the right to exchange and acquire property thus became an organizing principle of the capitalist world. However, market fundamentalism has tended to obscure the role of human capital and the importance of the decision-making aspect of human capital in the production and distribution of desired goods and services. Put another way, market fundamentalism has tended to obscure salience of human choice as the critical factor in energizing human capital in the evolution of political economy and sustainable development. The continuing search for a theory of sustainable development parallels the challenges of the search for a new paradigm that speaks realistically to the crisis of political economy in global public order.

The current dominant economic theory is neo-liberalism, the foundations of which are rooted in market fundamentalism. La Porta, Lopez-de-Silanes, Shleifer and Vishny argued that the achievement of efficient financial markets—and thus economic development—is contingent on the inauguration of the right legal code.[*] In other words, in the neo-liberal view, the market functions largely as a self-generating autonomous institution, which controls and regulates the freedom of contract and the nature of value in terms of property. The market 'machine' functions as it does because concepts of liberty and property are provided for and protected by law; popular conceptions about the market as final arbiter of pricing, foreign exchange rates and more, the liberty to contract, and value related to real and intellectual property have become reified. For example, it is useful to consider the crisis of the Great Depression of the early 1930s, which was an outcome of the then-pervasive belief in *laissez-faire* economics and that the market could self-regulate.[†] A core lesson from the Great Depression was that it was caused by human choices and could be resolved by human choices. The role of the New Deal in regulating the legal foundations of its economic emphasis permitted government intervention to restrain the unlimited power of the private sector often validated by fundamental law. Two of the most important consequences of the victory of the New Deal were reflected first in the Atlantic Charter, which articulated both the war aims of the Allies and a vision for the future, which included freedom from want.[‡] These ideas found

[*] See generally, Rafael La Porta, et al, *Legal Determinants of External Finance*, 3 Journal of Finance LII 1131-1150 (1997); Rafael La Porta, et al, *Law and Finance*, 6 Journal of Political Economy 106, 1113-1155 (1998).

[†] Theodore Rosenof explained that the…devastation of the Great Depression...inspire[d] powerful challenges to orthodox theory, most notably that of Keynes. Orthodoxy had held that the economic "system" or "mechanism" was inherently self-correcting, that downturns were necessarily followed by cyclical upswings, that institutional "imperfections" or external "shocks" were mere aberrations, and that government intervention would only impede and delay normal and natural readjustment and recovery.

See Theodore Rosenof, Economics in the Long Run: New Deal Theorists and their Legacies: 1933-1993 5 (1997).

[‡] Roosevelt articulated four freedoms: freedom from fear, freedom from want, freedom of expression, and freedom of conscience and belief, all of which constituted the war aims of the Allies. *See Four Freedoms Speech*, *Franklin D. Roosevelt*, *1941*, *in* The Public Papers and Addresses of Franklin D. Roosevelt 663 (Facts-on-File, Inc. ed., 1995).

expression in post-war efforts to give direction to global economic development.* The economic foundations of international human rights were expressed in the Universal Declaration of Human Rights† as well as several important UN documents culminating in the Declaration on the Right to Development.‡ These developments confronted the emergence of neo-liberal political economy, with a claimed global reach.

Despite the lessons of the Great Depression and the achievements which followed, only eighty years later another economic crisis re-triggered fundamental concerns about the relationship between markets, governments and regulators, and posed further challenges to scholars and intellectuals seeking to develop a durable theory of sustainable development.§ Until relatively recently, a regulatory enquiry into potential misconduct by a financial institution was often a final "grade" where compliance, corporate governance and other internal control systems have failed to establish an effective operating environment. The global economic crisis of 2008 highlighted the global nature of the financial services industry and the domino effect, a serious failure of regulatory and political controls over financial markets and institutions can have on the soundness of global economies in general and the financial system in particular. The ascendance of neo-liberalism has since had to confront the problems of a global economic system characterized by a lack of regulation, including and particularly of trading financial derivatives, exotic financial instruments, such as credit default swaps, hedge funds and more. Efforts by regulators since then to re-establish economic stability and market confidence have highlighted the need for greater communication, information sharing and co-operation amongst international regulators. Cross-border investigations, harmonization of financial rules and regulations, and other steps toward regulatory convergence are crucial components of a sustainable theory of economic development because they can facilitate the successful and meaningful execution of international investigations and thus establish confidence in the effective regulatory supervision of financial organizations.¶ Legislation such as the Markets in Financial Instruments Directive** in Europe already mirrors in part certain US rules, such as FINRA Rules.†† This could not be highlighted more potently than by the investigations by law enforcement in the US of those financial organizations most severely impacted by the crisis, including Lehman Brothers, AIG, Fannie Mae and Freddie Mac. The wake-up call received by those organizations in the financial services sector that have relied on the notion of being "too big to fail" was epic. There is a profound lesson in this for a sustainable development paradigm: financial organizations that are "too interconnected to fail"

* See generally, Michael Bordo, *The Bretton Woods International Monetary System: A Historical Overview*, in A Retrospective on the Bretton Woods System: Lessons for International Monetary Reform, 3 (Michael Bordo & Barry Eichengreen, eds., 1993).

† UN General Assembly, Universal Declaration of Human Rights, 10 December 1948, 217 A (III). Noted in Article 22: "Everyone…has the right to social security and is entitled to realization… of the economic, social and cultural rights indispensable for his dignity and the free development of his personality."

‡ United Nations Declaration on the Right to Development, G.A. Resolution 41/128 (Dec. 4, 1986).

§ See generally, Deniz Igan and Mishra, Prachi, *Wall Street, Capitol Hill, and K Street: Political Influence and Financial Regulation*, 57 Journal of Law and Economics 5 (2014), *available at*: http://chicagounbound.uchicago.edu/jle/vol57/iss5/7.

¶ See Matthew Turk, *Reframing International Financial Regulation After the Global Financial Crisis: Rational States and Interdependence, not Regulatory Networks and Soft Law*, 36 Mich. J. Int'l L. 59, 62 (2014) (explaining that "at a high level, international financial regulation can be divided into the dual goals of maximizing the potential efficiency gains from global integration of financial markets and minimizing the losses threatened by the crises and instability that have historically characterized financial integration").

** Markets in Financial Instruments Directive (Directive 2004/39/EC), available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1398325978410&uri=CELEX:02004L0039-20110104 (last visited Feb 26 2016).

†† The Financial Industry Regulatory Authority ("FINRA") Rules, *available at*: http://finra.complinet.com/en/display/display.html?rbid=2403&element_id=607

will be bailed out by governments and regulators, since letting them go under would have too great an impact on ordinary people and their livelihoods.

> *"The consequence of inequality is that the most important resource in a nation's economic profile—its human capital—is often underutilized."*

The effect of the neo-liberal model on global resources and the climate has also been severe. However, a creeping recognition that unrestrained, free enterprise could exhaust the resources it exploits and otherwise irreparably change the climate has surfaced in the popular consciousness in recent decades. For example, in 1987, the Brundtland Report connected sustainability to development by maintaining that development should promote the human development of people today without compromising the integral human development of people tomorrow.[*] An objective of a theory of sustainable development is that human development must create sustainable conditions of living for all human beings, now and in the future. A theory of sustainable development would necessarily insist that non-renewable resources be used modestly, until they can be entirely eclipsed by renewable resources, since the unlimited exploitation of certain resources could have consequences for the survivability of humanity in light of the ecological conditions of climate change.[†] However, notwithstanding increasingly widespread efforts, the concept of sustainable development is still a highly contested notion.[‡] A multitude of interest groups have latched on to the idea of sustainable development and given it a priority gloss which suits their particular interest orientation. Some interest groups may focus on human development, others may focus on environmental protection. In short, the integration of environmental, social and matters of political economy is an issue that cannot be usefully described, analyzed and evaluated without a recognition that all of these issues reflect matters of interdependence and inter-determination.[§] They require holistic thinking.

The neo-liberal political economy has likewise had significant political consequences on the distribution of the benefits of economic enterprise; as a global matter, it promotes a

[*] Brundtland Comm'n, *Report of the World Commission on Environmental & Development: Our Common Future*, ch. 2, Para 1, UN Doc. A/42/427 (Oct. 1987).

[†] The Report, *Transforming our World: the 2030 Agenda for Sustainable Development*, establishes the current global context with respect to nonrenewable resources and the implications of climate change:

Natural resource depletion and adverse impacts of environmental degradation, including desertification, drought, land degradation, freshwater scarcity and loss of biodiversity, add to and exacerbate the list of challenges which humanity faces. Climate change is one of the greatest challenges of our time and its adverse impacts undermine the ability of all countries to achieve sustainable development. Increases in global temperature, sea level rise, ocean acidification and other climate change impacts are seriously affecting coastal areas and low-lying coastal countries, including many least developed countries and small island developing States. The survival of many societies, and of the biological support systems of the planet, is at risk.

See Transforming our World: the 2030 Agenda for Sustainable Development, G.A. RES/70/1, UN Doc A/RES/70/1 at Para 14 (Sep 25 2015), *available at*: http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E. *See also*, World Health Organization, Climate Change and Human Health (A. J. McMichael, A. Haines, R. Slooff, and S. Kovats. eds.) 96 – 99 (Geneva, Switzerland, 1996) (detailing the human cost of decreased supplies of potable water which results from climate change, particularly the spread of waterborne disease).

[‡] See generally, Colin Williams & Andrew Millington, *The diverse and contested meanings of sustainable development*, 170 the geographical journal 2 (June 2004); and Steve Connelly, *Mapping Sustainable Development as a Contested Concept*, 12 Local Environment 3, (June 2007).

[§] See Bob Giddings, et al, *Environment, Economy and Society: Fitting Them Together into Sustainable Development*, 10 Sustainable Development 4 (2002).

radical form of inequality.* The consequence of inequality is that the most important resource in a nation's economic profile—its human capital—is often underutilized.† A theory of sustainable development would reflect the well accepted economic concept that human and social capital contribute to growth and stability; this concept emerged from the recognition that physical capital is far from the sum total of a state's total capital, which directly conditions a state's level of economic development. Human capital describes the economic value of the application of human knowledge and skill, which can be improved through investment, since the quality of labor conditions production input, which in part conditions economic growth.‡ Social capital describes the economic value of intangible aspects of human relationships, customs, and social institutions, including norms and networks, which inform and condition community-level capacity to work together to meet collective needs and achieve common goals.§ While this necessitates investment in institutions to encourage critical thinking, other factors, such as the political environment, culture and taboo, the strength of public networks, social cohesion or solidarity, access to information, communication, and more also directly impact the economic value of social capital. These two forms of capital are themselves interconnected, as the quality of one can help or hinder the quality of the other.¶ Economic crises in recent human history bear out the importance of human and social capital, since the relative health of a state's labor market is a frontline indicator of overall economic health.** Long term human and social capital investments positively impact employment and ultimately reduce national economic vulnerability when crises erupt.

While radical inequality is a global phenomenon,†† one need look no further than the American experience in recent decades for a potent example of the inexorable expansion of inequality within an economic system. Distinguished economists tell us that one percent of our population takes one quarter of all income in the United States, that this one percent controls forty percent of the nation's wealth, and that this one percent's income is rising. The neoliberal economic model has created an enabling environment for this ever-worsening inequality; in short, the explosion of radical inequality is an outcome of the policy process itself. When the US congress cuts taxes on the highest incomes and capital gains, and enacts

* See generally, James K. Galbraith, *Global inequality and global macroeconomics*, 29 Journal of Policy Modeling 4 (2007); Vicente Navarro, *Neoliberalism as a Class Ideology; Or, the Political Causes of the Growth of Inequalities*, 31 Int J Health Serv 1 (2007); Lisa Duggan, The twilight of equality?: Neoliberalism, cultural politics, and the attack on democracy (2012); and George DeMartino, Global economy, global justice: Theoretical and policy alternatives to neoliberalism (2002).

† See Oded Galor, *Inequality, human capital formation and the process of development*, Working Paper No. w17058, National Bureau of Economic Research at 25 (2011) ("...as human capital has become the prime engine of economic growth, a more equal distribution of income…has stimulated investment in human capital and promoted economic growth").

‡ Theodore Schultz, *Investment in human capital*, 51 The American economic review 1 (1961).

§ See, *e.g.,* John Brehm & Wendy Rahn, *Individual-level evidence for the causes and consequences of social capital*, American journal of political science (1997); Stephen Knack & Philip Keefer, *Does social capital have an economic payoff? A cross-country investigation*, The Quarterly journal of economics (1997); and Pamela Paxton, *Social capital and democracy: An interdependent relationship*, American sociological review (2002).

¶ See generally, Nan Lin, Social Capital: A Theory of Social Structure and Action (2002) (setting out a range of case studies and summarizing analyses of the relationship between human capital and social capital).

** See, *e.g.,* International Labour Organization, Labour Statistics, *available at*: http://www.ilo.org/inform/online-information-resources/research-guides/labour-statistics/lang--en/index.htm; The World Bank, Social Protection and Labor Data, available at: http://data.worldbank.org/topic/labor-and-social-protection.

†† See generally, Emma Seery & Ana Caistor Arendar, *Even it Up: Time to end extreme inequality*, Oxfam Report 7 (2014), *available at* https://www.oxfam.org/sites/www.oxfam.org/files/file_attachments/cr-even-it-up-extreme-inequality-291014-en.pdf; Branko Milanovic, Worlds apart: Measuring international and global inequality (2011); Sakiko Fukuda□Parr, *Reducing inequality–The missing MDG: A content review of PRSPs and bilateral donor policy statements*, 41 IDS Bulletin 1 (2010); Ayelet Shachar, The birthright lottery: Citizenship and global inequality (2009); Nancy Birdsall & Juan Luis Londoño, *Asset inequality matters: an assessment of the World Bank's approach to poverty reduction*, 87 The American Economic Review 2 (1997).

constraints on organized labor, and limits regulation—including and particularly of the financial sector—the one percent massively benefits. The repeal of Glass-Steagall resulted in the creation of powerful financial behemoths, which resulted in a concentration of financial benefits to the financial sector. The critical influences on the policy process are likewise reflected in the interest group politics of American society, which compete without restraint and demonstrate *de facto* limitations on the ideology of American pluralism, in light of the direct relationship between amounts of money spent and the likelihood of certain policy determinations by operational actors. Non-profit corporations are contributing to campaigns through Super PACs—now a regular part of US election processes—without disclosing the source of these funds. A term of art has been created to describe this phenomenon: "dark money".* A critical question is whether, under cover of American democracy, the political culture of the United States is gravitating toward a plutocracy, in which the system of governance is dominated by a minority of its wealthiest citizens.

It is important to note that radical inequality and the marked social and economic disparities which characterize it are not necessarily inevitable consequences of market forces. Indeed, across the last fifty years in particular, the private sector has been celebrated as a potential engine for social and economic development and a key driver of the global knowledge economy. However, the dangers inherent in an overly-powerful and unregulated private sector have long been apparent. One hundred years ago, American economist Thorstein Veblen asserted that a business professional is less a wealth creator and more an economic saboteur.† In Veblen's time, a range of wealthy elites in the US were subverting the implicit compact of the social democratic state. Reflecting on this phenomenon, President Theodore Roosevelt said, "…we had come to the stage where for our people what was needed was a real democracy; and of all forms of tyranny the least attractive and the most vulgar is the tyranny of mere wealth, the tyranny of a plutocracy."‡ The elites of today are likewise undermining the social democratic state and its promise of social protections, reasonable financial regulation, progressive taxation, and a commitment to civil rights and equality. A range of authoritative commentators continuously point out that even the most acrobatic arithmetical exercises do not bear out that the explosive income generation at the top is trickling down to the tens of millions of American citizens at the bottom, and that it has in reality extinguished opportunities for Americans across employment, education, health and welfare, finance, security, energy, and ecology contexts.§

---

* See, *e.g.,* Trevor Potter & Bryson B. Morgan, *The History of Undisclosed Spending in US Elections & How 2012 Became the Dark Money Election*, 27 Notre Dame Jl Ethics & Pub. Pol'y 383 (2013); Heather K Gerken, *The Real Problem with Citizens United: Campaign Finance, Dark Money, and Shadow Parties*, 97 Marq. L. Rev. 903 (2013).

† Thorstein Veblen, The Engineers and the Price System 38 (1921; New York: Harbinger, 1963).

‡ Theodore Roosevelt, An Autobiography 464 (1913).

§ At the global level, Oxfam has pointed out that "Far from trickling down, income and wealth are instead being sucked upwards at an alarming rate. Once there, an ever more elaborate system of tax havens and an industry of wealth managers ensure that it stays there, far from the reach of ordinary citizens and their governments." *See* Oxfam, *An Economy for the 1%: How privilege and power in the economy drive extreme inequality and how this can be stopped*, Oxfam Briefing Paper 210, at 3 (January 18, 2016), *available at*: http://www.oxfamamerica.org/static/media/files/bp210-economy-one-percent-tax-havens-180116-en_0.pdf *See also,* Era Dabla-Norris, et al., *Causes and Consequences of Income Inequality: A Global Perspective*, International Monetary Fund 7 (2015), *available at*: http://www.imf.org/external/pubs/ft/sdn/2015/sdn1513.pdf (finding an "inverse relationship between the income share accruing to the rich (top 20 percent) and economic growth. If the income share of the top 20 percent increases by 1 percentage point, GDP growth is actually 0.08 percentage point lower in the following five years, suggesting that the benefits do not trickle down").

With the global financial crisis of 2008 only a few years behind us and in light of continuing speculation about another on the way,[*] the circumstances under which the private sector can harm rather than help social and economic development have again come to the fore of the global development discussion, and Veblen's meditations have a contemporary relevance. This is because Veblen's observations in 1904 and the realities of the 21st century are part of the same conventional paradigm, which has failed either to recognize the flaw of deregulation or to meaningfully do something about it. A new paradigm for the political economy of shared prosperity, to eliminate radical inequality as a mission—critical step toward the achievement of sustainable development, is clearly needed. It will require a thorough review of the fundamentals of the neo-liberal economic model and a reasoned and deliberate move away from its failed methods and its lack of concern for the social consequences of its theoretical inadequacy.

3. Unpacking a process to develop a New Theory of Sustainable Development

The political economy of neoliberalism has given us an economic process which accelerates radical inequality. Radical inequality destroys the critical foundations on which economic and political sustainability rest and is self-reinforcing in its disabling effect because it radically subverts the economic value of human capital, which undermines freedom of opportunity, which further extinguishes capability. There can be no sustainable economy if radical inequality continues to dominate the global political economy.

Oxfam has demonstrated the shortcomings of economic models focused particularly on wealth acquisition by famously calculating that as of 2015, the world's 62 wealthiest people collectively have the same total wealth as one-half of the total human population: the world's 3.6 billion poorest people.[†] The organization has thus emphasized that "from Ghana to Germany, South Africa to Spain, the gap between rich and poor is rapidly increasing and economic quality has reached extreme levels…the consequences are corrosive for everyone. Extreme inequality corrupts politics, hinders economic growth, and stifles social mobility. It fuels crime and even violent conflict. It squanders talent, thwarts potential, and undermines the foundations of society."[‡]

Much is indeed needed to achieve a theory toward a comprehensive and effective sustainable development paradigm, including the following considerations:

- *Socio-Economic Development*: How can a range of global actors simultaneously prioritize complementary support for peace- and state-building activities, with an emphasis on

[*] Indubitably, China's fortune has waned since its gargantuan economic growth boom earlier this decade. China's surge in economic debt and decline in economic growth resembles much of the initial indicators of the 2008 global financial crisis, indicating a potential impending crisis for the super economy. *See* The International Monetary Fund, *Global Financial Stability Report*, IMF Survey (April 13, 2016), *available at*: http://www.imf.org/en/News/Articles/2015/09/28/04/53/sopol041316a.

[†] See Oxfam, *An Economy for the 1%: How privilege and power in the economy drive extreme inequality and how this can be stopped*, Oxfam Briefing Paper 210, at 2 (January 18, 2016), *available at*: http://www.oxfamamerica.org/static/media/files/bp210-economy-one-percent-tax-havens-180116-en_0.pdf.

[‡] Emma Seery & Ana Caistor Arendar, *Even it Up: Time to end extreme inequality*, Oxfam Report 7 (2014), *available at*: https://www.oxfam.org/sites/www.oxfam.org/files/file_attachments/cr-even-it-up-extreme-inequality-291014-en.pdf

"inclusive political settlements, security, justice, jobs, good management of resources, and accountable and fair service delivery?"*

- *Employment*: How can global food security, full employment, and abolition of poverty be achieved within a decade?
- *Energy*: What does practicable, sustainable green energy look like, which combines responsible government and private sector action for transformational energy generation? How can an exponential growth in local technical expertise be achieved, lest any energy assets created be at risk of accelerated deterioration and thus stymie or undo energy transformations?†
- *Ecology*: How can global living standards be raised to middle class levels without depleting or destroying the environment or depriving future generations of the capacity to sustain these achievements?
- *Human Capital – Equality, Education, Health and Welfare*: How can global levels of education and public health be raised to OECD level? Inequality severely limits efforts to rid the world globally of extreme poverty—how can sustainable equality be achieved?
- *Finance*: How can the necessary financial resources be generated and mobilized to achieve the goals described in the first three questions?
- *Security*: How can we permanently eliminate war and weapons of mass destruction (WMD) which threaten to destroy all other development achievements?
- *Governance*: How can we design and implement systems of global governance capable of implementing necessary measures to achieve the other five goals for the welfare and well-being of all?

But do the SDGs account for these considerations effectively? Concerns about the substance of the SDGs and what they will measure have been voiced by a range of authoritative commentators. For example, Charles Kenny, a senior fellow at the Center for Global Development, has asserted that the creation of the SDGs was characterized by "overwrought and obese drafts proposed by negotiating committees [which] so far almost ensure that the post-2015 goals will have comparatively limited value and impact."‡ Similarly, the International Council for Science (ICSU) and the International Social Science Council (ISSC) released a 2015 analysis of the 169 SDG targets and asserted that only 29% are "well-developed"; that 54% "could be strengthened by being more specific"; and that 17% "require significant work".§ For example, the authors find SDG 16—popularly called the "governance goal"—"overly timid", stating that "the way…SDG [16] is formulated, narrowly emphasizing justice,

* See g7+, Fragility Spectrum (2013): "Fragility is a period of time during nationhood when sustainable socio-economic development requires greater emphasis on complementary peacebuilding and state building activities, such as building inclusive political settlements, security, justice, jobs, good management of resources, and accountable and fair service delivery."

† See Hazel Henderson, *The Politics of the Solar Age*, (2015)."Green transition is powered by fundamental shifts in human perspectives leading to paradigm shifts in science, academia, governance, leadership, finance, business, social norms, communications and network structures."

‡ See Charles Kenny, *MDGs to SDGs: Have We Lost the Plot?*, Center for Global Development (May 27, 2015), *available at*: http://www.cgdev.org/sites/default/files/CGD-Essay-Kenny-MDGs-SDGs-Have-Lost-Plot.pdf.

§ International Council for Science, International Social Science Council, Review of Targets for the Sustainable Development Goals: The Science Perspective (ICSU, 2015, *available at*: http://www.icsu.org/publications/reports-and-reviews/review-of-targets-for-the-sustainable-development-goals-the-science-perspective-2015/SDG-Report.pdf).

accountability and inclusion, is arbitrary and disconnected from research on how governance affects sustainable development." The authors conclude that "SDG 16... falls short of what the evidence suggests is needed…[and] because the SDG 16 elements point a spotlight overwhelmingly on poor countries, whereas the broader set of governance targets require action universally, the choice of targets undermines the overarching ambitions of the goal."

"Achievement of a new paradigm would depend on operational participants who authentically recognize that the management of political economy is a matter of human choice and decision, and not a matter of meta-physical speculation."

In light of these considerations, what are the necessary elements of a new paradigm of sustainable development? In short, legal theory provides robust guidance for the development of a comprehensive and effective sustainable development paradigm to augment economic theory, and to better facilitate the achievement of a new paradigm. Such a theory must be:

- Contextual, i.e., it must perceive all features of the social process of immediate concern in relation to the manifold of events comprising the relevant whole;
- Problem-oriented;
- Multi-method; and
- Interdisciplinary, with a focus on the dynamics of global interdependence and global inter-determination.

To qualify as a new paradigm, it follows that fundamental change would need to happen. Achievement of a new paradigm would depend on operational participants who authentically recognize that the management of political economy is a matter of human choice and decision, and not a matter of meta-physical speculation; who acknowledge centrality of human capital as the prime concern of responsible economics; who recognize the need to balance freedom of contract and responsible regulation toward more and better economic accountability and improved choices for the common good; who examine and clarify the base values of the concepts of free market and command economies; who prioritize the complementary promotion of liberty, equality, security, social justice, conservation, and responsible production.

4. Conclusion

The notion of global political economy is coterminous with the idea of a global sustainable political economy; a new paradigm of sustainable economy should include precepts for a new paradigm for sustainable development, and be focused on how effective and controlling decisions are made and put into effect in the public interest of all social participants. Unpacking this public and private decision-making is a necessary first step

toward understanding the creation and the distribution of the values which underpin the policy process of the conventional paradigm, and the development of a theory of sustainable development.

"Approaches to resolve challenges are subject to conflicting claims, priorities and interests, for which concerted efforts at reconciliation are necessary."

Lessons emerged for the development of a theory of sustainable development, which is itself a further step toward the achievement of a new global paradigm which transcends narrow disciplinary boundaries, emphasizes open access to new knowledge and facilitates the availability of new tools and technologies for sustainable human productivity, embraces the primacy of interrelated and interdependent implementation of sustainable development solutions and eschews partial or sectoral approaches, surfaces, implements, and celebrates global solutions and coordinated actions by the international community, and recognizes that approaches to resolve challenges are subject to conflicting claims, priorities and interests, for which concerted efforts at reconciliation are necessary.

Authors Contact Information
Winston P. Nagan *– Email*: nagan@law.ufl.edu
Craig Hammer *– Email*: chammer@worldbank.org
Maxat Akhmetkaliyeva *– Email*: maxava88@yahoo.com

CADMUS, Volume 3, No.2, May 2017, 58-67

Education Isn't Education:
The Creativity Response or How to Improve the Learning Curve in Our Society

Stefan Brunnhuber
Medical Director & Chief Medical Officer, Diakonie Hospital, Germany;
Fellow, World Academy of Art & Science

Abstract

Despite rising expenditure and general enrolment rates on a global level, educational output is stagnating, if not declining. There is increasing empirical evidence that we need a completely different approach to enhancing the learning curve; this holds true for early childhood, primary education, secondary education and higher education. Most existing educational programs do not tap into the full creative potential of our minds and our brains and often lead to suboptimal outcomes both for the individual and for society as a whole. Findings in clinical psychology, neurobiology and social psychology are not sufficiently considered when setting up appropriate educational programs. It is not the cognitive part of the curriculum that makes a difference, but rather the non-cognitive features (including stress management, impulse control, self-regulation, emotional attachment etc.) that improve creativity. A 'six-pack' of features, including exercise, nutrition, social contact, mindfulness-based practices, sleeping well, and multi-sensory learning, is introduced as part of a 'creativity response'. They are simple, affordable, evidence-based and efficient strategies that can be implemented promptly without additional costs, increasing our learning curve.

1. Introduction

Our current educational system developed in the 18th and 19th centuries. Yet we now live in a world where the half-time of knowledge is 5 years in most disciplines; we set up courses which last 3-5 years, and apply this learning to situations in which 3/4th of firms currently operating will not exist 10 years from now and 40% of jobs will be replaced by automation.

The question is, how to improve the learning curve, unleash maximum creativity in each individual, and adapt this to the new world? What does science tell us about this question? We must bear in mind that education is always ambivalent: On the one hand, it has to conserve existing knowledge and transmit it to the next generation. On the other hand, it is supposed to prepare the present generation for the future while incorporating all the latest wisdom.

"Most existing educational programs do not tap into the full creative potential of our minds."

Most existing educational programs do not tap into the full creative potential of our minds and brains and often lead to suboptimal outcomes. Findings in clinical psychology, neurobiology and social psychology are not sufficiently considered when setting up such programs. It is not the cognitive part of the curriculum that makes a difference, but rather the non-cognitive features (including stress management, impulse control, self-regulation, emotional attachment etc.) that improve creativity. The following text attempts to demonstrate that it is not the (cognitive) curriculum, not the input factors, but the non-cognitive factors in the educational process that are underemphasized, missed or misinterpreted. Thus, we constantly fail to improve the mental capacity for learning in our society.

"Education is an investment, not a consumer good."

"Should we continue along this path of 'more of the same': more teachers, more chalk, tablets, toilets, computers, fixed roofs, textbooks, more input?"

Why do we need education and why more creativity? This is not about happiness, fun, satisfaction, love, wellness or wealth. It has to do with creativity, with unleashing each human being's full capacity. Actually, humans cannot not learn. The question is rather how to improve and maximize this intrinsic capacity. We are concerned with a form of adapting to the world, where new information and new forms of networking allow new thinking, processing, coping with challenges, solutions to problems. Creativity and learning are about something new—something original. By creativity, we do not mean genius, a specific talent; instead, we are talking about a human condition that is part of each human being. Someone who is creative is able to balance out and integrate opposites (from competition to cooperation; theory to practice; from ascetic life to abundance; from extroversion to introversion; from one discipline to another, etc.); he/she is able to discriminate between good ideas and bad ideas, to ask questions that have never been asked, and respond to challenges that have never been responded to—and all of this in a unique, individual way. This takes place every day, in each human being from preschool to primary school to secondary school to higher education, all over the world, 8 billion times, 24/7, throughout life. But education is an investment, not a consumer good. And investing in such changes generally requires about 50 years: 10 years for the actual reform and 40 to replace the workforce under that reform. If we want to make a change now, we have to look for different tools than the ones we have been using so far.[*]

2. The Input-Output Fallacy

For several decades, the world has been spending an increasing amount of money on the

[*] Pritchett, Lant (*The Rebirth of Education: Schooling Ain't Learning*, Brookings Institution Press, 2013) claims there are six components in a successful education system: open free access; decentralized and local organization; performance-based outcome measures; professional networking, including certified and monitored training; conference and communication among teachers; flexible financial and technical support. These institutional factors are necessary, but not sufficient, to improve learning in a society.

educational system. This money is supposed to enhance the learning curve and the capacity for problem solving in a more complex world; it is supposed to make access to the labor market easier, thereby resulting in better living standards, and to improve the greatest capacities and talents in each individual as an end in itself.* This form of input supposedly correlates with an increasing output. However, the link between input and output is pretty weak in education. Some examples should serve to demonstrate this:† Developing countries have tripled the enrolment rate over the last 50 years and individuals there now spend more years in school than in OECD countries in the 1960s. Brazil and South Korea spend about the same amount of money per capita on education. But South Korea outperforms Brazil by 176 PISA points.‡ The US spends over 10.000 USD per year per capita on students aged 5 to 15, while Poland spends 3.900 USD on the same cohort, but both countries have similar outcomes. Finland spends the same as Spain, but Finland has 80 PISA points more than Spain. 4/5th of fourth-graders in India cannot read, despite increasing enrolment rates in the country over the last decade. In OECD countries, spending has increased by a factor of 2-3 over the last 50 years, but the results have been stagnating for decades. In the US, spending has been the highest in the world over the last 50 years, yet no change has been seen in reading or mathematical skills over the last 40 years; in fact, they have partly grown worse. Should we continue along this path of 'more of the same': more teachers, more chalk, tablets, toilets, computers, fixed roofs, textbooks, more input?

If we take current educational progress in developing countries (PISA, TIMSS or other measures) and project it into the future, it would require 60-100 years (!) and more to gain, for example, 100 PISA points in learning assessments. In some developing countries it would take 100-330 years to catch up with the pace of learning in OECD countries. Maybe we are doing something wrong and failing to understand the process of learning, creativity and education in the 21st century. Pumping in more of the same does not make sense.§ We are spending more and more money and achieving less and less outcome.

Input is not output, schooling is not education and learning is not creativity. Two biases and false convictions are relevant to gaining a better understanding of this skewed development: First, we spend twice as much money on higher education as on primary education and even less on pre-schooling, despite the fact that the educational Return On Investment (ROI) of any early educational intervention is up to 10 times higher than in

* From a purely financial perspective, the situation is pretty clear: We need 40 billion USD to provide 12 years of good education for every child on the planet; this is equivalent to 8 days of military expenses, globally. Such an investment would have a huge and varied impact on society: child marriage would drop by 59%, premature births by 59%, mortality among under-5s by 49%; every extra year in education would increase earnings by 10% in the future, etc. See: https://www.malala.org/malalas-story

† There is even a methodological bias built in: In most studies that are non-experimental with uncontrolled variables, input variables and unspecific uncontrolled variables are attributed to one another. This leads statistically to the false conclusion that the input is highly relevant for the output. However, as shown in this text, motivational, psychological, socioeconomic and non-cognitive variables (often classified as unspecified and uncontrolled) have a huge independent impact on outcome. See also Pritchett L, 2013 for the examples in this text.

‡ PISA stands for Program for International Student Assessment, see: https://www.oecd.org/pisa/

§ The situation is more complicated than mere behavioral approaches employing incentives and reinforcements. In fact, Roland G. Fryer was able to show that in over 25,000 students there was no impact on performance, attention, compliance and long-term behavioral change, demonstrating that most such stimulus programs are ineffective to negative in educational outcome in older pupils and that there is no evidence of success in children. See Roland G. Fryer, Jr, June 2013, Information and Student Achievement: Evidence from a Cellular Phone Experiment, NBER Working paper 19113, Cambridge, MA, National Bureau of Economic Research June 2013; Fryer 2013, Teacher Incentives and Student Achievement Evidence from New York City Public Schools, Journal of Labor Economics 31, 2, April 2013.

higher education.* This is irrational, feeding only into the short-term demands of the labor market and not into the more general, long-term demands of the individual and society. Second, we do not differentiate sufficiently between the different intermediate factors that constitute the input and output factors. Roughly about 1/4th can be attributed to input such as schooling infrastructure, teacher-student ratios, pencils, textbooks, computers and so on. 3/4th go somewhere else.† They basically go into the black box that lies between the input and the output of the educational system, described in the following section.

3. The Intermediate Black Box

The intermediate black box refers to what is happening between input and output, namely what is happening in the classroom. Basically, two major factors are involved: a cognitive and a non-cognitive factor. The cognitive factors refer to the curricula or the programs in place. For primary and secondary education, this concerns skills such as numeracy, reading, calculation, verbalizing, arguing, debating, literacy, and thinking. In higher education, these are the different degrees students are applying for, from law to bio-science, from medicine to economics, from the humanities to agriculture, from arts to engineering.‡ These cognitive factors follow a specific rationale and program in each faculty or discipline and they differ from non-cognitive factors. They refer to skills which are not explicitly captured and expressed by the official curriculum in which the student or pupil is enrolled. Non-cognitive factors comprise skills such as self-control, conscientiousness, curiosity, novelty seeking, grit, optimism, resilience towards failure, perseverance, emotional attachment, impulse control, executive functions like planning ahead or anticipating, stress management, self-regulation, cognitive flexibility, increased working memory, focused attention, sitting in silence and so on. In the following pages I will emphasize that it is the non-cognitive skills that are key to good outcomes in education.§ They can be enhanced in two major ways: first, by personal and interpersonal skills and second, by specific lifestyle changes, which include a 'six-pack', what I call a 'creativity response'. We will look more closely into this later in the coming sections. Figure 1 illustrates the non-cognitive building blocks necessary to enhance learning and creativity.

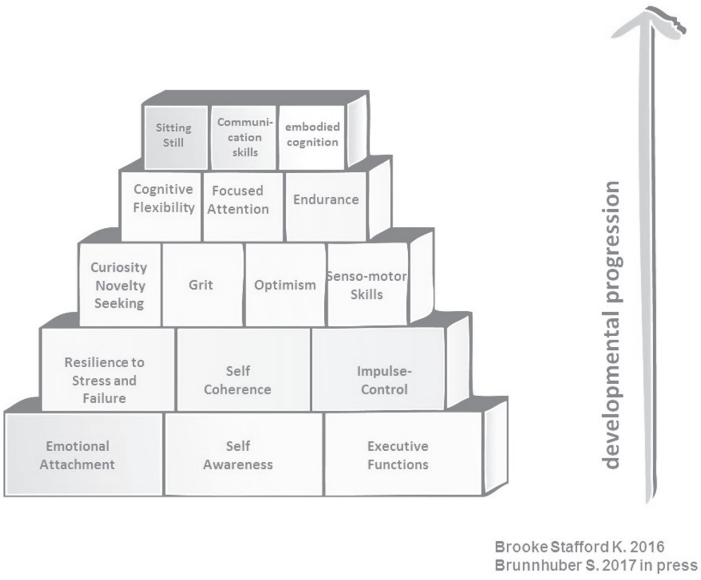
* And even in the pre-school phase, as a community we spend the least money on early education and care, knowing full well that science tells us to do the exact opposite. For example, we spend only 5% on 0-2-year-olds and the other 95% of all money spent on pre-schooling goes to 3-5-year-olds. The Heckman curves demonstrate the huge losses we are creating by misaligning the money spent on education, see: heckmanequation.org or Noreen M. Yazejian and Donna M. Bryant, Educare Implementation Study Findings - August 2012 (Chapel Hill, NC: Frank Porter Graham Child Development Institute, 2012); or Noreen Yazejian, Donna Bryant, Karen Freel, Margaret Burchinal, and the Educare Learning Network Investigative Team, "High-Quality Early Education: Age of Entry and Time in Care Differences in Student Outcomes for English-Only and Dual Language Learners," *Early Childhood Research* Quarterly 32 (2015).

† Pritchett, Lant, 2013, *The Rebirth of Education: Schooling Ain't Learning*, Brookings Institution Press.

‡ Historically, over the centuries, general knowledge turned into discipline-specific expertise, going from fewer than 10 disciplines in the 19th century to over 50 in the 20th century to over 1000 at the beginning of the 21st century (including all sub-disciplines). This compartmentalization has expanded knowledge tremendously, but dissociates this knowledge from reality, producing masses of statistically significant, but in part irrelevant information (such as: 'Do we really need this study?') that is dissociated from knowledge in other disciplines (such as: 'Do they really know what is going on?') Any further cognitive specialization means that we risk losing our perspective of the whole.

§ Angela L. Duckworth and David Scott Yeager, 2015, "Measuring Matters: Assessment Personal Qualities Other than Cognitive Ability for Educational Purposes", *Educational Researcher* 44, 4 2015; see also Paul Tough, *Helping Children Succeed. What Works and Why*, June 2016, or *How Children Succeed, Grit, Curiosity and the Hidden Power of Character*, New York: Houghton Mifflin Harcourt, 2012; Terrie E. Moffitt et al., "A Gradient of Childhood Self-Control Predicts Health, Wealth, and Public Safety", *Proceedings of the National Academy of Sciences* 108, no. 7 (February 2011): These studies demonstrate that the non-cognitive skills improve outcome parameters such as future income, health, societal success, credit problems, early pregnancy below the age of 15 among others.

Figure 1: Building Blocks for a Higher Learning Curve and Higher Creativity



3.1. Personal and Interpersonal Factors

Looking at the current discussion and empirical findings on what determines learning in humans, John Hattie investigated 800 meta-analyses with 50,000 single studies and over 80 million students and came up with 136 variables in an attempt to answer the question: What works, and what is neutral or negative with regard to educational outcomes? Educational outcomes are mainly determined by personal and interpersonal variables. And compared with other factors, such as institutional and socioeconomic ones, the (inter-)personal variables outperform the others by a factor of 2.* Whereas institutional factors have an Effect Size (ES) of 0.23, personal and interpersonal factors have a compound ES of 0.49. This means that concept mapping, peer tutoring, feedback, meta-cognitive training, cooperative learning, self-evaluation, feedback, mutual learning, and learning by teaching among others are doubly as effective as the institutional arrangements.† Generally speaking, it is the emotional attachment and response between the pupils or students and the teacher or mentor which are key to the improvement or deterioration of the learning curve.‡

* The statistical measure for this is the Effect Size (ES), which indicates the difference of an intervention with regard to the standard intervention. So ES (d=1.0) means a difference of one standard deviation. Negative ES is of course something to be avoided, ES 0-0.2 reflects general development; 0.2-0.4, an average training program. Everything above 0.4 reflects an intentional attempt to improve learning outcomes, performance and ultimately creativity.

