The Information Society and Its Philosophy: Introduction to the Special Issue on The Philosophy of Information, Its Nature, and Future Developments

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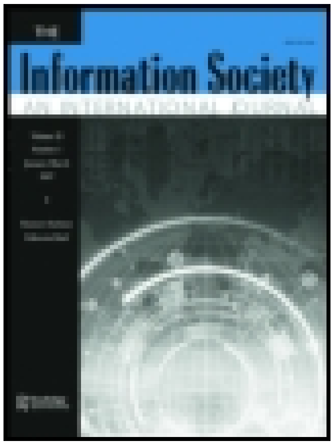

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The article introduces the special issue dedicated to "The Philosophy of Information, Its Nature, and Future Developments." It outlines the origins of the information society and then briefly discusses the definition of the philosophy of information, the possibility of reconciling nature and technology, the informational turn as a fourth revolution (after Copernicus, Darwin, and Freud), and the metaphysics of the infosphere.

Keywords fourth revolution, infosphere, philosophy of information, philosophy of technology

HISTORY AS THE INFORMATION AGE

History has many metrics. Some are natural and circular, relying on seasons and planetary motions. Some are social or political and linear, being determined, for example, by the succession of Olympic Games, or the number of years since the founding of the city of Rome (*ab urbe condita*), or the ascension of a king. Still others are religious and have a V-shape, counting years before and after a particular event (e.g. the birth of Christ). There are larger periods that encompass smaller ones, named after influential styles (Baroque), people (Victorian era), particular circumstances (Cold War), or some new technology (nuclear age). What all these and many other metrics have in common is that they are all *historical*, in the strict sense that they all depend on the development of systems to record events and hence accumulate and transmit information about the past. Thus, history is actually synonymous with the information age, since prehistory is the age in human development that precedes the availability of recording systems. One may therefore argue that humanity has been living in various kinds of information societies at least since the Bronze Age, the era that marks the invention of writing in different regions of the world, and especially in Mesopotamia (4th millennium BC). And yet, this is not what we typically mean by the information revolution. There may be many explanations, but one seems more convincing than any other: Only very recently have human progress and welfare begun to depend mostly on the successful and efficient management of the information life cycle.[1]

The length of time that the information society has taken to emerge should not be surprising. Imagine an historian writing in a million years.[2] She may consider it normal and perhaps even elegantly symmetrical that it took roughly six millennia (from its beginning in the Neolithic, 10th millennium BC, until the Bronze Age) for the agricultural revolution to produce its full effect, and then another six millennia (from the Bronze Age until the end of the 2nd millennium AC) for the information revolution to bear its main fruit.[3] During this span of time, information technologies evolved from being mainly recording systems, to being also communication systems (especially after Guttenberg), to being also processing systems (especially after Turing). Thanks to this evolution, nowadays the most advanced economies highly depend, for their functioning and growth, on the pivotal role played by information-based, intangible assets, information-intensive services (especially business and property services, communications, finance and insurance, and entertainment), and information-oriented public sectors (especially education, public administration, and health care). For example, all G7 members[4] qualify as information societies because, I would argue, in each case at least 70% of the gross domestic product (GDP) depends

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on intangible goods, which are information related, not on material goods, which are the physical output of agricultural or manufacturing processes.

The almost sudden burst of a global information society, after a few millennia of relatively quieter gestation, has generated new and disruptive challenges, which were largely unforeseeable only a few decades ago. As the European Group on Ethics in Science and New Technologies (EGE) and the UNESCO Observatory on the Information Society have well documented, the information revolution has been changing the world profoundly, irreversibly, and problematically since the fifties, at a breathtaking pace, and with unprecedented scope, making the creation, management, and utilization of information, communication, and computational resources vital issues.

