

Ivo ŠLAUS\*

## CONCLUDING REMARKS

I am sure I speak on behalf of all of us when I express our gratitude and congratulation to Momir Djurovic for organizing such a wonderful event, for choosing such an important and timely topic and for assuring so many excellent participants.

Global scientific output doubles in about 9 years<sup>[1]</sup>, which means that the rate is now five times larger than it was at the time of Newton, Faraday, Einstein and Bohr. Comparing total scientific output with progress in only one discipline — physics, is not correct. The end of science<sup>[2]</sup> has been claimed: there are no major breakthroughs beyond quantum physics and general theory of relativity, and theory of evolution. However, less than two decades ago when physicists were concerned with The Standard model and the Higgs boson, measurement using ESA satellite Planck demonstrated<sup>[3]</sup> that our universe is composed of dark energy (68.3%), dark matter (26.8%) and only 4.9% of our ordinary matter. And we still do not understand either dark energy or dark matter. Now, major progress is witnessed in all scientific disciplines. New inter-disciplines are emerging: synthetic biology, artificial intelligence and nano-sciences, as well as new materials — not discovered, but new, genuinely new. Is it necessary to invert Hamlet words „There are more things in heaven and in the earth, my Horatio, than are dreamt of in your philosophy.” or are „new materials” in one of parallel worlds of multiverses, which we are somehow imbedded in and/or connected with.

The rate of technological achievements is increasing, as it was impressively outlined by our introductory speaker L. Christophorou<sup>[4]</sup>, as well as by G. McBean<sup>[5]</sup>, T. Bajd<sup>[6]</sup> and P. McGrath<sup>[7]</sup>. We will address here only two technologies: artificial intelligence and beyond biology.

The Moore law<sup>[8]</sup> is the observation that a number of transistors in an integrated circuit doubles about every two years. Many studies in ICT show that performance in relation to price doubles every 18 months. It is estimated that the increase in our current technological ability will increase more than 500 times in next ten years.

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\* Dag Hammarskjöld University College; The World Academy of Art and Science

The future technology comes faster than expected. It is likely that at some point in time — not too distant — machines will be smarter than humans and that is referred as technological singularity<sup>[9]</sup>. Kurzweil anticipates humans merging with machines<sup>[10]</sup>, whatever it means!? Diamandis considers the future of unimaginable abundance<sup>[11]</sup>. Consequently, economy is rapidly changing. Classical industrial production will be unnecessary, since the advanced 3-dimensional printing will allow for printing of complex products at home, so most of the distribution channels from a factory in the land with cheap labor to the supermarket store will not be necessary. Now 4 D printing is coming: products that will be able to modify themselves in time. The most important component will be the algorithm for printing. Similarly, machines would perform other daily tasks, and their performance would depend on the algorithms. Today the classical software industry amounts to about \$500 billion (about 0.5% of global GDP) and is growing at about 2% — faster than the rest of the economy<sup>[12]</sup>. Almost all areas of human activity will need intelligent algorithms that will control the machines. Methods of artificial intelligence and other advanced machine learning tools are already used in many areas of life, and their applications are expanding rapidly. Significant paradigm changes in computing are forthcoming and the most promising seems to be the so-called quantum adiabatic computing. An example of a 1000-bit quantum computer based on quantum annealing was developed by D-Wave Systems<sup>[13]</sup>.

Chimera: part human — part animal beings existed in folklore and fiction. Now it is reality. Chimerism within a species occurs naturally in nearly all animals. Inter-specific chimeras, rarely exist in nature due to the unlikelihood of specific conditions required. In 1989, scientists at the University of California, Davis breached this barrier and created the first artificial chimera, a sheep-goat hybrid dubbed the „geep.” Such research into chimeras elicited little public attention and outcry until August 2003, when Hui Zhen Sheng at the Shanghai Second Medical University created the first human-nonhuman chimera. Sheng and his team removed the genetic material from some of the cells in a rabbit embryo and inserted human DNA, creating a human-rabbit chimera<sup>[14]</sup>. J. Craig Venter Institute transformed one kind of bacteria to another — a completely synthetic organism was created<sup>[15]</sup>. Biological research and these results prompted Lord Martin Rees to bet: „By year 2020 an instance of bio-error or bio-terror will have killed one million people.” (Unfortunately, laboratory accidents happen much more frequently than the public knows! Bio-error in Sverdlovsk in 1979!)

Most technologies have dual-use, many can be misused, many have been and are misused. This prompted Ambassador Toth to address his talk here<sup>[16]</sup> Weapons and Technologies of Mass Destruction, and Aleksander Likhotal stressed that it is not science but ignorance that is responsible for misuse of science and technology<sup>[17]</sup>.