† This is one of the reasons why the so-called constructivist (non-directive) approach failed empirically: students are considered to do their best if they are put into an enriching environment and then encouraged to find out what further course of action to take by themselves. This approach works well in pre-school, but the older the students/pupils become, the more they benefit from direct instructions, drill, feedback and self-evaluation. Constructivism is a theory of knowledge, but failed to become an educational intervention technique.

‡ To be more precise, it is neither the amount of positive or negative emotions, nor the power of the emotions (strong versus weak), but the so-called emotional granularity that makes the difference. See for example: Todd B. Kashdan, Lisa Feldman Barrett, and Patrick E. McKnight, *Current Directions in Psychological Science*, 2015, Vol. 24(1) 10–16 "Unpacking Emotion Differentiation: Transforming Unpleasant Experience by Perceiving Distinctions in Negativity"; or http://www.nytimes.com/2016/06/05/opinion/sunday/are-you-in-despair-thats-good.html

3.2. The Six-Pack: The Creativity Response

Besides the (inter-)personal and psychological features, there is increasing empirical evidence of at least 6 medical and psychological domains that can make a significant difference regardless of the discipline, the curriculum chosen and the stage of education in question. I call this the 'six-pack' or the 'Creativity Response'; it refers to several specific lifestyle modifications and attitudes, which can in part be implemented in the classroom. In the following sections I will simply provide some examples to outline the argument.

3.2.1. Exercise

Pre-clinical, clinical and population-based data show that exercise enhances cognitive performance, memory functions, attention span and so on. A simple 90-minute walk[*] in the park already significantly reduces worrying and repetitive thought processes, increasing cognitive speed. Simple long-distance running can increase the IQ.[†] Additionally, neurogenesis, reduced pro-inflammatory states and increased blood flow in the brain are associated with numerous exercise programs.Walking increases the blood flow in the brain by 13%, while jogging does so by 25%. Exercise is proven to be stress-releasing and has a positive impact on sleep and concentration. A simple 4-minute in-class intensive exercise interval program over several weeks already increases the attention span, mathematical skills and overall performance.[‡] And this effect is in part dose-dependent: The more, the better (20 minutes versus 10 minutes).[§] And the more complex the sensomotoric exercise is, the better the results.[¶] So what kind of exercise has the highest impact? Aerobic, resistance, coordinative or mental-based exercise? There is preliminary evidence that in order to stimulate the hippocampus and the prefrontal cortex, which are both necessary to improve resilience, performance, creativity and learning, we need forms of sensomotoric exercise with a highly inbuilt mental and mindfulness-based component. So it is not only about running on a treadmill, weight-lifting and jogging, it is about more complex coordinative exercises or practices: yoga, qigong, martial arts. This is what Eastern wisdom is all about: increasing mindfulness in everything we are doing.

3.2.2. Mindfulness and Meditation

Herbert Benson, together with John Kabat-Zinn, started identifying and standardizing mindfulness-based techniques, mainly from the East Asian tradition (Zen, yoga, qigong, Tonglen, tai chi, etc.)[**] Some of the findings are: mindfulness-based programs can stabilize

[*] Gregory N. Bratman, J. Paul Hamilton, Kevin S. Hahn, Gretchen C. Daily, and James J. Gross, *PNAS* 2015 112 (28) 8567-8572; published ahead of print June 29, 2015.

[†] http://well.blogs.nytimes.com/2016/07/13/can-running-make-you-smarter/?smprod=nytcore-iphone&smid=nytcore-iphone-share&_r=0

[‡] *Applied Physiology, Nutrition, and Metabolism* 2015 Mar; 40(3):238-44. doi: 10.1139/apnm-2014-0309. Epub 2014 Nov 10. Four minutes of in-class high-intensity interval activity improves selective attention in 9-11 year olds. Ma JK1, Le Mare L, Gurd BJ; Cell Metabolism 2016 Jun 21. pii: S1550-4131(16)30247-9. doi: 10.1016/j.cmet.2016.05.025. Running-Induced Systemic Cathepsin B Secretion Is Associated with Memory Function. Moon HY, Becke A, Berron D, Becker B, Sah N, Benoni G, Janke E, Lubejko ST, Greig NH, Mattison JA, Duzel E, van Praag H.

[§] *Research Quarterly for Exercise and Sport* 2015 May 26:1-8. [Epub ahead of print] Acute Effects of Classroom Exercise Breaks on Executive Function and Math Performance: A Dose-Response Study. Howie EK1, Schatz J, Pate RR.

[¶] *Journal of Science and Medicine in Sport* 2014 Sep 21. pii: S1440-2440(14)00177-7. doi: 10.1016/j.jsams.2014.09.007. The relationship between motor skills and cognitive skills in 4-16 year old typically developing children: A systematic review. van der Fels IM, Te Wierike SC, Hartman E, Elferink-Gemser MT, Smith J, Visscher C.

[**] See Herbert Benson, *Relaxation Revolution*, 2010. ISBN 978-1-4391-4865-5; Paulson S, Davidson R, Jha A, Kabat-Zinn J. "Becoming conscious: the science of mindfulness". *Annals of the New York Academy of Sciences* 2013 Nov; 1303:87-104.

and even reverse the degradation of grey matter in aging;[*] In long-term meditators, the impact on the hippocampus is dose dependent;[†] The more and longer a candidate has been meditating, the better his or her memory functions are.

Mindfulness-based aspects are now implemented in a large number of syndrome-specific clinical programs. We have specific programs available for dementia, mild cognitive impairments,[‡] depression, anxiety, suicidal ideations,[§] pain relief, sleeping disorders and eating disorders among others.

If we took these findings into the classroom——this is called Mindfulness In School Projects (MISP)—what would happen? The non-cognitive factors, as described above, indirectly enhance cognitive performances.[¶] Pupils learn to sit still, increase their attention span, learn to focus, become more resilient to stress and failure, improve their face-to-face communication and their capacity to distinguish between relevant and irrelevant information. Mindfulness is characterized as a form of improved or enhanced consciousness; it is not a technique for falling asleep. However, sleeping well is another non-pharmacological intervention which offers substantial benefits that increase the learning curve.

3.2.3. Rest and Sleep

Adults require 7-9 hours' sleep a day. Historically we sleep 20% less than we slept 100 years ago. And there is 10 times more artificial lighting per capita than there was 50 years ago. Sleep is important for homeostasis, memory consolidation, and mental and physical performance. Insomnia, which is lack of proper sleep, is not only a risk factor, but a causal link for high blood pressure, obesity, dementia, depression and stress-associated symptoms. The correlation between stress, performance and insomnia is cyclical: More stress causes sleeplessness, thereby causing more stress during the day, which results in more sleeplessness. Almost 78% of participants in a study perceived more stress when they did not get enough sleep.[**] By now, over 2/3rd of British men sleep for less than 7 hours, which clinically is a form of insomnia: the consequences are restlessness, concentration problems, lack of motivation, negative emotions, and lack of control—all parameters that feed into lower cognitive performance. In children, memory is best restored when they have a nap or sleep after reading or studying (1-3 hours). Medical students' sleep quality has been the best predictor of the grades of their final exams.[††]

[*] *Frontiers in Psychology* 2013 Jul 9;4:398. doi: 10.3389/fpsyg.2013.00398. eCollection 2013. Brain Gray Matter Changes Associated with Mindfulness Meditation in Older Adults: An Exploratory Pilot Study using Voxel-based Morphometry. Kurth F1, Luders E2, Wu B3, Black DS.

[†] Meditation effects within the hippocampal complex revealed by voxel-based morphometry and cytoarchitectonic probabilistic mapping. Luders E1, Kurth F, Toga AW, Narr KL, Gaser C.

[‡] *Frontiers in Behavioral Neuroscience* 2014 Jan 27;8:17. doi: 10.3389/fnbeh.2014.00017. eCollection 2014. "Effect of meditation on cognitive functions in context of aging and neurodegenerative diseases". Marciniak R1, Sheardova K1, Cermáková P2, Hudeček D1, Sumec R1, Hort J3.

[§] *Med Care*. 2014 Dec;52(12 Suppl 5):S19-24. Mindfulness-based stress reduction (MBSR) reduces anxiety, depression, and suicidal ideation in veterans. Serpa JG1, Taylor SL, Tillisch K.

[¶] "Effectiveness of the Mindfulness in Schools Programme: non-randomised controlled feasibility study" Willem Kuyken, Katherine Weare, Obioha C. Ukoumunne, Rachael Vicary, Nicola Motton, Richard Burnett, Chris Cullen, Sarah Hennelly, Felicia Huppert *The British Journal of Psychiatry* Aug 2013, 203 (2) 126-131; DOI: 10.1192/bjp.bp.113.126649

[**] Bastien CH, Vallières A, Morin CM. "Precipitating factors of insomnia". *Behavioral Sleep Medicine* 2004; 2:50–62.

[††] Irwin MR, *Annual Review of Psychology* 2015 Jan 3;66:143-72. doi: 10.1146/annurev-psych-010213-115205. Epub 2014 Jul 21. "Why sleep is important for health: a psychoneuroimmunology perspective"; or Tempesta D, De Gennaro L, Natale V, Ferrara M *Sleep Medicine* 2015 Jul;16(7):862-70. doi: 10.1016/j.sleep.2015.01.024. Epub 2015 Apr 14. Emotional memory processing is influenced by sleep quality.

3.2.4. Social Contact

What is the link between the quality of social support and learning performance?[*] There is a huge connection—but it is indirect. Social competency in kindergarten determines college performance 15 years later: Children who scored high on social skills were four times as likely to graduate from college as those whose scores were low. Indeed, one of the most powerful and cost-effective interventions is to help children develop core social and emotional skills. If a person has a happy friend who lives within a mile, the person themselves is 25% more likely to be happy as well. In addition, it was found that a person's happiness can be related to the happiness of someone separated by up to three degrees (a friend of a friend of a friend).[†]

By contrast, a study showed in 2900 Dutch subjects[‡] that if social contacts are adverse or dysfunctional (crime, vandalism, noise, neglect), this not only increases biological age by 10 years, measured as perceived neighborhood stress and length of telomere, but a low level of social interaction was also found to have an impact equivalent to smoking nearly a pack of cigarettes a day or being an alcoholic.

The impacts of Adverse Childhood Experiences (ACE) on later life events have been well documented. The so-called ACE studies identified that more than 2 out of 10 adverse experiences (abuse, neglect, dysfunctional home) increase behavioral problems in school by a factor of 8 and repeating school by a factor of 2; when more than 4 out of 10 parameters are fulfilled, the probability of addiction, depression, anxiety, and even lung disease and cancer is increased by a factor of 2-3. But such disadvantageous social exposure is in part reversible. For example, take neglect: If the caregiver merely pays attention through direct verbal and nonverbal responses, this changes early childhood experiences dramatically only after several weeks and increases positive stable attachments, cognitive, emotional, motor and social skills.[§]

3.2.5. Multi-sensory Learning

The way we learn is in part determined by the media we choose—whether a simple book or a complex computer program.[¶] For example, one-channel learning through digital learning differs from the impact of multi-sensory and cross-modal learning:[**] an OECD study

---

[*] See: National Scientific Council on the Developing Child, "Excessive Stress Disrupts the Architecture of the Developing Brain," Working Paper 3, updated edition (2014); Robert Anda, "The Health and Social Impact of Growing Up with Adverse Childhood Experiences," presentation at the 2007 Guest House Institute Summer Leadership Conference in Minneapolis

† Fowler JH, Christakis NA. "Dynamic spread of happiness in a large social network: longitudinal analysis over 20 years in the Framingham Heart Study. BMJ" 2008;337:a2338. doi: http://dx.doi.org/10.1136/bmj.a2338

‡ Mijung Park, Josine E. Verhoeven, Pim Cuijpers, Charles F. Reynolds III, Brenda W. J. H. Penninx. "Where You Live May Make You Old: The Association between Perceived Poor Neighborhood Quality and Leukocyte Telomere Length". *PLOS ONE*, 2015; 10 (6): e0128460 DOI:

§ See also: "Children's Physical Resilience Outcomes: Meta-Analysis of Vulnerability and Protective Factors". Lavoie J, Pereira LC, Talwar V. *Journal of Pediatric Nursing* 2016 Aug 23. pii: S0882-5963(16)30160-9. doi: 10.1016/j.pedn.2016.07.011. [Epub ahead of print] Review; or *Monographs of the Society for Research in Child Development* 2008; 73(3): vii–295. doi: 10.1111/j.1540-5834.2008.00483.x PMCID: PMC2702123, NIHMSID: NIHMS84380 The effects of early social-emotional and relationship experiences on the development of young orphanage children, The St. Petersburg–USA Orphanage Research Team, WITH COMMENTARY BY Susan C. Crockenberg., Michael Rutter Marian J. Bakermans-Kranenburg, Marinus H. van IJzendoorn, and Femmie Juffer, W Andrew Collins

¶ This issue refers to the retention rate of learning. It determines the amount of content a subject can remember or successfully apply. We know from clinical evidence and field studies that there is a 'pyramid' of learning from lecturing, to reading, to audio-visual, to demonstration, to group discussion, to practice by doing, to teaching others. Every curriculum should include components of 'learning by doing' and 'teaching others' to be successful. See http://thepeakperformancecenter.com/educational-learning/learning/principles-of-learning/learning-pyramid/

** *Journal of Learning Disabilities* 2016 Jan 8. pii: 0022219415617167. [Epub ahead of print] "Relationships of Attention and Executive Functions to Oral Language, Reading, and Writing Skills and Systems in Middle Childhood and Early Adolescence". Berninger V, Abbott R, Cook CR, Nagy W

(2015)* showed, for example, that despite an annual global spending of over 20 billion USD on information technologies, students using computers very frequently show "no significant improvement" in reading, numeracy or science skills, and there is not a single country where performance is improved. When different senses are involved, from tactile (touch and balance), gustatory (taste), olfactory (smell), visual (sight), and auditory (hearing) to the sensomotoric system, any multi-coding learning generally leads to deeper memory consolidation and higher cognitive speed processing.

Any vocational training normally outperforms single mode training. This is true for cooking, running, dancing, sports, fishing, but also more complex procedures like driving a car, building an engine or giving a public talk. All these activities require both hemispheres to be active (left and right brain).† On the other hand, if cognitive programs try to include a lot of virtual multitasking, students will end up with a reduced ability to prioritize and discriminate and increased stress levels.‡

3.2.6. Food

What is the impact of nutrition on performance, learning and creativity? Generally, Mediterranean and wholefood diets are healthier than processed food. Trans-fatty acids (contained in fries), for example, correlate negatively with memory consolidation. In a study with 1000 subjects and a 5-year follow-up, trans-fatty acids were measured per day: Mood, behavior and cognition were impaired in young subjects below 45 years of age.§ Fasting, intermittent fasting or calorie restriction has a positive impact on mood disorders and anxiety; it reduces episodes of mania and depression in bipolar individuals and increases awareness, concentration and cognitive processing, memory functions, life expectancy and neurogenesis.¶ There is increasing empirical evidence that supplements have an impact on stress-related mental symptoms. For example: In a cohort in over 30 countries with 28,000 men, the quality of food, measured by an alternative healthy eating index, showed that higher quality of food is associated with less cognitive decline in a follow-up of 56 months.** In 2000 Japanese employees, the intake of magnesium, calcium, iron, and zinc was inversely associated with the prevalence of depressive symptoms and positively correlated with performance and well-being.†† The International Society for Nutritional Psychiatry Research recommends Omega-3 FS, vitamin D, zinc, magnesium, vitamin B and iron as supplements.‡‡

---

* OECD, 2015, Sept, Students, Computers and Learning – Making the Connection.

† This is one of the reasons why higher education constantly devalues the vocational, practical, haptic, social and emotional aspects of knowledge, referring to semantic and logical skills only, see: Julian Nida-Ruemelin, 2014, Der Akademisierungswahn: zur Krise beruflicher und akademischer Bildung, Körber.

‡ The Informed Brain in a Digital World: Interdisciplinary Team Summaries. Editors National Academies Keck Futures Initiative Informed Brain Steering Committee. Source Washington (DC): National Academies Press (US); 2013 May; *Frontiers in Psychology* 2015 Sep 8;6:1366. doi: 10.3389/fpsyg.2015.01366. eCollection 2015. "Efficient multitasking: parallel versus serial processing of multiple tasks". Fischer R, Plessow F.

§ Golomb BA et al. A Fat to Forget: Trans Fat Consumption and Memory. *PLoS ONE* 2015; 10(6): e0128129. doi:10.1371/journal.pone.0128129

¶ "Fasting in mood disorders: neurobiology and effectiveness. A review of the literature". Fond G, Macgregor A, Leboyer M, Michalsen A. *Psychiatry Research* 2013 Oct 30; 209(3):253-8. doi: 10.1016/j.psychres.2012.12.018. Epub 2013 Jan 15.

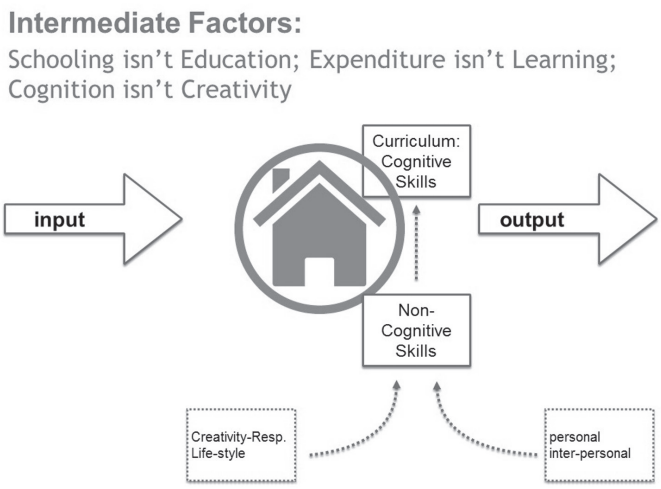
** *Neurology* 2015 Jun 2;84(22):2258-65. "Healthy eating and reduced risk of cognitive decline: A cohort from 40 countries". Smyth A, Dehghan M, O'Donnell M, Anderson C, Teo K, Gao P, Sleight P, Dagenais G, Probstfield JL, Mente A, Yusuf S.

†† *Nutrition* 2015 May;31(5):686-90. doi: 10.1016/j.nut.2014.11.002. Epub 2014 Dec 3. "Dietary intake of minerals in relation to depressive symptoms in Japanese employees: the Furukawa Nutrition and Health Study". Miki T, Kochi T, Eguchi M, Kuwahara K, Tsuruoka H, Kurotani K, Ito R, Akter S, Kashino I, Pham NM, Kabe I, Kawakami N, Mizoue T, Nanri A

‡‡ International Society for Nutritional Psychiatry Research (ISNPR)

In conclusion, the abovementioned examples for each component of the 'six-pack' should simply support the idea that non-cognitive factors increase learning and creativity. They demonstrate the importance of non-cognitive factors in improving creativity and learning: Mental and mindfulness-based exercises, multi-sensory and cross-model learning, meditation and silence, rest and sleep, reliable social contacts and a good meal all make a difference in education.

Figure 2: Input is not Output—Expenditure is not Learning—Cognition is not Creativity



4. Conclusion

Human beings cannot not learn. And if 'Learning means changes of behaviors over time' (D. Bandura) and if 'Education is the most sophisticated technology evolved by human beings for conscious social evolution', as Garry Jacobs defines it, besides psychologically skilled teaching staff we also need a lot of exercise, good-quality sleep, good meals, social contact, silence and meditation in the classroom and multi-sensory, cross-sensory learning to make that happen. The core argument presented here is that we have to differentiate between cognitive and non-cognitive factors and between psychological and lifestyle modifications. Overall, it is not the institutional input into the educational system, nor is it the cognitive input, represented by the curricula or the program the student is enrolled in, but rather the non-cognitive factors that can enhance creativity and learning in the individual and in society as a whole.

Author contact information:
Email: brunnhuber.cor@gmxpro.de

CADMUS, Volume 3, No.2, May 2017, 68-84

Disruptive Technologies, A Critical Yet Hopeful View

Carlos Alvarez-Pereira
Founder & Chair, Innaxis Foundation & Research Institute;
Fellow, World Academy of Art & Science

Abstract

A new perspective is attempted on the role played by Information and Communication Technologies (ICTs) in the evolution of human societies in the last few decades. Particular attention is paid to their (lack of) relationship with the challenges of sustainable development, presenting the view contrary to mainstream perception that for now ICTs have a negative impact on sustainability overall. This in turn is described as a result of how ICTs and innovation in general are presently conceived and framed in a way that actually inhibits their potential for human progress in harmony with the environment. Some hints are suggested on how to reverse this situation and make digital tech useful for life as a whole.

Most of the necessary knowledge is now available but we do not use it.

— Rachel Carson, "Silent Spring" (1962)

1. Disruptive, or not enough for Sustainability?

Nowadays, we humans devote a significant part of our time, attention and resources to digital artifacts. While there are many other domains where technology is evolving, 'digital' has become a synonym for "technology" and a mandatory part of the public sphere: as such, periodic launches of the latest smartphone model or a popular videogame going "real" in the streets of our cities get massive news coverage for free. And so, at least in the minds of the public in industrialized countries (and it is a lot), digital impetus is perceived as the best herald of science, technology and innovation, and the driving force of change in society. While "digital immigrants", the elderly who grew up with book, pens and paper, are being left behind, the young see themselves as "digital natives", whose behaviour keeps changing rapidly, in line with hundreds of new apps every year and the so-called "digitization" of society, the buzzword of the time. Technological innovation is speeding up, or so it seems, and introducing new products, altering processes, shaking markets, and ultimately changing our lives, by inducing transformations which are deemed as "disruptive".

This concept of disruptive innovation based on technology is generally presented, and probably perceived by most as something positive opening the future to new solutions for many of our problems, if not all, with benefits for everybody and no negative consequences. It builds on the longstanding success of Science and Technology (S&T) which has made tangible many crazy wishes of human imagination like flying, travelling to outer space or chatting with other people wherever they are on the planet. And so it feeds our dreams by

extrapolating past achievements to all the good things that will happen in the future because of the miraculous progress of technology. With it is revealed a desire for omnipotence, our aspiration to an infinite capacity to break the physical limits which restrain humans, including that of time and death.

Since the 1980s, an explosive growth happened in Information and Communication Technologies (ICTs) and their presence has become pervasive. The widespread frenziness provoked by the latest digital gadgets mirrors a true and exciting entrepreneurial spirit which is mobilized by the potential of technologies to address human challenges. But when looking into the future, little attention, if at all, is paid to the three centuries we have already lived in the context of knowledge creation and technological innovation and the learnings acquired about how these processes contribute to shape the evolution of our societies. Science and technology have strongly influenced the path followed by humanity since the 18th century, which means that they have also often been (still today) effective instruments of mass destruction, environmental degradation and social exclusion. This obscure role of S&T is generally hidden, either as unintended consequences to be corrected later or through the argument of "neutrality" by which new technologies are just tools and their good or bad usage depends entirely on society, not on the process of innovation itself.

In parallel with the explosion of ICTs, humanity became aware of the many and intertwined challenges it faces to make life on this planet enjoyable and sustainable in the long run, a complex set of interrelated issues for which the Club of Rome coined the term "world problematique" back in the 1970s. The Brundlandt Commission popularized in 1987 the concept of "sustainable development" almost in sync with the launching of the first personal computers (IBM PC in 1981, Commodore 64 in 1982 and Macintosh in 1984). But Sustainable Development (SD) has to still prove it is not an oxymoron. In the last 30 years the price of moving towards higher levels of human development has been a great increase in ecological footprint and overall unsustainability, with several of the most critical planetary boundaries having been already crossed and the "Overshoot Day" happening earlier and earlier. So, we still have to find, now urgently, a pathway to decrease dramatically the negative impacts of human societies. And the only human way to do so is to greatly raise the standards of living of most of the world population without increasing their ecological footprint, while at the same time making developed countries reduce their footprint dramatically without major damage to their levels of human development.

The size and nature of this transformation are unprecedented. All types of human capacities will be required to achieve this transformation. And, since S&T play a key role in shaping our relationship with nature and our aspirations and values, should not the best and brightest of researchers and innovators make major contributions to address the challenges of the "problematique"? In particular, should we not use digital technologies to overcome the dilemmas created by our unsustainable way of life? Is digital disruption aligned with the goals of sustainable development? If not, how can we align them for the sake of humanity?

Surprisingly enough, the first answer to these questions is that we do not have an answer. Although sustainability has become part of the discourse as well as a real concern for the ICT

industry, digital technologies and sustainability have been rarely analyzed together in a rigorous manner. The scientific literature about this topic is so far worryingly thin and in many aspects we do not even have the right questions yet, much less the responses.

But if we start by considering the direct impacts of ICTs in terms of sustainability, there is no doubt that the first-order effect is negative. The evidence is accumulating and has many different faces as follows.

- **Critical resources**. ICTs as well as other high tech developments for renewable energy or electric vehicles depend for their production on many mineral resources: more than 50 different kinds of metals are used in a smartphone. Awareness is now growing about the criticality of those resources, in terms of physical access and geopolitics, China being by far the largest provider of the most critical ones. And this reality has a very ugly side: as *The Guardian* put it in 2012 at the time of the Second Congo War which claimed more than 5 million lives,

  "In unsafe mines deep underground in eastern Congo, children are working to extract minerals essential for the electronics industry. The profits from the minerals finance the bloodiest conflict since the Second World War; the war has lasted nearly 20 years..."[1]

  A list of Critical Raw Materials (CRMs) is defined and reviewed regularly by the European Union, and it contains now 20 items, including indium, germanium, niobium and the group of Rare Earth Elements (REE), which are key ingredients in every digital artifact. The degree of recycling of such materials is low, at most around 15 to 20%, and their demand is high and growing, hence their criticality. In this respect, ICT is not different from other industries intensive in the use of non-renewable resources of growing scarcity.[*]

- **Production processes**. Producing microchips, the basic component of digital technologies, is not only intensive in critical materials, it is a process whose efficiency is extremely low as measured by input-output ratio. A single 2-gram DRAM chip is estimated to require 1600 grams of fossil fuels and 72 grams of chemical inputs (so the material input-output ratio is more than 800:1), as well as 32000 grams of water and 700 grams of gases (mainly nitrogen). As Williams, Ayres and Heller put it,

  "The production chain yielding silicon wafers from quartz uses 160 times the energy required for typical silicon, indicating that purification to semiconductor grade materials is energy intensive. Due to its extremely low-entropy, organized structure, the materials intensity of a microchip is orders of magnitude higher than that of "traditional" goods."[2]

  Producing microchips is an extraordinary achievement of human intelligence but we consume them nowadays as if they were abundant and low-impact commodities, while they are definitely not.

[*] See European Union. 2014 "Critical Raw Materials". http://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en

- **Waste**. Although they look very clean, digital devices are a major source of waste in the consumerist framing which still drives our behavior. Electronic waste (e-waste) is made of discarded electronic devices and components such as computers, mp3 players, televisions and mobile phones which contain hundreds of chemicals, including lead, mercury, cadmium, Brominated Flame Retardants (BFRs) and Polyvinyl Chloride (PVC). Many of these chemicals are known to cause cancer, respiratory illness and reproductive problems and they are especially dangerous because of their ability to migrate into the soil, water, and air and accumulate in our bodies and the environment.

  The US Environmental Protection Agency (EPA) estimates that e-waste is growing 2 to 3 times faster than any other source of waste, the total amount being over 50 million tons per year, with the USA and China being the largest contributors, while the % of recycling continues to be low. Although official directives exist on Waste Electrical and Electronic Equipment (WEEE) and Restriction of Hazardous Substances (RoHS), the dangerous and often illegal deconstruction of e-waste is a growing business worldwide, estimated at more than 10 billion US dollars annually. It includes practices such as the massive exports of e-waste from rich countries to the rest of the world or the exploitation in the USA of prison inmates working without adequate protection, in poor health and safety conditions.[*]

- **Energy consumption**. Of course, the digital tech sector is a huge consumer of energy. Mild as it is, a single Google search is equivalent to a standard light bulb operating for between 15 and 60 minutes.[3] The operation of a smartphone is quite efficient (4 kWh per year) but the energy used to manufacture it amounts to 280 kWh, while it is meant to last only 2 to 3 years.[†] And while the patterns of consumption are changing due to the evolution of devices from stand-alone PCs to efficient smartphones and tablets connected to growing cloud infrastructures, this does not prevent operating consumption from growing: it has stagnated around 830 billion kWh per year between 2010 and 2015, with less consumption in end-user devices but more in data centers, and the prospect is that it will grow at a 2% annual rate, up to 1020 billion kWh in 2025 (without taking into account energy spent in production).[‡]

- **GHG emissions**. Last but definitely not the least, the ICT sector is the fastest growing contributor to emissions, currently contributing around 2.25% of total emissions but with a compound annual growth rate of around 6%![§] This is due to the combined growth of networks, number of devices, time of usage and dependency of organizations on digital tech.

While being contemporaries, the aspiration for sustainable development and the expansion of ICTs have not been aligned, until now. On the one hand, environmentalists have been

[*] See Silicon Valley Toxics Coalition. 2006. "Toxic Sweatshops". http://svtc.org/our-work/e-waste/

[†] Daniel Pargman. August 2016. "Designing for Sustainability: Breakthrough or suboptimisation?". 4th International Conference on ICT for Sustainability (ICT4S). Amsterdam

[‡] Ralph Hintemann, Jens Clausen. August 2016. "Green Cloud? Current and future developments of energy consumption by data centers, networks and end-user devices". 4th International Conference on ICT4S. Amsterdam

[§] Climate Group for the Global eSustainability Initiative. 2008. "SMART 2020: Enabling the low-carbon economy in the information age". http://www.smart2020.org/_assets/files/02_Smart2020Report.pdf.

pushing their claims and proposals of solutions to policy-makers in order to convince them of enforcing regulations against harmful activities and to change the patterns of economic development. In that context, ICTs have at best a secondary position. There is no systematic assessment of their role in "The future we want" resolution adopted as an outcome of Rio+20,[*] nor is one proposed in its recommendations for the future. ICTs are present in the SDGs but only in a few number of goals and targets.[†] Not everything is negative in this respect, though. The International Telecommunication Union, a UN agency, identified in 2013 a number of clear challenges and developed methods to assess the impact of ICTs on energy consumption and policy guidance for developing countries on the application and use of ICTs to combat climate change and other environmental issues. The OECD even adopted in 2010 at ministerial level a document of "Recommendations on ICTs and the Environment" that sets out 10 principles as a general framework addressing first, second and third order effects of ICTs. But will the recommendations be enforced with enough momentum?

On the other part of the equation, that of the ICT industry, after recognizing the negative direct effects mentioned earlier, sustainability has become part of the agenda, due to the costs of energy consumption and waste treatment as well as to avoid reputational risks. The telecom industry (both operators and manufacturers) created the Global eSustainability Initiative (GeSI) which issued in 2008 its SMART 2020 report[‡] and the Electronics-Tool for Accountable Supply Chains (e-TASC) to help measure the sustainable performance of companies. The aspiration is that ICTs will help the emergence of sustainable development and in general of a "better world" by promoting a "smart" transformation of economic activities, a better and generalized access to education, health and knowledge, the empowerment of people and a greater transparency, as well as a growing awareness of sustainability issues, with a greater capacity to influence public opinions and agendas. Wherever information is relevant (where is it not?), digital tech can be there to improve current processes, or so it seems. But to be true, indirect impacts of ICTs have not been analyzed in detail, and even if they are, they are done so often only from the point of view of GHG emissions. And the conclusions of one of the few systematic studies are not very optimistic:

> *"While the overall impact of ICT on most environmental indicators seems to be weak, the impact of specific areas or types of ICT applications can be very relevant in either direction. On an aggregated level, positive and negative impacts tend to cancel each other out."*[4]

ICTs play different roles and serve different purposes. But of course, they depend on the societal logic in which the organizations are embedded. If profits are required for a business to survive and regulations do not ensure that sustainability goals contribute to profitability, how could we expect businesses to behave in an eco-friendly way? Likewise, ICTs can be disruptive but they, or the transformations they enable, do not necessarily improve sustainability or promote circularity in the reuse of non-renewable resources. How would

[*] UN General Assembly. Resolution adopted on 27 July 2012. "The future we want"

[†] David Souter. July 2015 "Advancing a sustainable Information Society for all". UN Public Administation Program

[‡] Climate Group for the Global eSustainability Initiative. 2008. Ibidem

they, if the purpose is not built in their design? Whether higher efficiency or dematerialization is achieved depends on decisions that are taken by managers outside the ICT sector, on the basis of commercial viability rather than environmental sustainability. As a consequence, we have no evidence yet of the order of magnitude of those sustainability gains, not if ICT-driven greater efficiencies provoke rebound effects à la Jevons (See Jevons' Paradox or rebound effect).

On the contrary, we have a strong evidence of how the growing efficiency of micro-processing is exploited in a massive rebound effect on the other side of ICTs, when they fulfill no other purpose than consumption itself, just as devices of entertainment with very short cycles of usage. The positive effects of ICTs on sustainability are probably more than offset by the mass consumerism whose magnitude is to become the driving force of this industry: the number of cell phones is already larger than world population, but the truly astonishing figure is that of annual shipments, which was more than 1400 million units in 2015!

On the one hand, there are well intentioned but ineffective declarations recommending SD as a new paradigm. On the other, there is this extraordinary strength of a creative and fully deployed industry feeding and being fed by our consumerist addictions. It is pretty clear why, for the time being, the opportunity for an encounter between Sustainable Development and ICTs has been lost.

For three centuries our driving belief has been in the progress of humanity, of course reinforced by the success of S&T. But, while for generations born before the 1980s changing the world for the better required (or primarily) political and social innovations, now it seems that "disruptive innovation" has even displaced every other source of hope. In a sense, we put **it at the core of societal evolution**, and this is why we also think it should rescue us from all disasters, even those provoked by ourselves. But is it not too much to expect? Beyond a generic claim of ICTs to contribute to a better and "green" world, the actual lack of mutual recognition and cooperation between digital tech and sustainable development is very significant of the effort still to be made to harness the power of innovation for the progress of humanity.

2. The Future: Techno-utopian or Technolitarian?

Digital technologies are certainly a success story but their origins are not recent. They go back to a long series of scientific advancements that have been taking place since the early 19th century and, 30 years after first PCs, many ICT-driven changes have also taken place. We can analyze them from a historical perspective, without reference to a perfect future of dreams yet to come, but to what has actually happened. In particular, many of the promises of ICTs are already applied in leading-edge companies such as Google, Amazon, Apple and the like. Now, the question is, what is prominent in the history of these three decades?

From a technical point of view, two main drivers are at the core of the process of digital development, both referred to as "laws" while they are actually educated guesses with an empirical validation but no evidence of a universal or eternal validity. The first is Moore's law (named after the founder of Intel) which holds true even now (it was stated 40 years ago)

"There are no limits to what we can achieve."

and states that technical progress in miniaturization makes it possible to double the number of transistors in a dense integrated circuit approximately every two years, thereby enabling the computing power of microprocessors to be increased extremely fast without increasing their cost (or so it seems), so that new digital artifacts and applications can be created at a faster pace. The second driver is Metcalfe's law stating that the value of a network is proportional to the square of the number of connected users. This means that a competitive diffusion process over a network can be very fast because the advantage of the leading player is more than linear, it grows faster and faster with the number of connections it gets. Software business, telecommunications and the Internet exhibit such strong network externalities.

These observed characteristics are now used as foundations for a new belief in "exponential innovation" as a process able to disrupt all areas of human practices for our benefit. Ray Kurzweil and Peter Diamandis are the best known promoters of this vision of infinite improvements which they interpret as "*the way to a new world of abundance*",[5] in which the needs of the billions of inhabitants of the planet would be met by using new technologies of water purification, solar energy, medicine, education, and the reuse or recycling of rare minerals. This "digital solutionism" favors the vision that every problem we face (real or imaginary, and whatever its relevance) has a digital solution[6] and claims a "right to disrupt" any kind of activity, but does it really work? Actually, the improvement of existing processes in a purposeful way seems harder than trying to replace incumbent businesses by newcomers, and this in turn is harder than discovering a "blue ocean", i.e. to create a completely new activity which did not exist (or in a limited way) and where no competitors of the old world will be found.[7] This is where Microsoft, Google, Facebook and Twitter succeeded. Following Metcalfe's intuition, once a digital company is able to outdo its competitors in terms of number of clients or users, it will have very good chances of becoming a private monopoly in the category where its main business is, which is why utilities used to be publicly regulated or owned. But digital moguls have been able to dodge regulations and occupy a digital world divided into modern fiefs. This explains the paradox that digital tech was supposed to have levelling consequences but produced instead an **extraordinary concentration of power and wealth** in few hands, those of the gatekeepers of the cyber-space.

Digital tech presents itself as a sector offering neutral, general purpose tools to meet all human and societal needs. It claims innocence since its outcomes, good or bad, will depend on the usage that humans will make of them. To be more precise, the sector presents itself as a positive achievement whose negative impacts, if any, can only be attributed to bad usage, not to the conception of the technologies themselves. In our view, this perspective deserves the name of "digital ideology". ICTs are certainly an expression of human genius but they are also truly dependent on the social and political contexts in which they were born and are developed, and are neither neutral nor exogenous to society. Entangled with societal evolution, they derive from human decisions, including design choices which create path dependencies and lock-ins since the networked nature of the digital world facilitates the emergence of monopolies. And those decisions are based on a certain modelling of reality

and are not free of economic interests, political intentions and in general values in certain frameworks of interpretation, specific to times and places, and are not truly universal.

> *"Human achievements are not based on erasing physical limits but on better understanding them and finding ways to build on our limitations."*

Therefore, we should ask what futures we could build by using digital tech in one way or another and, more importantly, by designing their next generations in one way or another. For the time being, high risks are already here which could pave the way to "technolitarian" futures in which human and environmental purposes would be secondary to the logic of technological innovation. Those risks (maybe unwanted by the promoters of digitization, but still real) are related to underlying assumptions of the digital ideology.

First is the **denial of physicality**, through the self-illusion of "dematerialization" in the Singularity jargon. At a time when we need to recognize that the resources on which our life depends are actually quite limited, making us ignore that the challenge is of course a step in the wrong direction. While ICTs could be crucial in monitoring externalities of all kinds, that role is played in marginal or even contrarian ways, by asserting that there are no limits to what we can achieve. Digital ideology interprets limits as unbearable limitations and declares their obsolescence (except of those imposed by markets). Dematerialization is used as a claim to become free from them, as is implicit in terms like "zero cost" or the "cloud", while we are still physical beings living in a finite planet with physical costs. Actually, digital infrastructures are huge, and so is the amount of resources spent every year in the mass consumerism of digital artifacts with a minimal circularity of materials. Human achievements are not based on erasing physical limits but on better understanding them and finding ways to build on our limitations, which is the true foundation of our freedom: we do not fly as birds, we create artifacts transporting us in the air while still respecting physical laws. A different, real kind of dematerialization should certainly happen enabling human development to be free from the accumulation of material artifacts, but this is not what the digital industry is doing right now.