To have some simple, quantitative measure of the transformations experienced by our generation, consider the following findings. In a recent study, researchers at Berkeley's School of Information Management and Systems estimated that humanity had accumulated approximately 12 exabytes[5] of data in the course of its entire history until the commodification of computers, but that it had produced more than 5 exabytes of data just in 2002: "print, film, magnetic, and optical storage media produced about 5 exabytes of new information in 2002. Ninety-two percent of the new information was stored on magnetic media, mostly in hard disks.... Five exabytes of information is equivalent in size to the information contained in 37,000 new libraries the size of the Library of Congress book collections" (Lyman & Varian, 2003). In 2002, this was almost 800 MB of recorded data produced per person. It is like saying that every newborn baby came into the world with a burden of 30 feet of books, the equivalent of 800 MB of data on paper. This exponential escalation has been relentless: "between 2006 and 2010 ... the digital universe will increase more than six fold from 161 exabytes to 988 exabytes."[6]

Not feeling under pressure would be abnormal. The development of information and communication technologies (ICTs) has not only brought enormous benefits and opportunities but also greatly outpaced our understanding of their conceptual nature and implications, while raising problems whose complexity and global dimensions are rapidly expanding, evolving, and becoming increasingly serious. A simple analogy may help to make sense of the current situation. Our technological tree has been growing its far-reaching branches much more widely, rapidly, and chaotically than its conceptual, ethical, and cultural roots. The lack of balance is obvious and a matter of daily experience in the life of millions of citizens.[7] The risk is that, like a tree with weak roots, further and healthier growth at the top might be impaired by a fragile foundation at the bottom. As a consequence, today, any advanced information society faces the pressing task of equipping itself with a viable philosophy of information (PI). Applying the previous analogy, while technology keeps growing bottom-up, it is high time we start digging deeper, top-down, in order to expand and reinforce our conceptual understanding of our information age, of its nature, its less visible implications, and its impact on human and environmental welfare, and thus give ourselves a chance to anticipate difficulties, identify opportunities, and resolve problems, conflicts, and dilemmas.

It is from such a broad perspective that I would like to invite the reader to approach this special issue of *The Information Society* dedicated to "The Philosophy of Information, Its Nature, and Future Developments." The four articles constituting the issue perfectly complement each other. Written by leading experts in the area, they tackle some of the key issues in PI, ethically (Charles Ess), epistemologically (Don Fallis and Dennis Whitcomb), culturally (Adam Briggle and Carl Mitcham), and information-theoretically (Leslie Willcocks and Edgar Whitley). Since the authors need no introduction, and the articles are well summarized by their abstracts, in the rest of this introduction my contribution will be to highlight and briefly analyze four related topics that run across this special issue: what PI is, the possibility of reconciling nature and technology, the information revolution, and finally a philosophical interpretation of the infosphere.

DEFINING THE PHILOSOPHY OF INFORMATION

PI may be defined as the philosophical field concerned with (a) the critical investigation of the conceptual nature and basic principles of information, including its dynamics, utilization, and sciences, and (b) the elaboration and application of information-theoretic and computational methodologies to philosophical problems.[8]

The first half of the definition concerns PI as a new field. PI appropriates an explicit, clear, and precise interpretation of the classical Socratic question "ti esti... ?" ("what is... ?"), namely, "What is information?" This is the clearest hallmark of a new field. PI provides critical investigations that are not to be confused with a mathematical theory of data communication (information theory). On the whole, its task is to develop an integrated family of theories that analyze, evaluate, and explain the various principles and concepts of information, their dynamics and utilization, giving special attention to systemic issues arising from different contexts of application and the interconnections with other key concepts in philosophy, such as knowledge, truth, meaning, reality, and ethical values.

By "dynamics of information" the definition refers to:

1. *The constitution and modelling of information environments*, including their systemic properties, forms

of interaction, internal developments, applications, etc.

2. *Information life cycles*, i.e., the series of various stages of form and functional activity through which information can pass, from its initial occurrence to its final utilization and possible disappearance.
3. *Computation*, both in the Turing-machine sense of *algorithmic processing*, and in the wider sense of *information processing*. This is a crucial specification. We have seen that, although a very old concept, information has finally acquired the nature of a primary phenomenon thanks to the sciences and technologies of computation and ICT. Computation has therefore attracted much philosophical attention in recent years. Nevertheless, PI privileges "information" over "computation" as the pivotal topic of the new field because it analyzes the latter as presupposing the former. PI treats "computation" as only one (although very important) of the manufacturing processes in which information can be involved.

