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Social Responsibility and Self-governance by the Scientific Community

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Abstract

Over the past century there have been many profound scientific, technological, economic and social transformations. In the near future, the most dramatic breakthroughs will probably be achieved through combinations of various scientific disciplines, such as work cutting across physics, molecular biology, neurosciences, biotechnology, nanotechnology and microelectronics, chemical genetics, energy technologies, etc. There are many who, facing the next century, wonder if it will be possible and/or desirable to continue along the path of such prodigious changes. Technological advancement in new products and new ways of organizing human work is one of the most important concerns of our future. These changes in technology are not followed by change in human spirituality. In fact, looking at the time scale spirituality changes linearly in contrast to technological advancement which changes exponentially. On top of that, technologies pose threats, either by accident or through malevolence, to the natural and human environment. Thus, in time scale there is a bigger and bigger difference between what we do and who we are. Preservation versus dynamism is one of the many important unknowns in the coming future. Therefore, understanding the full potential of tomorrow's technologies to contribute to human well-being calls for a better understanding of the ways in which technological changes interact with the human capacity to accept them.

There is in Plato's *Phaedrus* a story about Thamus, the king of a great city of Upper Egypt. For people such as ourselves, who are inclined (in Thoreau's phrase) "to be tools of our tools", few legends are more instructive than his. The story, as Socrates tells it to his friend Phaedrus, goes this way: "Thamus once entertained the god Theuth, who was the inventor of many things, including number, calculation, geometry, astronomy, and writing. Theuth exhibited his inventions to King Thamus, claiming that they should be made widely known and available to Egyptians. Socrates continues: Thamus inquired into the use of each of them, as Theuth went through them expressing approval or disapproval, and judged Theuth's claims to be well or ill founded. "It would take too long to go through all that," Thamus is reported to have said for and against each of Theuth's inventions. But when it came to writing, Theuth declared, "Here is an accomplishment, my lord the King, which will improve both the wisdom and the memory of the Egyptians. I have discovered a sure receipt for memory and wisdom." To this, Thamus replied, "Theuth, my paragon of inventors, the discoverer of an art is not the best judge of the good or harm which will accrue to those who practice it. Those who acquire it will cease to exercise their memory and become forgetful;

they will rely on writing to bring things to their remembrance by external signs instead of by their own internal resources. What you have discovered is a receipt for recollection, not for memory. And as for wisdom, your pupils will have the reputation for it without the reality: they will receive a quantity of information without proper instruction, and in consequence be thought very knowledgeable when they are for the most part quite ignorant. And because they are filled with the conceit of wisdom instead of real wisdom they will be a burden to society."

Over the past century there have been many profound scientific, technological, economic and social transformations. There are many who, facing the XXI century, wonder if it would be possible and/or desirable to continue along the path of such prodigious change. No reasonable person could deny that science and especially technology have been a major force in making the world we live in a better place, but it is always important to keep in mind that in this process they have not operated independently of the society in which they are imbedded. In this process we are facing risks of ignoring the potential that they offer for improving the condition of humankind and the state of nations by over- or underregulation, and over- or undercapitalisation of new developments. On top of that, we keep accepting uncritically the enthusiasm about new developments while neglecting the social, economic, political constraints, and have practiced to overlook secondary effects which are often more significant than the basic problems. An increased opportunity for human agency is thus offered by social constructivism rather than technological determism. It is not likely that the ability to influence the course of technological change will be evenly distributed among the population as a whole. To the contrary, social constructivist analyses have often shown how differences in power and access to resources have shaped technological change. Often particular technologies may be devised, selected, and disseminated because they serve the interests of a particular group, possibly in opposition to the interests of other groups. No doubt, technology confers power, as C. S. Lewis has reminded us, "Man's power over nature is really the power of some men over others with nature as their instrument."

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The full potential and governance of science and tomorrow's technologies and innovations as contribution to human well-being, seem to be depending heavily on the capacity and risks for a better understanding of the ways in which performance trends interact with societies' readiness to embrace economic, social and technological changes. The emergence of these

risks is shaped by forces other than pure scientific feasibility, and will depend not only on the extent of the actual and comprehended dangers of new scientific discoveries and in particular technologies but also, and crucially, on social and political choices. An analysis of the governance of scientific knowledge in the contemporary world shows the practical incompleteness, fragility, obsolescence and often failure of attempts to govern science.