Second, digital innovation is increasingly focused on the **disposability of humans**, on replacing them by automated machines, potentially threatening every single job on Earth, skilled or not, up to that of President of the USA for which (not a joke) the IBM Watson software has been proposed.[*] Even analysts of stock markets are at risk of being replaced by machines in a self-devouring pirouette of financialization,[8] pointing to the dystopia of a world owned by the happy few and operated by robots, while the 99% of us would have to struggle for the crumbs. Of course the story-telling is different: it says that all of us will enjoy a plentiful life of leisure on the beach while robots do all the necessary work, which looks like a weird dream of spoiled kids. But at a time when inequalities are rising everywhere, who can believe

[*] IBM. 2016. "Watson for President 2016". http://watson2016.com

that our social structures will use technologies to produce that future except for a very few? Moreover, in an obssessive quest for tech-based performance, the Singularity offers to end human life, replacing us with digital replica "living" forever in digital networks. What emotions, love, sex or care will become in that case remains unclear, but is this anyway a dream for humanity or a nightmare? Does it not sound like a revival of eugenics, the movement for the "improvement" of the species which won strong recognition in the UK and USA in the first decades of the 20th century until it was discredited as part of the Nazi ideology?

And, again and again, we see the **fantasy of omnipotence**. The claim is that more digitization, connectivity, access to data and algorithms will produce a holistic Artificial Intelligence (AI), much superior to the human intelligence (while we still ignore what intelligence is), and that it could understand world's evolution and make it predictable, controllable and ready to be optimized for the benefit of all, of course by taking the right decisions better than humans. One could argue that more connectivity and digitization also bring new vulnerabilities, f.i. to electric transmission grids which would be more exposed to cyber-attacks. But, although important, this is not the main point. In the cult of AI, the assumption is implicit that all societal problems can be reframed to have technical solutions, and that only human weaknesses prevent us from doing what is better for all. No doubt, this is a subtle but totalitarian way of hiding that true decisions are not fully technical but concern political and moral dilemmas, about what we consider as values, what we interpret as good or bad, better or worse.

And by the way, a growing number of autonomous entities (human or not) and more connections between them makes life and society more complex, not less, and then more unpredictable and prone to so-called "emergent phenomena", which could be positive or negative. Overall, this is a welcome trend since it opens the space of possibilities (life emerged from non-living elements), but it definitely excludes the perspective of a panoptic controllability of the world as a machine. AI and Big Data can be put at profit to create specific environments where predictability improves and this could be used for human benefit (as well as for perverse intentions), but it requires the understanding of specific contexts and goals, the involvement of human stakeholders and ultimately taking political decisions to make sure that sound purposes are enforced.

On the other hand, ICTs have also played a key role in the evolution of the public sphere, starting with the massive deployment of television. Enough time has passed since the TV and Internet were founded, so we can assess their impact on content production and diffusion, and on the formation of public opinion. Digital techs are credited with facilitating access to knowledge and art, as well as the free expression of citizens. Is this really happening? Not on the side of content creation: in the age of so-called "knowledge society", artists and journalists have a much harder time making a living out of their creations, except for a handful of them.[9] At the same time, a few "lords of the cloud" become the monopolistic owners of our attention, and in the frenziness of YouTube postings we, the public, get distracted by making our lives available for open scrutiny in search of worldwide recognition, although mundane and strictly ephemeral. We enjoy and suffer everyday the arrogance of novelty, the obsession with instant gratification and the reductionism of life to the limited, database-oriented nature

of online interfaces.[10] And what kind of knowledge brings the trivial access to pornography? Are we empowered citizens or is all that already invented by Berlusconian TV in late 1980s and now globally expanded, just the reminder that Guy Debord was right, that we live in the "**société du spectacle**"?

"Since more effort is devoted to improve machines than to expand the cognitive capacities of humans, it is unclear if we are really facilitating access to knowledge."

Through our multiple addictions, including that of videogames keeping us in eternal adolescence, we are entertained to death[11] and our conformist mass-media culture inhibits the genuine expression of humanity through artistic creation. Drowned as we are in an endless deluge of gossip, we get lost in the "trending topics" of the day and thinking in perspective becomes extremely difficult: if we connect to instant reality we are not able to think; if we disconnect from it, will our thinking be valuable or even heard? Alternative thinking exists and is probably richer and stronger than ever but we do not pay much attention to it. We have access to much more information, but since more effort is devoted to improve machines than to expand the cognitive capacities of humans, it is unclear if we are really facilitating access to knowledge. We live in a constantly accelerated time[12] and we are not so interested in learning when it is contrarian to the high-speed mainstream. In a sense, we live in a true **gridlock of thinking**, by which we are also able to unlearn very fast some wise lessons acquired at high cost in the past (f.i. that of a strong regulation of financial markets).

Moreover, ICTs are especially well suited to create extensive representations of reality and, in a dangerous twist, to create the illusion of a substitution of reality by its artificial representation. A **self-referential reality** is emerging where digital technologies talk all the time about themselves and try to capture all our attention to create lives only experienced online, way beyond what commercial TV started to do decades ago. This tends to reduce the richness and complexity of human life: algorithms are designed by the "lords of the cloud" to maximize the audience of their websites, not to enhance the diversity of life[13] and when we are shopping online, our whole personality is downgraded to a consuming profile. Everything that the e-shop knows about us is cleverly used to make us buy more. Is an e-shop like Amazon to blame? The company brilliantly plays according to the rules of the game, promoting instant gratification in one-click consumption, reinforced by our permanent exposition to digital scrutiny. Also, "digital totalism"[14] achieves a tour de force in making us think that our gadgets are more than they are and in the end that they are better than us, so we have to adapt ourselves to them instead of the other way around. If we do not understand how a new gadget works, it is our fault and never that of a poor design. Learned helplessness seems to be the generally accepted pattern of behaviour when dealing with digital technologies.

And scrutiny is constantly growing: the digital ideology legitimates the capture of every conceivable data, including those of public origin to be used for commercial purposes, and

the representation of everything we do into data that can be captured, stored, analyzed and exploited. The nightmare of Bentham's **panopticon** is enabled by digitization, and the fantasy of omnipotence comes with a flavor of absolute control: in every ongoing dicussion about technology and security, the main thread is about more surveillance and control, rather than asking how technologies could help in creating more trust among humans. Big Data is in the end so close to Big Brother, not of a stalinist kind, rather an ultra-sophisticated corporate one. For good or bad reasons, affluent cyber-libertarians at the core of digital discourse distrust governments and existing political processes,[*] which is practical to justify tax avoidance, but they are definitely friends of big digital corporations whose power is deemed to be innocent by definition and which require everybody to be transparent while they are themselves not, in another twist of self-referential blessing.[15]

In the way ICTs are used today, an autistic dynamic is at work: a performative capacity is being deployed to create a world dependent on (what is assumed to be) their underlying logic, overriding the idea that they could be used as beneficial tools in our relationship with other humans and the environment. All in all, it is very hard to state that the public sphere and our social bonds are being enriched by becoming digital, it seems rather the other way around. Of course the way out of this wrong direction is not the denial of technological innovations but leveraging them to address the pressing challenges of humanity. But how to do that? How to go beyond pure critique to ensure that digital tech also contributes to the solutions? Maybe a closer loop at their societal dynamics could help.

3. The Dynamics & Framing of Digital Tech

The dynamics leading to the existence and development of ICTs are complex, and this complexity is a big part of their success. Ironically enough, although the digital world likes to depict itself as a bottom-up movement based on free will and the soft power of inventive people fighting against the establishment, it actually started in the very core of government, and the most traditional part of it: neither computers nor the Internet would exist without the driver of military research since the 1930s, especially in the USA through the Defense Advanced Research Projects Agency (DARPA) and its precedents. So, ICTs were actually developed as part of a top-down agenda with very specific purposes. But over time the field integrated other contributions and it is a stroke of genuine American genius to have mixed many different ingredients in the digital cocktail we know today. We identify at least six relevant factors that give ICTs their extraordinary momentum:

- The strategic intention of the USA to keep its global dominance in pursuit of its national interests through a panoply of means not limited to the military, which includes keeping the leading edge in S&T. This intention is still much alive today as shown f.i. in the ongoing discussions on the governance of Internet.[16]
- The success of government-driven agendas to foster the advances of basic research in physics and the great potential of applications of electronics, telecommunications, miniaturization, optics and other disciplines.

[*] John Perry Barlow. 1996. "A Declaration of Independence of the Cyberspace". www.eff.org/cyberspace-independence

- The enthusiasm and creative energy of relatively small groups of young "techies" willing to "change the world" (whatever this could mean), originated in the Californian "anti-establishment" movements in the 1960s and focused since the 1980s on a disruptive agenda with a mainly libertarian stance.
- A unique capacity of the marketing and advertisement industry to develop attractive story-tellings in order to convince people of adhering to new gadgets, get rid of the "old" ones and do it again and again at a very high frequency. This industry was also created in the USA in the 1950s with the emergence of mass consumerism, but by using technologies it is now reaching new heights of excellence in designing the mental frameworks to foster our digital enthusiasm.
- A long-term aspirational trend by people everywhere to acquire, at the same time, more personal autonomy and more participation and connectedness, to which the digital world brings a seemingly simple vehicle.
- And, not least, the agility of financial markets to look for "blue oceans" once and again and to mobilize initial investments, once it becomes clear that digital techs are fantastic to keep alive a consumerist model of economic development.

Although there are many contradictions between them, all these elements are still acting together today and all are critical to the continuing expansion of ICTs. But of course their alignment with sustainability challenges is far from being granted. "Disruptive innovation" is now the rallying cry of this complex dynamics. The term itself was coined by Clayton Christensen in 1995[17] to characterize the process by which new market and value networks are created with the effect of disrupting existing ones. Although inspired by technological innovation, Christensen actually puts the focus on the business model, enabled or not by technological breakthroughs, as the key element of disruption:

> *"Generally, disruptive innovations were technologically straightforward, consisting of off-the-shelf components put together in a product architecture that was often simpler than prior approaches. They offered less of what customers in established markets wanted and so could rarely be initially employed there. They offered a different package of attributes valued only in emerging markets remote from, and unimportant to, the mainstream."*[18]

This concept resonates with the "creative destruction" analyzed by Joseph Schumpeter in 1942, which itself can be traced back to Werner Sombart in 1913[19] and ultimately to Karl Marx. In Schumpeter's view, creative destruction is the *"process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one"*[20] and as such is a further elaboration of the Marxist perspective of capitalist dynamics, i.e. it constantly destroys and reconfigures previous economic structures, and in doing so devaluates existing wealth in order to create new wealth.

For Marx, Sombart and Schumpeter, this process of ceaseless destruction and creation would ultimately lead to the collapse of capitalism itself. But the concept was later adopted

by mainstream free-market economics with a positive meaning also shared by Christensen. In this perspective the mass manufacturing of standardized products at low-price points is critical for disruption to happen by opening new and larger markets, in the same way as the technological prowess of the automobile did not disrupt the market for transportation until the Ford Model T appeared in 1908. So, the effectiveness and societal consequences of innovation do not derive only from technological changes, but rather from their framing into institutional arrangements not necessarily linked to nor disrupted by inventions. In particular, as per its current definition, "disruptive innovation" means that everything new has to pass the market test; an innovative product is only successful if millions of units are sold once and again, no matter what the side effects are, positive or negative; and innovation becomes a synonym for modern market competition, which explains why Christensen focuses so much on cost advantage as the critical factor. Conversely, an innovation which is not successful in markets, whatever its merit from social or environmental points of view, is left behind or even totally forgotten.

"Financial profitability is a one-dimensional, reductionist metric unable to provide the right incentives to cope with the multi- or infinite dimensionality of the complex challenges we face."

Although its dynamics include many different elements, digital disruption is actually conceived as a linear path: it starts with publicly-funded, top-down scientific research, then goes to innovation funded by venture capital and ultimately reaches commercial survival maybe in 1% of the cases and true market success recognized by a monopolistic stock valuation in only 1 case or less out of 1000 start-ups. At early stages in this process short-term financial profitability acts as the dominant selection mechanism and the final outcomes are a failure in most of the cases and, in one per category, rentier exploitation of a one-player-wins-all dominance. This makes innovation as practiced today very ineffective as far as societal challenges are concerned. It creates an illusion of (debt-driven) growth which is increasingly uneconomic, adverse to the environment and socially unequal. Financial profitability is a one-dimensional, reductionist metric unable to provide the right incentives to cope with the multi- or infinite dimensionality of the complex challenges we face.

In previous sections we discussed the many dark sides of digitization. But maybe the darkest is what could be called the "**innovation paradox**": in a world with a very high degree of ICT-enabled financialization, the worst enemy of true innovation is precisely its great exposure to short-term financial expectations. All the technological miracles we take now for granted have required huge efforts, a lot of patience, large investments over long periods of time and a good amount of serendipity. But further progress in innovation is now subject to an **endless stream of speculative bubbles**.[21] Actually, the perception of accelerated innovation is high because its working economic model requires it to be widely publicized. The dogmatic perspective of techno-utopianism has to be widely assumed in order to ensure that

vast public and private resources are invested fast in its spasmodic development. The running logic is that of short-term obsession, to cash in now on future and fully uncertain realizations of innovative ideas, which is a good recipe for inflating an already huge amount of fictitious capital and avoiding that enough investments are made at the right pace over enough time to reap the benefits for the common good. While the discourse of ICTs says that everything is possible, their evolution is a consequence of the way they were born, their historical contingencies and the lock-ins they have produced, but especially of their current dynamics, which are complex enough to feed their strong momentum, but not enough to contribute in a proper way to the challenges that humanity is facing. While the strength of young and enthusiastic entrepreneurship is for sure present, the current framing actually inhibits the possibility of addressing the challenges of "world problematique" in the appropriate time and space scales.

It is worth recalling that this framing of innovation has not been dominant except in the last few decades. Under the current view of societal evolution, we tend to forget that governments have been (and are) the most consistent players in research and innovation, with a unique capability to mobilize public and private efforts through the multi-faceted capacities of the State: as nº1 client in any country, able to drive large-scale innovative demand; as regulator pushing companies to invest in S&T; and, not least, as an entrepreneur able to bear the burden of uncertainty and long-termism much better than private corporations.[22] At the core of any major leap forward of S&T (including digital tech), it is easy to identify the foundational initiative of the State. Of course intervention by governments is not in the mainstream thinking of Western elites today (although it is, and very effectively, in the practice of non-Western countries). And probably the world is too complex anyway to rely just on the coming back of "good old times". But on the other hand governments (and not corporations) are developing an agenda of (much needed) international agreements on SD. How can we solve this Gordian knot for the sake of humanity? Beyond the critique, how can we reconcile the excitement and wonders of S&T and digital tech with the challenges posed by the "problematique"?

4. Room for Hope: Digital for Life

In digital tech as in any other domain, changing the course of things requires huge amounts of social energy. For now this is not happening at a large scale, only seeds are being planted, initiatives such as "Computing within Limits",[*] "Slow Tech"[†] or many local projects truly using ICTs in a smart way to promote sustainability (besides the "Smart Everything" hype). Transformation research does not explain yet how to go from local seeds to a global change. Our hypothesis is that more complexity is required to bring the innovation processes closer to how life happens, and by complex we mean rich in interactions and diverse enough to produce multidimensional outcomes and unexpected results. Innovation is more about technologies, and technologies are not only digital. Rather than being exogenous and linear, innovation is a complex and recursive process intertwined with society and depends not only on technical but also political "*choices leading to specific designs and applications and not*

[*] August 2016. "Computing within Limits: Visions of Computing beyond Moore's Law". Workshop at the ICT for Sustainability Conference, ICT4S 2016. Amsterdam

[†] August 2016. "Slow Tech: Clean ICT, an overview and case study exploration". Workshop at ICT4S 2016.

to others, which opens the possibility of altering its current trajectory so that it becomes consistent with sustainable development".*

"We have to prove, now and urgently, that sustainable development is not an oxymoron."

More complexity means substituting financial profitability with **positive contribution to societal challenges** as the metric of success. While official R&D agendas declare that innovation has to be challenge-driven, in practical terms it is market-driven. This means that new designs are driven by prices, which in the absence of appropriate regulations do not reflect true costs of non-renewabilities and negative externalities. Prices are themselves driven by the distribution of power in society, which is related to the access to scarce resources but does not integrate the requirements of life conservation. Instead, sustainability has to be built in at the design stage. In the case of ICTs, probably a good way to do that would be to multiply by 10 or 100 the price of critical resources on which they depend. But beyond that, it would be worth exploring how to use them in a way such that negative externalities of processes would be more evident from the beginning at the design stage. In a sense, that would be to exchange more or better **information against entropy** increase. How much of this could be done is a basic question to assess the true potential of ICTs for sustainability, but until now, it remains almost unexplored.† Monitoring negative externalities is left out as an ex-post task, when it is simply too late, pretty much as recycling only happens when waste has already been produced.

More complexity also means involving all stakeholders in decision-making processes, which is not only opening online consultations here and there (for which lobbyists of many kinds are much better prepared than citizens at large). It requires a more radical change of paradigm in S&T, towards **Citizen Science**, Co-Creation and Responsible Research & Innovation (RRI), concepts already invented and officially enacted f.i. in the Horizon 2020 programme of the European Union, but still to be developed beyond lip service. And ICTs could help in this, by being at the same time the object of reflection and the tools facilitating the active participation of stakeholders to address societal challenges for the common good in an "**innovation democracy**".‡ They can (and in some cases they do) enable the mobilization of citizens, the creation of grassroots alternatives and the diffusion of knowledge, but we cannot take for granted that this will happen easily. Awareness is growing about the negative aspects of our development model and the risks of S&T as they work today, and with it come positive energies to face the challenges, but a lot has yet to be done to ensure proper involvement in new designs. Digital tech being until now mainly created by young men in California, the participation of women, older persons and people from the rest of the planet would certainly give a richer perspective of real challenges than conducing to the videogame society. And if stakeholder involvement is taken seriously, this will lead to stopping or decelerating some developments that are too costly and have little benefit to society.

* Robin Mansell. October 2012. "ICT Innovation and Sustainable Development". IISD

† Antonio Valero. 2016. Private communication

‡ Andrew C. Stirling. 2014. "Towards innovation democracy? Participation, responsibility and precaution in the politics of science and technology". UK Government Office of Science

Of course, a stronger dialog between ICT and sustainability communities is also part of the more complex path to sustainable innovation. But a dialog requires willingness and commitment from both parties, starting with a recognition that the course of things has to be changed because we are failing in the path towards SD. In particular, the current idea that digital is "zero cost" and that it deserves to be free from regulations should be replaced since, as T. Ranald Ide and his colleagues put it:

> *"The new wealth of nations is found in the trillions of digital bits of information pulsing through global networks. These are the physical/electronic manifestations of the many transactions, conversations, voice and video messages and programs that, taken together record the process of production, distribution and consumption in the new economy."* [23]

As a consequence, they proposed to levy a tax on bits, very small but still large enough to generate fiscal revenues of billions of dollars which could be used to combat negative externalities of ICTs and fund SD designs. But on the ICT side, whose leaders are extremely successful and influential, it is unclear how much time it will take to get to such a shared vision.

More complexity also means designing in a way closer to life (which is **sustainable by design**). One way is to get inspiration from nature, as done in the "Blue Economy" projects.[24] Of special interest could be the attempt to artificially replicate photosynthesis in order to greatly accelerate its effects, as envisioned by Microsoft Research in its Computational Science Lab, but we cannot help mentioning that the vision of the Lab head is utterly pessimistic about our chances of finding a peaceful pathway to SD.[25] In a wider view we should start using sustainability (in all its complexity) as the critical factor of design in new inventions, which includes invoking one of the most successful mechanisms of biological evolution, **exaptation**, i.e. the capacity to reuse an existing design for purposes other than those for which it was created. And, as said, to do all that we could exploit the huge potential of ICTs to better understand the relationship between entropy and information in all physical processes.

The combination of scientific knowledge and technological sharpness has a strong generative capacity, which could lead to many different global scenarii, to old-fashioned accumulation in very few hands and unsustainable ways of life (as happens today) as well as to the emergence of vibrant ecosystems for the benefit, diversity and sustainability of humankind. We have to prove, now and urgently, that sustainable development is not an oxymoron. The role of technological innovation in that mission is critical but not granted. To a large extent it is right now captured by financial speculation, not driven by societal challenges, focused on "solutionism" rather than on specific contexts and produced without an active involvement of the stakeholders (ultimately, humanity at large as well as the natural environment). So, it is not helping to drive our course away from socio-ecological disasters. But it could be the opposite.

Overcoming this situation requires mobilizing a mix of holistic vision, strategic intentions, scientific commitment, activist enthusiasm and story-tellings in a cocktail strong

enough to connect with the deep human aspirations to autonomy and participation in a more genuine way than what digital tech does today. Of course this will also require financial resources, and therefore political decisions to foster the process towards a true "**Innovation Democracy**" that is able to master the potential of new inventions for the sake of life on Earth. By far we are not yet there. The seeds exist but they have to be assembled and fed with social energy. But instead of resorting to a blind faith in digital tech as our savior, the time has come to make a proper use of all the knowledge we already have.

Author Contact information:
Email: calvarez@innaxis.org

Notes

1. Frank Piasecki Poulsen, "Children of the Congo who risk their lives to supply our mobile phones" *The Guardian* 7 December 2012 https://www.theguardian.com/sustainable-business/blog/congo-child-labour-mobile-minerals.
2. E.D. Williams, R.U. Ayres and M. Heller, "The 1.7 Kilogram Microchip: Energy and Material Use in the Production of Semiconductor Devices," *Environmental Science and Technology* 36, no. 24(2002): 5504–5510.
3. Robert Rattle, "ICTs roles in an Environmental Society" In M. Lapka & E. Cudlínová, eds. *Towards an Environmental Society?* (Prague: Karolinum Press, 2012).
4. Lorenz M. Hilty et al., "The relevance of ICTs for environmental sustainability. A prospective simulation study," *Environmental Modelling & Software* 21 (2006): 1618-1629.
5. Peter Diamandis and Steven Kotler, *Affluence. The future is better than you think* (New York : Simon & Schuster, 2015).
6. Evgeny Morozov, *To Save Everything, Click Here* (New York: PublicAffairs, 2014).
7. W. Chan Kim and Renée Mauborgne, *Blue Ocean Strategy* (Boston: Harvard Bus Review Press, 2016).
8. N. Popper, "The robots are coming for Wall Street" *International New York Times* 27 February 2016 https://www.nytimes.com/2016/02/28/magazine/the-robots-are-coming-for-wall-street.html?_r=0.
9. Jaron Lanier, *You are not a gadget. A manifesto* (London: Penguin Books, 2011).
10. Lanier. *A manifesto.*
11. Neil Postman, *Amusing Ourselves to Death: Public Discourse in the Age of Business* (New York : Penguin Books, 2006).
12. Hartmut Rosa, *Accélération : une critique sociale du temps : suivi d'un entretien avec* (l'auteur Paris: La Découverte, 2013).
13. Morozov, *To save everything.*
14. Lanier. *A manifesto.*
15. David Golumbia, "Cyberlibertarians' Digital Deletion of the Left" J*acobin Magazine* 4 December, 2013 https://www.jacobinmag.com/2013/12/cyberlibertarians-digital-deletion-of-the-left/.
16. Ian Traynor, "Internet governance too US-centric, says European Commission" *The Guardian*. 12 February 2014 https://www.theguardian.com/technology/2014/feb/12/internet-governance-us-european-commission.
17. Joseph Bower and Clayton Christensen, "Disruptive Technologies: Catching the Wave" *Harvard Business Review* January-February 1995 https://hbr.org/1995/01/disruptive-technologies-catching-the-wave.
18. Clayton Christensen, *The innovator's dilemma: when new technologies cause great firms to fail* (Boston: Harvard Business School Press, 2016).
19. Werner Sombart, *Krieg und Kapitalismus* (New York : Arno Press, 1975).
20. Joseph A. Schumpeter, *Capitalism, Socialism and Democracy*. (Mansfield Centre : Martino, 2011).
21. Carlota Pérez, *Technological Revolutions and Financial Capital: The Dynamics of Bubbles and Golden Ages* (Cheltenham: Edward Elgar, 2014).
22. Mariana Mazzucato, *The Entrepreneurial State: Debunking public vs private sector myths* (London: Anthem, 2015).
23. Arthur J. Cordell, *The New Wealth of Nations: Taxing Cyberspace* (Toronto: Between The Lines, 1997).
24. Gunter Pauli, *The Blue Economy. Version 2.0.* (New Delhi: Academic Foundation, 2015).
25. Stephen Emmott, *Ten Billion* (New York: Books on Tape, 2013).

CADMUS, Volume 3, No.2, May 2017, 85-95

The Role of Presuppositions in the Social Sciences

Carlos Blanco
Pontifical University of Comillas, Spain;
Associate Fellow, World Academy of Art & Science

Abstract

Any expression of rationality is based upon premises, many of which cannot be ultimately justified. The role of these presuppositions becomes particularly important in the domains of the social sciences and the humanities. A philosophical reflection on the foundations and methodologies of these disciplines can shed valuable light on how to overcome the rigidity of many present conceptual systems in order to fully grasp the richness and complexity of human action.

1. Introduction

Physics, chemistry, biology and neuroscience, together with logic and mathematics as structural foundations of their rational inquiry, represent our most powerful tools to achieve knowledge endowed with the highest degree of certitude. Nevertheless, the human mind, in its far-reaching aspiration to conquer new territories of knowledge, cannot renounce exploring the realm of the most complex objects available to our experience: the productions of the mind in the form of cultural and social institutions. It is therefore imperative to deal with the nature and scope of the social sciences.

Any attempt to approach an object, whether in the domain of the natural sciences or of the social and humanistic disciplines, always encounters a deep difficulty: the methodological perspective employed. In the case of the natural sciences, the problem, although real, is exhibited on a smaller scale. The referent is clear and explicit enough that we find plausible ways of contrasting the theoretical models that have been elaborated. If we want to explain how nature works, the limitation of our theoretical models will be reduced to the way in which they correspond to the frame of reference given by nature itself, its structure and its function. However, in the sphere of social and humanistic disciplines, the frame of reference is produced by the human being through his action. Abstracting from the historical element is then revealed to be an impossible task.

By deconstructing and reconstructing the object of study within the natural sciences, the loss of reality is minimal. Except in biology and neuroscience, where the object of study is under the constant influence of the medium and is constituted precisely in that continuous reciprocity with the ecosystem, with space and time, with the vicissitudes of history, the becoming of a material particle does not prevent us from grasping a series of basic dimensions that inevitably belong to the object. We can thus say that the human mind has managed to

elucidate the object with a degree of depth and rigor that will only be constrained by the shortcomings of our technique and the imperfections of our theoretical models.

On the contrary, when we examine any portion of human reality, any production of the spirit or any work of civilization, historicity becomes a defining characteristic. By germinating from individual intentions and their insertion in collective networks, man's creations are not easily subsumed into theoretical models. There is no key frame of reference that has the last word for determining the validity of a theory.

However, it would be naïve and futile to limit oneself to proposing mere interpretations capable of shedding light on the objects of the human world. Hermeneutics offers valuable and instructive tools, but the study of the human being does not have to yield to an interminable rhapsody of interpretations. Interpreting and explaining need not be contemplated as inevitably contradictory and irreconcilable methodologies (as Dilthey did in his rigid distinction between *verstehen* and *erklären*), because they have to be complemented in every field of knowledge.

2. Social Sciences, Conceptual Systems, and Human Rationality

Any progress in the refinement of our conceptual systems gradually leads to a new conceptual system which, although imperfect and fragmentary, is remarkably close to reality. In the case of the humanities and the social sciences, this approach consists of the cultivation of theoretical frameworks and empirical techniques capable of assimilating a greater number of phenomena and a greater range of relevant perspectives. Just as the researcher may feel indebted to Marx's work on the influence of social status on the mode of thought, but without admitting his entire system and his vision of historical evolution, a deeper conceptual framework, more versatile and blessed with higher explanatory power, will be able to conquer higher levels of extension and intensity.

The criterion of parsimony does not have to be applied here. The lack of necessary laws beyond biological and social conditioning (human will being a law in itself) turns the multiplicity of perspectives and the breadth of the principles into extremely relevant factors, which cannot be disdained for the sake of the economy, condensed into the famous Ockham's Razor. If in the natural sciences the basic criterion is that of extension (that is, the number of phenomena explained by a given law), in the social and humanistic disciplines it is essential to pay attention to the intensity of the model. There is no point in creating false expectations about a single law suitable for explaining everything, because each object of study arises as its own law: every period, every civilization...; each individual, in short. We would never complete the scientific discourse in these matters without exhausting all the manifestations of the individuality, the contingency, the historicity that mold human realities. Such a goal would not only be unavailable but also unreasonable, as it would imply reproducing everything that man has done, thought and desired throughout the centuries. Yet what is important is to identify the guiding principles that, in the course of history, have determined the events on a large scale.

"Human history can be regarded as the gradual discovery of rationality in its different manifestations."

The presupposition from which this perspective emanates refers to the rationality of human action, to the idea that there is a logic whose articulation gives coherence to historical events. It is evident that this presupposition is incomplete, because not everything that has happened has always emerged as the unmistakable fruit of rationality, pure and limpid, devoid of the intrusions generated by arbitrary or relentless contingency. Will and chance have played a role of equal or greater explanatory significance. However, we can hope that the combination of three great methodologies will propitiate a framework *that tends to* completeness in the study of the human being and his productions. The first methodology will be devoted to examining the logic of history, its insertion into rational patterns, into clearly discernible economic, social and technological factors; the second will concentrate its efforts on clarifying the motivations that govern human psychology, on the burdens that weigh on it, on the limits that surround rationality, on the unavoidable blueprint of emotions, on the genesis of desires, on the beautiful arbitrariness which moves the will; the third will seek to understand the contingencies that so often determine the course of humanity, but which can often be encompassed into basic and reiterated typologies.

Human knowledge has advanced by leaps and bounds in these three areas. Today we accumulate an extraordinary amount of data on the history of the economy, social organizations, technology and knowledge. At the same time, our understanding of the human mind has also progressed incontestably, and the detailed description of historical events provides us with an invaluable perspective for weighing the different causal elements that concur in a specific fact.

A science absolutely devoid of prejudice would never be feasible, because the human intellectual enterprise is guided by at least one presupposition: that of the intelligibility of the world. It gives us the hope that our mind will always be able to access increasingly hidden spaces of the universe, in a potentially infinite, exhausting but rewarding career. Fortunately, this presupposition is minimal, which does not really affect significantly the development of scientific activity. The fact that science itself has gained consciousness of the limits of human knowledge represents a relevant argument in favor of its infinite elasticity and its almost unrestricted permeability to the stimuli that come from the world.

The situation that we contemplate in the social and humanistic disciplines is completely different from the scenario that presides over the natural sciences. In social studies, the power of prejudices is of the highest importance. Yet although its shadow can never be completely dissipated, we must convince ourselves that the progress of these branches of knowledge cannot be based upon the absolute eradication of prejudices but on their insertion into broader frameworks that explain and interpret human phenomena. Beyond the traditional distinction between explaining and understanding, all scientific work, natural or social, aims to identify the great patterns of behavior that prevail in the different domains of reality. For example, by founding his analysis upon primary concepts like social class, conflict and socio-economic

system, Marx thought that he had discovered a fundamental law: conflicts between the classes that form a certain social and economic system inexorably generate historical change.

Today, the aspiration to identify a single law that rules the destinies of history is utopian. Not even thermodynamics can be unified into a single law (the so-called "theories of everything" seem to look for an *Urgesetz*, but it remains unknown, and it is possible that it may be unattainable).* It is more useful to speak in terms of the forces that prevail in each level of cultural development. And the different levels can be measured in accordance with the quantity and quality of the information managed by a certain culture (that is to say, in accordance with the *knowledge* accumulated by a certain culture). Hence, human history can be regarded as the gradual discovery of rationality in its different manifestations.

Human behavior is unquestionably more complex than the behavior of any object in physics and chemistry, but it nonetheless remains a perceptible phenomenon that responds to causes and produces effects. In order to understand the behavior of an electron, it is not necessary to use an "intensive" method meant to penetrate the interior of the object, since this inner dimension does not exist. As we rise on the phylogenetic scale, interiority dawns in increasingly higher degrees, and the scientist cannot but recognize that inner world which defines the realm of life and which shines with its own light in the *Homo sapiens*. Understanding human behavior therefore requires a detailed examination of its interiority, its psychology, the functioning of mind, the amalgamation of reasons, desires, emotions and stimuli that shape it. But, whether explanatory or interpretive, every discourse of reason that strives to adapt itself to reality does nothing but to integrate the particular into the universal. There are neither infinite modalities of conduct nor infinite modalities of production or social organization; also, there is no infinite number of laws that govern the movement of the different strata of physical reality. While we lack a unified theory of physical nature, we have strong reasons to believe that the number of primitive laws is relatively small. Every scientific discourse always aspires to find the premises and rules of transformation that underlie a specific phenomenon of the world. To connect the particular and the universal is the goal of every explanation and every interpretation.

It is undeniable that every form of conscious knowledge is always indirect. The mediation of the senses represents the principal channel through which we access the external world. With the exception of the pure creations of mind, such as logic and mathematics, as well as certain philosophical propositions justified by virtue of the very exercise of self-consciousness (St. Augustine's *si enim fallor, sum* and Descartes' *cogito, ergo sum* give us

* The first reason is that our knowledge of nature is always constrained. For example, until the 20th century, physicists thought that two fundamental forces sufficed to explain material processes. Today, we are aware of the necessity of at least four fundamental forces to understand the universe. The second reason points to the limits in our capacity to know and think that have been discovered by science itself. The two fundamental borders for our knowledge are Gödel's incompleteness theorems and Heisenberg's Uncertainty Principle. The first raises an analytic limit, referred to the inner structure of logical thinking, while the second poses a synthetic barrier to knowledge. Any law of nature establishes a type of behavior in material entities that concomitantly poses an epistemic limit. For example, the law of the constancy of the speed of light in vacuo defines a fixed, finite quantity for the displacement of a ray of light in vacuum. It is therefore impossible to know anything instantaneously, and absolute simultaneity is unachievable for our mind. However, the most distinctive feature of the Uncertainty Principle resides in its direct epistemological content: it immediately refers to a limit in human knowledge, because this law of nature concerns a potential observer that aims to measure simultaneously two canonically conjugated variables. It is inevitable to speculate whether a much superior mind would be subject to Gödel's prohibition or to Heisenberg's restriction. Would a divine-like entity find its knowledge restricted by these boundaries, or would it be blessed with some sort of "higher rationality", capable of avoiding Gödel's theorems, and with a deeper understanding of nature, capable of surmounting Heisenberg's indeterminacy? We do not know, and we do not know whether we will ever be able to answer this question. In any case, logical and physical evidence underlines the existence of at least two fundamental limits of human knowledge.

the best examples), in all knowledge ordered to effectively represent reality it is inevitable to employ mediations. Both the linguistic sign and the mental image seek to code, in channels imbued with a certain degree of permanence, the multiplicity of an inherently heterogeneous and mutable reality. In such symbolic structures it is possible to record the thoughts dealing with realities that are external to the mind. Thanks to the art of combination, through a reduced number of linguistic signs and mental images we are able to generate a potentially infinite number of propositions reflecting, in higher levels of fidelity and attunement, the features of the world.

Through thinking, the human mind is capable of multiplying and distributing regardless of the constraints of space and time (as the classical dictum states: "*natura ad unum, ratio ad opposita*"). This power stems from the possibility of establishing a dichotomy between object and subject, because the mind is able to multiply reality, whereas unconscious beings are strongly determined by the specificities of the stimuli and their own situation. The ability to detach itself from the object ("to objectify") is particularly fertile at categorizing, at finding "types" and models, but in examining the subjective life, if we restrain our activity to objectifying, we lose reality. For example, in biology it is very difficult to find general laws (not even Mendel's laws are absolutely universal). This fatality obeys the increasing complexity of biological entities, in which there is an "underdetermined" relation (a "degenerate system" in the sense that the same goal can be reached through different ways, adding uniqueness and singularity to the process) between the general law and the entity that falls under its domain. We can fulfil the laws of physics through different ways, and this possibility allows us to develop a vast and exuberant world of identity and subjectivity that, without contradicting the fundamental laws of nature, nonetheless builds "its own world", with its own "laws" (aspirations, character, rationality…). Thus, it is feasible to multiply the variability almost exponentially, and it is perhaps here where intuitive thinking and "intellectual empathy" become more important. Culture is a new world of its own, with laws rooted in human will, creativity and adaptability. It is the noblest fruit of our symbolic capacities, and the symbol precisely consists of the power to make humans detach themselves from a fixed paradigm in order to establish new, imaginative connections, thereby expanding the scope of rationality.

Although we can never draw a 1:1 scale map,* science and thought progressively lead us to a finer awareness of the elements that vertebrate the world. This increasing degree of consciousness also implies a greater deepening into ourselves, into our own consciousness and into the elasticity of human imagination. The consequence is clear: knowledge of the external can admirably confluence with the knowledge of oneself, the task to which we are exhorted by the famous imperative of the Oracle of Delphi.

From this perspective, all knowledge is constructive. Data of the external and internal experience are purged by symbolic imagination, language and the presuppositions of logic, which articulate the information in an increasingly sophisticated architecture. Inevitably, the human being must separate himself from reality in order to rationally access it. Therefore, we always have to lose elements of reality, for example the instantaneity in which many

* This attempt would itself be a vain and distorting project, because it would prevent us from thinking: it would frustrate any attempt to distance ourselves from the world in order to scrutinize, question and transform it creatively.

phenomena manifest themselves. As soon as we intend to capture some parcels of reality, these have already undergone alterations, and we never apprehend exactly the same state of the world that we attempt to elucidate.

> *"Each act of analysis requires a parallel synthetic attempt, susceptible to closing the circle of a reality that is neither analytic nor synthetic, but unitary."*

Instead of discouraging us, this inexorable gap between the mind and the world should infuse us with a feeling of deep humility before the vastness and richness of the universe and the limitations of the human mind. It should also invite us to explore all the options available to channel the impulses of thought.

3. From Analysis to Synthesis

The analytic method (which can be called "*la méthode de résolution*")[1] offers unmatched results in the detailed study of the elements of reality. However, analytic thinking is unable to deal on its own with the highest complexities of the world. After decomposing reality, we need to "recompose" it. The whole adds new information to the data contained in the parts, as a result of the interactions and environmental relations established between the parts. Therefore, the truth about the parts is different from the truth about the whole, given that the truth about the whole may need to consider the compatibilities and incompatibilities between the parts, the importance of their reciprocities... Just as in thinking we always need a proposition (a premise) and a rule of transformation, in dealing with reality we have to pay attention to both the parts ("the objects that fall under a certain function or domain") and the system in which they are integrated through a set of relations ("the functional, operative rules").

Of course, analytic thinking is confronted with a pressing paradox: in its pursuit of the most basic components of reality, it is always haunted by the specter of a *petitio principii*, because it can never attain the absolute certainty that these elements represent genuine atoms, ultimate and undivided as Leibniz's monads. Moreover, when it comes to examining their relations, the ruling laws of the cosmos, the large-scale processes of nature and history, it is not enough to dissect the object into its parts. Rather, it is necessary to reconstruct and unveil the connections that link these atoms together in larger structures. The analytic impulse behind some of our greatest intellectual achievements cannot aspire to standardize a heterogeneous reality full of differences and particularities. It cannot rely on fragmentation, reductionism and the configuration of models which, in the long run, are divorced from the reality towards which the noblest efforts of human knowledge are directed.[2] But the mind cannot place its hopes in a quick form of holism, intoxicated by speculative delusions and false explanatory promises which, for the sake of integration, neglect the details and darken the actual functioning of a world that is exquisitely sustained on individual elements, whose constraints cannot be ignored.