From an environmental perspective, PI is critical and normative about what may count as information, and how information should be adequately created, processed, managed, and used. Methodological and theoretical choices in information and computer sciences (ICS) are also profoundly influenced by the kind of PI a researcher adopts more or less consciously. It is therefore essential to stress that PI critically evaluates, shapes, and sharpens the conceptual, methodological, and theoretical basis of ICS—in short, that it also provides a *philosophy of ICS*, as has been obvious since early work in the area of philosophy of artificial intelligence (AI).

As we have already noted, an excessive concern with current issues may lead one to miss the important fact that it is perfectly legitimate to speak of a philosophy of information even in authors who lived a long time before the invention of computers, and hence that it will be extremely fruitful to develop a historical approach and trace PI's diachronic evolution, as long as the technical and conceptual frameworks of ICS are not anachronistically applied, but are used to provide the conceptual methods and privileged perspectives useful to evaluate reflections that were developed on the nature, dynamics, and utilization of information well before the availability of digital ICTs. This is significantly comparable with the development undergone by other philosophical fields like the philosophy of language, the philosophy of biology, or the philosophy of mathematics.[9]

The second half of the definition (point 2) indicates that PI is not only a new field, but provides an innovative methodology as well. Research into the conceptual nature of information, its dynamics, and its utilization is carried on from the vantage point represented by the methodologies and theories offered by ICS and ICT. This perspective affects other philosophical topics as well. Information-theoretic and computational methods, concepts, tools, and techniques have already been developed and applied in many philosophical areas.

So far, this is a very high-level description of PI. Turning now to more specific aspects, one of the fundamental topics investigated by PI is whether nature (*physis*) and technology (*techne*) may be reconcilable. Since it is also a topic of particular relevance to this special issue, it deserves its own separate discussion.

THE MARRIAGE OF *PHYSIS* AND *TECHNE*

According to PI, whether *physis* and *techne* may be reconcilable is not a question that has a predetermined answer, waiting to be divined. It is more like a practical problem, whose feasible solution needs to be devised. With an analogy, we are not asking whether two chemicals could mix but rather whether a marriage may be successful. There is plenty of room for a positive answer, provided the right sort of commitment is made.

It seems beyond doubt that a successful marriage between *physis* and *techne* is vital and hence worth our effort. Information societies increasingly depend upon technology to thrive, but they equally need a healthy, natural environment to flourish. Try to imagine the world not tomorrow or next year, but next century, or next millennium: A divorce between *physis* and *techne* would be utterly disastrous both for our welfare and for the well-being of our habitat. This is something that technophiles and green fundamentalists must come to understand. Failing to negotiate a fruitful, symbiotic relationship between technology and nature is not an option. Fortunately, a successful marriage between *physis* and *techne* is achievable. True, much more progress needs to be made. The physics of information can be highly energy-consuming and hence potentially unfriendly toward the environment. In 2000, data centers consumed 0.6% of the world's electricity. In 2005, the figure had risen to 1%. They are now responsible for more carbon dioxide emissions per year than Argentina or the Netherlands, and, if current trends hold, their emissions will have grown fourfold by 2020, reaching 670 million tonnes. By then, it is estimated that ICTs' carbon footprint will be higher than aviation's.[10] However, ICTs will also help "to eliminate 7.8 metric gigatons of greenhouse gas emissions annually by 2020 equivalent to 15 percent of global emissions today and five times more than our estimate of the emissions from these technologies in 2020."[11] This positive (and improvable) balance leads me to a final comment.

The greenest machine is a machine with 100% energy efficiency. Unfortunately, this is equivalent to a perpetual motion machine and the latter is simply a pipe dream.

