Editorial

This special issue of **Scientiæ studia** contains articles that are partly derived from papers delivered at the 18th International Conference of the Society for Philosophy and Technology, "Technology in the Age of Information" (SPT-2013), that took place in the School of Economics and Management (ISEG-ULisbon), Lisbon, Portugal, June 4-6, 2013. Although the articles deal with diverse themes and perspectives, the concern of all of them with the dilemmas and crossroads, which one finds in the current forms of technoscience, provides a unifying thread. The great power of contemporary science and technology has repercussions in all domains of human, social and cultural life, and even on nature itself. The articles contribute to opening up paths for understanding how technologies change; they also reflect all the dimensions of human life and how they are affected by innovationism and commercialization.

This issue begins with Hermínio Martins' article in which he deals with epistemological questions connected with the status and role of "visual images produced by instruments" in contemporary science. In the first part of his article, after providing an overview of the process whereby images have become predominant in Western culture and how they have become influential in many areas of contemporary science and technology, he describes the transition (made possible by electronic instrumentation) from the photograph to the digital record, elaborating the projects of super-senses and universal observation, and the consequent explosion of data and the use of images in the most diverse scientific areas. In the second part, he concentrates on epistemological problems connected with the growing instrumentalization of scientific research, in particular on the problem of canonical interpretations of images and photographs. The combination of mathematical tools and machine-generated images leads to the predominance of "algorithmic imagism" and of mathematical models, and consequently the predominance of Bayesian inductivist interpretations. The argument concludes by pointing to a change of direction in the scientific enterprise: science is no longer "theory-driven" but "tool-driven", since science has become "big science" that is dominated by powerful high-energy machines, laboratory instruments, and large technological systems. The triumph of image is the triumph of technological instrumentation.

In the second article, Lacey, in his keynote adress delivered at SPT-2013, focuses on how science and technology may be intertwined with social justice, democratic participation and sustainability. Most of the institutionalized practices of modern science tend to neglect these values, for they are responsive to the values of technological progress and of capital and the market that presuppose the "modern valuation of control" and bear mutually reinforcing relations with methodologies in which "decontextualizing strategies" are privileged. For Lacey, this underlies an incoherence in the traditional interpretation of scientific research, and he proposes that there are available today two interpretations that could replace this incoherent interpretation; he calls them "commercially-oriented technoscience" and "multi-strategy research". The former predominates in contemporary scientific institutions, and it serve especially well interests that incorporate the values of capital and the market. The latter make use of "strategic pluralism", without which it is not possible to carry out investigation that could

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inform practices linked with the values of social justice, democratic participation and sustainability. Lacey illustrates "strategic-pluralism" using the examples of "social technology", agroecology and food sovereignty; and he shows that, despite the hegemony of "commercially-oriented technoscience", the interests served by it have not managed to eliminate completely spaces in which investigations in the stated areas (and other alternatives) may be conducted and their practices developed.

Helena Mateus Jerónimo's article takes an in-depth look at the specific nature of risk and uncertainty in the light of the classic conceptual distinction between them, derived from economics, and its importance in addressing and dealing with many of today's technological and environmental problems**.** Although they are conceptually close to one another and are often confused, *probabilistic risk and non-probabilistic uncertainty are quite different domains of theoretical and empirical understanding and interpretation,* just as their normative and political implications are distinct. In the current context, however, the language of risk and the practices it has produced are clearly dominant, having adjusted to a chance-negating attitude which is deeply embedded in modern culture. The author puts forward the concept of "riscophrenia" to designate this almost exclusive conceptualization of the world in terms of risk, and its concomitant argumentative rhetoric, which shuts out the elements of unpredictability and randomness. Jerónimo draws on John Maynard Keynes' idea of "animal spirits" to reinforce her thesis that the ontological contingency of individual and collective life is ineradicable, and cannot be tamed by probabilities and quantitative studies. She argues further that the language of risk emerges as a device for rationalizing and ratifying the techno-scientific paradigm dominant in our societies.

Pablo Rubén Mariconda, reflecting on the frontiers of science and technology and from the perspective of an evaluative image of science, analyses the risks occasioned by large-scale technological applications, paying attention particularly to the case of high-input and transgenic agriculture. The article begins by providing an overview of the process of industrialization and increasing artificiality of rural zones and agricultural fields, starting in the middle of the 19th century, that accompanied the transformation of the natural environment into one becoming more and more technological, more and more mediated by technical equipment, instruments and processes. Second, Mariconda discusses four characteristics of technology: openness and closure of possibilities as consequence of technological applications; proliferation of problems arising from particular and decontextualized solutions; inseparability of the good and bad effects of the technology; non predictability and uncertainty of technological applications. His discussion of these four characteristics serves to make it clear that it is ambiguous to consider the transformation involved with the process of industrialization in terms of "technological progress". And third he shows how, since about 1850 the great technological innovations have occurred in a state of "technological exception", in which values and rules (of scientific method) are put aside so as to allow the twofold process of technical normalization and juridical regulation. The article concludes by showing that the state of "technological excep-

tion" is maintained by antiscientific practices, and analyzing how these practices affront both ethical sensibility and the survival of humanity.