Analytic and synthetic strategies must complement each other adequately. Each one must be aware of its assumptions, of its premises and boundaries. However, this task cannot be accomplished *a posteriori*, because we do not know the limits of a certain methodology until we have stumbled upon an insurmountable barrier. To immerse oneself in the study of the parts can lead to the knowledge of the totality, and each act of deconstruction ends in a process of reconstruction. Our intellectual enterprise does not have to resign itself to offer, on the one hand, meticulous descriptions of reality that overwhelm us with minute details, and to paint, on the other hand, the great canvas of general principles practically dissociated from the real elements that arm reality. Each act of analysis requires a parallel synthetic attempt, susceptible to closing the circle of a reality that is neither analytic nor synthetic, but unitary.

"All great science requires a synthesis, an integrative strategy that links the parts according to laws."

The analytic method has produced many conspicuous fruits in the study of the constituents of reality. In our time, its fervor coexists with a no less passionate synthetic project. Its benefits start to be appreciated in areas such as ecological thinking, the sciences of complexity and the theory of information. The social and humanistic disciplines would fall into a false dilemma if they felt obliged to choose between analysis and synthesis. Knowing the smallest details is essential for a rigorous study of reality. However, the quest for the great tendencies and the guiding principles not only brings amplitude to the analytic stage, but obeys the very nature of a reality that, constructed on atomic elements, on bricks susceptible to a diaphanous delimitation, owns an architecture, a conformation, a qualitative disposition that organizes it inexcusably. All great science requires a synthesis, an integrative strategy that links the parts according to laws. As Descartes did, it is necessary to embark on the analysis and then proceed with the reconstruction.

Science does not progress through the mere accumulation of facts. It is fermented by the conceptual exploration of that which has not yet fallen under the domain of empirical confirmation. The most creative minds have been able to rise above the forests of evidence, perched on deep and innovative intuitions, not always immediately verifiable, to contemplate what did not seem to exist. Stung by imperfections and contradictions, eager to delve into the most genuine meaning of the ideas and principles that articulate a given discourse, nonconformists with the generally accepted presuppositions, they have not ceased in the effort to reconcile the opposite, to perceive the imperceptible and to examine discarded or neglected options. They have always been guided by the compass of truth, that is, of the greater conformity between an infinitely malleable thought and a potentially inexhaustible reality.

In any case, we can realize that by subsuming individuality into generality we can violate reality itself, causing a loss of information that may seriously compromise the most legitimate goals of knowledge. However, indulging in the heterogeneity of the real, without seeking to discern unifying principles, would curtail the human longing for knowledge. Consequently,

we must take the greatest possible degree of consciousness about the cognitive and emotional constructions of which we are participants, but without engulfing ourselves in despair and despondency, because the human being can always transform the conditions given by nature or created by ourselves.

"Respect for the eminent authors of the past is praiseworthy, but it paralyzes the spirit if it becomes a dogmatic attachment that blinds us to the contemplation of the world and the realities that we seek to elucidate."

All veils can be torn by a reason whose capacity for openness to reality and questioning of itself is, for practical purposes, infinite. No mirage, no illusion, no spell wrought by the Maya goddess holds the last word. Reason can always override any previously erected frontiers and venture to explore virgin territories of the human spirit. However arduous it may seem to cross the porticoes that divide reality and our construction of reality, we have the best known instrument to free ourselves from any determination and to break all the chains of thought and action: rationality. Within this framework, truth is outlined as an asymptotic boundary, although we must not desist in our endeavor to seek it. We can always add more truths to the temple of knowledge, potentially infinite, but impeccably real. No universe of meaning carved by man is ineluctable. It is always plastic and perfectible.

It is easy for a frame of reference, for a conceptual system with rigid principles and considerable explanatory breadth, to succumb to a feeling of arrogance about its achievements. But it is important to notice that many conceptual systems of the past were believed to possess full explanatory powers. Who could have convinced the Aristotelian philosophers of the Middle Ages and early modern period that the physics of the Stagirite, idolatrized by the Scholastics and brimming with all kinds of philosophical epicycles, did not really explain the fundamental processes of reality? Despite its teleologies, elements and embellishing substantial forms, the miracle of reducing everything to principles of metaphysical intelligibility was proved to be largely erroneous.

To widen the circle of our thinking and our imagination implies, above all, to expand the radius of the possibilities of our mind. It is a gift and not a punishment. Anything that contributes to stimulate the mind, to awaken it to that beautiful state of luminosity that the Japanese tradition calls *satori*, should be welcomed. Enthusiasm is constantly needed, because reason does not cross the skies of knowledge with its own wings, but is driven by emotions and commitments, by attachments and desires, by pre-rational phenomena that, paradoxically, unleash the wonder of rationality.

As with any great human enterprise, significant advances in the field of thinking only happen when the protagonist has been able to internalize a difficult mix of ambition, concentration, courage, perseverance and strength to overcome the inherited opinions. Stigmatized

by all sorts of inertias, concepts, theories, information, publications, teachings, schools... we can feel uncomfortable, and we can even renounce examining the questions in themselves; not as embedded in dense and entangled networks of philosophical doctrines, but as universal problems that call upon any mind longing for truth, rigor and the exchange of ideas. Respect for the eminent authors of the past is praiseworthy, but it paralyzes the spirit if it becomes a dogmatic attachment that blinds us to the contemplation of the world and the realities that we seek to elucidate.

Of course, philosophical thought will never obtain the clarity that shines in many mathematical statements, because its frame of reference cannot be fixed with such a degree of certainty. Nevertheless, it is always fruitful to assume healthy doses of the discipline, precision and passion for truth that prevail in mathematics. Arguments must be studied and valued irrespective of who proposed them and when and how they were proposed, and the honest contrast between hypothesis and reality—the key to scientific success—must immunize us from the temptation to enthrone our subjective preferences.

This observation is not an obstacle to emphasize the creative dimension of philosophical thought, which, far from limiting itself to explaining what is given, also ventures into prophesy, into imagining the future, into exhorting humanity and reason to follow one path instead of another. But creation only becomes truly profitable when it is based on rationally justified reflections, on evidences and not on arbitrariness, because this process paves the path to the universal. Beyond schools and burdensome traditions, the grandeur and beauty of certain philosophical questions must shine forth, beyond obscure dogmatisms and hoarding drives.

Today more than ever, the amount of knowledge accumulated by humanity requires an interdisciplinary treatment, because the complexity of some problems makes it impossible to approach them from a single perspective. Many of these problems are not the patrimony of a concrete province of knowledge. The compartmentalization of knowledge is due to strictly practical motives, not to any irrevocable, aprioristic law. The world is unitary: from the subatomic particles to the most sublime works of the human spirit, in all it is possible to perceive a fabulous thread that links the tiny and the colossal, unified by the very laws of nature and participant in the same logical, physical, chemical and biological scenario. It would be negligent for the physicist to despise the help of the philosopher, or for the philosopher to forget the discoveries of the natural sciences for—theoretically—failing to reveal a hypothetical and hidden metaphysical essence which he has idolized. Similarly, the challenges of humanity grant us a vivid proof of the urgency of taking an interdisciplinary approach, where the natural sciences, the social disciplines and the humanities are not entrenched in their respective methodological frameworks, but show boldness to understand each other and give each other valuable ideas.

Knowledge not only stems from the discovery of that which appears before us, but from the imagination of what has not yet been given. There is no real progress in any domain of science without acquiring consciousness of the provisional nature of knowledge and the

imperative to increase our present understanding. To know is to identify, but it is also to imagine and explore that which has not yet appeared, but may arise in the future, or that which does not spring from the work of nature, but the work of man.

Science should not fear intuition and imagination, but rather realize its extraordinary potential to multiply knowledge and help us abandon incomplete paradigms. The recognition of the present structures, of the testable patterns, of the available evidence, is not incompatible with the fruitful lucubration about what we still ignore or what has not yet been given to us. Logic leads us to follow a linear, sequential, diaphanously marked path. However, in order to create, it is necessary to look for parallel paths, unforeseen analogies, discontinuous leaps which will later be subjected to the demands of the most scrupulous logical canons, even if they were initially born from the spontaneous grasping of the absent.

Ultimately, it is true that there is only *one* form of rationality in its strictest and most powerful sense, but in practice, the faculties of the human mind function as if we enjoyed different kinds of rationality which, in the course of an uninterrupted struggle, propitiate the magic of creativity, the bursting of an unpredicted novelty. There is rationality in many emotions, and in many intuitions, and in many actions that have not been unleashed by a process of crystalline rational deliberation, although in the long run lead human consciousness through the most transparent of rational itineraries. Therefore, art and science are not as distant as we might think at first glance, but art shines as the best ally of science, as the way to channel deep and powerful intuitions whose expressivity not only inspires the scientist, the human being who struggles to unravel the laws of the universe, but, happily liberated from the onerous holdings of pure rationality, dares to ponder other scenarios, other ideas and other ways of reconciling the seemingly incompatible. Instead of interpreting ambiguities, conflicts and uncertainties as hostile phenomena whose darkness hinders the conquest of full knowledge, we must see them as stimuli that propel the mind into new conceptual territories.

The ambiguity of any frame of reference is not necessarily negative. It can actually encourage the search for ever more perfect and deep systems. The very essence of creativity is based on ambiguity and paradox, because the new is never automatically inferred from the old. The different itineraries that the creative mind could have followed are not unambiguous, devoid of the beautiful and powerful manifestation of the unconscious, the intuitive and the emotional. In addition, every conceptual system is composed of subsystems, of subsets associated with their own presuppositions.[3,4] Collisions often occur between these subsystems, and violent eruptions emerge within conceptual systems and frames of reference. The ultimate criterion that determines the validity of a system can be no other than that of its openness to reality, that of the strength and economy of its principles and that of its flexibility to account for new phenomena.

We are condemned to coexist with presuppositions and conceptual systems, but we are also called to rebel against them as soon as they show the slightest hint of imperfection and incompleteness. To abandon any system of concepts and representations would lead us to a no man's land, an abyssal gorge, a nihilistic and discouraging silence. Our inability to find the absolute foundation, the system of all systems, the *forma formarum*, the ultimate

law that governs and binds everything, not only strengthens the awareness of our limits and allows us to journey through beautiful and unsuspected scenarios (as the study of the limits of our logical and physical knowledge), flanked by unpredicted boundaries, but gives us an unrestricted and continuous possibility of overcoming and searching. Like Hegel, we will always seek the system of systems, a system blessed with infinite degrees of freedom and able to cover every need, every reality and every possibility. In this incessant expansion of boundaries and frontiers, it is worth noting that, just as the finite does not become dissolved into the infinite,* deprived of its identity, phagocytized by the unsearchable, it is possible to preserve the reality of the finite in the midst of an infinite concatenation of processes, because the value of a single truth crowned by the human mind does not pale before the potentially infinite scope of our intellectual enterprise.

Author contact information
Email: carlos.s.blanco@gmail.com

Notes

1. Antoine Arnauld and Pierre Nicole, *La Logique, ou, L'art de penser* (Paris: Flammarion, 1970), 368.
2. Garry Jacobs, "Limits to Rationality and the Boundaries of Perception," *Eruditio* 1, no. 2 (2013): 108-118.
3. William Byers, *The Blind Spot: Science and the Crisis of Uncertainty* (Princeton: Princeton University Press, 2011).
4. William Byers, *Deep Thinking: What Mathematics Can Teach Us About the Mind* (New Jersey: World Scientific, 2015).

* A useful example of this scenario is given by Cantor's theory, which proves that it is possible to have numerable infinite sets (such that, in spite of finding an infinite number of elements in the set, each element can be numerated instead of becoming diluted).

CADMUS, Volume 3, No.2, May 2017, 96-105

Anticipation in Law and Social Science*

Winston P. Nagan
Chairman of the Board of Trustees, World Academy of Art & Science;
Samuel T. Dell Research Scholar Professor of Law, University of Florida

Megan E. Weeren
Junior Fellow & Research Assistant,
Institute of Human Rights and Peace, University of Florida, USA

Abstract

This article explores a particular aspect of the role of anticipation in social and legal processes. The program begins by recognizing that social interaction happens within a time-space manifold of events. This means that society functions in terms of events located on the plane of time and the situation of space. This means that social process is a dynamic. As an ancient philosopher put it, change is so ubiquitous that you cannot jump into the same river twice. Since we tend to look at social dynamics in a more static way, one major theorist reminds us that the stable in social process is a special case of the unstable. The article underscores a point that the anticipatory perspective is a ubiquitous part of social dynamics and change. Indeed, it is a critical component of social coexistence. To briefly illustrate, if the members of a governing group come into power, they will immediately have to anticipate the security needs, the economic needs, the educational needs, the health and well-being needs, the skill and labor needs, the food needs of the body politic, the requirements of effective family relationships, the requirements of morality and ethics and the needs of aesthetics. The paper provides a framework in which anticipation is used to predict the problems that emerge from the social process. The value of a social science that facilitates anticipation before problems occur provides opportunities on the time-space manifold of society to develop problem-solving strategies with a better chance of those strategies being successful. To utilize this approach, the authors provide the sophisticated model of social process developed by WAAS Fellows Lasswell and McDougal: Human beings pursue values through institutions based on resources. Using this model the authors provide a provisional map of the social process with key markers at points likely to generate important problems. The markers in the maps are as follows: participators, perspectives of participators, base values accessible to participators, situations in which events occur, strategies to be deployed, outcomes and consequences. The authors use this map to provide a provisional simplified model of a process of mapping the problems contextually.

1. Introduction

Anticipation is an important resource in the development and social relevance of the

* This article is based on a talk delivered by the lead author at the Conference on Anticipation, Agency & Complexity held at Trento, Italy on April 6-8, 2017.

practice of law. It is also an important goal or objective in the contribution that the social and political sciences make to the stability and endurance of the system of public order. Anticipation involves the capability of some systems to modify their behaviour on the basis of a model of the future evolution of the context in which they are rooted.[1] The study of the social and political sciences is, in general, to provide a scientific enlightenment about the foundations of the systems of public order that govern human societies.

> *"The central issues are how to sustain a responsible process, to enhance the productive capacity of society including the full utilisation of its human capital."*

An important focus of the social and political sciences invariably is influenced by the role of power and the emergence of law as important components of the architecture of the system of public order. In this sense, the study of social and political sciences and the study of law and power are matters of intimate association. An important gloss on the notion of the science of society and law is the need to understand the nature of the public order as it is.[*]

In this sense, the social sciences share with law the need to understand the state of law in society as it is. Both society and law work in the context of a time-space manifold of events of importance to both law and social sciences. The essential challenge of law and society, in this context, is the trajectory of these events in the time-space manifold of events which include conceptions that implicate the anticipation of future of bodies politic for both law and society. This means that social process is inevitably a consequence of the dynamism of the legal and social events that project their consequences into the future time-space manifold. However, no particular future is assured unless legal and social theorists build into their description and analysis of legal and social phenomena—at least a partial understanding of what those futures might entail. It is impossible to avoid the consequences of understanding the state of law and society without generating a concern for the anticipated future or futures of those legal and social phenomena. Indeed, in order to anticipate a projected public and legal order, we already encounter the prospect that description and analysis without a concern for contingent futures miss the point of understanding law and society; and what their anticipated future holds for the relevant universe of stakeholders.

2. Anticipation: Problems and Social Process

The above introduction suggests that we need to graft onto our conceptions and methods of legal and social process, a vital space for the role of anticipation in the evolution and development of these phenomena. This perspective is made more important when we consider that the study of any form of social organisation and law will generate certain outcomes which we designate as problems emerging from the legal and social processes. The importance of a problem-oriented gloss is that it gives social relevance and policy importance

[*] For a detailed examination on public order in the context of international law, see McDougal, Myres S., Harold D. Lasswell, and Lung-chu Chen. *Human Rights and World Public Order: The Basic Policies of an International Law of Human Dignity*. New Haven, CT: Yale UP, 1980. Print.

to the capacity to anticipate problems before they actually occur. Additionally, problems themselves sharpen the guidelines that permit the anticipation of problems generated by problems on the plane of space and time.

Rather than being overcome by the specifics of a new scenario, agents look to substitute alternatives with activities they are accustomed to and act in certain ways that demonstrate a high level of predictability to putatively take in order to have a greater chance of anticipating the end result.*

The anticipation of economic security is another of the most important aspects of the health of the public order. Wealth is a critical base of power that may be used to secure all other values and institutions of importance. As a consequence, the anticipation of the prospects of economic security or insecurity is a critical factor that is implicit in studies of social and political science and law. The central issues are how to sustain a responsible process, to enhance the productive capacity of society including the full utilisation of its human capital. Optimising productive capacity generates the important anticipation of the fairest and just method of allocating the benefits that inhere in the system of productive relations. A critical anticipation of the optimal production and distribution of wealth is the anticipation that the stakeholders in the system will have maximal opportunity and capability freedoms.

Anticipation is progressively becoming the centre of modern discourse relating to a wide range of social and political issues.[2] Briefly, the importance of anticipating problems is a central and critical feature of good, responsible, and accountable governance. Virtually all bodies politic work on a notion that has to anticipate the emergence of certain problems. For example, all bodies politic have an actual or prospective anticipation of security problems. Anticipation permits them to examine problems in the light of realistic anticipated projections into the future and then plan for the contingencies of securities. These include size of the military, institutionalisation of intelligence services, coordination of law enforcement, investment in technologies of national defence, directing economies into situations where invention, production and distribution hold a proper place for defence interests.

Tavory and Eliasoph (2013) develop a guideline that analyses how actors engage each other toward their futures. They then classify forms of future-coordination into three distinct types—(a) **protentions**, or moment-by-moment anticipations that humans regularly fail to properly appreciate, (b) **actors' trajectories over time**, which progress in ways that are more or less culturally foreseeable; and finally, (c) **plans and temporal landscapes**, all-encompassing temporal orientations that humans experience as unavoidable and even normal.† By handling future-coordination in this manner, it is clear that the subtle choreography preserves agents' cooperative orientation toward the future while accepting motion, uncertainties, and missteps. Agents have to share a vision of a future with each other, even if done so indirectly—to be able to coordinate plans and/or action.

* For a comprehensive analyisis on anticipation, see Riegler, A. (2003). "Whose Anticipations?" In M. V. Butz, O. Sigaud & P. Gerard (Eds.), *Anticipatory Behavior in Adaptive Learning Systems* (p. 12). Berlin: Springer.

† For a detailed classification of future-coordination, see Tavory, Iddo. & Eliasoph, Nina. Coordinating Futures: Toward a Theory of Anticipation. *American Journal of Sociology*, Vol. 118, No. 4 (January 2013), pp. 908-942 Published by: The University of Chicago Press Stable URL: http://www.jstor.org/stable/10.1086/668646

The propensity towards greater levels of uncertainty seen in modern societies is reinforced by the interaction between non-concrete outlooks and the role of technology for communication purposes. Communication is now immediate and is also networked through the globe. Thus, the outcome of the unclear future prospects and the rise in the speed of communication are uncertain.[3]

All bodies politic have an interest in food security; they must plan for contingencies that require sustained food production, storage facilities, for long-term food needs and interests, and thus anticipation will ensure adequate markets and state support to sustain food production. Bodies politic also have an important interest in health security. Bodies politic must anticipate the necessities for adequate health service and accessibility, problems of preventative strategies to improve health, and the anticipation of responses to health crises such as pandemics. Bodies politic therefore must anticipate the needs of the body politic in access to health and well-being.[*]

One of the most important instruments for the development of human capital in society is the production and distribution of educational/enlightenment values. Depending upon the combined role of public and private education, the state must anticipate the effect of demographic growth, appropriate access to schools, technical training and universities to ensure the adequacy and preparedness of each generation of social participators.

Society must also anticipate the nature and distribution of economic skills in terms of its labour potential. Both the state and private sector must therefore be concerned about the adequacy of labour opportunities and values to sustain capital in a society; this requires an anticipation of labour needs and values and their distribution in the future. Because societies are not static in terms of their own legal and social structure, the state must be alert to the anticipated futures and the expansion and contraction of class stratification, gender stratification, ethnic stratification to ensure that opportunity freedoms are maximised and catastrophic disabilities which result in accelerated poverty are reduced. In short, the state must keep an eye out on an anticipated future of approximate equality and avoid aggressive inequality. Radical inequality and unemployment may be anticipated as net losses to the aggregate value of the body politic.

Bodies politic at least implicitly maintain an anticipated perspective that their continued future must enhance the loyalty, solidarity and patriotism of the participators in the social process. Since these values are rooted in the principles of affection and compassion, bodies politic generally have an interest in reproducing family forms that maximise affection and positive sentiment as the emotional bases of bodies politic which bring greater social and political cohesion to the body politic. The politics of affection[†] although understudied is nonetheless an important anticipation for the continued success of any rational social order.[‡]

All societies have some forms of religious, spiritual, ethical and moral experience to ensure longer term solidarity and patriotism. The state in general has an interest in the

[*] For more information regarding bodies politic, see Grosz, E. A. (1995). *Space, Time, and Perversion: Essays on the Politics of Bodies*. Routledge.

† For an extended discussion of the politics of affect, *see*, Nagan, et al, *Human Rights and Dynamic Humanism*, Brill/Nijhoff, pp. 564-654 (2017).

‡ A detailed review of the politics of affection can be found in Velásquez, Eduardo A. *Love and friendship: Rethinking politics and affection in modern times*. Lexington Books, 2003.

reproduction of those moral sentiments that make ethics and morality a common experience of an anticipated future. Rectitude therefore is a widely embraced expectation that elites consider a necessary element of social solidarity.

Finally, the state and society exist in cultural forms and traditions with elements of creativity that embody the fundamental aesthetics of the society. It is difficult to imagine an anticipated future society with an absence of aesthetics. Therefore, society has an anticipated interest in the future aesthetic of the body politic as a mechanism of approaching an enduring commitment to the solidarity of the body politic. The relevance of aesthetics may be anticipated from the dynamics of social communication and collaboration over time. This will give us a clearer sense of the salience of aesthetics to the public order of the community. Aesthetics in the form of propaganda may be crucial in time of crisis or war and may also be a political tool of propaganda to mobilise particular interests in the body politic.

3. Social Dynamism and Anticipation

In all social relations, you may universally determine that human beings have needs, wants and desires. All humans come to social relations as an instrument of energy which, with varying degrees of success, they use to acquire values they need, want or desire. In seeking access to these values, they will cooperate with each other or they will engage in some form of conflict with each other. When they are forced to resort to conflict, the conflict is invariably about a valued thing that one participator wants and another participator denies. We can therefore anticipate that the state of any social organisation will generate outcomes of collaboration and outcomes of conflict. Outcomes of conflict may be resolved by forms of lethal conflict or forms of conflict resolution. In general, if there is anticipation of conflict, resolution is meant to be lethal, then it is important to anticipate the scope, scale and strategies of lethality that may be employed. Here the anticipation may simply be that the anticipation of conflict is a zero-sum game. One side wins. Those losers may have anticipated the loss and devised strategies for elite or group survival. The winners may have to consider an anticipated future where lethal conflict is diminished and where nation building solutions are needed.

The outcomes of conflict may represent a stalemate in which each side experiences losses and does not anticipate advantages from continued conflict. The key protagonists may have to anticipate a negotiated solution to end the conflict on terms that are mutually beneficial and then anticipate how power should be managed to represent an effort to identify the common interests of the parties. Here the parties may consider methods which anticipate the stabilisation of power relations, a fair distribution of power competencies.

The understandings may anticipate the evolution of a behavioural constitution in which the parties respect the agreed upon allocation of decision making powers in the body politic. The behavioural constitution may in turn anticipate the representation of constitutional expectations in a document. The parties may be realistic enough to note that the constitution may not necessarily abolish conflict.

The conflict may have to change in terms that are not destructive but produce results that strengthen the coherence and solidarity of the group as a whole. Such arrangements may

anticipate institutions of dispute settlement which may include components of administrative justice, juridical forms of dispute settlement. They may anticipate non-judicial methods of settlement such as arbitration, mediation, conciliation, good offices, negotiation, as well as ad hoc methods to secure the pacific settlements of disputes. In terms of legal culture, the dynamics of legal culture are triggered by the value contestations between participators. When a participator seeks to invoke the law to secure his or her interests it comes with an anticipation of winning or the cost of losing. When a client seeks legal representation, the client is generally moved by self-interest and therefore wants a cleaner sense of anticipation of winning or the price of losing. Anticipation will deeply influence judicial decision making since a great deal of what judges and decision makers do rests on their sense of anticipation. Judges use many tools to provide themselves with the guidance that their trained anticipation will produce stability in expectation and an approximate sense of justice from the point of view of society, an articulate sense of the problems and conflicts that may be seen from a given context involving goals, trends, conditions, and anticipated futures. This underlines the importance of anticipating conflicts and anticipating solutions to conflict as a consequence of the anticipation of social and political science. In the case of both law and social science therefore the anticipated state of the public order as a consequence of scientific insight permits via a focus on problems the capacity to anticipate problems and build on that by anticipating solutions that the problems create.

Thus far, we have seen the centrality of anticipation in the evolution of public orders influenced by social sciences and law. We now must engage in a technical shift of focus. If we accept the fact that the problems generated by social interaction are problems that require authoritative responses, we are still left with the challenge of how to identify and predict problems with the help of scientific specificity. This requires a provisional map of social dynamics in which we can locate the specific problem outcomes with a specificity that comes from mapping the social process and mapping the problems onto the different phases of that social process.

The most elegant method of mapping the social process emerges from the work of Harold Lasswell, Myres McDougal and their associates. This tool of mapping they describe as a phase analysis for the purpose of the identification of problems with specificity in a specific contextual location.[*] We summarise the phase analysis with a brief definition and a broader description. The conceptual basis of the phase analysis of mapping is as follows: Human beings pursue values through institutions based on resources. To develop this conceptual framework into a map, the following markers are used.

4. Mapping the Social Process and its Relevant Anticipated Problems

I. Identification of the **participators**

II. The relevant **perspectives** of the participators

[*] See McDougal, Myres S. and Lasswell, Harold D., *Criteria for a Theory About Law* (1971). *Faculty Scholarship Series*. Paper 2573. http://digitalcommons.law.yale.edu/fss_papers/2573. Also see Nagan, *Contextual Configurative Jurisprudence: The Law, Science and Policies of Human Dignity*, Vandeplas Publishing (2013).

a. perspective of identity
b. perspective of demand
c. perspective of expectation

III. **Bases of power** (all demanded values sought, power, wealth, respect, health and well-being, skill, affection, rectitude, aesthetics).

IV. **Situations** (spatial, temporal, institutional crisis)

V. **Strategies** (coercive and persuasive-economic, diplomatic military, pacific methods)

VI. **Outcomes** (problems relating to 1 to 5 above)

VII. **Effects** (where the problems are resolved, who resolves, how they are resolved and the consequences for the production and distribution of values for the body politic). Every one of the categories above will generate problems.

5. Mapping the Problems of Participation

The problems of the universe of participators are as follows: who is included and who is excluded. The problems of inclusion and exclusion are the central problems of any political culture. In this situation, we can specifically and contextually locate the problem in a context of actual and potential stakeholders. The role of anticipation here is the expectation that exclusion will be entrenched, diminished or extinguished.

6. Problems of Perspectives

Item II identifies the perspectives or psychological states of the participators. The specific breakdown deals with conflicts, deprivations or indulgences based on the essential identity or the ascribed identity to the participators. For example, refugees have diminished rights, citizens have maximised rights. Hence the problem of whether refugees may acquire more rights to alleviate their condition. Indicators of identity can serve as markers for value indulgences or deprivations.

The perspective of demand represents insights of ego-psychology. It is ego that demands access to values that ego needs, wants or desires. These can be identified as follows: power, wealth, respect, health and well-being, skill, enlightenment, rectitude, affection and aesthetics. When these demands are not met or there is deprivation, problems result.

7. The Anticipation of Problems as Value Contestations in Law & Society

Above we set out a map that permits a contextual breakdown of the social dynamics in which each marker provides us with a key to the anticipation of the contestations about values, which contestations permit us to anticipate the specific value problems and their precise location in the map of legal and social process. What follows is a brief summary of the major value contestations that we might anticipate in any social process at any level of analysis.

8. The Problems of Conflicts about the Value of Power

Here, we ask the reader to analyse the specific problems of power by placing them in the context of the markers that we have identified in the map.

8.1. Problems of power: claims to power and claims to depreciate power

- The power claim to be acknowledged as a human being
- The claim to appropriate status of group affiliation (Nationality, domicile, citizenship)
- The power claim of minority groups to equality and dignity
- The problem of the freedom of access to participate in the system of power relations
- The freedom of choice for reasonable access to power and other value institutions
- Freedom of access to representations via global governance and diplomatic institutions
- Freedom from capricious incarceration, seizures and confinement
- Problems of maximising the access of rule of law protections for individuals
- The maintenance of a strong independent judiciary and independent bar and wide access to legal services

8.2. Problems relating to the autonomy of the individual and basic respect

The value of respect is often viewed as the most fundamental value incorporated in the principle of human dignity. The problems therefore of the reduction of respect have a fundamental quality to them. The following are the anticipated problems of the production distribution of respect. The central problem concerning the issue of respect is whether the freedom of choice to fully participate in all the value institutions of society is respected or diminished.

- Freedom of choice to take part in all value processes
- Equal opportunities, freedom and the replacement of invidious discrimination
- A central value of respect is the recognition of a person as a contributor to the public interest
- Liberty of choice about the following:
  - » Optimal involvement in shaping and sharing respect
  - » Opportunity freedom to achieve realism in expectations
  - » Opportunity freedom of access to institutions
  - » Ensuring all are respected during crises
  - » Opportunity freedom from forced labour, violence and terrorist activities

8.3. Problems relating to enlightenment

- Optimal achievement in the aggregate sharing and shaping of enlightenment
- Provision of access to enlightenment for all
- Non-discrimination in procurement, usage and communication of knowledge and information

- Immunisation from biased communication
- Immunisation from deprivations of enlightenment inconsistent to crisis
- Opportunity freedom of assembly of appropriate resources for enlightenment
- Freedom from censorship, indoctrination and distortions

8.4. Anticipated problems relating to well-being

- For ideal influence and sharing of well-being
- For essential and core levels of safety, health and comfort
- For compassionate euthanasia
- For general contribution in realisation of bodily and mental health and growth
- For continued existence and development
- For an atmosphere favourable to survival and development
- For freedom to acceptable well-being and other value institutions
- For availability of state support adequate to defend and fulfil demands for well-being
- For freedom to receive or decline medical service
- For the use of genetic engineering

8.5. Problems relating to wealth

- For preservation of high levels of efficiency
- For essential levels of benefits from the wealth process
- For experiencing benefits on the basis of input and compassion
- For liberty to take part in the wealth process
- Liberty to accrue resources for productive purposes of the public interest
- Freedom from profligate use of resources (sustainability of values)

8.6. Problems of labour and skill

- For ideal aggregate in attainment and employment of skills
- For additional acquisition in terms of talent and emotional energy
- For acquisition of a basic minimum of skills pertinent to actual sharing in all value processes
- For prospects of having talent recognized
- For opportunity to procure skills and utilise them without discrimination
- Freedom for right to use institutions specialised in skills

8.7. Problems relating to affection

- For an ideal aggregate in moulding and sharing of affection universally
- For basic recognition necessary for individuals to obtain the motivations and capabilities of functioning effectively in shaping and sharing values

- Freedom to provide and experience loyalties
- Freedom to initiate and establish intimate and amiable personal relationships

8.8. Problems relating to rectitude, morality and ethics

- Preservation of public and civic mandate in which individuals' demand of themselves and others that they act responsibly for the shared interest
- Minimum prospects to obtain positive evaluation of rectitude
- Movement toward a fuller involvement of all in responsible conduct
- Freedom of association for promoting universal dignity on the basis of rectitude
- Abolition of religious intolerance
- Freedom of religious and rectitude association

9. Conclusion

We can follow this model by posing the question of the deprivations of these values and the distinctive problems they represent. We can anticipate that the full reach of deprivations will reflect the fullest measure of human rights losses. We can anticipate that the general problems we have outlined give us a clue for the anticipation of what further problems may be encountered in different aspects of the map of social and legal process. What is clear is that the intellectual task of identifying problems is the first step in the specification of problems in detail that we might anticipate. To anticipate these problems accurately permits us to deploy the intellectual tools of problem solving. These include the task of goal clarification and specification, the intellectual tools of trade analysis, the intellectual tools of scientific conditions, the deployment of the tools of developmental anticipation, the deployment of the tools of creativity as a response to an anticipated projection of problems that require legal and political intervention.

"To anticipate problems accurately permits us to deploy the intellectual tools of problem solving."

Authors contact information:
Winston P. Nagan *– Email: nagan@law.ufl.edu*
Megan E. Weeren *– Email: meganweeren@yahoo.com*

Notes

1. Roberto Poli, "Anticipation: A New Thread for the Human and Social Sciences?," *Cadmus* 2, no. 3 (2014): 23-36 http://cadmusjournal.org/files/pdfreprints/vol2issue3/reprint-cj-v2-i3-anticipation-rpoli.pdf.
2. Poli, "Anticipation: A New Thread for the Human and Social Sciences?"
3. Barbara Adam and Chris Groves, *Future Matters* (Leiden: Brill, 2007).

CADMUS, Volume 3, No.2, May 2017, 106-112

Peace, Security, Globalisation & Cultural Diplomacy

Ashok Natarajan
Senior Research Fellow, The Mother's Service Society;
Fellow, World Academy of Art & Science

Abstract

This article argues for a positive, comprehensive conception of peace that goes beyond the mere absence of war and a more integrated conception of human security that encompasses a wider range of issues than threats of physical violence. Education is one of humanity's most effective social institutions for redirecting the violent physical energies of destruction into higher avenues of civilization and culture as an instrument of conscious social evolution. Organization is knowledge of higher accomplishment. Organization has the power to vastly accelerate and multiply the potentials of education for the promotion of peace and security. Peace and Security have a mutually reinforcing effect on each other in the sense that peace results in security while security results in peace. Physical violence eventually led to the development of the knowledge needed for the avoidance of violence by means of diplomacy, trade and cultural exchanges, marking the beginning of the transition from the physical to the mental level of evolution. Trade requires travel, transport, human interaction, exchange, trust with respect to products, and reliable mechanisms for the exchange of a stable currency that can only be effectively founded on an enduring peace that generates confidence among the traders. Isolated communities evolve a communal consciousness as they mature into organized social units founded on shared customs and culture, which later develop into a common legal framework. What began as diplomacy so many centuries ago has now evolved into a near universal recognition of fundamental human rights and the rule of law. The evolution of diplomacy in previous centuries is the foundation for the remarkable betterment of human life witnessed in recent times. The world is in the process of evolving a unifying global culture founded on universal values and recognition of the rich contributions of different cultures to humanity's progress. As physical force once shaped global events, today ideas possess the power for effective action that can change the world.

The world in general is moving in a progressive manner in all its aspects. Peace is one such important aspect. Traditionally peace has been defined negatively as the absence of war. With human beings being the center of existence, it may be pertinent to redefine peace in the human context. Peace prevails only when the situation is conducive to the growth of human delight. We say life is generally secure when factors causing physical disturbances are absent. However, security is at a much higher level than mere physical security. Security is enhanced when life situations are arranged in such a way that fosters a man's inner joy. There is plenty of scope for arranging external situations in such a way as to guarantee security.

"Education is a long, slow subconscious process by which human beings convert long years of trial and error experience into usable knowledge that can be passed on to future generations."

A philosopher historian once commented that centuries of existence are required to generate a little history. Many more centuries are needed to create a little civilization. An even greater number is required to distill a culture. All such accomplishments require education. Education gives in a compressed form all our past accumulated knowledge. Education can be a very inspiring process. Given in the right manner, education can make it difficult to lure students' attention away from it with mundane pleasures. It sublimates, diverts and channels the intense physical energies that express destructively as violence into activities that foster evolutionary progress. It converts conflict into enlightened diplomacy. Education is a long, slow subconscious process by which human beings convert long years of trial and error experience into usable knowledge that can be passed on to future generations. But humanity is also capable of a more rapid, conscious process of education. Education has transformed primitive human life into a life of sweetness. In a broad sense education is the yoga of society, a systematic method for conscious social evolution. When education imparts culture, it in turn generates courtesy. Education used to be accessible to a small minority and denied to the multitudes. It is a sign of social goodwill that it is now available to almost all members of society. This marks a great beginning and shows that a great goal has to be reached.

The social spread of education and culture is unevenly distributed. This is said to be the nature of things. What we call Nature is the power of society as it normally functions. But society possesses a higher power of organisation that can be consciously applied to vastly expand the reach of education and other social benefits. The agencies of the UN in international affairs and the power of Internet in cyberspace are examples of powerful organizations that await full exploitation.

The world is forever on the move. It is a movement that widens horizontally and deepens vertically. The development of agriculture 10,000 years ago transformed nomadic communities into sedentary societies. Foreign trade developed more than 2000 years ago into an important catalyst for the spread of ideas, inventions, and culture. Indian handwoven cottons were prized in Europe for centuries until the Industrial Revolution brought in cheaper machine made fabrics. The physical conquests of Greece, Rome and the Mongols were important vehicles for the expansion of commerce, civilization and culture.

They fostered the spread of knowledge from Asia through the Middle East to all parts of Europe. Physical expansion began in earnest with the conquest of the Mongols who reached distant Spain and India. Physical conquests build temporary connections, while spread of trade fosters lasting relationships. As a result of trade, Europe came to India and Indonesia and America came to Japan and China. Knowledge in the form of technology spreads quickly as gunpowder, paper, railways and telegraph etc. The spread of culture however takes more time.

Globalisation takes place at many different levels. At the physical level the movement is not yet complete. There is no rhythm or linearity in these movements. Each part as it tries to reach perfection is overtaken by the next adjacent part. For example, the thirst for physical conquest morphed into economic imperialism and colonialism which have morphed into the global marketplace we know today. The course of progress is uneven and somewhat unpredictable. This seems to be the normal method for Nature.

Each civilization has made a unique contribution to the evolution of humanity and the process continues. While Asia sought prosperity through fullest development of emotions, Europe sought it through development of Mind. As a result European levels of prosperity became the world standard. In a broad sense, emotions have a more fulfilling power than Mind. Mental efficiency can have a dazzling effect, but it can divorce itself from life and grow dry. Gorbachev, former President of the Soviet Union, pointed out this very fact to a Western journalist when he asked a question. In this respect, cultural contacts are revealing and instructive. Hence multicultural diplomacy acquires great significance. Peace and security have a mutually reinforcing effect on each other in the sense that peace results in security while security results in peace.

Evolution of Diplomacy

Through experience we acquire both knowledge as well as capacity. Long experience on the battlefield improves the organization, skills and capacity of troops for coordinated action. Organization is knowledge of higher accomplishment. It eventually leads to the knowledge that warfare itself is superfluous as a means for achieving social objectives. Thus, physical violence led to the development of the mental clarity and knowledge needed for the avoidance of violence by means of diplomacy, intermarriage among communities and trade. Knowledge is power. As humanity's physicality diminished and its mentality increased, the power of its knowledge grew too. Seeing that violence could be avoided through negotiations leading to compromise gave rise to diplomacy. This transition to diplomacy signified the transition from physical man to mental man. Knowledge gained at one place has a tendency to spread elsewhere. Diplomacy is a mental exercise in which thoughts are organized in a neat and presentable manner. Diplomacy has a refining effect on the way human beings live and relate to one another, one of the earliest exercises in humanity's evolution from an animal existence to one of civilization and culture worth passing on to the next generation. This gave rise to a sense of history.

When the faculty for diplomacy develops, all other faculties also develop in parallel. Historical research has documented this process. An earlier stage in the process was humanity's transition from shouting to symbolic language. This capacity for communication preceded the development of transport. But they have a mutually beneficial impact on each other. We can trace the process even more clearly in recent times, where facts are plentiful. We see how the League of Nations evolved into the UN. The League aborted its mission, though its founder was awarded the Nobel Prize. The First World War was followed by the Second as a result of its failings, which led to the founding of the UN. The UN has succeeded in avoiding a major international hot war for seven decades due to its subtle strength. Today

we find the veto power a very irritating obstruction. But during the days when the UN was founded, no consensus was available as to how major powers could be made to work together without some mechanism for voicing disapproval. It was then that the veto was conceived as a mechanism that made the UN a reality.