However, we also know that such an impossible limit can be increasingly approximated: Energy waste can be dramatically reduced and energy efficiency can be highly increased (the two processes are not necessarily the same; compare recycling vs. doing more with less). Often, both kinds of processes may be fostered only by relying on significant improvements in the management of information (e.g., to build and run hardware and processes better). So here is how we may reinterpret Socrates' ethical intellectualism: We do evil because we do not know better, in the sense that the better the information management is, the less moral evil is caused. With a proviso, though: Some ethical theories, especially in the Christian tradition, seem to assume that the moral game, played by agents in their environments, may be won absolutely, i.e., not in terms of higher scores, but by scoring perhaps very little as long as no moral loss or error occurs, a bit like winning a football game by scoring only one goal as long as none is received. It seems that this absolute view has led different parties to underestimate the importance of successful compromises (imagine an environmentalist unable to accept any technology responsible for some level of carbon dioxide emission, no matter how it may counterbalance it). The more realistic and challenging view is that moral evil is unavoidable, so that the real effort lies in limiting it and counterbalancing it with more moral goodness.

ICTs can help us in our fight against the destruction, impoverishment, vandalism, and waste of both natural and human (including historical and cultural) resources. So they can be a precious ally in what I have called elsewhere[12] *synthetic environmentalism* or *e-nvironmentalism*. We should resist any Greek epistemological tendency to treat *techne* as the Cinderella of knowledge; any absolutist inclination to accept no moral balancing between some unavoidable evil and more goodness; or any modern, reactionary, metaphysical temptation to drive a wedge between naturalism and constructionism by privileging the former as the only authentic dimension of human life. The challenge is to reconcile our roles as agents within nature and as stewards of nature. The good news is that it is a challenge we can meet. The odd thing is that we are slowly coming to realize that we have such a hybrid nature. A turning point in this process of self-understanding is what I have defined as the *fourth revolution* (Floridi, 2008a).

THE FOURTH REVOLUTION

Science has two fundamental ways of changing our understanding. One may be called *extravert*, or about the world, and the other *introvert*, or about ourselves. Three scientific revolutions have had great impact in both ways. They changed not only our understanding of the external world, but also our conception of who we are. After Nicolaus Copernicus (1473–1543), the heliocentric cosmology displaced the earth and hence humanity from the center of the universe. Charles Darwin (1809–1882) showed that all species of life have evolved over time from common ancestors through natural selection, thus displacing humanity from the center of the biological kingdom. And following Sigmund Freud (1856–1939), we acknowledge nowadays that the mind is also unconscious and subject to the defense mechanism of repression. So we are not immobile, at the center of the universe (Copernican revolution), we are not unnaturally separate and diverse from the rest of the animal kingdom (Darwinian revolution), and we are very far from being Cartesian minds entirely transparent to ourselves (Freudian revolution).

Freud (1917) was the first[13] to interpret these three revolutions as part of a single process of reassessment of human nature. In a similar way, when we now perceive that something very significant and profound has happened to human life after the informational turn, I would argue that our intuition is correct, because we are experiencing what may be described as a fourth revolution, in the process of dislocation and reassessment of humanity's fundamental nature and role in the universe. We do not know whether we may be the only intelligent form of life. But we are now slowly accepting the idea that we might be informational organisms (*inforgs*; see Floridi, 2007) among many others, significantly but not dramatically different from natural entities and agents and smart, engineered artifacts. It seems that, in view of this important change in our self-understanding—and of the sort of ICT-mediated interactions that we will increasingly enjoy with other agents, whether biological or artificial—the best way of tackling the new ethical challenges posed by ICTs may be from an environmental approach, one that does not privilege the natural or untouched, but treats as authentic and genuine all forms of existence and behavior, even those based on artificial, synthetic, or engineered artifacts. This sort of holistic environmentalism requires a change in our metaphysical perspective, the topic of the next section.