Robert-Jan Geerts, Bart Gremmen, Josette Jacobs e Guido Ruivenkamp – in the context of the urgently needed transition towards a "sustainable energy regime" in which technological advances have a very important role – point out that the necessity and sufficiency of the so-called "green technologies" (from new types of photovoltaic cells to vehicles moved by bio-fuels) have not been critically evaluated. Hence, they propose a philosophy of energy that would be capable of questioning and comprehending the exact nature of the energy transition. Focussing on the example of "green energy" (produced by wind turbines or biomass combustion), they put into dialogue two apparently opposite conceptions of energy – as flux ("something flowing, elusive, uncontrollable and omnipresent"), and as potentiality ("something static that can be put to use at the flick of a switch") – with the thesis of "energy neutrality" (that entities are "energy neutral" if they produce and consume that same amount of energy in a given period of time). They suppose that the energy transition will draw upon different energy sources. While fossil combustibles function as potentialities, solar and wind energy are forms of flux. Furthermore, the transitions and the redesign of our energy system imply not only a change in the sources of energy, but also a wider network in which consumers are important protagonists.

The relation between basic science and technology is dealt with by Marcos Barbosa de Oliveira, as well as the global process of commoditization of science implicated in the linear model of innovation (LMI). This model, which originated in the 1980s and became the key element of "Innovation Studies/Theory", posits that there is unidirectional movement from basic research to technological applications, a claim also made in the influential 1945 report of Vannevar Bush, *Science: the endless frontier*. Oliveira argues that an anachronism lies behind the failure of the thesis of LMI. The notion of innovation that it incorporates, introduced only in the 1970s in the context of the neoliberal economy, is essentially associated with a commercial dynamic, so that an innovation is equivalent to a lucrative technological advance. For the author, the thesis of LMI is a device of neoliberal commoditization; it is also a straw man, a rhetorical trick that serves to further the point of view that opposes financing of basic science by the state. Finally, Oliveira defends the view that basic science has validity and that public financing of it is legitimate. For him, LMI and innovationism incorporate a purely instrumental conception of science, and ignore other forms of intrinsic value that science has that could legitimate the public financing of basic research – in particular its cultural value, reflected in the interest in basic science shown by the lay readers of newspapers and journals that report on science.

Renato Rodrigues Kinouchi addresses scientometrics, the application of quantitative metrics for evaluating the quality and impact of scientific and technological activities. He discusses the development of the technologies of information, and the role of Eugene Garfield (among others), who created one of the most successful businesses of the informational

economy – the Institute for Scientific Information (ISI), later acquired by Thomson Reuters – which controls the largest body of data about publications. Originally it was presupposed that a quantitative "science of science" would eventually be able to significantly inform science policies. Kinouchi shows that this presupposition has some difficulties. While the axiomatic base of scientometrics derives from statistics, the interpretation given to its key concepts has its roots in economics. It is for this reason, according to the author, that the quest of the science of science fits so well with the economic preoccupations of governments and private corporations. Kinouchi maintains the a "democratic scientometrics" is needed that would, on the one hand, put an end to the concentration of the collection and control of scientific information within a narrow niche of businesses and, on the other hand, inform science policies that could justify investing in areas where there is a lack of production.

Finally, José Artur Quilici González, Mariana Claudia Broens, Maria Eunice Quilici Gonzalez e Guiou Kobayashi discuss the future of human autonomous action in the light of the generalized and increasing use of ubiquitous computing, digital disguisers and technologies of information, in a context of the expanding of social and individual dependence on artificial intelligent systems (those which control a great part of human life, from trains to the distribution of water). Notwithstanding the advantages that these systems also permit, this dependence is eroding our autonomy in many dimensions of social/individual existence. The authors propose a "complex system perspective of human action" arguing that it could help us predict eventual long-term consequences of our choices in areas where human autonomous action is directly affected by informational technologies. This vision expresses a type of "systemic compatibilism" that allows expansion of the set of possibilities made available in the processes of autonomous human decision-making. In order to illustrate the need to adopt systemic compatibilism and the limitations of traditional ethics, the authors pay attention to the radical human enhancement project (or trans-humanism) begun by Raymond Kurzweil, Aubrey de Grey & Rae, and Nick Bostron. Contrary to the partial acceptance of this project by deontological, utilitarian and customary ethical approaches, the complex systems analysis would weigh the long-term consequences and multi-scale dynamics of the complex systems in which individuals participate.

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