When war rages, trade is severely affected. Trade requires travel, transport, human interaction, exchange, trust with respect to products, and reliable mechanisms for the exchange of a stable currency founded on an enduring peace that generates confidence among the traders. Farm products normally come from cultivated fields, which are severely hampered during times of war, when most farmers are taken to the battlefront. Thriving agriculture is possible only when peaceful conditions prevail. Only then can suppliers be assured of buyers if they take their products to the specified market. For the transaction to be successful it requires that the buyer carries currency that is recognized by the government of the day. Prolonged peaceful trade requires that there be banks representing both the buyer and seller. When war breaks out, all such functions break down or are severely hampered. It may even lead to famine conditions. However when a country is generally peaceful, its reputation spreads far and wide prompting even foreign buyers to visit its shores. This is how in earlier centuries India attracted traders from England, France, Portugal, Holland and Denmark because she offered mature conditions for commercial exchange etc. Flourishing trade is a sign that a nation has achieved a level of social maturity beyond the stage of war. Once war breaks out, it takes a long time for normal trade to resume. This ripening social maturity and culture develop through several complex levels.

Conquests that form empires unite various regions. Religion unites people where even conquest has failed. Trade forges relationships and unifies populations, enriching people's lives by presenting them with a more diversified product range. Commerce develops by developing standards for weights, measures, coins, cash and contracts, etc. A commercial society is more developed than a mere agricultural society. Commercial societies develop urban centers, banking, insurance, education, entertainment and arts to occupy people in their leisure time, etc. Commerce has a way of compelling society to focus on more sophisticated issues, such as law and governance. A farmer generally learns to cultivate his fields and safeguard his production. Normally he does not directly sell to people. He approaches a middleman experienced in all aspects of the purchase, transport and marketing of produce.

For a population to discover itself as a society is a great accomplishment, though at a rudimentary level. For a population to mature into a society, the minimum requirement is that it overcome unsettling disorders that threaten to undermine its very functioning. To the extent it moves away from it, to that extent order enters into social formation. In early centuries populations lived in isolated pockets at different locations. Communal consciousness emerges when these pockets come under a single ruler. This marks the earliest stage in development of national consciousness. Over the course of time they discover a unity of purpose through intermarriage and professional complementariness or some other bonding factor. Though they arrive at some order, the order has not yet acquired the power of law. Development of a legal framework marks an advanced stage of social formation. Building judicial machinery to enforce such laws marks a further advance in social formation. Society is actually governed

more by custom and usage than by law and order. People conduct festivals, administer temples and hold marriages and manage so many other social functions within society. They feel a great joy in these activities. Indian mathematician Srinivasa Ramanujan is universally recognized as a great genius. But Ramanujan felt that he owed his genius to an inspiration emanating from his personal deity Namagiri. It is in such local contexts that the psychological truth of society lies. The outcaste in India is one who falls outside of the local context and he finds it very difficult to reenter Indian society. Untouchability is unique to India, but such social exclusion is prevalent in all countries without exception. It is such cultural affairs that decide the social status of individuals. In America, African Americans working in the houses held themselves in superior status to those working in the fields. Such distinctions are not socially formalized, but they are there in the social scheme of things.

"World peace is an essential condition for the survival and development of international organizations."

Universal recognition of human rights became a universal phenomenon after the founding of the UN. Society has started treating each human being as a respectable individual to be duly governed by the process of law. Prisoners, invalids and physically challenged people are now extended basic rights and legal facilities that were previously absent. Two centuries earlier, insurance developed as a striking example of how society can extend support to the individual through social institutions. In the post-war era it has penetrated almost all fields of social activity globally. Such social support climaxed with abolition of capital punishment by many Western countries. When a criminal was brought to trial for killing a four-year old child for jewelry worth a few rupees, an Indian High Court judge asked how capital punishment could be abolished when crimes are committed for trivial issues. The comment of the Judge seems valid, but the cancellation of capital punishment is equally valid. Today education has become universal and life has lost its original roughness. Now the aim of society is to make life comfortable for the traveler as well as the tourist. The world community is taking all-out efforts to eradicate communicable diseases like influenza, polio and typhoid. These developments stand in stark contrast to the persistence of gun culture in the U.S., the cause of thousands of deaths every year. This relic of the earlier culture of violence could be a reason for the failure to abolish nuclear weapons. Moreover the world still suffers from want of a fool-proof justice system. It has been found in the U.S. that 25% of those in prison were victims of unfair prosecution. Some Muslim countries still feel it is right to deny education to women.

Each passing decade stands testament to rising human values and the betterment of human life. This is the end result of the civilizing influence initiated by the evolution of diplomacy in human history. Informal channels of diplomacy often succeed where more formal diplomatic efforts fail. Indian and Pakistani civilian groups have been engaged in Track II diplomacy even during times when governmental relations were at their worst.

The future of global government is a topic of great concern to leading thinkers of the world. The UN is perceived as an important precursor of development of more truly

democratic, representative institutions of global governance. The UN itself was preceded by the League of Nations, which proved to be unviable due to lack of political strength. World peace is an essential condition for the survival and development of international organizations. The world's activities have all expanded in the direction of globalization. Every field of economic activity, including agriculture, transport, banking, manufacturing, research, education and communication, has acquired a major global dimension. This expansion attests to the fact that wherever they may be, human beings are the same. While physical things such as new technology and fashions spread quickly, the spread of psychological elements such as values is much slower.

The value of freedom stands foremost of all the values that humanity cherishes. Some 300 years ago European countries began to outlaw slavery and abolish slave trade. It took more than a century for Europe to get rid of that evil. The abolition of slavery marks an evolutionary transition of society to a higher stage of human development. In the physical stage, people believe in the superiority of the mental man and justify slavery. Society entering the mental stage took the initiative to wean itself from the practice of slavery as a degrading practice. The USA atoned enough for its earlier reluctance to outgrow a barbarian practice by electing Barack Obama as the first African-American President. The world has long desired cultural unity, which does not mean cultural uniformity. Cultural unity must be based on a recognition and respect for the rich diversity of cultural influences that have contributed and continue to contribute to human evolution. The unification of cultures will enable each society to complement and complete its own cultural development by enriching it with the multicultural perspectives of other societies. Even if cultural unity remains a distant goal, at least cultural cooperation is possible now. Travel and tourism are great promoters of international cooperation and cultural appreciation. They open the closed minds of people who have not travelled. It is a pity that India does not have much recorded history. Historians have gathered a lot of beneficial information from the writings of Chinese travelers. Historical information about medieval India has been obtained only from foreign documentation. Why Indians failed to document their experiences remains a mystery.

"Thought that leads to action" carries the implication that the thinkers of the world can unite for global action. The entire Western world's thinking has been modeled on thoughts that originated in Greece some 2500 years ago. In the 19th century the world revolved around Europe. Then Darwin came on the scene with his theory of evolution. Many notable thinkers contributed to European thought around the time of World War II. Roosevelt formulated a grand vision of a world free of imperialism. That thought was mainly endorsed by Britain after the war when it chose to disband a large part of its colonies. When mental ideals are passionately embraced, they acquire a power of action and express themselves sooner or later. The motto of WAAS has found expression in the fields of economics, education and employment. Academic thought soon leads to academic research. Politics later on energises the thought. Even Greek democracy became live only after English aristocrats decided to wrest power from the English monarchy in the 16th century. This revolutionary momentum continued with the French and Russian Revolutions. The 21st century is far more amenable to rule by the power of ideas than by violence or war.

"Leadership in thought that leads to action" is the motto of WAAS. True to its ideal, it strives to identify new perspectives and token initiatives that can act as catalysts for global progress. Employment for all job seekers is a subject of immense importance in the field of economics, though contradictory views are put forth regarding its feasibility. When recognized as a fundamental human right, it will acquire the political power for implementation. WAAS has conceived of an idea to establish a new international research institution in East Asia to promote coordinated global strategies for addressing the challenges confronting humanity today. Kazakhstan has abandoned nuclear weapons and given a call to other countries of the world to give them up. This it has done in spite of the limitations of democracy within the country, a fact of tremendous political significance. The current UN General Assembly is now considering a proposal for a global convention banning nuclear weapons.

"Ideas can still acquire the power required for effective action."

The World Academy can present to politicians a great many ideas for effective action. A country's receptivity to violence is largely determined by its general level of education. Moreover, how vested interests can turn ideas upside down is well documented by recent political events. Such irrationalities foster violence that lies dormant within nations. Setting such anomalies right is the task of politicians. Academic research can support this effort. Ideas can still acquire the power required for effective action.

Author contact information
Email: secretary@motherservice.org

CADMUS, Volume 3, No.2, May 2017, 113-130

The Role of Scientists in a Human-centered Society

J. Martin Ramirez
Head, Center for Conflict Studies, Nebrija University, Madrid;
Fellow, World Academy of Art & Science

Juan Cayón-Peña
Rector, Nebrija University, Madrid;
Fellow, World Academy of Art & Science

Abstract

Scientists have an important role not only in avoiding inappropriate and dangerous decisions, but also advising policymakers and other stakeholders about the best and wiser moves to make towards a human-centered society, thereby fomenting scientific knowledge and enhancing cross-cultural connections and joint research. They should also not forget the objective limitations of Science, which is always incomplete. With this purpose, we stress the importance of transferring knowledge among all scientific disciplines, using a transdisciplinary cross-talks approach. A few examples of how this may be done are presented in the paper.

1. Introduction

Science and technology are essential tools for innovation. To reap their fullest social potential, we need to articulate and solve the many aspects of today's global issues that are rooted in the political, cultural, industrial and economic realities of the human world.

> *"There are some objective limitations to Science itself. Science is still faraway from its goal of knowing the truth, which it always finds to be incomplete; also, science is not the only way to search for Truth."*

Our society is witnessing an era of ever-faster growing revolution at all levels, in an exponential spiral pace that sometimes may awaken a feeling of vertigo. It doubtless goes towards objective improvements in humanity and nature.

However, the society is not immune to eventual serious unintended consequences. Scientists have to be alert, therefore, in not only avoiding inappropriate and dangerous decisions, but also advising policymakers about the best and wiser moves to make, since having a human-centered society is advantageous to everybody.

We should not forget that there are some objective limitations to Science itself. Science is still faraway from its goal of knowing the truth, which it always finds to be incomplete; also, science is not the only way to search for Truth. There are other valuable ways, such as philosophy, ethics, and religion, which are unfortunately limited too, because we always arrive at concepts of reality which are unintelligible to reason. Now or later, we will always find unintelligible mechanisms that are "left face to face with the awful mystery which is reality" (Dampier, 1971, p 501).

Before elaborating on these points, we will start clarifying some conceptual generalizations of interest in this context.

2. Conceptual Generalities

What do we understand from Science? Etymologically, the term "Science" comes from the Latin *scientia* (*scire* = to learn, to know), meaning a process of studying and knowing the fundamental laws of nature, through a dialogue between theory and experiment. It is one of the most remarkable inventions of humankind, a source of inspiration and understanding, which lifts the veil of ignorance and superstition, is a catalyst for social change and economic growth, and saves countless lives.

The function of science is to expand continually our knowledge of the phenomena of nature, giving us an insight into the complex interrelations of phenomena, or rather between the concepts used to interpret those phenomena.

Whereas in other languages, like German (*Wissenschaft = Naturwissenschaft & Geisteswissenschaft*), the extension of the concept coincides with the extension in the classical Greco-Roman times, in English the word "science" is limited to natural sciences, also known as "hard sciences", something done in a laboratory; which involves taking measurements with instruments, accurate to several decimal places; and controlled, repeatable experiments where you keep everything fixed except for a few things that you allow to vary. Areas that often conform well to these stereotypes include chemistry, physics, molecular biology...

This divide between natural sciences on the one side, widening our knowledge of the phenomena of the nature and the relation between the different concepts used to interpret them, and philosophy and arts, on the other side, focused more on human origin and destiny, the project of life, the *Weltanschauung*, even when it realizes its impossibility of achieving this purpose because there is no human way of solving everything, started in the 19th century (indeed, the word "scientist" was not coined until 1833) and according to Richard Holmes (2016), it was destructive as it was neither a natural nor a necessary divide.

They are traditionally divided between a primarily **basic** science, which studies the fundamental laws of nature: in a free search for progress of pure knowledge, from microcosms (atoms) to macrocosms (universe), and a secondarily **applied** science on how the power of thinking can be increased by pursuing useful purposes and eventual specific practical advantages like medicine, engineering, industry, cyberspace, economics, quality of life, environmental and climatic changes…

A new call to abolish this traditional division came from Venkatesh Narayanamurti, former Dean of Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS), in 2008, who described it as artificial, as it assumes a linear relationship that does not always exist—discovery goes both ways, while inventions draw on scientific knowledge and scientists gain insight from new devices and applications. Narayanamurti proposes organizing science as a cycle that moves from discovery to invention and back again, a highly nonlinear model, because they must feed on each other, in a cross- and interdisciplinary work that breaks down disciplinary walls and encourages collaboration, which has been successful in some of the top scientific institutions. Some of the world's most important inventions were made not by basic scientists and applied scientists working sequentially in isolation, but by those who teamed up, sharing ideas and insights and even sometimes switching roles in cross- and interdisciplinary work. For instance, Bell Labs, home to many important discoveries, such as the development of the transistor in 1947, which laid the foundation for modern electronics and earned eight Nobel Prizes, blurred lines between disciplines, talented personnel, ample resources, and leadership (Powell, 2017).

"No single discipline can capture reality fully or claim to have the complete knowledge."

There are other disciplines such as social sciences (sociology, economics, political science, history…), and human sciences (philosophy, ethics, theology, art, psychology, anthropology…), usually known as **soft sciences**. Do they really constitute science at all, and do they deserve to stand beside the hard sciences? A key problem is that the task of operationalizing intuitive concepts is inevitably more difficult and less exact in the soft sciences, because there are so many uncontrolled variables (Lang, 1975). Far from colonising social science under the banner of natural science, some social scientists consider their disciplines as science, and others want to think that the robustness of the philosophical approach is even more intense and transcendent than the so-called natural sciences, say, nuclear physics, because they offer achievements of great importance. Philosophy is forced to consider science as the best available evidence. In its intention of achieving a complete construction of reality, philosophy focuses on human origin and destiny, and its *Weltanschauung*, or project of life, even if it realizes the impossibility of achieving this purpose—solving all problems, because there is no human way of solving everything (see: Ramirez, in press).

3. Towards a Transdisciplinary Approach in the Natural & Social Sciences

The science of the 21st century is in most areas far too complex to be understood, let alone experimentally verified, by any one person. This necessity of knowing something in depth reveals how the different specialties of knowledge become continuously more specialized, erecting barriers between disciplines, even if, in the end, these barriers between disciplines may block the possibility of judging and of doing better. This is why we need an interdisciplinary approach, a cooperative integration between all the branches of sciences, with each branch competent in a restricted field, but in contact with the rest, keeping all the

subjects in permeating touch with each other, for better answers about being human and our single common Universe, because no single discipline can capture reality fully or claim to have the complete knowledge. "The moment a problem of any kind is encountered, recourse is always made to interdisciplinary solutions" (Giarini, 2002, p. 148). Moreover, conclusions from different disciplines cannot contradict one another. [Tooby & Cosmides, 2017].

"Sciences and humanities are actually not independent, but interdependent ways of getting to know the world."

These interconnections and comprehensive approaches are becoming more and more apparent at different levels: a) within a discipline, as the translational approach in medicine shows, "from field to bench, and from bench to bedside", i.e. before applying the adequate therapy (pharmacology or surgery), we have to know its pathology (abnormal) and, even prior to that, its physiology and structure (normal); and b) between all different disciplines of sciences and humanities, transferring knowledge gained in one discipline to others, with the very desirable goal of the integration of the human sciences, at some level, rendering coherent the areas where various disciplines overlap.

Sciences and humanities are actually not independent, but **interdependent** ways of getting to know the world. Both share a sense of reality that transcends time and place; hence their common interest in a fixed 'human nature'. This is tied to a way of thinking and a sense of knowing that are largely contemplative. As it may seem self-evident, and was regarded as important by Einstein, Bohr and the founders of quantum theory a century ago, and by Karl Popper, who argued that falsifiability was a hallmark of good science, "all our theorising and experimentation depends on particular philosophical background assumptions" about the world (Koch, 2004).

An especially good example of transferring knowledge gained in one discipline to others is the Viennese school, one of the most important intellectual schools of the 20th century, which had a mixture of classes and nationalities, faiths and worldviews, amid a babble of peoples and languages. It was known as the *Wiener melange*. It found universal forms of communication, discovering what people had in common. For instance, a) Ernest Dichter, author of *The Strategy of Desire*, used the tools of psychoanalysis to revolutionise business; b) Paul Lazarsfeld, the founder of modern American sociology, applied his expertise in data and quantitative methods (he studied maths in Vienna, completing his doctorate on Einstein's gravitational theory) to examine public opinion, or market "field research"; and c) political economy, where the "Austrian school" of economists like Joseph Schumpeter, Ludwig von Mises and his student Friedrich Hayek, strongly influenced the revival of liberalism and conservatism in the West, overwhelmed by the collectivism and totalitarianism of the right and the left during the interwar years.

We would like to mention specially the greatest contribution of Hayek, who combined technical expertise in economics with a global breadth, publishing on law, sociology and

more, to restore intellectual rigour to the free-market school, expositing in detail the "price mechanism" to show that socialist economics would not possibly work in theory, let alone in practice. In 1947, he founded the Mont Pelerin Society (MPS), along with Milton Friedman & Karl Popper (the "Chicago school" of economists was made up largely of MPS members) and his ideas were taken up again by a subsequent generation of politicians in the mid-1970s, including Margaret Thatcher and Ronald Reagan, He was the recipient of the 1974 Nobel Prize in Economic Sciences.

Why has the Viennese school produced ideas so influential in the West? Because it articulates a more convincing defence of freedom, placing the life experience of individuals—rather than the abstractions of class, race and nationalism favoured by their opponents—at the heart of its intellectual enterprises. "I suddenly realised that Keynes and all the brilliant economic students in the room were interested in the behaviour of commodities, while I was interested in the behaviour of people," Peter Drucker, the founder of modern management theory, clearly stated after attending a lecture by John Maynard Keynes (The Economist, 2016).

We are aware that bridging disciplinary divides cannot be easily done. As the various disciplines model human behavior in distinct and sometimes incompatible ways, the task requires a common underlying model of individual human behavior, specialized and enriched to meet the particular needs of each discipline (Gintis, 2003). There is a lack of shared language between disciplines; insights from one field can be lost on researchers in another because of terminology differences, incompatible standards of evidence. And we may also find practical differences in funding different disciplines, and strong incentives created by the academic promotion process to do disciplinary, rather than interdisciplinary work. As Silk (2004) explains, "drawing the line between philosophy and physics has never been easy. Perhaps it is time to stop trying. The interface is ripe for exploration."

Consequently, a new transdisciplinary approach among all scientific disciplines, philosophy, art and theology included, can bring some badly needed insights probing into the meaning of our very existence. As MIT President L. Rafael Reif said, solving the great challenges of our time will require multidisciplinary problem-solving—bringing together expertise from science, technology, the social sciences, arts, and humanities. "We use the term the collective wisdom of MIT to solve a problem; now we're talking about collective wisdom of the world… working together to solve global problems" (Berglof, 2012).

4. Towards an Integrated and Comprehensive Technological Revolution

We stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another. In its scale, scope, and complexity, the transformation will be unlike anything humankind has ever experienced before. We do not yet know just how it will unfold, but one thing is clear: the response to it must be integrated and comprehensive, involving all stakeholders of the global polity, from the public and private sectors to academia and civil society, as Klaus Schwab, Founder and Executive Chairman of the World Economic Forum, exposes in *The 4th Industrial Revolution* (2016).*

* The First Industrial Revolution used water and steam power to mechanize production; the Second used electric power to create mass production; the Third used electronics and information technology to automate production; a Fourth Industrial Revolution is building on the Third, the digital revolution that has been occurring since the middle of the last century.

This Fourth Industrial Revolution is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres: ubiquitous, mobile supercomputing, artificially intelligent (AI) robots, self-driving cars, neuro-technological brain enhancements, genetic editing… The evidence of dramatic change, which is happening at exponential speed, is all around us.

"The desire to know the unknown is what inspires humankind's search for knowledge."

We cannot close our eyes to the information technology (IT) challenge, when diffusion is continuously spreading throughout the scientific world and everybody is investing more in it and in high-tech, and each time more intelligently. IT is an authentic revolution, with higher efficiency, more productivity and less transport expenses, resulting in an increase in quality of life.

a. Internet, a ubiquitous and an exponential growing web, has become the first global social organization, linking and bringing together different people into a single global cultural community, affecting international relations (Choucri, 2013) and forging a common sense of humanity;

b. mobile phone usage and internet access have exponentially risen: social media has become important and fundamental, connecting families across vast distances, the internet is now quintessentially helpful for e-banking, education or medical reasons, or for market trading (80% smartphones; smart cities…); in the case of migrants and refugees their importance goes well beyond staying in touch with people back home—phones have become a lifeline, suggesting where they should go, and whom they should trust. They even help us in dealing with important risks too, such as rumors leading to misinformation, or sensitive data falling into the wrong hands

c. artificial intelligence may help improve our decision-making capacity, and unravel the complexity of biology (producing drugs) and advanced human health (diagnose), given that living organisms are complex systems which process information using a combination of hardware and software (The Economist, 2017)

d. Internet of Things (IoT) is going to change business more than the industrial revolution did one century ago, encouraging innovation and offering prediction and prevention as one of its most valuable assets; it requires interoperability among all the different systems and kinds of applications; for instance, a smart city with a digital ecosystem including citizens, universities, hospitals, companies, government…

Even if we cannot live without IT, we should not forget that its use is not free of risk: social media webs, so efficient for agglutination of attention, are not appropriate for a public discourse, given their volatility: they are uncontrollable, unstable, short-lived and amorphous, appear suddenly and disperse with the same speed, showing a lack of stability, consistency and credibility, as the Korean philosopher Byung-Chul Han (2017) argues: digital communication enables instantaneous, impulsive reaction, being in fact responsible for the disintegration of community and public space. Suspicions about security have also

risen, given the vulnerability of the present digitally connected cyber world (Ramirez & Garcia-Segura, 2017).

The most important comment, however, is that the last decision belongs to humans, because we are the ones who have to know how to use these new concepts adequately, knowing how to discriminate in the event of eventual risks inherent to their above described whirl.

5. Limits of Sciences

The continuous appearance of new scientific discoveries—some by serendipity, like the usefulness of some drugs or the law of gravity, which was discovered after Newton observed the fall of an apple—shows that **science has no borders**. Once, when Max Planck went to Munich to study Physics in 1875, somebody advised him not to do so because "there was nothing left to be discovered", when it is probably Physics that shows better the living continuity of knowledge (Zichichi, 1990; Weatherall, 2016). The desire to know the unknown is what inspires humankind's search for knowledge; the more we know, the more questions we ask. We want our understanding to be completely harmonious, which is never totally accomplished.

"What is important is not the objective reality, but subjective perception."

Science's quest for knowledge about reality presupposes the importance of truth, both as an end in itself and as a means for resolving problems. When we are using science, we are trying to arrive at the truth. In many disciplines, we want the truth to translate into something that works. But if it is not true, it is not going to speed up computer software, it is not going to save lives and it is not going to improve quality of life. However, experience says that science can only disclose certain aspects of reality, but not the whole truth. Universal truth is beyond the scope of any scientific enterprise. **Science is not synonymous with truth**. Let us base this assertion on a couple of arguments: the tentative nature of Science, by definition, the subjectivity of the perception, and the undeniable fact of the existence of many scientific studies subject to error and to fraud.

a. The **nature of Science is tentative** by definition, by a scientific self-limitation to believe only what is empirically verifiable, and the emphasis that reality is measurable (Dupré, 2001); scientific concepts are not realities, but just models: Science is a hypothesis which produces laws which, to be universally acceptable, do not need to have an overall contradiction, even when described from different coordinate systems. Examples of common assumptions, which have played significant roles in pursuit of truth: the laws of energy conservation and of entropy increase, causality, constant light velocity in vacuum… Science expands our knowledge of nature, giving us an insight into the complex interrelations of phenomena, or rather between the concepts in which phenomena are expressed.

   But these generalizations, even if they are universally accepted as ultimate scientific concepts, have often proven to be mistaken; they are just inductions, which may be useful, only working hypotheses, drawing more or less probabilistic conclusions.

Science, thus, is only a guide to what is probable, an affair of probability; even if the odds in favor of much of it are very high, it is impossible to reach the exact complete knowledge. There are **no scientific dogmas**, there are no certainties in science: all scientific theory is open to challenge; scientific findings cannot be ignored, nor treated as mere matters of faith.

b. **What is important is not the objective reality, but subjective perception**. Even when we accept the old scholastic dictum *nihil est in intellectu quod prius non fuerit in sensu*, science only gives information about what is apprehended by the senses. This does not imply that all we perceive is an objective reflex of the physical reality: we can never know what things are like 'in themselves', independent of how our minds format what we perceive, as Immanuel Kant's quite sensible contention asserted. This implies, for example, that what is true of the world for humans is probably different from what is true for an elephant or an *E. coli*.

Our own experience tells us that the subjective perceived phenomena, the human sensations, are not reliable, because what is perceived cannot be separated from the perceiver. Knowledge is inevitably constructed by the knower in interaction with his nervous activity, and we should never forget that each scientist has his own values, priorities and may also have all sorts of cognitive biases, prejudices or unfounded speculations (Popper, 1932). Much of the public hears what it wants to hear. Thus, although science attempts to unify different ideas, prejudice and self-righteousness, it bases itself on an illusion from a particular viewpoint, and there may be struggles. Many things have to be scientifically understood. We are far from understanding the truth (Ameniya, 2017).

The same things may look different if our viewpoint is different, as it is evident from the quite well known Indian tale about six blind men who touch an elephant to learn what it is like: The one who feels the leg says the elephant is like a pillar; the one who feels the tail says the elephant is like a rope; the one who feels the trunk says the elephant is like a tree branch; the one who feels the ear says the elephant is like a hand fan; the one who feels the belly says the elephant is like a wall; and the one who feels the tusk says the elephant is like a solid pipe. The different interpretations of the elephant imply that one's subjective experience is inherently limited by its failure to account for other truths or a totality of truth. At various times the parable has provided insight into the relativism, opaqueness or inexpressible nature of truth, the behavior of experts in fields where there is a deficit or inaccessibility of information, the need for communication, and respect for different perspectives. We cannot thus ignore the subjective experiences and the limitation of our faculties of perception, given that the human cognitive capacity is limited.

c. The daily experience also tells us that many scientific studies are **subject to error**: for instance, wine testers have more sophisticated sensations than ordinary people; the visual field does not perceive any blind spot, even if there is one, known as *optic papilla*, in the area of the retina where the optic nerve arises; the *phi phenomenon* takes place when

two successive lights are turned on, a sensation of movement of light is perceived, even if in reality nothing moves; or take *cryptomnesia*, the capacity of remembering something we are not conscious of remembering, mixing real and imaginary memories.

d. Many aspects of scientific progress may also be inhibited by **fraud,** not unusual at all, since that the scientific system is based on trust: some 14% of scientists say that they have witnessed it (Clark, 2017). For instance, given the logistical difficulties of providing visual evidence or replicating precisely remote field work, there may be a number of irreproducible (and often poorly conducted) studies, which may foment dishonesty, when scientists or researchers invent data, but which in reality may have come from major manipulation to outright fabrication of data.

6. Reality goes beyond the Limits of Science

We have just asserted that science only gives information about what is apprehended by the senses, but these senses do not reveal the Reality. This does not necessarily have to be restricted to physical terms, by suppressing its subjective dimensions, even if—we have to admit it—these observations are subtler. If we want to understand the human being and the universe, science has a lot to say, but it is not the only test of validity. The uniqueness of a human mind is its ability to think about things which do not fall under the senses. There are other ways of knowledge, but to see life steadily and as a whole, we need something that will overpass the limits of science, ethics, philosophy, art and theology, all of them equally valid and limited in isolation, like science.

Science has plenty to say about many aspects of the world—about art, drawings, paintings, poetry, sports, anything you mention…, but it has nothing or very little—to say about many other basic questions, such as: What was the beginning of the universe*? What is the universe made of†? Might an alternative model of gravity remove its *raison d'être*? What is the origin of life on Earth? Are we alone in the universe or is there a probability of life elsewhere in the universe? What is human nature? How much can human life span be extended? How do organisms know when to stop growing? Can cancer be cured or ageing be stopped? What genetic changes made us uniquely human? Is "consciousness" present outside of organisms? Is morality hard-wired into the brain? What are the limits of learning by machines? and so on (Weiss, 2005).

Given the enormous complexity of reality, there will always be things unintelligible to the human mind. For instance, the existence of moral values, social institutions, God… cannot be subject to experimental tests, but it does not mean that they do not exist. We need them as pilots of our life and our social relations. The **vision of the human being** searching for a purpose in life thus **transcends scientific knowledge**. *Ignoramus, Ignorabimus!*

* All we have are theoretical assumptions which have not been tested by experiment

† Until last century it was thought that the universe was composed of atoms and light; now we know that, besides the atoms, composed of protons, neutrons and electrons, dark energy exists, which has a gravitationally repulsive effect (without it, the experimental facts of the universe expanding at an accelerating speed cannot be explained), and dark matter, composed of one or more species of sub-atomic particles that interact very weakly with ordinary matter, too (without dark matter, the revolting galaxy in which the solar system exists would be disintegrated by centrifugal force) (NASA, 2014; Ameniya, 2017)

Faith (belief in what we don't know) is a normal part of human cognition, founded on our direct experience. Belief is a decision rationally as fundamental, and consequently at least as respectable, as no belief. We dare to say that **everybody has faith**. Obviously, 'believers' may feel religious needs, seeing life in a transcendent world: "we need the apprehension of a sacred mystery, the sense of communion with a Divine Power, that constitute the ultimate basis of religion" (Dampler, 1971, XXII). Others, even if we are color-blind and have no religious sense, still use faith in acceptance of science, because, otherwise, we would not accept any science that we have not personally studied ourselves and get convinced of the evidence presented.

We would like to add to these considerations that there is a need for a **bridge between science and religion**, because both have things to say about the same subject matter. They are different ways of studying the same territory; they have different kinds of things to say; they are different phases in humanity's attempt to understand the world, and they each have a strong contribution to make to the efforts of humans to cope with life. Some aspects of the world can be known through empirical observation; others, through religious thought. Science tells us more and more about how things work. Why they work, and what is the overarching reality, are issues of an evolving religion. Science without religion is soulless. Religion without science is superstition, or, as Einstein stated, "science without religion is lame; religion without science is blind" (Ake, 2001). Consequently, science and religion should not be seen as conflicting forces; on the contrary, they have to progress and share the same pedestal: science has to be inspired by values such as love for Creation, respect for life and promotion of human dignity.

In sum, recognizing the limits of scientific knowledge—science does not have the last word—includes an explicit recognition of the tentative nature of science, combined with the fact that some things are, theoretically, unknowable scientifically. In the end, we seem to be brought to the theologian dictum of Tertullian, *credo quia absurdum.*

7. How Scientists can help create a Human-centered Society

In spite of their limitations, scientists can play an important role in favouring a human-centered society. We suggest a few simple examples of how this may be done.

7.1. An international team of experts, after estimating that as much as 85% of the US biomedical research effort is wasted, has recently produced a manifesto with a master plan to improve the quality of scientific research, "to perform good, reliable, credible, reproducible, trustworthy, useful science" (Ioannidis, 2017). Its goal is to increase the speed at which researchers get closer to the truth, taking into account four major categories: methods, reporting and dissemination, reproducibility, and evaluation and incentives. Who are responsible for improving the quality of science? Not just the researchers, but also other stakeholders, such as research institutions, scientific journals, funders and regulatory agencies. Fomenting scientific knowledge and enhancing cross-cultural connections and joint cooperative research have to be their main goal.

7.2. **Scientific cooperation in easing relations between governments:** Science is fundamentally an interactive, cooperative pursuit, which allows us to expose the results of research to review and critique through a common language to more easily cross cultures and borders.

Rachel Rothschild, analysing centers on The European Monitoring and Evaluation Programme (EMEP), which was designed to investigate the pollutants causing acid rain and began operations under the United Nations Economic Commission for Europe in 1977, notes that the creation of the EMEP is an evidence of how addressing global environmental concerns can pave the way for easing geopolitical conflicts. "EMEP's formation illuminates the importance of developing technological networks and international research projects on acid rain in furthering both détente among European countries as well as international research and policies for environmental protection" (Rothschild, 2016).

The impetus for cooperating across the Iron Curtain on air pollution monitoring came from a group of scientists and environmental officials in Norway working on acid rain. Despite security concerns over disclosing power plant locations and resistance on placing pollution monitoring stations within the Soviet Union, the Scandinavian scientists were eventually able to secure the commitment of the Communist bloc to a Europe-wide environmental research program—a breakthrough that resulted in limited technological cooperation. This development helped ease Cold War tensions, fostering subsequent political relationships, which culminated in the 1979 UN Convention on Long-range Transboundary Air Pollution.

Another example is how science brought Americans and Russians together, just after the dissolution of the Soviet Union and the end of Cold War, in late 1993, a US-Russian collaboration into sensitive areas, like the safety and security of nuclear weapons and materials. The Russian Federal Nuclear Center VNIIEF and Los Alamos National Laboratory conducted a ground-breaking joint experiment to study high-temperature superconductivity in ultra-high magnetic fields, sharing each other's previously highly secret sites on nuclear weapons programs. VNIIEF sent to Los Alamos explosive magnetic flux compression generators from Russia, which were charged with US-supplied explosives and stationary pulsed power machines to produce ultra-high electrical currents and magnetic fields that, in turn, produced a wide range of high-energy density environments needed to pursue a unique approach to civilian nuclear fusion. This joint collaboration resulted in over 400 joint publications and presentations between 1993 and 2013, and opened the door for joint work in other areas (Hecker, 2016).

These stories clearly demonstrate that countries can achieve some scientific collaboration by working together, although it is less evident whether scientific cooperation can become a precursor for political collaboration, i.e. whether science would be a driver for peace, bringing peace to the region or the whole issue is just wishful thinking. We hope science would play its part.

7.3. **Improving the public's understanding of socially relevant science:** The ubiquitous impact of science-based information and technologies in everyday life suggests that

misunderstanding how science works can have serious consequences. Although the fake news phenomenon in the context of science is not at all new, social media disseminates this kind of news much faster among online social networks. There is an increasing need for the scientific community to have a more prominent role in social media, because people's decisions and strongly held beliefs are often at odds with the conclusions and recommendations of empirical studies and scientific consensus; they can be influenced by unscientific mass media and widely publicized campaigns providing inaccurate information via disconnections between human emotion and rationality. Surrounded by like-minded friends and followers, opinions are reinforced and become more extreme, because simply presenting facts is unlikely to change beliefs when those beliefs are rooted in the values and groupthink of a community. It should bring us a necessary shot of humility: be sceptical of your own knowledge, and the wisdom of your crowd (Regan, 2017; Sloman & Fernbach, 2017).

People often have strong opinions about issues they understand little about. In some cases, the implications of misunderstanding or rejecting science are more or less harmless, because what the public admires is a sense of wonder and fun about the world, or answers to big existential questions, such as the popularization of physics, of animal behaviour, of how brain works; or if someone believes the Earth is the centre of the Universe or if there are other planetary systems, like the TRAPPIST-1 that was recently announced by NASA. Does it really matter to our daily life?

In other cases, however, the issues that people face in their lives can be socially relevant or even critical, like when they are focused on uncertainty perhaps under the label of environment, health or food. Here are a few examples:

a. **Vaccination** is a particularly important issue to think about here, given the rise of the anti-vaccination (anti-VAX) movement that has the potential to reverse the health gains achieved through one of the most powerful interventions in medical history. Researchers estimate that between 1963 and 2015, in the U.S. alone, nearly 200 million cases of polio, measles, mumps, rubella, varicella, adenovirus, rabies and hepatitis A and approximately 450,000 deaths from these diseases were prevented, thanks to the development of a human cell strain that allowed vaccines to be produced safely, with Leonard Hayflick's discovery of WI-38, in 1962, to safely grow the viruses needed to produce vaccines against more than 10 diseases. The anti-VAX is an emotionally-charged phenomenon distrusting healthcare, undervaluing many vaccine-preventable diseases that have become much less common, like smallpox and polio. It is based on a flawed debunking of a chronological (but not causal) relationship between vaccination and autism, based on a falsified and discredited study by Andrew Wakefield in 1998, that has since been shown to be fraudulent but often highly cited. Vaccine refusal is not just a problem for unvaccinated children (measles outbreaks), but for everybody because it endangers the health of an entire generation of children, lowering local herd immunity.* But if enough people forego vaccination, vaccine-preventable disease outbreaks can

* Local herd immunity means that when almost everyone in a community is immunized against a disease, if an unimmunized person becomes infected, the disease has little opportunity to spread because there are very few unprotected hosts.

occur since the disease spreads among unprotected individuals, as the recent emergence of some diseases that were previously considered dormant in Western countries, such as a revival of measles, pertussis, mumps and rubella demonstrates (S. Jay Olshansky & Leonard Hayflick, cited by Parmet, 2017).

b. Another example of myths and not medically validated alternative therapies may be found among cancer patients. After an endless series of eventually not-so-efficient **oncotherapy** of some kinds of cancer, and the inherent feeling that death may be close, the despair of many patients is quite understandable, which may lead them to look for any type of alternative assistance *agarrándose a cualquier clavo ardiente,* as we say in Spanish, like grasping at straws, as a last resort, even if most of them have not been proven to be efficient. In the '60s-'70s of the last century, the public opinion seemed to consider nuclear energy as a panacea, as a healer of illness such as cancer, heart insufficiency, lung emphysema… Top class restaurants were offering highly radioactive bottled water; we do remember a Bohemian spa in Joachimsthal, next to a uranium mine, offering thermal water, radioactive from uranium mines. Nowadays we know that, used in high amount, they can be cancerogenous. We may also find other alternatives: Gerson diet, reflexology, chiropractics, neurolinguistic programming…[*] Leaving aside the quite unacceptable chrematistics abuse of these situations by some "practitioners", however, this decision may be understandable in certain cases when one cannot find any other solution. Is this not reason enough for resorting to homeopathic therapy?

c. There is an increasing trend among many people to favor "clean", healthy diets, even if they have not been diagnosed with any intolerance. These people prefer ecological and sustainable agriculture, choose containers or smoothies with the words "bio" or "detox", and eat foodstuff without lactose, sugar, flour or palm oil just because it seems healthy to them, and, on the other side, they worry about eventual toxins or artificial ingredients in processed frozen or junk food, which may reduce its nutritional value, lead to overweight, or even enhance the risk of diabetes or cancer, demonizing them as "pure poison". A few decades ago, the 'danger' was the saturated or trans fats; nowadays it seems sugar has become the main 'devil'; it was quite advisable to eat the blue fish not long ago because of its omega-3 acids, but now, the issue is quite dubious given the presence of too many heavy metals in it; whereas some people suggest that coffee may be 'a bomb' within our organism, others, on the contrary, say that caffeine even might cure cancer; are eggs good or bad?; quinoa is quite in (it has become a good source of income for South American farmers), because it seems to be the panacea: it leads to lower cholesterol and less body weight, due to saponines that alterate the permeability of intestines, but when you wash it, before eating, the saponine goes away.