THE METAPHYSICS OF THE INFOSPHERE

Within the information society, it seems that we are modifying our ontological perspective, from a materialist one, in which physical objects and processes still play a key role, to an informational one, in which (a) objects and processes are dephysicalized, typified, and perfectly clonable; (b) the right of usage is perceived to be at least as important as the right to ownership; and (c) the criterion for existence is no longer being immutable (Greek metaphysics) or being potentially subject to perception (modern metaphysics) but being interactable. If all this seems a bit too "metaphysical," let me provide an illustrative example.[14]

Despite some important exceptions (e.g., vases and metal tools in ancient civilizations or books after Guttenberg), it was the industrial revolution that really marked the passage from a nominalist world of unique objects to a Platonist world of types of objects, all perfectly reproducible as identical to each other, therefore epistemically indiscernible, and hence pragmatically dispensable because replaceable without any loss. Today, we find it obvious that two automobiles may be virtually identical and that we are invited to buy a model rather than a specific "incarnation" of it. Indeed, we are rapidly moving toward a commodification of objects that considers repair as synonymous with replacement, even when it comes to entire buildings. This has led, by way of compensation, to a prioritization of *branding*—a process compared by Klein [2000] to the creation of "cultural accessories and personal philosophies"—and of *re-appropriation*: The person who puts a sticker on the window of her car, which is otherwise perfectly identical to thousands of others, is fighting an anti-Platonic battle. The information revolution has further exacerbated this process. Once our window-shopping becomes Windows-shopping and no longer means walking down the street but browsing through the Web, the problem caused by the dephysicalization and typification of individuals as unique and irreplaceable entities starts eroding our sense of personal identity as well. We become mass-produced, anonymous entities among other anonymous entities, exposed to billions of other similar inforgs online. So we self-brand and re-appropriate ourselves in cyberspace by blogs and Facebook entries, home pages, YouTube videos, and Flickr albums. We use and expose information about ourselves to become less informationally indiscernible. We wish to maintain a high level of informational privacy almost as if that were the only way of saving a precious capital that can then be publicly invested by us in order to construct ourselves as individuals discernible by others. Now, processes such as the one I have just sketched are part of a far deeper metaphysical drift caused by the information revolution. And PI is the sort of approach we need to develop if we wish to tackle the challenges posed by such profound transformations.

NOTES

1. A typical life cycle includes the following phases: occurring (discovering, designing, authoring, etc.), processing and managing (collecting, validating, modifying, organizing, indexing, classifying, filtering, updating, sorting, storing, networking, distributing, accessing, retrieving, transmitting, etc.), and using (monitoring, modeling, analyzing, explaining, planning, forecasting, decision making, instructing, educating, learning, etc.).

2. According to recent estimates, life on Earth will be destroyed by the increase in solar temperature only in a billion years, so we have time, if we do not mess too much with our planet.

3. The relation between the agricultural and the information revolutions may be more a matter of circular return to our origins than a linear evolution from them if, according to the information foraging theory, human users search for information online by relying on ancestral foraging mechanisms that evolved in order to find food in a pre-agricultural society (Pirolli, 2007).

4. Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States.

5. One exabyte corresponds to 1,000,000,000,000,000,000 bytes or 10^{18}.

6. Source: "The Expanding Digital Universe: A Forecast of Worldwide Information Growth Through 2010," white paper, sponsored by EMC–IDC, http://www.emc.com/about/destination/digital_universe/

7. Such daily experience normally translates into dealing with information-related ethical issues; see Floridi (2008c).

8. The definition is first introduced in Floridi (2002). The nature and scope of PI are further discussed in Floridi (2003a) and Floridi (2004). Floridi (2003b) provides an undergraduate level introduction to PI.

9. See Adams (2003) for a reconstruction of the informational turn in philosophy.

10. Source: *The Economist*, May 22, 2008.

11. Source: McKinsey's Information Technology Report, October 2008, "How IT can cut carbon emissions," by Giulio Boccaletti, Markus Löffler, and Jeremy M. Oppenheim.

12. See the preface to Floridi (2008d).

13. See now Weinert (2009).

14. The reader interested in a more philosophical analysis may wish to see Floridi (2008b) and Floridi (in press).

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