"Scientific advances are most likely to arise, or are most easily promoted, when scientists from different disciplines are brought together and encouraged to free themselves from disciplinary constraints."

Scientific progress can be of various types/discoveries of phenomena, theoretical explanations or syntheses, tests of theories or hypotheses, acceptance or rejection of hypotheses or theories by the relevant scientific communities, development of new measurement or analytic techniques, application of general theory to specific theoretical or practical problems, development of technologies or useful interventions to improve human health and well-being from scientific efforts, and so forth. Consequently, many different developments might be taken as indicators, or measures, of progress in science, but very few as controlling it.

One of the best known modern theories of scientific progress is that of Thomas Kuhn. Science, in Kuhn's view, is usually a problem-solving activity within clear and accepted frameworks of theory and practice, or "paradigms". A quite different account is that of John Desmond Bernal* who was inspired by Marxist social science and ideals of planned social progress. Whereas in Kuhn's view science progresses according to its inner logic, Bernal asserted that intellectual and practical advances could be engineered and managed. Derek Price's vision of a quantitative "science of science" has focused less on how innovations arise than on how they spread and how their full potential is exploited by small armies of scientists. There are also evolutionary models of scientific development, such as that of the philosopher David Hull. Extending Darwin's view of evolution by variation and selection, Hull argues that science continually produces new ideas, which, like genetic mutations, are essentially unpredictable.

Autonomy has traditionally been seen as a major characteristic and crucial precondition for scientific progress. Even when science and technology have manifested problems of considerable magnitude it is often more difficult to terminate a problem than to continue with it, which is one of the greatest defects of our system of governing science and technology. Ernest Fitzgerald said: "There are only two phases to a major military program. The first: It is too early to tell, the second: It is too late to stop."

* See http://www.brainyquote.com/search_results.html?q=john+desmond+bernal

The idea progresses in the view that scientific advances are most likely to arise, or are most easily promoted, when scientists from different disciplines are brought together and encouraged to free themselves from disciplinary constraints.

Gaining an understanding of the meaning of words is often the beginning of knowledge. The linguistic roots of the word "technology" can be traced to the Indo-European stem *tekhn-*, which seems to have referred to woodworking. It is the source of the Greek word *techne*, which can be variously translated as "art", "craft" or "skill". It is also the root of the Latin word *texere*, "to weave", which eventually took on the larger meaning of fabrication or construction. The term "technologist" was occasionally used by Aristotle and others in his time, but in their usage it referred to a grammarian or rhetorician. By the early eighteenth century the word had come close to its present meaning when an English dictionary defined it as "a Description of Arts, especially the Mechanical".

Significant progress, which is an uncertain process with many unforeseeable consequences, is likely across a broad spectrum of technologies such as computing, genetics, brain technology, new materials, in particular miniaturization and smart composites, energy, transportation and environmental tools and systems. But, perhaps the most dramatic breakthroughs in the not-too-distant future will be achieved through combinations of various scientific disciplines. For example, work cutting across biochemistry, physics, molecular biology, neurosciences, biotechnology, nanotechnology and microelectronics is all set to make significant advances in the field of bioelectronics, and neuroinformatics. The major advances in other cross-disciplinary fields could take to the creation of synthesized gene-derived enzyme catalysts, non-existent in nature; biological processes to fabricate molecular structures and more complex materials; bioengineered plants to produce pharmaceuticals and raw materials for plastics, and many more.

History has demonstrated that the availability of a particular scientific discovery or innovative technology is no assurance that its potential would be extended only to useful applications, or that it would diffuse widely or render its fullest utility to those who might use it most productively. No doubt tomorrow's technologies will contain destructive potential that will be both powerful and difficult to control. They could pose threats to the natural and human environment, either by accident or through malevolence. Furthermore, purely technological risks involve the possibility of greater vulnerability to systems. Many fear that as the world becomes more diversified, decentralized and dependent on technology, there will be a higher risk of unmanageable failures in either the physical or social systems that underpin survival. Certainly, at the same time, one should not ignore effects related to ethics, values and mindsets, having in mind that everything depends on a complex interaction with underlying economic, social and political conditions.