Similar comments may be made on another scientific myth according to which antioxidants are good and free radicals are bad. By the 1990s, many people were taking antioxidant supplements, such as vitamin C and carotene, based on the theory that free radicals cause

[*] For instance, the Spanish Group of Cancer Patients (GEPAC) has published a manual where "78 myths" are mentioned. GEPAC (2016), *Mitos y pseudoterapias.*

ageing as proposed by Denham Harman (free radicals would be reactive molecules that build up in the body as by-products of metabolism and lead to cellular damage), assuming the corollary that molecules that neutralize free radicals, such as antioxidants, were good for human health. Yet in the early 2000s, scientists trying to build on the theory encountered bewildering results: mice genetically engineered to overproduce free radicals lived just as long as normal mice (Doonan, et al., 2008), and those engineered to overproduce antioxidants didn't live any longer than normal (Pérez, et al. 2009). It was the first of an onslaught of negative data, which initially proved difficult to publish. David Gems started to publish his own negative results in 2003, and then, one study in humans (Ristow, et al., 2009) showed that antioxidant supplements prevent the health-promoting effects of exercise, and another associated them with higher mortality (Bjelakovic, Nikolova & Gluud, 2013). Today, most researchers working on ageing agree that free radicals can cause cellular damage, and that this seems to be a normal part of the body's reaction to stress. And the idea still holds back publications on possible benefits of free radicals (Ristow, et al., 2009). Some researchers also question the broader assumption that molecular damage of any kind causes ageing. "There's a question mark about whether really the whole thing should be chucked out," says Gems. The trouble, he says, is that "people don't know where to go now" (Keaney & Gems, 2003; Scudellari, 2015).

All this is going out of our hands, leading towards what is known as **orthorexia**, which is the term for a condition that includes symptoms of obsessive behavior in pursuit of a healthy diet: if certain diets were previously rejected because of certain elements, considered prohibitive, these days the main problem is with conservatives or colorants, antioxidants, additives which pretend to conserve the life of products, avoiding mold or micro-organisms which destroy the food, emulsions which prevent the food from sticking to different surfaces, and thickeners which give body to sauces and stews. All food has chemicals; even milk contains thiamine and riboflavin, i.e., vitamins B1 and B2; and those called "functional foods"—because they affirm to have more nutrients like calcium or Omega-3—keep adding chemicals to the original product. All this does not make much sense to a world that flees from the "artificial" searching for the 100 % pure and natural (Quintas, 2017).

The main aim of dietetic guidelines, rather than being red nutritional advice, should be to help keep an ordered meal, adapted to each local cultural habits; f.i. 5 fruits/day, eat every 3 hrs, no carbohydrats after 5 PM, one glass of wine or beer… In few words, just follow common sense!

How can scientists influence what is being presented in social platforms? By articulating how this kind of science works when they talk to journalists, or when they advise policymakers. For instance, since as humans, we have all sorts of cognitive biases that come into play when we try to evaluate the risks posed by any decision, scientists should offer an alternative to bias-based decisions, enabling leaders to create more effective policies and avoid a "cure" which may be worse than the disease. We are aware that using inaccurate and false information in the context of science is much murkier and unclear, because usually there is no clear dichotomy between fake news and real news, it challenges the position of science as a singular guide to decision-making, and because it involves owning up to not having all of the answers all the time while still maintaining a sense of authority.

"Scientists cannot neglect the ethical responsibility concerning their work."

But if we want "to inoculate" the public against popular sticky misinformation campaigns, including the damaging influence of some fake news that circulates on scientific matters propagating myths on whatever topic, we cannot risk leaving this task in the hands of journalists because, besides not being well-trained to assess the validity of all studies (many of you may have already heard the difference between a scholar and a journalist: a scholar is somebody who knows a lot about very few things, whereas a journalist knows very little about a lot many things), they are attracted by the human interest of a news and the hope of creating an attractive headline. Scientists, therefore, need to "break the echo chambers as much as we can", as Dominique Brossard (2017) says, engaging toward better science communication, talking to journalists and people about real facts, to help explain and contextualize the news and to stop the dissemination of fake news or bad reporting because people are going to use science stories that fit better what they want to believe, improving the way that socially relevant science is presented to the public in popular media, providing a cognitive capacity to evaluate it in a coherent way that helps build up resistance to misinformation, and presenting them with accurate scientific statements and well-known facts (Klymkowsky, 2017; Makri, 2017; Nielsen, 2017; van der Linden et al., 2017).

8. Ethical Values of Science

We do not wish to close our presentation without a brief comment on one of the most important issues a scientist must face in his contribution towards a human-centered society: the relationship of science with ethics.

Science has been a catalyst for social change and economic growth, and saved countless lives. But, even if *in se* science is not good nor bad, it is evident that there is always an eventual danger or evil concerning its application. For instance, a new anti-malaria drug dispenser of a drug called ivermectin kills *Anopheles* mosquitoes, the sort that transmit malaria. But, in addition to helping in the eradication of this illness, protecting the people indirectly, by making their blood poisonous to *Anopheles,* it may also cause other obvious ill effects in the digestive system, turning human beings into chemical weapons.

The atomic research, besides its deadly applications we all know about (nuclear weapons), may also lead to peaceful applications, like the "tracer elements", which can be applied as a radio-active method of diagnosis, in cancer radiotherapy or as effective fertilizers.

Besides the above-mentioned invention of nuclear weapons, other discoveries have also done far more harm than good. To name just a few: massive blunders like fossil fuels, CFCs (chlorofluorocarbons), leaded petrol and DDT, and tenuous theories and dubious discoveries like luminiferous aether, the expanding earth, blank slate theory, phrenology…

But, even if choosing good or bad is not a scientific choice, **scientists cannot neglect the ethical responsibility concerning their work**. Society wants clear guidelines as to how these technologies have to be managed, but the factors that drive much of public

sentiment are largely based on ethical and social concerns, rather than safety or efficacy. For instance, human genome editing raises a lot of questions related to the implications of new technologies, such as CRISPR-Cas9, that can alter the genome of living organisms, including humans. The fact that they can potentially be used by almost anybody either for beneficial or harmful purposes, has raised fears that CRISPR could become a weapon of mass destruction. Many countries, such as Austria, Italy, Spain and the Netherlands, have decided to ban the use of technologies to modify the human germline. In this context, The National Academies of Sciences, Engineering, and Medicine (NASEM) recommends that at least a series of stringent conditions should be met before authorizing this use. So while clinical trials for modifications of somatic cells are given a green light, the use of genome editing for enhancement purposes is given a red light for the moment and should be subject to further and wider discussions. The modification of reproductive cells (eggs, sperm and embryos) which would lead to germline modifications has raised fears about a brave new world of "designer babies". The report concluded that it would only be fine if three requirements are met: to prove that there are sufficient prospective benefits relative to the risks of using these techniques before starting clinical trials; to involve experts in a broad dialogue about the use of these technologies; and to guarantee that germline genome editing will be used only to prevent a serious disease, where no reasonable alternatives exist, under strong supervision.

In the NASEM report on gene editing, which he co-authored, Gary Marchant draws parallels between the public's concerns on that technology and how best to proceed incorporating social, ethical and religious aspects into regulations. "As biotechnologies grow more powerful and increasingly raise more profound ethical issues, we can no longer leave these ethical and social dimensions off the decision making table" (Marchant 2017). International scientific cooperation and dialogue seem to be essential components of good governance for new technologies. Otherwise, it would be profoundly detrimental to the success of those technologies.

9. Conclusion

All stakeholders have to be conscious of the importance of investment in Science, fostering scientific knowledge through the interconnections between all its branches with an open mind, transdisciplinary approach, enhancing joint research and cross-cultural connections, and providing funds not only focused on real life problems, but also on the fundamental tenets that will underpin the future of a human-centered society.

If development of science is important, what is even more important is human development, i.e. development of human beings themselves, which is all about "growing up truly to human beings, capable of governing themselves and the universe through the well-balanced development of science, art & religion" (Amemiya, 2017).

Authors contact information:
J. Martín Ramírez *– Email: mramirez@ucm.es*
Juan Cayón-Peña *– Email: jcayon@nebrija.es*

Bibliography

1. Ake, S.E. (2001). Metanexus: Views 2001.10.15 Dual Magisteria: Louis Martin.
2. Amemiya, Y. (2017), Overall view of science, and the ideals of human civilization. 23rd ICUS, Seoul, February 4-5, 2017.
3. Berglof, A.M. (2012). At home: Rafael Reif The Financial Times, November 9, 2012.
4. Brossard, D. (2017). *How science should respond to fake news*. Annual meeting of the American Association for the Advancement of Science. February 18, 2017 https://phys.org/news/2017-02-expert-science-fake-news.html.
5. Chandrasekaran, M. (2016). Unifying Subjectivity & Objectivity", *Cadmus*, 3 (1): 93-104, 2016.
6. Choucri, N. (2013). *Cyberpolitics in International Relations.* MIT Press.
7. Clark, T.D. (2017). Science, lies and video-taped experiments. *Nature* 542, 139 (09 February 2017) doi:10.1038/542139a http://www.nature.com/news/science-lies-and-video-taped-experiments-1.21432?WT.ec_id=NEWSDAILY-20170209%20.
8. Dampler, W.C., (1971). A History of Science, Cambridge University Press, 4th edition.
9. Doonan, R. et al. (2008). Against the oxidative damage theory of aging: superoxide dismutases protect against oxidative stress but have little or no effect on life span in Caenorhabditis elegans. *Genes Dev*. 22, 3236-3241.
10. Dupré, J. (2001) *Human Nature and the Limits of Science*, Oxford University Press.
11. Economist, (2016) How Vienna produced ideas that shaped the West, *Economist*, Dec 24th 2016).
12. Giarini, O. & Tuzzi , U. (2002) Itinéraire vers la retraite à 80 ans, Economica, Paris, 2002.
13. Gintis , H. , (2003). Towards a Unity of the Human Behavioral Sciences February 24, 2003.
14. Han, Byung-Chul (2017). *In the Swarm: Digital Prospects (Untimely Meditations)* Stanford University Press.
15. Hecker, S.S. (*2016) Doomed to Cooperate: How American and Russian Scientists Joined Forces to Avert Some of the Greatest Post-Cold War Nuclear Dangers, Los Alamos Historical Society's Bathtub Row Press, 2016.* http://www.losalamoshistory.org/doomed-to-cooperate-ad.htm.
16. Holmes, R. (2016). *This Long Pursuit: Reflections of a Romantic Biographer***.** William Collins.
17. Ioannidis, J. (2017). Nature Human Behavior, Jan. 10, 2017 http://phys.org/news/2017-01-master-science.html.
18. Keaney, M. & Gems, D. (2003). No increase in lifespan in Caenorhabditis elegans upon treatment with the superoxide dismutase mimetic EUK-8. *Free Radical Biology & Medicine* 34, 277-282.
19. Klymkowsky, M. (2017). What can the anti-vaccination movement teach us about improving the public's understanding of science? *Plos Blogs*, January 10, 2017.
20. Koch, C. (2004). review of Searle's Mind: a Brief Introduction, *Science.*
21. Lang, S. (1975. *Diaphontine Approximation on Abelian Varieties with Complex Multiplication*. Advances in Mathematics, Elsevier.
22. Makri, A. (2017). Give the public the tools to trust scientist, *Nature* 541, 261 (19 January 2017) doi:10.1038/541261a.
23. Marchant, G (2017). *Governing Ethical, Social and Religious Aspects of Biotechnologies.* Annual meeting of the American Association for the Advancement of Science, Boston, February 17, 2017 https://phys.org/news/2017-02-advanced-technologies-social-ethical-lines.htm.
24. Narayanamurti,V. & Odumosu, T. (2008). *Cycles of Invention and Discovery*.
25. NASA (2014). What is the Universe made of? https://map.gsfc.nasa.gov/universe/uni_matter.html.
26. NASEM (2017). National Academy of Sciences and Medicine report on Safe and ethical ways to edit the human genome, February 14, 2017 https://phys.org/news/2017-02-safe-ethical-ways-human-genome.html.
27. Parmet, S. (2017). Ten million lives saved by 1962 breakthrough. *Medicine & Health / Diseases, Conditions, Syndromes* March 3, 2017 https://medicalxpress.com/news/2017-03-ten-million-breakthrough.html.
28. Pérez, V. I. et al. (2009). The overexpression of major antioxidant enzymes does not extend the lifespan of mice. *Aging Cell* 8, 73-75.
29. Popper, K. (1932, 2008). *Die beiden Grundprobleme der Erkenntnistheorie.*
30. Troels Eggers Hansen (Editor) The Two Fundamental Problems of the Theory of Knowledge. Routledge Classics.
31. Powell, A. (2017). The false choice of basic vs. applied research, *Harvard Gazette*, January 4, 2017, http://phys.org/news/2017-01-false-choice-basic.html.
32. Quintas, A. (2017). *Adelgaza para siempre. De forma fácil, saludable y definitiva*. Planeta.
33. Ramirez, J.M. (in press). The Limits of Science and the Benefit of Unified Values. In: Earth's Environmental Crisis, and the Role of Science.

34. Ramirez, J.M. & Garcia-Segura, L. (2017). *Cyberspace: Risks and Benefits for Society, Security and Development*. Springer.
35. Regan, A. (2017). Can social media connect science and society? *TResearch* April 5, 2017 https://phys.org/news/2017-04-social-media-science-society.html www.teagasc.ie/media/website/publications/2017/TResearch-Spring2017.pdf.
36. Ristow, M. et al. (2009). Antioxidants prevent health-promoting effects of physical exercise in humans. Proceedings of the National Academy of Sciences USA 106, 8665-8670.
37. Rothschild, R. (2016). Environmental cooperation in 1970s helped ease Cold War tensions*, Technology and Culture*, November 17, 2016 http://phys.org/news/2016-11-environmental-cooperation-1970s-ease-cold.html.
38. Schwab, K. (2016), *The Fourth Industrial Revolution,* World Economic Forum, Davos.
39. Scudellari, M. **(**2015). The science myths that will not die. *Nature*, vol 528, issue 7582, 16 December 2015.
40. Sloman, S. and Fernbach, Ph. (2017). *The Knowledge Illusion: Why We Never Think Alone.* Riverhead. Pan Macmillan.
41. Tooby, J. & Cosmides, L. (2017). *Evolutionary psychology: Foundational papers*. Cambridge, MA: MIT Press.
42. van der Linden, S. et al. (2017). *Global Challenges*, DOI: 10.1002/gch2.201600008 January 23, 2017 https://phys.org/news/2017-01-psychological-vaccine-immunize-fake-news.html.
43. Weatherall, J.D. (2016). *Void: The Strange Physics of Nothing***.** Yale University Press.
44. Weiss, R. (2005) Scientists far from knowing all the answers *Washington Post*. Jul. 18, 2005.
45. Zichichi, A. (1990). From Galilei to Dirac**,** *Europhysics News*, 21.
46. Zichichi, A. Dirac, Einstein and Physics, (2000]. *Physics World*, March 2000.

CADMUS, Volume 3, No.2, May 2017, 131-149

Principles of Sustainable Economy:
An Anthropologist's Perspective

Thomas Reuter
Professor, University of Melbourne, Australia;
Fellow, World Academy of Art & Science

Abstract

Contemporary economies must undergo a transformation to sustainability if we are to avoid a descent into ecological and socio-political crises of ever escalating severity. In order to achieve such a major reform, principles consistent with sustainable ecosystems and social systems need to be identified and applied systematically. What are these principles in their most fundamental form, how can they become widely accepted, and how can they be applied? To answer these three questions, this article draws on the cumulative insights of anthropology, a bridging science dedicated to the holistic study of humanity across the entire span of our evolutionary development (physical anthropology) and across the full breadth of its cross-cultural diversity (cultural anthropology).[*] This broad and longitudinal anthropological understanding of human societies will be compared with what we now understand about the characteristics of ecosystem, primarily to show that they are fundamentally similar. An alternative cultural outlook and political procedure is then proposed that—if adopted—would deliver a shared global vision for a socially and ecologically sustainable future and lay firm pathways toward that future in the now.

1. Introduction

The paper begins with a brief synthesis of what we know about conditions that will facilitate healthy and resilient social and ecological systems, and why such conditions are not being created under the currently hegemonic economic and societal paradigm and associated cultural narrative. The key requirements for both kinds of systems to flourish are a high degree of diversification and the maintenance of a dynamic web of mutual interdependence relationships that capitalises from such diversity. These systems' requirements are not recognized within prevailing economic narratives, whose proponents have instead promoted a naïve Darwinism to legitimize and promote self-serving and monopolistic behaviour. The false premises of this narrative are challenged and its negative consequences are charted in order to demonstrate why it must be replaced with a new narrative that will promote human well-being and responsible environmental stewardship.

The social behaviour of human beings is culturally learnt and voluntarily adjustable to a degree not found in other species. Theoretically, this should provide us with the option of

[*] Author's note: I do not speak for all anthropologists, and risk oversimplification in providing this very condensed overview of my discipline. Such syntheses must be attempted, however, if scholars are to speak across silos. All errors in the present attempt are mine.

adjusting our behaviour to prevent ourselves from causing a systemic social, ecological crisis, but in practice we seem to lack such freedom. The second part of the paper thus explores the preconditions that would allow us to consciously adjust our fundamental cultural narratives and behaviour as needed to realise the alternative of a socially and ecologically sustainable economics and way of life. The key requirement for freely exercising our cultural options, I shall argue, is an increase in metacultural awareness of the kind routinely pursued as part of the professional practice of cultural anthropology. Such metacultural awareness can be scaled up for the purpose of societal change because it is now spreading also at a more popular level as a side effect of globalisation. This new awareness creates the potential for either a relapse into a fearful populist identity politics or a liberating 'anthropological moment' in the history of human consciousness.

"A self-reflexive opening-up to new and better ways of living and a revision of our cultural narrative is not sufficient."

A self-reflexive opening-up to new and better ways of living and a revision of our cultural narrative is not sufficient. A new culture becomes real when it is put into practice. The replacement of prevailing regimes of practice, however, must be informed by a stocktake and analysis of the objective conditions and systemic trends at the present moment. A brief exploration of this 'demand end' of change will reveal an unmet need for coordination at two levels: At the demand end of change we must recognise that the problem is systemic and cannot be addressed in piecemeal fashion; at the supply end of change, responses must be coordinated across the whole of society and also across societies, which is impossible without a very solid consensus. The article closes with a proposal for an inclusive political procedure that would deliver such a consensus, building on principles of openness, diversity and mutual dependability. Such a procedure is indispensable for generating a shared vision of and pathway to a sustainable Anthropocene age.

2. Understanding and Promoting Sustainability within Social & Ecological Systems: Why prevailing economic narratives have failed us

2.1. The Two Dimensions of Sustainability

Sustainability is often conceptualised dualistically in terms of a hypothetical human-nature divide. From this perspective, sustainability appears to be a condition whereby the rate at which human activities produce ecological footprints does not exceed the rate at which the natural environment is able to erase them. Conversely, when nature fails to keep up with human demands we are said to exceed the planet's carrying capacity. From this perspective, nature is the 'sustainer' and humanity, the sustained. This is a rather anthropocentric and misleading point of view. Other species are no different from humans; they too are sustained by the whole of 'nature' and they too put its carrying capacity to the test. We thus need to ask: In a sustainable world, who is really sustaining whom?

The science of ecology has come to the simple but profound conclusion that individual species are not self-sustaining. Rather, life as a whole is sustained by an inconceivably

complex web of interdependent relationships involving a vast diversity of species, humans included, as well as by reciprocal interactions between living organisms and the complex dynamic systems of inanimate nature. Life is characterised by a paradoxical state of unity in diversity, given that biodiversity is the prerequisite for the web of interdependent relationships that give rise to an encompassing ecological system. Life forms are interdependent and evolve together in a historical process, and thus every species, humanity included, is at once the sustainer and sustained. Particular interdependent relationships can be rather durable (sustained over time), but they are not permanent.

From the relative (non-systemic) perspective of a single species, the basic fact of interdependence is also evident, but it is unevenly distributed. There is a powerful 'interactive proximity' factor. On a planetary scale, for example, life forms are all linked through the exchange of carbon and oxygen via the global medium of the atmosphere. Particular species are more intensely interdependent when they come into more direct contact with one another through interactions within the context of specific ecological systems. They come into immediate contact through specific predator-prey or symbiotic relations. And, finally, individual specimens of the same life form are the most intensely interdependent upon one another, though to variable degrees: some species are hermaphrodites, or provide little parental care for their offspring, or are less social as adults than others. Humans, however, have evolved to become the most mutually interdependent or 'social' of all species. Simply put, social systems are merely the 'near end' of ecological systems.

Importantly, the logic of diversification and the imperative of mutually interdependent existence apply equally to the natural and the social world. Nature is intrinsically interactive or 'social', and society in turn shows all the ecological characteristics of a natural system—because it is a natural system.

2.2. Social Sustainability: The Human Dimension

The spectacular success story of the human species is based on our ability to cooperate socially on an unprecedented scale, an ability underpinned by our unique capacity for language-based communication. Modern economic life bears daily testimony to the complex social interdependencies we have created. As is the case in ecosystems, interdependence in social systems is based on diversification and cooperative mutuality. Within human societies, however, diversity takes new, socio-cultural forms. In the context of economics, for example, diversification is most prominently expressed in the division of labour. Founders of social science like Emile Durkheim and Max Weber already emphasised the importance of diversity in human societies, and noted that increasing diversification and interdependence have been the main drivers of their historical development.

Among hunter-gatherer and subsistence farming societies we find the beginnings of professional specialisation, exploiting differences in aptitude. The livelihoods of specialists for tool making, healing or ritual, for example, are already provided by the surplus primary production of other community members, at least in part. In sedentary farming societies with a large surplus, which first proliferated in fertile river basins in different parts of the world between 8000 and 5000 BC, we see the foundations of village life and urbanisation

and an associated explosion in the division of labour, boosted further by growing systems of specialist training and education, by the invention of writing, mathematics and sciences, and the introduction of money as a medium of exchange. Detailed historical research by Norbert Elias has shown how this process of ever-increasing diversification led to the formation of ever larger and more complex social systems, such as modern nation states, because it created ever-extending webs of interdependence.[1]

This historical trend toward diversification and ever lengthening chains of social interdependence accelerated once more in the wake of the 18th century industrial revolution, and has reached its preliminary climax in our current condition of globalisation, wherein increased mobility and new-media-based interactions as well as increasingly complex flows of goods and services have combined to create a single world system of human interdependence. The global impact of the collapse of the US subprime mortgage pyramid scheme is one illustration of the global reach of social interdependence chains today. Moreover, the drowning of island nations like Kiribati due to the historical carbon emissions primarily of western developed countries further shows that human impacts on the environment can translate back into social impacts, both *in situ* and globally. In other words, social and ecological systems are not just similarly based on webs of interdependence, but the two webs of interdependence are also interlaced within an encompassing socio-ecological system, spanning from the local to the global.

This rapid sketch of two vast fields of research, ecology and social science, may still seem a longwinded way to make a simple argument for the similarity of and intimate connection between social and ecological systems. This argument is vital for this discussion, however: Societies that are ecologically destructive tend to also be socially destructive, because they operate on cultural narratives that violate sustainability principles across social and ecological domains.

2.3. Ecological Sustainability: The Environmental Dimension

Human social systems are ecosystem-like in that their health depends on diversification and mutual interdependence. Humans who recognise that their existence is premised upon social interdependence therefore should not find it difficult to recognize also their dependence on other species and on the whole of life and nature. Indeed, many indigenous societies consider other species as agents with distinctive subject positions or 'perspectives,'[2] and view nature as an intrinsically social world in which humans are embedded.[3] We must set aside for a moment our grave concerns over the current global environmental crisis, and contemplate the remarkable and highly relevant fact that all modern humans have been living in fairly sustainable ways across 99.9% of the time elapsed since modern humans first evolved in Africa, 195-160,000 years ago. Early modern humans did of course have an environmental impact and this impact may have been transformative even before the advent of agriculture, but the impact was not devastating on a systemic level, as it is now. What is true across temporal scales also is true across geographical scales: The great majority of contemporary non-western societies that have been studied by anthropologists were found to have lived sustainably until recently, or continue to do so. Indeed, data compiled by the Global Footprint

Network shows very graphically how western style modernist development (HDI rating) correlates with growing ecological footprints.[4] The prevailing economic development paradigm thus continues to undermine the relative sustainability of many traditional societies around the world.

"It is the hitherto dominant influence of the industrial, modernist culture of Western Europe on this global cultural commons that is largely responsible for the current ecological and social crisis."

Without such a broader and more long-term anthropological perspective, one is all too easily led to the false conclusion that humanity is destined to destroy the web of life. The present 'Anthropocene Age,' according to climatologist and Nobel Prize-winning chemist, Paul Crutzen, is the "geological age that man created."[5] Humans are now disrupting the world's ecologies with unsustainable demand for resources, and we are also interfering with the geo-physical system, notably the atmosphere. We are on the brink of one of the most devastating crises in the history of life on Earth, and we are responsible.

The rise of a disruptive species is not unprecedented in the planetary history of life. An interesting case for comparison is the so-called Great Oxidation Event or GOE. The powerful villains who caused this crisis were cyanobacteria, which had evolved into multicellular life forms some 2.3 billion years ago, approximately 200 million years before the GOE. They were the first microbes to produce oxygen by photosynthesis. Before the GOE, the free oxygen they produced was captured by chemical reaction with dissolved iron and organic matter. The GOE only occurred when these oxygen sinks became saturated, at which point the oxygen was free to escape into the atmosphere. This atmospheric oxygen was toxic to anaerobic life, and also caused massive global cooling, ushering in an unparalleled ice age. Cyanobacteria later entered into a symbiosis with other aerobic bacteria that are the ancestors of all plants and animals today. Admittedly, it has taken humans a mere 200 years—not 200 million years—to trigger a climate crisis (by filling available carbon sinks with our fossil fuel use), but we are not the first species to do so.

The disruptiveness of humans is not due to our physiology, or it would have manifested instantly as soon as humans evolved. Nor is it cultural per se. If human disruptiveness were due to our cultural capacity as such then it would again have manifested very quickly, given that culture-capability is also enshrined in the physiology of modern humans. The problem then must lie at the level of cultural content, and we must ask what are the precise cultural contents that have made us into the cyanobacteria of the present age.

Some argue the trouble with humans began some 9000 years ago with the Neolithic Revolution and the rise of sedentary farming, which in turn was made possible by favourable climatic change during the Holocene interglacial period. This did increase human ecological

impacts significantly, but not to the point of causing widespread devastation. It was not until the advent of the Industrial Revolution in the 18th and 19th centuries and, more so, of global mass consumer society in the post-WW2 period that human activities began to thoroughly devastate ecologies and change the climate and other geophysical systems. Humans thus became a systemic threat very recently and the resulting crisis has unfolded very rapidly. It coincides with the advent of modernity, science and technology, fossil fuel driven industrial production and mass consumption.

If there is anything within human nature that sets us apart from other life forms it is the exceptional speed with which we can change key elements in our way of life. This cultural adaptability allowed early modern humans to disperse out of Africa and around the globe, adjusting their ways of life to suit the conditions of the very wide range of different ecosystems they encountered, from the icy world of the far north to the hot and arid plains of Australia. Progressively branching and dispersing human communities developed their own languages and diversified cultures over centuries. A vital part of localised cultures is their unique knowledge of a specific local environment and their practical strategies for sustainable coexistence, covering the planet with a plurality of human ecologies. Information flows in cultural adaptation are faster than in genetic adaptation, and hence this cultural diversification process was rapid, measured on evolutionary time scales. In today's world of advanced mobility and electronic communication, finally, the exchange and global spread of cultural knowledge and technology have become extremely rapid, reducing the depth of localised cultural diversity to a degree but also creating the foundation for the beginnings of a parallel, global culture, a sphere of shared understanding. It is the hitherto dominant influence of the industrial, modernist culture of Western Europe on this global cultural commons that is largely responsible for the current ecological and social crisis.*

The long-term and cross-cultural perspectives on the human story that physical and cultural anthropology provide reveal that culture is at worst ambivalent in its ecological effect: Many cultures have enabled sustainable living, although some became unsustainable at a local level and either changed, migrated or disappeared. But then there is one culture that did not become unsustainable merely at a local level but expanded worldwide and shaped global culture to become a planetary ecological threat. What is it, then, about the contemporary, liberal consumer-capitalist global culture that makes it so extraordinarily damaging to the social and ecological systems on which human survival and well-being depend?

2.4. Today's Cultural Crisis: A Legacy of Individualism and Modernism

Essential to understanding the cultural malaise of contemporary societies and their particular capitalist culture is the question of how societies and economies should deal with the issue of conflict and competition in social life. This question invokes different ideas about human nature, and hence it is often answered by reference to the way in which conflict and competition are presumably dealt with in natural systems. Contemporary capitalist culture

* The military dominance of the western industrialised countries in the age of colonialism and until now has had a great influence on the current content of global culture, but it is nevertheless a hybrid culture with many contributors. Even the modernist element in global culture has not simply been imposed but has also held a certain promise that proved attractive to many.

has answered the question incorrectly because it is based on a mistaken interpretation of nature and also of human nature.

> *"Adam Smith, though he advocated for free markets, was one of the first to criticise pseudo-realist approaches in the field of economics."*

Central to unravelling this misinterpretation is the following paradox: From one perspective, conflict avoidance through differentiation and mutual interdependence is the typical case, and is a prerequisite for the very existence of a system; from a more localised perspective, however, conflicts of interest between constituent elements routinely arise in social systems, as they do in ecosystems.

Two very different interpretations have been proposed to explain these basic facts: Fatalists tend to emphasise conflict and ruthless competition as the defining feature of social and natural life. Life is intrinsically brutish and human nature makes us incorrigibly selfish—'wolves' even in our relations to one another. This kind of philosophy of life struggles to explain why systems have durability and what makes them resilient to change, and tends to gloss over or deny the relevance of interdependence. The more optimistic alternative interpretation has been that social ecosystems are characterised by cooperation, and that systemic disruptions are temporary aberrations, characteristic only of unhealthy systems. This point of view struggles to explain the dynamic nature of systems, the emergence of systemic crises, and the ability of systems to change and adapt.

I contend that a fatalist, Hobbesian-style view of human nature has been elevated to the status of a foundational cultural narrative within modern, liberal-capitalist societies and in their economies, and therein lays the root of the cultural malaise that has driven social and ecological systems to the edge of destruction. This view simply fails to inspire responsibility toward the socio-ecological whole, on which all life depends. The Hobbesian view has had many critics in formal philosophy, of course, but it has prevailed as a popular ideology because it seems plausible to many in the light of their negative experiences of life, which tend to be more salient. Importantly, this view is also ideally suited as a legitimisation narrative to justify, for example, the imperial domination of 'weak' nations by stronger nations, the destruction of diversified production systems and markets by more powerful cartels, and the domination of weak individuals by stronger ones. This narrative frequently has been marketed as consistent with evolutionary science, and hence as a form of realism.

Adam Smith, though he advocated for free markets, was one of the first to criticise such pseudo-realist approaches in the field of economics. The typical case of economic life is described in Smith's *Theory of Moral Sentiments*,[6] where he characterises societies as systems of mutual interdependence upheld by sympathy for the moral sentiments of others. Focusing on the "Beggar-thy-neighbour" trade policies of mercantilism, Smith also provided

a pertinent example of the atypical case, whereby unsustainable, self-serving economic behaviour becomes a temporary system feature.[7] He argued that the self-serving philosophy of mercantilism was hostile to systemic equilibrium and ultimately self-destructive and irrational because it was blind to the way healthy systems of market interaction produce benefits for all. He pointed out that Beggar-thy-neighbour policies falsely regard trade as a zero-sum game, whereas in fact the comparative advantage of each economy offers gains from trade for all parties.

"Neoliberal capitalism promotes a crisis producing and crisis maintaining form of economic behaviour and, unless it is stopped, it could stagger on until the social and ecological system is destroyed completely."

Remarkably, Smith's contention that 'comparative advantage' within an economic system resolves conflict resonates very strongly with the solutions that evolution has found to resolve competitive conflicts within ecosystems. It turns out that nature in not brutish at all, but keen to avoid conflict. According to Gause's law (the competitive exclusion principle), the systemic effect of competition in ecosystems is not the creation of a Hobbesian all-against-all battle for supremacy (*bellum omnium in omnia*). Rather, competition between species with similar traits drives the diversification of species, and furthers their adaptation to ever more specialised ecological niches.[8] In short, the problem of resource scarcity and associated competition may appear as a competitive struggle from a relative perspective but, overall, ecosystems work to maximise the potential for life, even in very harsh environments such as deserts, as species evolve to occupy different niches. This diversification effect is illustrated by the phenomenon of 'character displacement,' whereby similar and competing traits diverge in the direction of greater specialisation.[9] We can conclude that healthy social ecosystems resolve conflict over time and also exploit it as a motor for continuous diversification, with the ultimate outcome of establishing complex webs of interdependence wherein species are mutually sustained.

From the perspective of particular individuals or groups or species, competition can be painful, and this can make life look the part of a Hobbesian struggle rather than equilibrium. To interpret natural selection from such a personal angle is not uncommon or hard to empathise with, but it is naïve Darwinism. Ferrari and Chi note that naïve biology students (not to mention laypersons) tend to

> *focus on the idea of survival of the fittest, but embed this idea within an event ontology that involves actors struggling to overcome obstacles and achieve goals. Results showed that most naive subjects' evolutionary explanations reflected an event ontology. Furthermore, event ontology attributes were positively correlated with non-Darwinian explanations; by contrast, equilibration attributes, when present, were positively correlated with key Darwinian principles.*[10]

The problem with the pseudo-realist view is the one-sided, negative and naïve way in which it interprets the character of natural systems. This view has been picked up and developed into a global cultural narrative by the currently hegemonic neoliberal economic theory. Hobbes' idea of the social contract as a means of 'taming the wolves' is conveniently forgotten or buried in legal formalism. The event-focused, short-term logic of market fundamentalism, driven by the voracious profit appetite of financial capital, thus rests on a radical articulation and popularisation of traditional fatalist philosophies of life. It does not have a single source and does not apply any single philosopher systematically, but it has a long pedigree pointing back to the origins of capitalism and an associated secularisation and rationalisation within modernist worldviews.[11] According to this logic, when a business systematically engages in unsustainable economic behaviour, maximising private profit and externalising social and environmental (systemic) costs, that behaviour is portrayed not as immoral but as natural and also rational, in a narrow instrumental sense. A compounding factor is that the more such behaviour spreads and succeeds, albeit temporarily, the more it appears to prove its own philosophy of life correct. Neoliberal capitalism promotes a crisis producing and crisis maintaining form of economic behaviour and, unless it is stopped, it could stagger on until the social and ecological system is destroyed completely.

The pursuit of self-interest is celebrated as a heroic effort and, indeed, no effort is spared to reduce the moderating effect of the rule of law to a minimum, justified with disparaging rhetoric about the "nanny state," "overregulation" and "green tape." What regulatory legislation there is must be bent to one's purpose or changed with the help of a horde of lobbyist and hefty political party donations. Within the legal domain, such as it is, the approach promoted by this alt-liberal philosophy of life is again adversarial, and the battle for supremacy is simply fought with different means. Empathy for others is dismissed as naïve romanticism or socialism. The ultra-alienated neoliberal incarnation of *Homo economicus* thus cannot identify with and has no intrinsic moral or rational commitment to the whole. His (more often than her) system-smashing, winner-takes-all mentality resonates with the social Darwinism of an earlier age of liberal, *laissez-faire* capitalism,[*] a pseudo-evolutionary theory about the presumably 'natural' inferiority of less-than-equal social classes, races, ethnic groups and nations,[12] not to mention non-human species, who according to this theory fairly deserve to be exploited and extinguished by their superiors, the chosen few, destined by nature to be the new masters of a dying universe.

The irrationality of the policies that spring from this pseudo-realist logic can be demonstrated in many ways, but one current example is the competitive reduction of corporate tax rates and employer contributions to health and pension insurance (wage costs) among nation states influenced by neoliberal thinking. This 'beggar thy neighbour' strategy appears quite rational from an individual perspective, serving the aim to draw more FDI to one's own country, but from a systemic perspective it is quickly revealed as a runaway competition that eventually only serves to erode the tax base of all nation states and to increase inequality, largely to the benefit of the wealthiest 1%. As the work of Thomas Piketty has famously

[*] Herbert Spencer and others first promoted the idea in the mid-19th century, but the idea proved persistent and spread beyond the British cultural sphere. For example, the theory helped inspire the extermination of so-called "inferior races" in Nazi concentration camps.

shown,[13] and as the World Economic Forum too is now willing to concede: Inequality has become 'the greatest threat to the world economic system.'[14] It is also producing a wave of public resentment captivated by populist movements, many of which are flying under the false flag of "we, the people" to once again promote the interests of private capital.

"Science too has inadvertently contributed to a sense of complacency, with its excessive focus on the description and rational analysis of facts and its fear of reaching for the future in the only way that we can: By following the moral compass of 'system-friendly' and wellness promoting values, and by utilising the much neglected and maligned human faculty of imagination."

It is not helpful, however, to lay blame solely at the feet of neoliberalism, given that individualism, instrumental rationality and alienation are part of a much wider phenomenon of modernity, and of associated processes of scientific innovation and industrialisation that gave rise to our present global consumer capitalist culture. Nor is it helpful to suggest the current lack of political commitment to transformative change can be attributed solely to vested interests, such as the fossil fuel lobby. Everyone participating in the life of a modern, industrial consumer society is substantively and morally contributing to its maintenance, like it or not, and we all should muster the humility to accept this inconvenient truth. Collectively, it seems, we are trapped by the belief that 'the world as we know it' is the only possible world. Proposals for fundamental change thus cause anxiety, while this old world, no matter how flawed, provides us with a sense of reassurance. Science too has inadvertently contributed to a sense of complacency, with its excessive focus on the description and rational analysis of facts and its fear of reaching for the future in the only way that we can: By following the moral compass of 'system-friendly' and wellness promoting values, and by utilising the much neglected and maligned human faculty of imagination.

Notwithstanding the great speed of cultural evolution compared to genetic evolution, it seems the former proceeds in small steps also. Fundamental cultural shifts are indeed infrequent and often take quite a long time, or only happen under great duress. Today duress is near us and has brought misery to many people already. It is time to shift gear and accelerate change, taking pre-emptive action before irreversible earth systems failures strike.

3. Cultural Options: A Cross-cultural Perspective on Overcoming Change Resistance in Society and Science

This is easier said than done. Projects for systemic change toward a more equitable and sustainable world, of which the UN's set of Sustainable Development Goals is emblematic, are predicated upon a hopeful belief in our capacity to change our culture, our way of doing things. Unfortunately, and of necessity, the most basic cultural narratives that encapsulate

our philosophy and way of life are deep-seated, often unconsciously taken for granted and hence rendered largely invisible, unquestionable and change resistant.[15] Cultural core principles do need some gravitas, because they create, and more or less uphold, 'the world' as we understand it, thus guiding our way of inhabiting the world. To 'allow' a major reset of today's globally prevailing cultural narrative and of prevailing orders of practice to happen, therefore, certain special conditions need to be met. We literally need to permit change to happen. We, as a global community, would need to open up our minds to the positive and achievable vision of a new and more liveable world. I shall argue that such an opening up is possible and that the quantum leap in consciousness it will require can be achieved, by capitalising on a momentous rise in meta-cultural awareness within this global age. Moreover, anthropological researchers from all over the world have long pursued this kind of awareness, and have shown for all to see that it is achievable, and how it can be done.