The new economy is algorithm economy with sustainable abundance comprising new materials and new processes and therefore, the development of quantum algorithms and synthetic biology will have to be addressed requiring an educational paradigm change from a culture of standardization to a culture of creativity<sup>[18]</sup>. Several participants addressed the role of education (E. Hoedl<sup>[19]</sup> and A. Zucconi<sup>[20]</sup>). While most schools prefer the logical intelligence, many young people are

abundant in other types of intelligence, which are often lost in schools. This challenge will magnify as we approach the singularity, because the creativity will become more important. The nature of scientific progress does not allow predicting specific discoveries, so it is difficult to direct the educational systems towards specific knowledge and skills that would be necessary in the near future. In spite of this uncertainty, it is obvious that a more creative individual will have a comparative advantage in the more advanced society. Also, it is important that each person has a chance for a creative contribution to society, which is useful both to the total economic output as well as for the psychological wellbeing of that person<sup>[21]</sup>. One can truly conclude that our contemporary society is characterized by knowledge explosion<sup>[22]</sup>.

The opening sentence from the Tale of Two Cities „It was the best of times, it was the worst of times” describes our contemporary world: it is the best ever: our knowledge — possibly our understanding — tremendously increased, life expectancy increased, quality of life is higher than ever, but our contemporary world is not sustainable, it is self-destructing: natural and human capitals are being destroyed at a fast rate. Wars and violence, as well as chaotic migration are destroying human and also natural capital. Though significant results have been achieved: end of colonialism, end of the Cold War<sup>[23]</sup>, many successful international treaties, we are still faced with 20,000 nuclear missiles most at hair trigger alert, with chemical and biological weapons of mass destructions, we are witnessing terrorism, chaotic migrations<sup>[24]</sup> and blatant violation of international laws.

Climate change already has huge negative consequences and it will be worse<sup>[25]</sup>, as discussed here by Rajendra Pachauri<sup>[26]</sup>. Ecological footprint is 50% larger than our Earth can tolerate<sup>[27]</sup> (the stupidity of our contemporary development is best shown in Fig in ref 27 — a barely 10% improvement in HDI causes factor of 3 deterioration in ecological footprint) and while humans forgive sometimes, and God always, Nature never forgives<sup>[28]</sup>. Though humans should endeavor in colonizing space, it is important to appreciate that colonization of space is a much, much more difficult task than departure from Easter Africa was for our forefathers. Earth is our home as is beautifully emphasized in „Laudato si, mi Signor”, Pope Francis Encyclica<sup>[29]</sup> presented by Chancellor Archbishop Marcelo Sanchez Sorondo<sup>[30]</sup>.

Human capital — including individual and collective creative capitals — are being destroyed by us, by our current institutions and by our laws, by our ill-conceived self-interests, by our greed and by our prejudices. Just as this afternoon session closes — during its duration several thousand children have died from hunger. Th. Pogge estimates<sup>[31]</sup> that 423 million persons have died of hunger from 1991 till 2013. This is larger than the number — estimated by Rummel — of persons killed by their own governments in the 20<sup>th</sup> century — about 200 millions, or persons killed during WWII. „This economy kills!”<sup>[32]</sup>. Too many people live in slavery<sup>[33]</sup>. It is estimated<sup>[33]</sup> that close to 50 million persons today live in slavery, 30% more than a year ago. Is that a result of the fact that recovering from the recent economic crisis 95% of the gain went to the richest 1%<sup>[34]</sup>? When we hear that children die from hunger and that there are slaves, we tend to push it to some distant, unknown country. Yet, though my own country and Montenegro are among the

countries with smallest percentage of slavery, just 0.4% of their respective populations, it is 17,000 slaves in Croatia! Indeed: „This economy kills!” According to Oxfam 62 individuals control the same wealth as 3.5 billion poorest persons<sup>[34]</sup>. Inequality is bad for the economy: OECD study showed that the enriching the richest instead of increasing the income of the poorest slows the economy<sup>[35]</sup>. Various proposals: reduction of the taxes for the wealthiest<sup>[36]</sup> and the universal basic income<sup>[37]</sup> seems not be good „solutions”. Inequality<sup>[38]</sup> and unemployment destroy human capital and suffocate economic development.