American sociologist W.F. Ogburn began to wander in the tracks of Marx, as early as 1922, arguing that inventions occur most often in the field of material technology, perhaps because the advantages of improvements in technology are self-evident. A strain or stress has been set up between the new technique and various organizational aspects of the social

system. The result being disequilibrium between new technology and old social organization, which is termed social lag.

> *"Technological change does not take place in a social vacuum. Science and technology are human creations, and because humans are social creatures, scientific and technological change is necessarily a social process."*

The theory of cultural lag formulated by William F. Ogburn is predicated on the belief that habits, thoughts, values, and social arrangements often fail to change at the same speed as scientific and technological innovations. They move ahead, but many other things lag behind. Our spirituality does change very slowly in time compared to scientific and technological advancement, what in time scale makes us human beings more different compared to what we experience in practice. The belief that technology acts as an independent force in our life, unaffected by social forces, is known as 'technological determinism' and if it is true, we have become the servants of technology instead of its master.

Technology has deeply altered our modes of life. With each development in technology there comes, however, some disturbance to the effective working of the existing social order. The institutions of family, religion, morality, marriage, state, and property have been altered. On top of that inventions and discoveries in science have shaken the foundations of religion while at the same time strengthening nationalism. People are becoming more secular, rational and scientific but less religious in their outlook. The function of the state or the field of state activity has been widened. Modern governments which rule through the bureaucracy have further impersonalized human relations. In brief, people in the Middle Ages believed in the authority of their religion, no matter what; today, we believe in the authority of our science and technology, no matter what, not taking much care of how they are controlled.

The interrelation of science, technological and cultural changes is especially relevant in the globalized era in which we live. Closely associated with a belief in technological determinism, convergence theory argues that the nations of the world are becoming more similar to one another—that is they are converging—as they make use of the same technologies. Although this belief has been widely accepted, much of the evidence for convergence theory is impressionistic and anecdotal. Although the case for convergence theory is possible on both theoretical and empirical grounds, the role of technological change in promoting the convergence of societies is less certain. It would certainly be inadmissible to think of technological change as a universal solvent that dissolves all prior cultural, religious and social patterns so that they are dictated by modern technology.

Certainly, possible applications of technology two or three decades from now call for a better understanding of the ways in which scientific and technological performance trends interact with societies' readiness to embrace and control economic, social and technological

change. In this case, it is important to keep in mind that technological change does not take place in a social vacuum. Science and technology are human creations, and because humans are social creatures, scientific and technological change is necessarily a social process. In recent years, the study of technological change has been strongly influenced by a perspective known as "social constructivism". According to this approach, technological change does not occur because new devices and processes demonstrate their clear-cut superiority over other ways of doing things. For social constructivists, the analysis has to begin with the need to explain why certain technologies are assumed to work better than others.

Today's science and technology leaves us both exhilarated and terrified. Recent technological developments have presented us with such marvels as spacecraft leaving the solar system, instant access to billions of Internet web pages, and diseases cured through gene therapy. At the same time, the inexorable march of technology has produced global pollution, they could pose threats to the natural and human environment, overpopulation, and the threat of nuclear annihilation. On many occasions technological change has also produced social disruptions, as when automation destroys jobs in a particular industry or a new weapon upsets the balance of power between nations. Ever since technologies were employed these tools often have had a double edge—not only for survival but also for conflict. Scientific achievements and technological advances *per se* provide no foregone conclusions about how they will be used. Even the initial steps in the long-term development and diffusion of radical innovations could pose unusually strong challenges to existing ethical and cultural standards, and put greater burdens on people's tolerance of the unknown and foreign. This could generate serious social unrest.

As Bacon expressed, it is a world in which the idea of human progress has been replaced by the idea of technological progress. The aim is not to reduce ignorance, superstition, and suffering but to accommodate ourselves to the requirements of new technologies.

The answer is perhaps given by Vaclav Havel posed in an address to the U.S. Congress. "We still don't know how to put morality ahead of politics, science, technology and economics, we are still incapable of understanding that the only genuine backbone of our actions—if they are to be moral—is responsibility. Responsibility to something higher than my family, my country, my firm, my success."* And that is the most important responsibility to the future.

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