For more than a century anthropologists have professionally studied societies worldwide across the full of spectrum of human cultural diversity. The ethnographic method of 'participant observation' allows ethnographers not just to observe but also to become wholly immersed in the daily life of another society, and thus they have an opportunity to learn to see the world through a different cultural lens. In the course of tens of thousands of ethnographic studies, ranging from societies whose cultural economies were still based on stone-age technology,[16] to studies of the cultures of corporations and of internationalist institutions such as the World Bank,[17] anthropologists have shown that cultures are perspectives. This recognition of perspectivism is the prerequisite for what I like to refer to as meta-cultural awareness. One's own culture can no longer be taken for granted. One's dependence on it and resistance to changing it are lessened, because one can reflect back on it from the perspective of another culture that has its own positionality and logic and is evidently informing a viable, alternative way of life. To the extent that particular anthropologists can manage to take on a second cultural perspective, with the help of a particular set of professional tools designed to produce a thorough understanding of a second culture (and language), while simultaneously retaining their own native cultural perspective, they first of all suffer a fragmented sense of self. As I have discussed elsewhere,[18] this is not always a pleasant experience: It can be psychologically stressful, and can be unsettling because an individual has no means to resolve dissonance between two cultural perspectives at the level of their own social practice, except to switch codes as needed. Those who persist find, however, that it is a small price to pay. One gains a meta-cultural understanding of how culture shapes our understanding of the world and of the purpose of life, as well as informing the way in which we behave socially and ecologically. The result is a greater ability to examine one's own culture-informed behaviour without misguided attachment and without much fear that the world would collapse if a deep cultural change were to take place. Cultural ways of relating to diverse ecosystems (human ecologies) and of pursuing either sustainable or unsustainable livelihoods are learnt, and hence subject to reflection and change. Making such changes is a serious matter and must be considered very carefully, but it is not impossible.

We have a real chance today to consciously create a culture we can live by sustainably and humanely, and this is due to the meta-cultural awareness now spreading naturally.

Fortunately, such awareness is not restricted to anthropologists, though their professional approach does provide them with exceptional support for coping with this experience and for responding in a more constructive way. The experience itself, however, is becoming rather common in the wake of globalisation, as hundreds of millions of individuals are exposed to cross-cultural experiences through moving to different regions or countries, provided they also learn languages and socially engage. Many displaced persons find the experience threatening to their sense of self, triggered by a disruption of their cultural identity. The people around them, in their new location, may also feel threatened in their identity and invaded, particularly in a context of mass migration. At both ends, people receive little support, let alone professional training on how to learn and cope with unfamiliar worldviews or how to best live in heterogeneous communities. They may become susceptible to the pied piper call of populist parties, who exploit a rising fear of change and a rising fear at the lack of change in a crisis situation. Nonetheless, there is evidence that meta-cultural awareness is taking effect. My own research shows that there is a growing willingness to shift the very foundations of the world's cultures, which are often religious. Interfaith religious movements such as the World Parliament of Religions have been very actively promoting a transformation to social and ecological sustainability,[19] and mainstream religions are now following suit.[20] Countless individuals too, having seen a bit of the world, cannot help but conclude: we are free to decide to reinvent ourselves culturally. We can reconstruct the emerging layer of shared global culture to make it socially inclusive and sustainable, without threatening localised cultures but, rather, by recognising local knowledge as a tremendous resource and local ways of life as a wealth of human diversity that is beautiful as well as indispensable for matching the diversity of ecosystems around the world.

4. Conscious Socio-Economic Change in the Now: Meeting the demand for integrated social transformation and creating supply with a political process of open and inclusive communication

Once the torch of meta-cultural awareness is pointed at cultural practices, and particularly economics, an opening is created for real change at a practical level. This must begin with an assessment of the demand for change, followed by an assessment of possible solutions.

4.1. The Demand End of Sustainability Transformation

I have gone to considerable length to explain how social and ecological sustainability are inseparable, and it is at this point that the argument becomes important. From this perspective, we have a dual crisis with a common cause and similar solutions. The same strategy of unrestrained profit maximisation that drives escalating inequality also drives ecological destruction.

The social inequality crisis includes escalating disparities between rich and poor nations, as well as between rich and poor citizens of particular nations. At both levels, disparity has been growing rapidly, with some local variability. A 2016 report by Oxfam, drawing on information from the *Forbes Billionaires List and Credit Suisse Global Wealth Databook*, notes that today "eight men possess the same wealth as half the world's people."[21] Middle-class

people in affluent nations are not safe from these developments, as the brilliant research of Senator Elizabeth Warren has revealed with reference to the US case.[22] At the extremes of disadvantage, we find that some 795 million people went hungry in 2014.[23] At the extremes of affluence, the meaning of wealth is almost entirely disconnected from individual consumption needs, and becomes primarily a form of power. This concentration of power works to perpetuate and institutionalise inequality through overwhelming influence on national and international policies.

The ecological crisis has been much discussed in the media and academic literature, and also in the field of anthropology,[24] but even for experts it is hard to picture the full extent of the challenge. We all have heard of global warming, ocean acidification and sea level rise, all due to atmospheric carbon emissions; we read about the effects of other pollutants on land, water and living organisms (including nitrate, pesticides, herbicides, plastic, heavy metals, radioactive material, Nano materials and thousands of other harmful substances); and we have learnt about the impact of mechanical destruction (to build cities, roads, industrial plants, industrial farms) on forests and other ecosystems. The world population keeps growing, as does per capita consumption in many regions. Non-renewable resources are peaking, and renewable resources are extracted above their renewal rate. Biodiversity loss is now occurring at a rate that can only be described as catastrophic. According to the WWF 2014 *Living Planet Report*, we lost 52% of biodiversity between 1970 and 2010, a period during which the human population doubled.[25] Resources essential to sustaining the human population are also dwindling, with major water and food supply crises likely. Other ecological threats are less well known but equally serious, such as the fact that half of the life-supporting topsoil of the planet has been lost in the last 150 years.[26]

4.2. The Supply End of the Sustainability Transformation

This dual crisis has reached a critical state and its nature is systemic. On-going discussions around the UN's 2030 agenda in which the author has been involved show widespread consensus that implementation of the SDGs and related work programs of other agencies is likely to fail unless systemic synergies and trade-offs* are carefully considered and weighed up.[27] It will be a complex task to decide exactly what to do, locally, regionally and globally. The scientific community should contribute the best available evidence, but the decisions are not just factual. They involve values and interests and hence the process needs to be both rational and politically viable. The main political obstacle for a rapid and integrated response, in my view, is the lack of an effective process for achieving consensus and real commitment around mutually agreed multi-scalar crisis action plans.

Transformation to Sustainability (T2S) plans must be based on a clear understanding of the profound cultural change that will be required to meet the challenge, at both the production and consumption ends of the economy. Increasing product life, repair, reuse, upgrading, closed loop recycling, resource (rather than labour) taxes and a major redirection of investment flows are some of the key measures that need to be applied across the board.

* Biofuels for example may help meet renewable energy targets, but also threaten biodiversity (palm oil displacing rainforest) and food security (ethanol from maize).

Overall economic growth will only be possible in non-material consumption items or in specific areas, such as high value-added sustainable products. Labour will need to be reallocated from declining sectors to the sustainable economy. Available solutions must be implemented resolutely rather than blocked, as the *Desertec* project has been, which had promised a rapid transition to 100% renewable energy use.[*] Innovation will need to be targeted where solutions are not yet available. More broadly, however, there is a need to develop a new system-friendly and cooperative ethos, rather than a recklessly self-serving one, within the world economy by creating very strong incentives and sanctions to this effect. Profits may need to become less extravagant but more secure. Excessive per-capita material consumption may need to be curbed, but access to essential consumption items must become more secure. For investors and consumers alike, modesty and restraint will be more palatable when satisfaction of basic needs and expectations is guaranteed.

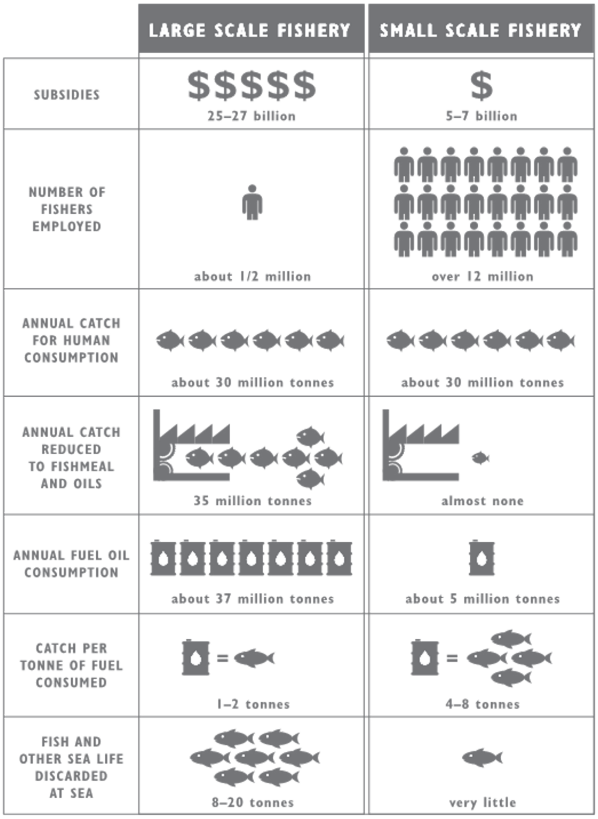
The transformative cultural change must be at a deeper level than usual. The prevailing assumption is that more technology will solve all problems, notwithstanding the fact that the entire dilemma we now face is due to inappropriate use of modern technologies. Regardless of this, the idea still persists that waves of innovation drive the business cycle, leading us onward and upward through ever-greater automation toward a fully mechanised, computer controlled technotopia. Five such 'Kondratiev waves' of innovation and economic transformation have been proposed:[28] The Industrial Revolution (1780-1848) to the Age of Railways and Steam Engines (1848-1873), the Age of Electrification and Heavy Engineering (1895-1940), the Age of Automobiles and Mass Production (1941-80) and The Age of Information & Communication Technology (1980+). The last wave, triggered by the ICT Revolution, according to the authors of a recent book, reached its peak in 2001 and is now in a downswing phase wherein returns on investment are dropping and demand for innovative new technologies is growing. These new technologies, the authors argue, will be focused on the sustainable economy.[29]

This continuing faith in a technology driven modernist vision of the future is dangerously flawed. It may be that ecological sustainability will be delivered in part by the efforts of innovators, entrepreneurs and investors, but there is much need to beware of the many unintended environmental and social consequences of new technologies. The high-tech, big industry perspective must be tempered by looking very carefully at what is already sustainable right now, or what was traditionally sustainable, whether this makes for a great investment opportunity or not. If we look it this way, we will rediscover the fact that very often 'small is beautiful,' as Ernst Schumacher already pointed out in the early 1970s.[30] A stunning contemporary example of this principle is the global fisheries industry, which is heavily subsidised to destroy biodiversity, create enormous waste, consume large quantities of fuel and threaten the livelihoods of 12 million small fishermen, even though the latter are much more efficient, have less diversity impact, use less fuel and produce less waste.[31] Similarly, local traditional food production tends to be more organic, diversified, sustainable and socially responsible on the whole.[32] These local, small scale economic solutions largely lie outside the frame of reference of contemporary debates about the future economy, and their benefits often

[*] http://www.desertec.org

escape standard measurements of economic performance that are focused on GDP rather than human well-being.

Figure 1: Small is Beautiful. Source: Daniel Pauly, University of British Columbia Fisheries Centre[*]



A fusion of sixth wave technology and small-scale diversified local solutions may also be possible. The Permaculture Movement is an example. Founders Bill Mollison and David Holmgren started developing ideas about stable agricultural systems in the Australian state of Tasmania in the late 1960s. They saw the dire consequences of rapidly growing industrial agriculture, its dependence on non-renewable resources, how it pollutes land and water, reduces biodiversity, and removes billions of tons of topsoil from once fertile landscapes. A new design approach called *permaculture* was their response, which combines technology and innovation with traditional organic farming methods.[33]

[*] Reprinted with permission

A cultural critique of the modernist and largely science-based method of technological problem solving is thus required, from a perspective of sustainability and social inclusion, along with a greater appreciation for local knowledge of sustainable living. This should be part of a wider self-critique within science of our over-reliance on fact-based intellectual analysis and simultaneous dismissal of the vital role of the values-based human faculty of imagination, which alone can guide us to a more just and sustainable future world. It matters not what science and technology can do, but what it ought to do, given the future condition we would like to create. We need a new values-based, visionary science for human and ecological well-being, not a new science of mass destruction

5. Toward a Shared Vision and Action Pathway: Leveraging the power of diversity through open dialogue

In order to meet the need for systemic, integrated T2S plans that will consider all human actions in their ecological context, we first must change the way we deal with one other, our own 'social ecology.' The political consensus we may arrive at in the end is a question that cannot be answered in advance; it is a social process and individual thinking cannot be a substitute for that. What we can and must ask in advance is how a shared commitment to sustainability that is socially just and inclusive can be achieved. What are the key 'social ecology' principles that would guide us toward such a political consensus?

The following is a preliminary list of some foundational principles that would need to be adopted by participants in conversations about T2S, if such conversations are to be effective in producing a workable consensus. Participants may nevertheless decide to develop and amend their guiding principles in the course of the conversation itself.

5.1. Presence, Acceptance and Openness

Presence is the conscious and honest acknowledgement of what is, of objective conditions at this moment, right now. It requires us to open up to the suchness of the moment and be mindful of dynamic flows of cause and effect from the past to the present and into the future. Conversation partners need to present also to one another, as genuine consensus and cooperative action are built on respect and mutual recognition. Conversations about specific private or local interests and associated conflicts are important, but must not cloud the view of systemic objectives.

5.2. Courage and Collective Responsibility

Full acceptance of the facts, at this time, is enough to inspire fear in any intelligent person and in society as a whole. Fear is an adaptive response to danger that must be matched with courage to inspire evasive action. Otherwise, archetypal ideas of an impending apocalypse will be fed by this fear and inspire a sense of powerlessness and apathy until in the end we are forced to default into a violent scramble for remaining resources in a depleted natural and social environment. Many in the scientific community say we already possess the technical tools today to address most aspects of the challenge, which should inspire us with enough confidence to take courage.

Courage is a key prerequisite for taking responsible action, but it needs to be matched with compassion. There is much cause for us all to look with empathy and compassion at all human beings and all other life, caught here with us, in this precarious moment. Compassion also reminds us that others too wish and deserve to be safe, and that the way forward is through solidarity and cooperation.

"Effective solutions often stem from the imaginations of people at the social margins who are not so invested in the prevailing order as to be blind to its failings."

5.3. Imagination

Taking responsibility for what we will create henceforth, in this Anthropocene age, opens the stage for imagination. Before we can commit to joint action, we must first engage in an act of collective imagining. Imagination is a distinguishing human capability, still poorly understood. It is the creative element in human consciousness that allows us to act not just upon the evidence of observable facts but to bring an imagined future to bear on the present, on the realm of action, thus enabling us to change the default trajectory of our world. Imaginaries of the future need to be openly debated and agreed upon to make this possible.

5.4. Respect for Diversity

The diversity of unique personal and social histories and associated diversity of personal and cultural knowledge is the greatest resource the world possesses. Ideally, if one person or culture was to discover an effective solution in a crisis, all would recognize the idea, enact it, and be saved from calamity. In reality, this does not happen because we do not fully appreciate and respect diversity. Openness to the ideas of others may receive much lip service, but what is needed is a way to ensure that conversations about a shared future vision and action pathways are actively freed of the corrosive effects of exclusion and domination.

Effective solutions often stem from the imaginations of people at the social margins who are not so invested in the prevailing order as to be blind to its failings.[34] Unfortunately, marginal people and their alternative knowledge tend to be ignored and excluded from important conversations and decision-making processes. Even in so-called free and open societies, marginal voices are often mistrusted and silenced by power holders. Knowledge and imagination are frequently distorted or colonised by power. Quite apart from the injustice of it all, such colonisation of knowledge and imagination leads directly to an impoverishment of public discourse and practice. We should not let this risk of distortion discourage us. Humans also have shown a tremendous capacity to share knowledge and values within cultures, and to engage in collective imagination and joint action. We are endowed with a unique ability to generalise knowledge and values through language-based communication, which has enabled unprecedented social cooperation and cultural development. Communication helps us achieve social unity, but unity must not be thought of as synonymous with sameness. Communication

is only meaningful between those who have different things to say. Conversations about a shared vision and collective action toward sustainability thus need to be convened by individuals who are aware of and committed to this final and most important principle, and thus will keep the centre of the conversation open and free of the effects of power.

The rational strength of communicative processes, the health of social systems and, likewise, the resilience of ecosystems, lie in a paradoxical state of unity in diversity. Respect for the value of diversity and commitment to open information flows are the psychological and social foundation for reaching a shared and truly rational (free knowledge exchange-based) understanding of how we can build a socially and ecologically sustainable future together.

Author contact information:
E-mail: treuter@unimelb.edu.au

Notes

1. Norbert Elias, *The Civilizing Process, Vol. 2; State Formation and Civilization* (Oxford: Blackwell, 1982).
2. Eduardo Viveiros de Castro, "Perspectival Anthropology and the Method of Controlled Equivocation," *Tipití: Journal of the Society for the Anthropology of Lowland South America* 2, no.1 (2004). http://digitalcommons.trinity.edu/tipiti/vol2/iss1/1.
3. Philippe Descola, *Par-delà nature et culture* (Paris: Gallimard, 2005).
4. "Ecological Footprint and Human Development Index, 1980-2011," *Global Footprint Network*. http://www.footprintnetwork.org/our-work/sustainable-development/.
5. Paul J. Crutzen and E.F. Stoermer, "The Anthropocene," *IGBP Newsletter* 41 (2000), 17–18.
6. Adam Smith, *The Theory of Moral Sentiments* (Cambridge and New York: Cambridge University Press, 2002 [1759], edited by Knud Haakonssen).
7. Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* (Chicago: University of Chicago Press, 1977 [1776]).
8. Georgii F. Gause, *The Struggle For Existence* (Baltimore: Williams & Wilkins, 1934).
9. Garrett Hardin, "The competitive exclusion principle," *Science* 131, no. 3409 (1960):1292–1297.
10. Michel Ferrari and Michelene Chi, "The nature of naive explanations of natural selection," *International Journal of Science Education* 20, no. 10 (1998):1231.
11. Max Weber, *The Protestant Ethic and The Spirit of Capitalism* (London: Penguin Books, 2002 [1905], translated by Peter Baehr and Gordon C. Wells).
12. Stephen Jay Gould, *The Mismeasure of Man* (New York: W. W. Norton, 1981).
13. Thomas Piketty, *Le Capital au XXIe siècle* (Paris: Éditions du Seuil, 2013).
14. Lauren Gensler, "Rising Income Inequality Is Throwing The Future Of Capitalism Into Question, Says World Economic Forum," *Forbes* 2017. www.forbes.com/sites/laurengensler/2017/01/11/world-economic-forum-income-inequality-capitalism/#274135505dd3.
15. Thomas A. Reuter, "Anthropological Theory and the Alleviation of Anthropogenic Climate Change: Understanding the Cultural causes of Systemic Change Resistance," *World Anthropology Network E-Journal* 5 (2010):5-27. http://www.ram-wan.net/documents/05_e_Journal/journal-5/2-reuter.pdf.
16. Marshall Sahlins, *Stone Age Economics* (Chicago: Aldine-Atherton, 1972).
17. Gustavo Lins Ribeiro, "Diversidad Étnica en el Planeta Banco: Cosmopolitismo y Transnacionalismo en el Banco Mundial," *Nueva Sociedad, Caracas* 178 (2002):70-88.
18. Thomas A. Reuter, "The Fragmented Self: Cross-cultural Difference, Conflict and the Lessons of Ethnographic Experience," *Paideuma* 52 (2006):220-232.
19. Thomas A. Reuter, "Faith in the Future: Climate Change at the World Parliament of Religions, Melbourne 2009." *The Australian Journal of Anthropology* 22, no. 2 (2011):260-65.

20. Thomas A. Reuter, "The Green Revolution in the World's Religions: Indonesian Examples in International Comparison," *Religions* 2015, no. 6:1217–1231. Special Issue, Religion and Ecology in the Anthropocene. http://www.mdpi.com/2077-1444/6/4/1217/pdf.
21. Melanie Kramers, "Eight people own same wealth as half the world," *Oxfam* 2017. http://www.oxfam.org.uk/media-centre/press-releases/2017/01/eight-people-own-same-wealth-as-half-the-world.
22. Elizabeth Warren, "The Middle Class on the Precipice: Rising financial risks for American families," *Harvard Magazine* 2006. http://harvardmagazine.com/2006/01/the-middle-class-on-the-html.
23. "The State of Food Insecurity in the World," *FAO* 2015. http://www.fao.org/3/a4ef2d16-70a7-460a-a9ac-2a65a533269a/i4646e.pdf.
24. Thomas A. Reuter, "In Response to a Global Environmental Crisis: How Anthropologists Are Contributing Toward Sustainability and Conservation,' in *Averting a Global Environmental Collapse: The Role of Anthropology and Local Knowledge*, ed. T. A. Reuter (London: Cambridge Scholars, 2015), 1-19.
25. "Living Planet Report 2014," *World Wildlife Fund (WWF)* 2014. https://www.worldwildlife.org/pages/living-planet-report-2014.
26. "Soil Erosion and Degradation." *WWF* 2017. http://www.worldwildlife.org/threats/soil-erosion-and-degradation.
27. Måns Nilsson et al., *A draft framework for understanding SDG interactions* (Paris: International Council for Science, 2016. http://www.icsu.org/publications/reports-and-reviews/working-paper-framework-for-understanding-sdg-interactions-2016/SDG-interactions-working-paper.pdf.
28. Joseph A. Schumpeter, *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle* (New Brunswick (N.J.): Transaction Books, 1983 [1934]). Originally published in German, 1911.
29. James Moody and Bianca Nogrady, *The Sixth Wave: How to succeed in a resource-limited world* (Sydney: Vintage Books, 2010).
30. Ernst F. Schumacher *Small is beautiful: Economics as if people mattered* (London, Blond and Briggs,1973).
31. David M. Braun, "World Governments Subsidize the Wrong Fisheries," *National Geographic Societ*y, 2008. http://voices.nationalgeographic.com/2008/08/26/fishing/.
32. Thomas A. Reuter, "The Struggle for Food Sovereignty: A Global Perspective," in *Averting a Global Environmental Collapse,* ed. T. A. Reuter (London: Cambridge Scholars, 2015), 127-147.
33. Bill Mollison and David Holmgren**,** *Permaculture One* (Sisters Creek, Australia: Tagari Publications, 1978).
34. Lars B. Jeppesen and Karim R. Lakhani, "Marginality and Problem-Solving Effectiveness in Broadcast Search," Organization Science 21, no. 5 (September 2010):1016-1033.

CADMUS, Volume 3, No.2, May 2017, 150-166

Greening Capitalism, Quietly:
Seven Types of Organizations Driving the "Necessary Revolution"

Michael Marien
Senior Principal, Security & Sustainability Guide;
Fellow, World Academy of Art & Science

Michael Sales
Principal, Security & Sustainability Guide;
Former Co-Chair, Society for Organizational Learning, North America

Executive Summary

In 2008, MIT's Peter Senge et al. wrote that the Industrial Age bubble was ending and that, especially due to climate change, a "Necessary Revolution" was needed to create a sustainable flourishing world in the decades ahead. Since then, many business organizations have moved toward sustainability to some degree, and many other organizations have emerged, mostly non-profits, to help business and/or prod them to pursue ethical strategies. This report explains how the revolution is unfolding, by briefly mapping some 150 organizations that are driving the greening of capitalism, and grouping them in several meaningful categories: Business-Led Groups, Ethical Groups, Broadened Accounting Groups, Certifying Organizations, Green Investing Groups, Sustainability Consultants, and Green Business Publishing. Each of these groups is important in facilitating the revolution, especially those promoting corporate social responsibility, broader accounting practices, certification, and green investing. Among groups that list their beginning, the median start-up date was 2003—thus a doubling in 13 years.

This revolution certainly appears to be well underway, leading to a contest between 21st Century Green (or Sustainable) Capitalism, valuing the triple bottom line of People/Planet/Profit to some degree vs. 20th Century Industrial Era Capitalism that adheres to a single bottom line and narrow accounting measures. But the revolution is a quiet one that is underappreciated, due to fragmentation and lack of leadership. Hopefully, if well-publicized and widely discussed, the January 2017 **Better Business, Better World** *report of the Business and Sustainable Development Commission, making a strong all-win business case for pursuing the UN's 17 Sustainable Development Goals, could provide a large boost to the necessary revolution. In turn, this could energize the larger system of more than 1500 sustainability-related organizations that are identified in the 329-page April 2017 Interim Draft of* **The Security & Sustainability Guide**. *We are not yet winning the struggle for sustainability in our era of great and intensifying uncertainty and danger. But with cities and responsible business taking the lead, and with more horizontal thinking that includes broad consideration of security issues, the necessary revolution can become more visible and thus accelerate.*

1. Introduction

In his thoughtful and important 2008 work, *The Necessary Revolution: Working Together to Create a Sustainable World,*[1] MIT's Peter Senge and four colleagues argued that the "extended bubble" of the Industrial Age is coming to an end, as concerns energy, food, wasted materials, growth measured as GDP, and societal organization and priorities. The only question, they conclude, is when and how, recognizing that collapse could occur rapidly. Reducing greenhouse emissions and creating a sustainable flourishing world for life beyond the Industrial Age in the decades ahead is "perhaps the greatest learning challenge humans have ever faced."

Senge, an expert on systems thinking,* management, and learning organizations, goes on to discuss how we got into our predicament, thinking together about the larger system, the business rationale for sustainability, getting people engaged, cross-sector collaborations, purposeful networking, innovation inspired by living systems, new strategic possibilities, the future of corporations and leadership and much more. Several dozen illustrative organizations are mentioned in passing, but the authors modestly note that "we are at the beginning of the beginning."[2]

Nearly a decade has passed since this inspiring work, and many business organizations have moved toward sustainability to some degree, and many other organizations, mostly non-profits, have emerged to help business and/or prod them to pursue ethical strategies. As Senge *et al.* note, "The watchdog role of countless NGOs is now a feature of the business landscape."[3]

The purpose of this report is to explain *how* the necessary revolution is unfolding, by briefly mapping a system of some 150 organizations that are driving the greening of capitalism, and to cluster them in several meaningful categories or sub-systems: Business-Led Groups, Ethical Groups, Broadened Accounting Groups, Certifying Organizations, Green Investing Groups, Sustainability Consultants, and Green Business Publishing. In short, business leaders are themselves pursuing the "necessary revolution," but there are many organizations driving them and supporting them. We believe that this important and positive development in a time of great uncertainty and danger is not adequately recognized, if at all. A broad mapping overview, even if necessarily imperfect, can enhance the understanding of this profound but quiet revolution, well under way, and hopefully speed it along.

Several caveats are needed. *First,* all of this information has been collected from organization websites. Some of the information may involve inflated promises or numbers; on the other hand, some information may be outdated and understated, in that organizations have added more staff or members, issued new and useful publications, and developed even more initiatives and alliances that seek to do good at a time when such is needed.

---

* Peter Senge, **The Fifth Discipline: The Art & Practice of the Learning Organization**. New York: Doubleday Currency, 1990; revised edition "with 100 new pages," 2006. The fifth discipline is systems thinking, which integrates the other disciplines of personal mastery of seeing reality, mental models of how to take action, building shared vision, and team learning for genuine thinking together. The cover of the 2006 paper edition claims "more than 1 million copies in print."

Second, the number of organizations covered here is constantly expanding. We hope that the most important players have been identified, but we have doubtlessly overlooked organizations that deserve to be listed. And, due to limited space, activities of organizations that are identified may not be fully represented.

Third, we apologize for the extensive name-dropping, which may assume mind-numbing proportions. But that is the point: to briefly illustrate the range and diversity of green organizations related to post-industrial-era business. If readers discover just one organization that closely fits their interest and needs, it will more than repay their investment in scanning this list. However, in many instances, there will be several organizations that deserve to be checked out by the readers. We have assigned an asterisk to organizations that seem to be more important, but this can easily be overridden by other considerations. We also include the date of founding, location of main offices, and number of staff if this information is provided on the website (in many instances it is not).

Fourth, this profusion of organizations makes a strong case that the greening of capitalism is underway, but not that green capitalism has arrived, nor will it fully arrive anytime soon. Unfortunately, many businesses have yet to make efforts related to sustainability, and many that have "gone green" have done so consciously or unconsciously in superficial ways. And many will not embrace greening, for a variety of reasons. And definitions of "green" and "sustainability" vary, while overlapping. Thinking "green" is generally narrower, suggesting energy efficiency and/or renewable energy sources, but can be broad, as in the "green growth" concept. "Sustainability" and "Sustainable Development" are generally broader, notably as articulated in the 17 UN Sustainable Development Goals. Overall, and most important, the many organizations embracing green and/or sustainable pathways point to an emerging bifurcation in the world of capitalism. The sooner this is seen and debated, the better.

2. Seven Types of Organizations

2.1. Business-Led Groups

There are a number of corporate-led groups that are well aware of emerging sustainability challenges and have been taking a leadership role in addressing these risks. Perhaps the two best-known groups are the ***World Business Council for Sustainable Development (WBCSD)*** (1992, Geneva) and the ***World Economic Forum*** (1971, Geneva; 400 staff). The WBCSD has 200 corporate members from 35 countries, and has issued an *Action 2020* platform and a *Vision 2050* best-case scenario. The WBCSD Chair is Paul Polman, CEO of Unilever, which initiated the Unilever Sustainable Living Plan in 2010, "to make sustainable living commonplace."

The World Economic Forum, much older and larger, is widely known for its annual January meeting of business and government leaders in Davos, but also issues many reports on such topics as sustainability, global risks, human capital, food security, the circular economy, health for all, and the water/food/energy nexus. The ***Business and Sustainable Development Commission*** (Jan 2016, London; 12 staff), launched in Davos by Paul Polman and Mark Malloch-Brown (former UN Deputy Secretary-General), makes the business case for a

new economy based on the UN's Sustainable Development Goals. Its outstanding "flagship report," **Better Business, Better World** (Jan 2017, 121p), offers a compelling growth strategy for business and the world economy, arguing that achieving the Global Goals will create more than 380 million new jobs by 2030, 70 million of them in affordable housing. *

Other similar groups are ***Ceres*** (1989, Boston), a very active coalition of 130 organizations to mobilize investor and business leaders for a sustainable world, the ***Corporate Eco-Forum*** (2008, 5 staff) for executives in 67 large corporations in 18 industries, the ***Responsible Business Forum on Sustainable Development*** (2012, Singapore) to build prosperity with economic, social, and natural capital, the ***American Sustainable Business Council*** (Washington; 12 staff) claiming >200,000 businesses and holding an annual Sustainable Business Summit, ***Business for Social Responsibility*** (1994, San Francisco; 100 staff in 8 offices) which networks >250 member companies, ***Environmental Entrepreneurs*** (2000, Washington) with 850 business leaders for sustainability, ***Sustainable America*** (Stamford CT, 5 staff) for entrepreneurial solutions, and ***Sustainable Value Creation*** (2008, Uxbridge UK) for sustainable business.

Small business is represented by the ***Business Alliance for Local Living Economies*** (Oakland CA) which claims 500,000 businesses supporting localist values and resilient communities, and the ***Climate Action Business Association*** (Boston, 6 staff), which helps small business leaders with climate action business plans. Focus on a specific industry is demonstrated by the ***Global Alliance for Action on Banking Values*** (2009, Zeist, Netherlands) assembling 27 banks for Principles of a Sustainable Banking Culture, and the ***Copenhagen Fashion Summit*** (2009, Denmark) which drew >1,200 participants to "the world's largest meeting on sustainability in fashion" and promotes new business models.

The impact of these various entities is not clear, and further research is needed. But the number of these associations and their ambitions is growing, presumably with at least some positive results.

2.2. Ethics-Driven Groups

Many groups explicitly stress ethics, responsibility or corporate social responsibility (CSR), and leadership and organizational ratings and performance reports reinforce these virtues. The best-known ethical driver is probably the ***UN Global Compact*** (2000, Geneva), which has 12,000 business signatories in 170 countries to 10 Principles regarding human rights, labor standards, environment, and corruption. The ***UN Global Compact Cities Programme*** (2003, Melbourne) encourages urban innovation and local businesses joining the Compact. Unfortunately, the Compact lacks any effective monitoring and compliance machinery.

Explicit mention of ethics is found in ***Ethical Corporation*** (London), which publishes a *State of Responsible Business Report,* Hazel Henderson's ***Ethical Markets Media*** (St.

* **Better Business, Better World**: The Report of the Business & Sustainable Development Commission (London, Jan 2017, 121p.), chaired by Lord Mark Malloch-Brown, asserts that achieving the SDGs opens up at least US$12 trillion of 60 market opportunities in four economic systems: Food/Agriculture (e.g. urban agriculture, sustainable aquaculture, micro-irrigation, land restoration, reduced food and packaging waste), Cities (e.g. affordable housing, energy-efficient buildings, public transport, smart metering, car sharing, municipal water leakage), Energy/Materials (e.g. circular models, renewables, energy efficiency/storage, CCS, green chemicals), and Health (risk pooling, telehealth, counterfeit drug detection, electronic records, healthcare training). Achieving these Global Goals would create >380 million new jobs by 2030.

Augustine FL), which publishes a *Green Transition Scoreboard* on swelling corporate investments and the *Ethical Money Directory* of 200 asset management firms, ***Ethical Trading Initiative*** (1998, London; 30 staff) promoting improved working conditions in global supply chains, and the ***Ethos Institute of Business and Social Responsibility*** (1998, Sao Paolo, Brazil), which pursues a CSR strategy for a fair and sustainable society.

Responsibility is the focus of the ***CSR360 Global Partner Network*** (1999, London) which claims 133 organizations from 64 countries reaching 6,000 companies, "to mobilize business for good." The ***CSRwire*** (1999, Northampton MA) offers books, reports, and press releases on corporate social responsibility. The *ICCR Corporate Examiner* is published 3 times/year by the ***Interfaith Center on Corporate Responsibility*** (1971, New York), which encourages "sustainable and just practices." Since 2002, the *Corporate Responsibility Index* has been compiled by ***Business in the Community: The Prince's Responsible Business Network*** (1982, London; 9 staff), to build "a fairer society and more sustainable future." ***Business Fights Poverty*** (2008, c/o Inspirus, London; 17 staff) promotes "responsible investing" to bring the SDGs into reality. The ***Center for International Environmental Law*** (1989, Washington; 15 staff) pursues legal levers for systemic change including "transboundary corporate accountability." ***Tomorrow's Company*** (1996, London; 15 staff) enables business to be "a force for good."

Leadership is emphasized by the ***Cambridge Institute for Sustainability Leadership*** (1989, Cambridge University; 132 staff), which offers executive education and graduate degree programs and promotes business action, and the ***IMD Global Center for Sustainable Leadership*** (1990, Lausanne, Switzerland), developing leaders to create best practices for future sustainability institutions and supply chains. And many individual business school professors, such as Sandra Waddock of Boston College, are promoting corporate responsibility and sustainability leadership. The ***Center for Environmental Leadership in Business***, one of three major programs at ***Conservation International*** (1987, Arlington VA; 900 staff in 30 offices), works with corporate partners to improve industry responsibility in mining and energy, promote sustainable sourcing, and invest in conservation innovations. Individual companies touting their leadership include ***LafargeHolcim*** (115,000 staff in 90 countries), "a new leader for a new world" of building materials for sustainable development, and ***Acciona*** (1997, Madrid; 33,000 staff in >30 countries) a Spanish conglomerate aspiring to leading in renewable energy, and sustainable water and infrastructure.

Ratings of business organizations are provided by the ***Dow Jones Sustainability Index*** (1999, New York), which evaluates sustainability performance of 2,500 large companies in 24 industry groups. ***Insight 360*** (7 staff) provides a dashboard for >8000 companies showing rank in sector and performance on sustainability and ESG (environmental/social/governance) factors. The *Global Cleantech 100* list of top companies is issued by the ***Cleantech Group*** (2002, Oakland and London; 14 staff) which seeks to accelerate sustainability innovation and help corporations and investors. ***GameChangers 500*** (2013, San Francisco) ranks the world's "top for-benefit companies." The ***Global Initiative for Sustainability Ratings*** (2011, Washington), sponsored by Ceres and the Tellus Institute, rates the raters of corporate sustainability activism and engagement, and seeks a single standard. Standards are

also developed by the ***Global Reporting Initiative*** (1997, Amsterdam) which issues *Sustainability Reporting Guidelines* for corporate sustainability reports; their *GRI Sustainability Disclosure Database* has 37,000 reports for >10,000 companies.

Ethics, responsibility, leadership, and sustainability are not necessarily defined in the same way, but the similarities in definitions may well outweigh the differences. This area, too, requires further research. Listings of the bad actors, past and present (e.g. Koch Industries), do not appear to be nearly as prevalent, but would also be helpful.

2.3. Broadened Accounting

The traditional image of accounting as dull number-crunching is quickly fading. As argued by Jane Gleeson-White in **Six Capitals, or Can Accountants Save the Planet? Rethinking Capitalism for the 21st Century**,[4] the "language of business" is increasingly learning to speak in multiple tongues reflecting the "triple bottom line." Modern corporate accounting, she argues, should assess the condition of six states of capital: traditional financial assets, physical assets, intellectual (idea) capital, human capital (well-being and engagement of staff), social capital (relationships with various communities), and natural capital.

Various groups are working to establish this broader picture. In addition to **GRI,** mentioned above, the ***Sustainable Accounting Standards Board*** (2011, San Francisco; 26 staff), chaired by Michael Bloomberg, is developing standards for more than 80 industries. ***The International Integrated Reporting Council*** (2012, London) encourages business to "think holistically" about sustainable development and value creation over time. ***Ceres*** (1989, Boston; 65 staff), a coalition of >130 organizations, advocates accounting standards that abolish the concept of free pollution and accelerates policies that reward sustainability performance. Ceres serves as a linking node between some of these organizations. ***Measure What Matters***, a three-year program led by the Green Economy Coalition (2012) of 150 global leaders, seeks to align global, national, and business indicators, to measure success beyond profit alone to include human well-being and health of the planet, proclaiming that "a data revolution is underway." ***GIST Advisory*** (2004, Mumbai; 6 staff), the Green Indian State Trust, offers sustainability consulting and encourages green accounting for Indian states. ***Accounting for Sustainability*** (2004, London; 11 staff), set up by HRH The Prince of Wales, convenes senior finance leaders to shift toward a sustainable economy and resilient business models. The ***Climate Disclosure Standards Board*** (2007, London; 8 staff), catalyzed by the World Economic Forum, supports a framework for business information in corporate reports. The ***American Carbon Registry*** (1996, Winrock International, Arlington VA) provides tools for greenhouse gas reporting and promoting carbon offsets. The ***Carbon Disclosure Project*** (2000, London; 34 major staff) seeks to "transform the way the world does business," working with corporations and investors to disclose greenhouse gases and water usage.

Complementing these efforts for a broader view, several other groups have a specific focus on natural resources. The ***Natural Capital Finance Alliance*** (Oct 2016) of >90 institutions, sponsored by the UNEP Finance Initiative and the Global Canopy Alliance, builds on the Natural Capital Declaration of the Rio+20 summit and encourages consideration of natural

capital in loans, equity, and accounting and disclosure frameworks. The ***Natural Capital Coalition*** (2012, Amsterdam) seeks standardized accounting for business using their Natural Capital Protocol. ***Wealth Accounting and Valuation of Ecosystem Services*** or WAVES (2010, World Bank Group) is a coalition to promote Natural Resources Accounting for sustainable development. ***Trucost*** (2003, London/NYC/Paris/Hong Kong) helps companies and investors to understand the economic consequences of natural capital dependency and issues a stranded assets report. ***Sustainable World Initiative*** (2008, Washington) promotes natural resource accounting and managing ecological footprints. Ecological footprint accounting tools have been highly developed by the ***Global Footprint Network*** (2003, Oakland CA and Geneva; 47 staff), founded by Mathis Wackernagel.