Several papers at this conference were devoted to economy, full employment and globalization (L. Gascon<sup>[39]</sup>, G. Jacobs<sup>[40]</sup>, and M. Veskovici<sup>[41]</sup>). Six year ago World Academy of Art and Science initiated research and endeavor toward new economy — based on human dignity and sustainability<sup>[42]</sup>. The striving for and the idea of a new economy is much older. One should never forget that Adam Smith was a moral philosopher. Sinking of SS Central America in 1857 prompted John Ruskin to switch to economy. Arguing against Malthus and Ricardo Ruskin wrote „The real science of political economy, which has yet to be distinguished from the bastard science, as medicine from witchcraft, ... is that which teaches nations to desire and labor for thing that leads to life.” And Ruskin concludes „There is no wealth but life.”<sup>[43]</sup> which foretells a recent statement by the UN „People are the true wealth of nations.”<sup>[44]</sup> Putting in numbers — human and natural capital are for most of the countries much larger than the manufactured capital (we devote so much to), e. g. for the USA inclusive wealth is over 100 trillions, while manufactured wealth is less than 20 trillions<sup>[45]</sup>.

The 70<sup>th</sup> anniversary of the UN is marked by two significant results: Transforming Our World — The UN Agenda 2030, also known as Sustainable Development Goals (SDGs)<sup>[46]</sup> unanimously accepted by the UN GA on September 25, 2015 and the Paris Agreement on Climate Change<sup>[47]</sup>, actually an important segment of SDGs. Both documents are expressions of core values necessary for survival, for human-based world. The values were addressed by several speakers at this conference (J. Engelbrecht<sup>[48]</sup>, Segerstrale<sup>[49]</sup> and Lagumdžija<sup>[50]</sup>). We in the World Academy are proud that several years ago — following our work on new economy and full employment as well as our endeavor to abolish war and any form of violence — we initiated an encompassing endeavor: A New Human-based and Humanity-based Paradigm. „We realized that contemporary world has truly dangerous enemies: destruction of natural and human capital — destruction of trust, extremely high unemployment and income inequality — economic, political and above all moral crises. Building peace and prosperity is a long and slow process and considerable success has been achieved. But it only takes seconds to destroy that peace. Let us not forget the words of President D. D. Eisenhower „Every gun that is made, every warship launched, every rocket fired signifies in the final sense a theft from those who hunger and are not fed, those who are cold and not clothed. This world in arms is not spending money alone. It is spending the sweat of its laborers, the genius of its scientists, the hopes of its children.” The old approach „they” and „us” does not solve anything.”<sup>[51]</sup> Our endeavors are just at the very beginning. They do demand more research and much more understanding. It is not a work of one per-

son, not even an organization, or scientific enterprise, not only of the UN. It is a joint endeavor of all of us, all 7 billion, all sovereign countries, scientists throughout the world, scholarly institutions, academies, business, laborers and trade unions. It is gigantic. It is comforting to realize that the pillar of this endeavor is deeply rooted in us — in the Golden Rule, in all major cultures, in our biology and in our history and it is the guarantor of our future<sup>[52]</sup>.

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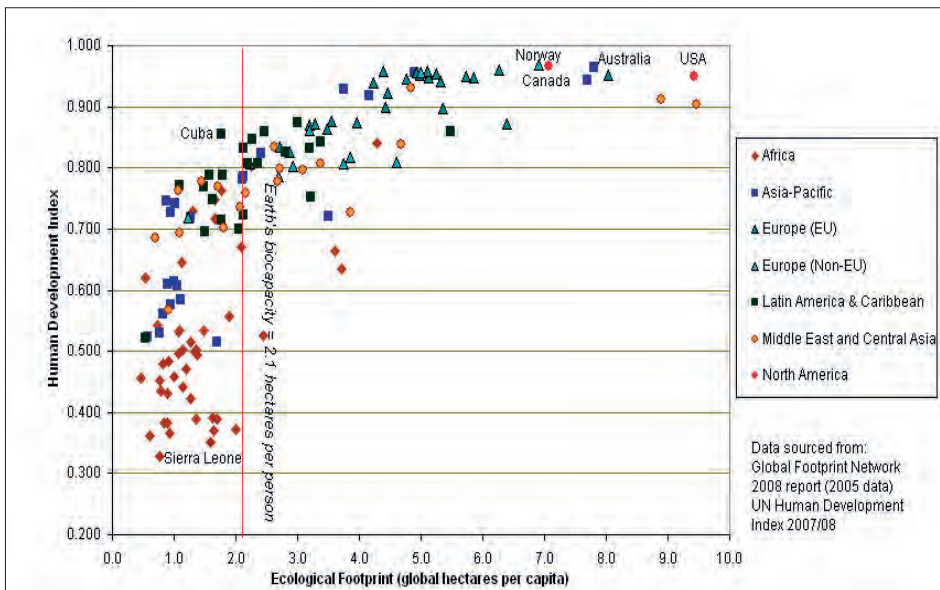


Fig. Human Welfare and Ecological Footprints Compared

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