These efforts to broaden accounting, even though they appear to have some differences, are important steps in reforming economic thinking that is appropriate to the 21st century. Criticism of the Gross National Product measure of economic progress has been made by numerous observers over several decades,* with little or no impact. One reason for this failure, despite increasing obsolescence of the GNP, is that the measure is deeply entrenched in economic thinking and not easily displaced or even supplemented by a more accurate and appropriate measure such as the Genuine Progress Indicator. Secondly, the critics of GNP are fragmented and largely non-activist academics, whereas organizations promoting broadened accounting are activists, and more prone to forming alliances. Thirdly, reforming business accounting, especially as concerns natural resources, can be a significant bottom-up step toward reforming systems of national accounts, as suggested by the Measure What Matters program, which seeks to align global, national, and business indicators.

2.4. Certifying Organizations

The internet, trade, and global travel are frequently cited as forces for globalization. Certifying organizations seeking global, regional, or national standardization of best practices are another driver, albeit a quiet one. The ***International Organization for Standards*** (1947, Geneva; 135 staff), comprising 163 national standards bodies, has issued many ISO standards, including Environmental Management, Energy Management, Risk Management, Food Safety, Information Security, and Social Responsibility.

But the world of global certification is far broader, as reflected by the ***ISEAL Alliance*** (2002, London; 25 staff), the International Social and Environmental Accreditation and Labelling Alliance of 19 standard-setting organizations and certifying systems, to distinguish and promote credible sustainable standards for products and services. ISEAL publishes an Annual Report, and sponsors Codes of Good Practice and the ISEAL Credibility Principles. Six ISEAL members have formed the ***Global Living Wage Coalition*** (2013), partnering with the UN Global Compact, to improve wage levels in certified supply chains. GLWC includes ***Social Accountability International*** (1997, New York), which issues the SA8000 Standard for decent work, used in 3,500 certified factories in 72 countries and 65 industrial sectors. SAI promotes its Social Fingerprint rating system for companies and supply chains.

* Michael Marien, "New and Appropriate Economics for the 21st Century: A Survey of Critical Books, 1978-2013," CADMUS, 1:5, October 2012, pp.86-102, covering 118 books in six categories. Available online from www.cadmusjournal.org.

Other specialized organizations certifying for sustainability and human rights:

- EXTRACTIVE RESOURCES: ***Extractive Industries Transparency Initiative*** (2002, Oslo) claims to be the leading global standard for extractive resource wealth as a key engine for sustainable growth and reduced poverty. See *EITI Standard Progress Report 2015.*
- DIAMONDS: ***Kimberley Process Certification Scheme*** (2002) involves 54 participants from 81 countries certifying conflict-free diamonds that do not finance rebel movements.
- SEAFOOD: ***Marine Stewardship Council*** (1996, London + 18 offices) certifies responsibly caught fish with the blue MSC label; it now covers 281 fisheries with almost 10% of the global seafood catch, plus 97 others being assessed.
- FORESTS: The ***Sustainable Forestry Initiative*** (1994, Washington & Ottawa; 18 staff) promotes the FSI Forest Certification Standard, Chain of Custody Standard, and Certified Sourcing labels. ***Forest Stewardship Council International*** (2003, Bonn) provides FSC Certification and publishes a 32-page *2015-2020 Global Strategic Plan*. ***Programme for the Endorsement of Forest Certification*** (1999, Geneva) is an umbrella organization of 35 national forest certification systems for small forest owners.
- AGRICULTURE: ***IFOAM – Organics International*** (1972, Bonn), The International Federation of Organic Agriculture Movements, has some 800 affiliates in >100 countries and sponsors the Organic Guarantee System to certify organic labels. ***UTZ: Better Farming Better Future*** (1999, Amsterdam) certifies sustainable cultivation of coffee, tea, and cocoa, covering >1 million farmers and farm workers in 36 countries. ***Animal Welfare Approved*** (2013? Marion VA; 29 staff) certifies family farms with high welfare methods. ***The Roundtable on Sustainable Palm Oil*** (2004, Kuala Lumpur) offers RSPO certification of sustainability claims based on RSPO Principles and Criteria. Similarly, ***The Roundtable on Renewable Soy*** (2006, Buenos Aires) offers certification based on the RTRS Standard.
- FAIR TRADE: ***Fairtrade International*** (1997, Bonn; c70 staff), formerly Fairtrade International Labelling Organization, sponsors the FLOCERT certifying organization to reduce poverty and increase sustainable development. The ***World Fair Trade Organization*** (1989, Amsterdam) promotes the Fair Trade Guarantee System and 10 Fair Trade Principles.
- PRODUCTS: ***Cradle to Cradle Products Innovation Institute*** (2010, San Francisco) has a Product Standards Guide and products registry for 2,500 products. ***McDonough Braungart Design Chemistry*** (1999, Charlottesville VA) provides "cradle to cradle" certification for sustainability companies. ***GoodWeave*** (1986, Washington) sponsors Child-Labor-Free Certification for the carpet industry and the GoodWeave standard of no forced or bonded labor.
- WASTE: ***The Zero Waste Business Council*** (2011, Corona del Mar CA; 4 staff) provides facility certification.

- PROFESSIONALS: ***The International Society of Sustainability Professionals*** (2007, Portland OR) certifies core competencies for individuals and has 1000 members in 10 chapters. ***The Association of Climate Change Officers*** (2008, Washington) began a CCO Certification program in 2015 to advance professional skills in public and private sectors worldwide. ***Chartered Institution of Water and Environmental Management*** (1987, London) provides training and academic accreditation.
- CORPORATIONS: ***B Lab*** (2006, Wayne PA), promoting Business as a Source for Good, has certified 2140 beneficial "B-Corps" in 50 countries and 130 industries as of May 2017.

Some of these certifying organizations are larger and better established than others, but, considered together, they represent a powerful non-governmental governance force for sustainability, conservation, and human rights.

2.5. Green Investing

Three broad indicator clusters suggest the robust turn toward green or sustainability investing, arguably the most potent of the seven groups of organizations surveyed here, because it is based not only on ethics but on increasingly strong economic arguments. First, the ***Sustainable Stock Exchanges Initiative*** (2009), facilitated by the UN Global Compact, UNCTAD, UNEP Finance Initiative, and Principles for Responsible Investment, now has 60 partner exchanges on board to promote sustainable business practices and responsible investment. Their "flagship event" is the bi-annual SSE Global Dialogue. The ***UN Environment Programme Finance Initiative*** (1992, Geneva) seeks systemic change in banking, insurance, investment practice, real estate finance, and valuing ecosystem services. ***Principles for Responsible Investment*** (2006, London) claims to be the "world's leading proponent of responsible investment," and offers online training via the PRI Academy and transparency reports of asset owners and investment managers.

Second, based on corporate reports, the *Green Transition Scoreboard* (April 2017, 37p), published annually by Hazel Henderson's ***Ethical Markets Media**, calculates $8.13 trillion in non-government green investments and commitments since 2007, divided in five categories: Renewable Energy ($3.43 trillion), Energy Efficiency ($1.75 trillion), Life Systems such as water and waste management ($1.66 trillion), Green Construction ($0.92 trillion), and Corporate Green R&D powered by the auto industry ($0.38 trillion). Extrapolating this upward trend, the *Scoreboard* sees private investors "on track to reach $10 trillion in green sector investments by 2020." EMM, a Certified B-Corporation, has also published *Ethical Markets Directory* (2016), with 200 brief entries describing green asset managers, investment advisors, banks, consultants, and NGOs.

A third indicator is provided by the ***Morgan Stanley Institute for Sustainable Investing*** (2013, New York), which notes that "sustainable investments have more than doubled since 2012," while "divestment in fossil fuels reached c.$3.4 trillion globally in 2016" (likely prodded by the ***Divest-Invest Philanthropy*** of >500 organizations). Joining with Bloomberg

LP, MSISI recently conducted a survey of 402 asset management professionals, concluding that "sustainable investing has entered the mainstream," with two-thirds of asset managers practicing sustainable investing and believing that its adoption will grow.* The report also cites a survey from ***US SIF: The Forum for Sustainable and Responsible Investment*** (Washington, 7 staff), finding that professionally managed US assets utilizing sustainable investment criteria grew from $3.7 trillion in 2010 to $8.7 trillion at the start of 2016. The US SIF is part of the six-member ***Global Sustainable Investment Alliance***, which seeks "to deepen the impact and visibility of sustainable investment organizations at the global level".

Some of the larger and more interesting investment organizations include the following:

- ***Breakthrough Energy Ventures*** (2016) of 20 mega-rich investors such as Bill Gates and Jack Ma forming a billion-dollar investment fund to transform energy R&D and "the landscape of innovation" in electricity, agriculture, manufacturing, and buildings.
- ***Carbon Tracker Initiative*** (2010? London; 20 staff) where financial specialists make "carbon investment risk real" with reports on the carbon bubble, stranded assets, etc.
- ***Climate Bonds Initiative*** (2012, London), an investor-focused non-profit to mobilize the $100 trillion bond market for climate solutions.
- ***De Tao Group*** (2014, Shanghai and Beijing), a think tank sponsoring the De Tao Institute of Green Investment and a Master Academy for future new energy.
- ***Generate Capital*** (San Francisco; 11 staff), "The Capital Partner for the Resource Revolution" of renewable energy, food, water, and materials, which has lined up $500 million for sustainable infrastructure projects in two years.
- ***Generation Investment Management LLP*** (2004, London & New York), co-founded by Al Gore and David Blood to advance "sustainability investing for the long term." The non-profit ***Generation Foundation*** (2015) seeks to mobilize asset owners and investors around the business case for Sustainable Capitalism, and supports the Sustainable Accounting Standards Board and the International Integrated Reporting Council.
- ***Insight 360*** (San Francisco, 7 staff), "Sustainability Meets Big Data," with the Insight 360 app to analyze sustainability performance and ESG factors (environmental/social/governance) of >8,000 companies for investment experts.
- ***Investor Network on Climate Risk*** (2003, Boston), a Ceres initiative of 110 institutional investors representing >$13 trillion in assets to promote sustainable leadership, parallel to the ***Institutional Investors Group on Climate Change*** (2005, London; 5 staff).
- ***RobecoSAM*** (1995, Zurich +4 offices), "We Are Sustainability Investing" for an increasingly resource-constrained world; it assesses 3,400 companies and partners with Dow Jones in *Sustainability Yearbook 2016,* listing leaders in 59 industries.
- ***Trucost*** (London, New York, Paris, Hong Kong), helping companies and investors to understand impacts of natural capital dependency and stranded assets.

* Morgan Stanley Institute for Sustainable Investing, **Sustainability Signals**: The Asset Manager Perspective, Nov 2016, 20p.

- ***We Mean Business Coalition*** (2015), assembling 677 companies and investors as of Dec 2016 to "create a low-carbon revolution."

Other investing-related organizations deserving mention include ***Asset Owners Disclosure Project*** (2012, London) to protect owners against climate risks by improving disclosure, ***Association for Sustainable and Responsible Investment in Asia*** (2002, Hong Kong) to promote corporate responsibility, ***Billion Dollar Green Challenge*** (2011, New York) to encourage universities and other nonprofits to invest in energy efficiency, ***Capital Institute*** (2010, Greenwich CT, 7 staff) which publishes *Guide to Investing in a Regenerative Economy* for pension funds, ***Clean Path Ventures LLC*** (1987, San Francisco) investing in solar PV projects, ***European Sustainable Investment Forum*** (2003, Brussels) to champion sustainability in European financial markets, ***Global Investor Coalition on Climate Change*** (2014?) with four regional groups in Europe, North America, Asia, and Australia/NZ, ***Green Alpha Advisors*** (2007, Boulder CO; 6 staff) to invest in the "inevitable economic/technological transition to sustainability," ***Green America*** (1982, Washington; 50 staff) publishing the *National Green Pages* and a guide to socially responsible investing, ***Green Century Funds*** (1990, Boston) owned by environmental non-profits to promote fossil-fuel-free investing, ***Kleiner Perkins Caufield Byers*** (1972, Palo Alto CA) investing "heavily in green start-ups" and "world-changing ideas" with Al Gore on the Board; ***Marion Institute*** (1993, Marion MA; 12 staff) to incubate "Serendipity Projects" in sustainability and social justice, ***Omidyar Network*** (2004, Redwood City CA; c.100 staff) for "philanthropic investment" and global innovation, ***Pegasus Capital Advisors*** (1995, Greenwich CT; 20 staff) applying Environmental/Social/Governance leadership principles, and ***SRI World Group*** (1999, Brattleboro VT; formerly ***Social Funds***), "the largest personal finance site devoted to social responsibility investing", with >10,000 pages of information.

Surely there are many more similar groups that could be added to the above listings, motivated by ethics and/or the increasingly compelling "business case" for green investing in companies. In turn, mention should also be made of individual company investing. Perhaps the most notable example is Elon Musk's ***Tesla***, which seeks to "accelerate the world's transition to sustainable energy through affordable electric vehicles and renewable energy generation and storage." To this end, its "Gigafactory" near Reno, Nevada, began mass production of lithium-ion battery cells in January 2017; full production is expected by 2018 in what they claim will be "the biggest building in the world."

2.6. Green Consulting

In addition to investment advisors, green consultants large and small offer their services to companies, cities, and other public and private entities.

Large groups include the ****Carbon Disclosure Project*** (2000, London + 14 offices; 34 major staff) with consulting services such as corporate footprints to promote sustainable business, products and cities, ***Ecology and Environment Inc.*** (1970, Lancaster NY + 50 offices) consulting on environmental management, ***Environmental Resources Management*** (1971, London; 5,000 staff in 160 offices) claiming "world's leading sustainability consultancy,"

Gerding Edlen (1996, Portland OR) consultants on green development, transformational buildings, and Principles of Place, ***GlobeScan*** (1987, Toronto + 5 offices) providing evidence-based strategy consulting" and Sustain/Ability Survey of challenges and opportunities, and ***Natural Step*** (1989, Stockholm + 10 offices) helping business and communities to accelerate transition to sustainable society and future-fit business.

Smaller organizations include ***Clean Energy Solutions*** (Boston; 4 staff) on energy efficiency and local energy alliances, ***Common Current*** (San Anselmo CA; 2 staff) on urban sustainability for government/business/non-profits, ***ENEA Consulting*** (2007, Paris & Melbourne; 22 staff) on actors in the energy value chain, ***Global Climate Adaptation Partnership*** (Oxford UK, 9 staff) on local adaptation approaches, ***Green Guru Network*** (2010, Hastings-on-Hudson NY) to share sustainability ideas in the Hudson Valley, ***International Synergies*** (2005, Birmingham UK) on industrial ecology solutions for the circular economy and zero waste, ***Natural Capitalism Solutions*** (Longmont CO, 9 staff); headed by Hunter Lovins, formerly of Rocky Mountain Institute) on the business case and tools for regenerative solutions, ***Natural Marketing Institute*** (1990, Harleysville PA) consulting on wellness and sustainability, ***Strategic Sustainability Consulting*** (2005, Lynchburg VA, 10 staff), and ***Sustainable Solutions Corporation*** (Royersford PA, 10 staff) consulting on sustainable buildings and corporate sustainability.

Special mention should be made of ***SustainAbility*** (1987, London/New York/San Francisco; 21 staff) to define the role of business in the sustainable development agenda. It was co-founded by John Elkington, who originated the "Triple Bottom Line" concept of People/Planet/Profit in 1994. Elkington is now "Chairman and Chief Pollinator" of ***Volans*** (2008, London; 4 staff) to help leaders to systemic solutions and breakthrough business models in collaboration with the UN Global Compact, "for sustainable growth in an exponential world."

2.7. Green Business Publishers

Similar to the wide variety of green consultants, large and small, green business publishers offer a broad range of books, journals, reports, and newsletters.

The newly-formed and aggressive ***Business and Sustainable Development Commission*** (Jan 2016, London; 12 staff) published a January 2017 "flagship" global report on accelerating the shift to a sustainable economy (see footnote on page 4). Two recent downloadable reports suggest the thinking that they are promoting: *Breakthrough Business Models: Exponentially More Social, Lean, Integrated and Circular* (Sept 2016, 39p), co-authored by John Elkington of ***Volans***, and *Valuing the SDG Prize in Food and Agriculture: Unlocking Business Opportunities to Accelerate Sustainable and Inclusive Growth* (Oct 2016, 47p).

****Cleantech Group*** (2002, Oakland & London; 14 staff), which seeks to accelerate sustainability innovation, provides a free bi-weekly *Cleantech Newsletter* on key trends, companies, and people in sustainability innovation and investment, *CTG Insights* bi-monthly report on the global innovation community, a *Quarterly Investment Monitor,* specialized intelligence briefs, and an annual *Global Cleantech 100* list of promising companies. ***Eco-Business*** (2014, Singapore; 18 staff) is a media company serving Asia Pacific's cleantech, smart cities,

responsible business, and sustainable development communities. ***Environmental Business International*** (1988, San Diego) has produced some 20 market research reports and publishes a free weekly newsletter, *Environmental Business Journal* (1988, monthly; $995 individual sub) providing strategic information in 14 business segments, and *Climate Change Business Journal* (2007, quarterly; $495 individual sub) for firms providing services or technology, and investors in renewable energy, energy storage, green buildings, carbon markets, or consulting. ***GreenBiz Group** (1991, Oakland CA; 20 staff headed by Joel Makower) offers videos, *GreenBuzz* daily newsletter, *VERGE* weekly newsletter, various reports, monthly surveys of the 3000-member GreenBiz Intelligence Panel, a *State of the Profession* report for sustainability executives, and an annual *State of Green Business Report* on the circular economy, green infrastructure, and corporate practices. ***Sustainable Brands*** (2006, San Francisco; 27 staff), produced by Sustainable Life Media, provides six newsletters, videos, and complimentary downloads of reports such as *22 Research Studies Proving the ROI of Sustainability.*

Greenleaf Publishing** (1992, Saltaire UK) issues a wide variety of books on sustainability, and journals such as *Journal of Corporate Citizenship* (2001, quarterly), *Building Sustainable Legacies* (2013, 3/year) on societal value co-creation, and *Business, Peace, and Sustainable Development* (2013, 2/year) on reducing violence as part of business strategy. The giant academic publisher ***Springer (1842, Berlin) issues the *International Journal of Corporate Social Responsibility,* on CSR, sustainability, ethics, and governance, charging a $980 "article processing fee" for authors! ***CSRwire*** (1999, Northampton MA) is a media platform for news and views on corporate social responsibility, with books, reports, and press releases. ***Triple Pundit*** (San Francisco; 6 staff) reports on the "triple bottom line" of People/Planet/Profit with a daily and weekly newsletter. ***Ethical Markets Media*** (St. Augustine FL, headed by Hazel Henderson) publishes the annual *Green Transition Scoreboard* of burgeoning green investments by the private sector, and the *Ethical Money Directory* of some 200 asset management firms, investment advisors, consultants, and relevant NGOs and banks.

As with each of the sub-systems we have identified, our inventory of Green Publishing is incomplete. In addition to organizations focused on publishing, there are many think tanks and action groups (e.g. OECD, IUCN, United Nations) that publish books, reports, pamphlets, factsheets, and newsletters on sustainability-related topics, as identified in *The Security & Sustainability Guide.* Unfortunately, there is no detailed consumer guide to where to get the best information on what topics, including the greening of business. At this point, we can only provide a listing of relevant organizations, with tentative suggestions as to which information sources may be most deserving of attention.

3. Lessons Learned and Questions Raised

1. The Necessary Revolution is Underway. It certainly appears that the revolution is no longer at "the beginning of the beginning." But whether it is at the middle of the beginning or somewhere beyond is difficult to estimate. And, due to recent political developments favoring "retro regimes," especially in the US, the revolution may be reversed to some degree, before continuing.

But the quiet trend to more and bigger groups seems sure to continue. As a rough measure, of the 150 groups noted here (several are mentioned more than once), 108 of them posted a founding date, with median start-up in 2003, thus a doubling in 13 years.

A proclaimed "data revolution" is underway led by the UN Sustainable Development Goals and the Measure What Matters program of the Green Economy Coalition, so better indicators should be available in the next few years, not only of how far we have come, but how far we have yet to go to meet the 17 SDGs, and whether greening companies are a small part of the capitalist world, say 5-10%, a large minority, or a majority. The Jan 2017 **Better Business, Better World** report (see footnote on page 4), building on the Global Goals, could go a long way in boosting the necessary revolution.

2. The Two Capitalisms. It may still be too early to note a contest between two forms of capitalism: the 21st Century Green (or Sustainable) Capitalism, valuing the triple bottom line of People/Planet/Profit and seeking to act responsibly, vs. the 20th Century Industrial-Era Capitalism that adheres to a single bottom line of maximum profit, often at any cost, and satisfying only stockholders. It is increasingly inappropriate to view capitalism and multinationals as one large monolithic entity. At some point, perhaps soon, Green Capitalism will be seen as a separate phase, and not an oxymoron, to be contrasted with Industrial-Era Capitalism. This could well be hastened by the new regime in the United States, with its nationalistic "America First" stance that could lead to ruinous trade wars (or worse), and should invite embrace of a green alternative in response. Serious debates are needed as to which option best serves American and global interests.

3. But Why is the Revolution So Quiet? Several reasons can be offered as to why Green Capitalism has yet to emerge as a truly viable, science-based, and attractive alternative. First, development of the Necessary Revolution has been gradual, similar to global warming and other environmental insults. Second, and probably most important, fragmentation and competition in the Green Capitalist system is profound, as illustrated by the many different organizations identified here, most of which have little or nothing to do with each other. There are few visible leaders, such as Al Gore, who tries to make the business case for "Sustainable Capitalism" through the Generation Foundation. Thirdly, the Green Capitalist system, as sketched here, is composed not only of individual companies, NGOs, and Global Action Networks.* Rather, it also includes components of the UN (notably the UN Global Compact, the UNEP Finance Initiative, and the UN-inspired Sustainable Stock Exchanges Initiative), for-profit consultants, and green investment advisors and publishers. All of these organization types are essential to understanding and driving the unfolding Necessary Revolution.

4. The Larger Context of Finance. A remarkable report on the "quiet revolution" in the global financial system was published in October 2015 by UNEP Inquiry: Design for a Sustainable Finance System (2014, Geneva; http://unepinquiry.org/). **The Financial**

* Steve Waddell, **Global Action Networks: Creating Our Future Together**. New York: Palgrave Macmillan, 2011. GANS are seen as a "critical organizing innovation," in that they involve multi-stakeholder networks of people in government, business, and NGOs of all sizes who seek a sustainable globalization that works for all. Also see Steve Waddell, **Change for the Audacious: A Doer's Guide**. Large Systems Change for a Flourishing Future. Boston: Networking Action Publishing, 2016. See Chapter 6 on "Creating Societal Change Systems" and Chapter 9 on systems mapping and learning.

"We cannot have sustainability without security, nor security without sustainability."

System We Need: From Momentum to Transformation seeks to align the public and private financial system with sustainable development by advancing national and international efforts to shape "an inclusive green economy." An updated report was issued in October 2016 (Full Report, 87p; Summary, 17p), finding that "*The last year has seen an acceleration in the quiet revolution's momentum across the financial system*" (italics added), incorporating aspects of sustainable development into financial system design and practice across three interlocking pathways of change: market leadership, national action, and international cooperation. Nevertheless, "today's momentum remains inadequate to deliver the transformation needed to finance sustainable development (in that) natural capital continues to decline precipitously, alongside growing social inequality and unrest." Moreover, "sustainable financial flows and stocks remain marginal to the deployment of capital, worldwide. The financial system remains disconnected from the long-term needs of the real economy." Although the UNEP Inquiry report is largely concerned with public policy and regulation, the business sector is an important aspect, as concerns co-evolution of market leadership and policy, market leadership as exemplified by green bonds, and public finance to mobilize private capital for sustainable development.

5. The Larger Context of Sustainability Organizations. The Green Capitalist "system," however defined, is only a small part of a larger system of more than a thousand sustainability organizations, most of them international, as identified in *The Security & Sustainability Guide.* These organizations are devoted to such topics as climate change, energy, public finance, food and agriculture, forests, oceans, population, biodiversity, water, cities, etc. And, in turn, this "sustainability system" increasingly overlaps the broad system of security organizations (including human security, peace, terrorism, corruption, migration, cyber-security, and arms control), in that we cannot have sustainability without security, nor security without sustainability. These two large and overlapping domains could form a Global Action Network that puts the growing inter-penetration of security and sustainability concerns at the center of all corporate and government strategic planning. However, those engaged in all domains of security have acknowledged that climate change is a "threat multiplier," whereas those engaged in promoting sustainability are virtually silent on security as a trend and driver of its context, and have yet to recognize that sustainability seen as a national and global security issue would advance their interests.

6. So, Are We Winning the Struggle for Sustainability? Probably not. It seems difficult to grasp the simple paradox of "improvement but growing inadequacy," but this seems to be the proper assessment at this moment. As argued by environmental critic Peter Dauvergne:

> "most multinational corporations have become more proactive in managing critics, avoiding obvious greenwash, and instead partnering with NGOs, offering eco-products and sponsoring third-party certification of production processes

> and consumer products…(which) can make it seem as if rapid progress is now being made toward global sustainability. However, the efficiency gains of eco-business are largely lost as firms reinvest energy and cost savings to stimulate even more unsustainable growth and consumption—a rebound effect that's at the heart of the failure of environmentalism of the rich to slow the escalating global sustainability crisis."[5]

"Fragmentation of knowledge and advocacy will continue to seriously inhibit progress toward sustainability and human well-being."

Dauvergne advocates "an energetic, critical questioning of the slight-of-hand illusions of sustainable development, corporate social responsibility, business-NGO partnerships, and market solutions."[6] Corporations now have two games to play, and must decide how much to devote to each road. Ongoing criticism and prodding is thus important, but should not foreclose the possibilities of serious and sincere progress on many fronts. But even if climate change is confined to the goal of less than $2^{O}C$, which seems unlikely under the present Paris climate accord,* there is much more to be done, as outlined in the UN's 17 Sustainable Development Goals.†

7. Cities Take the Lead. On a more upbeat note, Michael Bloomberg, former mayor of New York and chair of the Global Covenant of Mayors for Climate & Energy (Jan 2017), argues that "the new Trump administration will dominate headlines in 2017, but the biggest changes in the way we live will be driven not by Washington but by cities."‡ This ongoing trend will accelerate, he asserts, because power will continue to shift away from Washington, where partisan warfare kills off good ideas. Rather, cities and businesses will continue to reduce emissions, save on energy, build modern infrastructure, and protect themselves from extreme weather. This is confirmed by **The Security & Sustainability Guide**, which lists 37 urban groups, such as the C40 Cities Climate Leadership Group of 80 megacities and ICLEI—Local Governments for Sustainability, virtually all of them strongly advocating many sustainability-related actions. And most big businesses have headquarters in big cities and are equally concerned.

8. The Need for More Horizontal Thinking. This report is an exercise in horizontal thinking, which seeks to take a broad integrated view of systems and emerging trends, in contrast to the vertical thinking that is widely inculcated by academic institutions and proliferating scholarly journals that look at individual trees and not the forest ecosystem.

---

* John Schwartz, "Climate Deal Called Too Weak to Meet Goals," *The New York Times*, November 17, 2016, A12, citing the latest World Energy Outlook of the authoritative International Energy Agency on the 2015 climate change accord in Paris.

† Jeffrey D. Sachs, **The Age of Sustainable Development**. Foreword by Ban Ki-Moon. New York: Columbia University Press, 2015. Especially see chapter on planetary boundaries. Also see Simon Nicholson and Sikina Jinnah (eds), **New Earth Politics: Essays from the Anthropocene** (see Marien's review in Eruditio, 2:3, April-May 2017) (MIT Press, 2016) for a broader view on "Earth 2.0."

‡ Michael Bloomberg, "Where Washington Fails to Drive Progress, Cities will Act," *Time*, December 26, 2016. Also see Michael Bloomberg, "City Century: Why Municipalities Are the Key to Fighting Climate Change," *Foreign Affairs*, Sept-Oct 2015. In the US, many states are also taking the lead. See "On Climate Change, Look to the States," *The New York Times* editorial, December 26, 2016, A20.

Such thinking in depth and detail is not necessarily bad, but needs to be balanced by many more explicit efforts to fashion larger views, and to integrate the growing number of transdisciplinary integrators. Otherwise, fragmentation of knowledge and advocacy will continue to seriously inhibit progress toward sustainability and human well-being.

9. How Can the Revolution Become More Visible? This report argues that the Necessary Revolution is surely underway, but not visible to the general public or even, fully, to its participants. Illustrative of this overly quiet development is the recent US presidential election, where only the Democratic candidates mentioned climate change and only in passing, "sustainability" was never mentioned at all, and the moderators of the presidential debates never asked any questions about climate or sustainability. "Green Growth,"* advocated by OECD, UNEP, and the World Bank, does not appear to be mentioned anywhere in North America, at least. Another indicator is that three "Year Ahead" overviews for 2017 from *Time* magazine, *Bloomberg Businessweek,* and *The Economist* make no mention of sustainability.

   Efforts should be made, preferably collectively,† to encourage these annual publications to have a section on sustainability. *The New York Times* can publish a weekly section, rather than only occasional scattered mention of climate and energy issues in the news features and the weekly Science section. If the major media are unwilling to report on this major development, business leaders might purchase full-page advertisements reporting on the progress of Green Capitalism and inviting a wide-ranging and on-going debate on its merits. Many other ideas can be offered to enhance visibility of the Necessary Revolution, and we hope that this initial survey will elicit them.

Authors contact information
Michael Marien *– Email: mmarien@twcny.rr.com*
Michael Sales *– Email: mjsales@me.com*

Notes

1. Peter Senge et al., *The Necessary Revolution: Working Together to Create a Sustainable World*. New York: Broadway Books, 2010, p.12 (first published "in slightly different form" by Doubleday, 2008).
2. *The Necessary Revolution*, p.iv.
3. *The Necessary Revolution*, p.359.
4. Jane Gleeson-White, *Six Capitals, or Can Accountants Save the Planet? Rethinking Capitalism for the 21st Century* (New York: W.W. Norton, 2015).
5. Peter Dauvergne, *Environmentalism of the Rich* (Cambridge MA: MIT Press, 2016), 11-12.
6. *Environmentalism of the Rich*, p.152.

* See Global Green Growth Institute (2010, Seoul, 115 staff), Global Green Growth Forum (2011, Copenhagen), and Green Growth Knowledge Platform (2012, 8 staff), established by GGGI, OECD, UNEP, and the World Bank.

† Petra Kuenkel, **The Art of Leading Collectively: Co-Creating a Sustainable, Socially Just Future**. White River Junction VT, Chelsea Green Publishing, 2016. Parallel to the overly quiet Necessary Revolution, Kuenkel writes that her book is about the "underappreciated" collective side of leadership, in contrast to the traditional leadership paradigm that refers only to individuals. Most challenges of sustainability require building the capacity of groups and systems to move issues of common concern forward. "We cannot travel the path toward sustainability in silos; instead we need to harness collective intelligence and let it complement individual expertise." (p.34)

INVITATION TO PARTICIPATE

2nd International Conference on Future Education

Effective Learning in an Age of Increasing Speed, Complexity and Uncertainty

A multi-disciplinary, inter-generational dialogue in collaboration with the Roma Tre University

Rome, Italy—November 16-18, 2017

The Challenge: Society is changing more rapidly than ever before, generating unprecedented opportunities and challenges in its wake. Anticipating and addressing the consequences of the Fourth Industrial Revolution, environmental pressures, rising levels of youth unemployment and inequality, globalization and virtualization of business models, the explosive growth of online communications and education, the globalization of education, increasing intercultural contacts and migration will place enormous pressure on educational institutions, students, teachers and researchers.

The Solution: Education is humanity's most effective instrument for consciously steering social evolution to maximize the benefits and minimize the disruption and trauma associated with it. There is urgent need to expand the reach, accessibility, affordability and quality of education at all levels. But multiplying the existing model is not sufficient. Indeed it is likely to aggravate rather than alleviate many problems due to the time warp and gap between the education offered today and that which is so urgently needed. We need not only much more education but education that is qualitatively different— a new paradigm. Updating course content is not enough. We need an education that equips youth to adapt to future innovations and challenges that cannot be anticipated now.

The Participants: Building on a break-through conference at the University of California at Berkeley in 2013, the World University Consortium and the World Academy of

Co-organized by

Art & Science are collaborating with the University of Rome, the Inter-University Centre and other partners to conduct an international conference on Future Education to identify practical measures to meet the needs and aspirations of major stakeholders—youth, students, teachers, employers, workers, research institutions, governments and civil society. **The keynote address will be delivered by Edgar Morin.**

The Objectives: The conference will explore ways to

* Implement student-centered, person-centered, active, participative learning pedagogies;
* Harness the potential of emerging learning technologies and delivery systems;
* Foster synthetic, integrated modes of thinking;
* Make conscious and explicit the central role of values in human development;
* Shift toward multi- and trans-disciplinary approaches to knowledge;
* Development of independent thinking, creativity, entrepreneurship & leadership;
* Extend the scope of learning outcomes from information and mental skills to encompass development of social capabilities, personality, values and individuality.

The Format: This conference is designed to serve as an open, active platform for participants to share, collaborate and co-create new ideas, approaches, methodologies and best practices. The multi-stakeholder approach and structure of the conference will make it possible for participants to organize or participate in special sessions dedicated to in-depth exploration of specific topics ranging from subject content, pedagogy and learning technologies to social and economic impact on issues such as employment, skills development, business development, innovation, social power, citizenship, cultural diversity, personal development and individuality.

The Agenda: The conference will be organized into streams focusing on the following themes

* Learning in a time of increasing uncertainty
* Closing the time warp in higher education
* Education for Full Employment and Human Welfare
* Education distributes Social Power
* Transdisciplinary Education
* Person-centered learning
* Mind, Thinking & Creativity
* Anticipation in Education
* Developing Individuality through Education
* Learning as a way of life
* Value-based vs. Value-free education
* Social construction of knowledge
* Network-based education, learning spaces and learning communities

* Online and hybrid learning
* Disruptive educational technologies
* Technological enhancements, automation and digitization
* Storming the Ivory Tower
* Ways of Thinking and Knowing
* Sustainable Entrepreneurship
* Transformational Leadership
* Education beyond the university
* Navigating transitions in education and society
* Multi-stakeholder perspectives
* What students want from higher education
* Teaching in a time of instant information and rapid change
* Politics and Economics of Education
* Business and Employer Needs
* Workers' Perspectives

For further information, please visit *http://worldacademy.org/rome*
Or contact *support@worldacademy.org*

Special Notice to WAAS Fellows

"The S&S Guide offers a unique and invaluable glimpse of 1,500 mostly non-profit organizations of global interest—more than half begun since 2002. Especially note some 80 information portals, and nearly 100 alliances, consortia, and networks."

– Ted Trzyna (WAAS Fellow; Editor, World Directory of Environmental Organizations, 6th Edition 2001; President, Inter-Environment Institute, Claremont, Calif.)

The Security & Sustainability Guide:

1,500 Organizations Pursuing Essential Global Goals

Prepared by Michael Marien, David Harries, and Michael Sales

A 277-page August 2016 Interim Draft PDF of The S&S Guide, a project of the World Academy of Art & Science, was distributed to WAAS Fellows last fall. A new Interim Draft of some 330 pages, with expanded coverage of 1,800 organizations, will be available in June 2017 at www.securesustain.org. It reflects the critical fact that sustainability and security are both essential and can only be achieved in concert. The Guide is incomplete, but the compilers believe that, even in its current state, many WAAS Fellows will find it useful for illuminating many of the most serious problems facing humanity under the broad, overlapping categories of "Security" (weapons proliferation, terrorism, cyber-attacks, economic and food insecurity, human rights, peacemaking, crime and corruption, inadequate infrastructure, etc.) and "Sustainability" (climate change, biodiversity loss, pollution, energy, agriculture, population growth, cities, oceans, forests, vulnerability to disasters, green economics and finance, etc.)

The August 2016 draft of the S&S Guide features the following:

- Forewords by **Heitor Gurgulino de Souza** and **Garry Jacobs**
- Part 1: ***Overviews***
  - A. Major Categories Index (a quick orientation to key topics and # of orgs. under each)
  - B. 100 Notable Books and Reports (mostly recent and freely-available online reports)
  - C. 50 Notable Organizations (briefly described)
  - D. 25 Notable Individuals (to be added in 2017-2018)
  - E. 80 Information Portals (to various security and sustainability topics, e.g. climate)
- Part 2: ***Title Index*** to 1,500 organizations (more to come; suggested additions invited)
- Part 3: ***Organization Descriptions*** (400 orgs. with links to the Title and Subject Indexes)
- Part 4: ***Subject Index*** (already extensive—some 60 double column pages!)

For a free PDF of the S&S Guide, contact WAAS Fellows **Dr. Michael Marien** (mmarien@twcny.rr.com) or **Dr. David Harries** (jdsharries@bell.net). Comments on this work in progress are encouraged; also suggestions for funding to make this project sustainable.

INVITATION TO PARTICIPATE

2nd International Conference on Future Education

Effective Learning in an Age of Increasing Speed, Complexity and Uncertainty

A multi-disciplinary, inter-generational dialogue in collaboration with the Roma Tre University

Rome, Italy—November 16-18, 2017

The central issues are how to sustain a responsible process, to enhance the productive capacity of society including the full utilisation of its human capital.

Winston P. Nagan & Megan E. Weeren,
Anticipation in Law and Social Science

World peace is an essential condition for the survival and development of international organizations.

Ashok Natarajan,
Peace, Security, Globalisation & Cultural Diplomacy

Science can only disclose certain aspects of reality, but not the whole truth. Universal truth is beyond the scope of any scientific enterprise.

J. Martin Ramirez & Juan Cayón-Peña,
The Role of Scientists in a Human-centered Society

We need a new values-based, visionary science for human and ecological well-being.

Thomas Reuter,
Principles of Sustainable Economy: An Anthropologist's Perspective

This report is an exercise in horizontal thinking, which seeks to take a broad integrated view of systems and emerging trends, in contrast to the vertical thinking that is widely inculcated by academic institutions and proliferating scholarly journals that look at individual trees and not the forest ecosystem.

Michael Marien & Michael Sales,
Greening Capitalism, Quietly: Seven Types of Organizations Driving the "Necessary Revolution"

CADMUS

Inside This Issue

Complexity is the impossibility of separating a system from its context, a living being from its environment, an object from its measuring instrument.

João Caraça, Globalization Trapped

The call for new economic theory is based on the premise that the persistence of poverty together with rising levels of unemployment, inequality and ecological degradation reflect the limits of the present conceptual system, rather the practical limits for sustainable human development.

Garry Jacobs, Mark Swilling et al.,
Quest for a New Paradigm in Economics: A Synthesis of Views of the New Economics Working Group

A new paradigm for the political economy of shared prosperity, is clearly needed to eliminate radical inequality as a mission-critical step toward the achievement of sustainable development.

Winston P. Nagan, Craig Hammer & Maxat Akhmetkaliyeva,
Toward a New Theory of Sustainable Development: Drawing on Insights from Developments in Modern Legal Theory

Most existing educational programs do not tap into the full creative potential of our minds.

Stefan Brunnhuber,
Education Isn't Education: The Creativity Response or How to Improve the Learning Curve in Our Society

Financial profitability is a one-dimensional, reductionist metric unable to provide the right incentives to cope with the multi- or infinite dimensionality of the complex challenges we face.

Carlos Alvarez-Pereira,
Disruptive Technologies, A Critical Yet Hopeful View

There is no real progress in any domain of science without acquiring consciousness of the provisional nature of knowledge and the imperative to increase our present understanding.

Carlos Blanco, The Role of Presuppositions in the Humanities and the Social Sciences

Continued . . .

€10