



# Artificial intelligences and political organization: An exploration based on the science fiction work of Iain M. Banks

Yannick Rumpala

Université de Nice Sophia-Antipolis, Avenue du Doyen Trotabas, Nice, France

## ARTICLE INFO

### Article history:

Received 29 June 2011

Received in revised form 6 November 2011

Accepted 20 December 2011

### Keywords:

Anarchy  
Artificial intelligence  
Civilization  
Machines  
Politics

## ABSTRACT

This paper, using science fiction as a heuristic support for exploring technical potentialities, is based on part of the works of Iain M. Banks, the novels of the “Culture series”, in order to examine the role of artificial intelligences and the effects they could have on the life of a community from a political point of view. This series of science fiction novels portrays a galactic civilization based on anarchistic principles in which intelligent machines are largely responsible for managing the tasks linked to the handling of community affairs, thus freeing up the population to pursue more spiritual or fun activities. The first part of this paper shows that beyond the elements included in the stories, the Culture novels can be a way to address political questions that are raised by the widespread presence of highly evolved machines in the organization of a society. The second part, which takes into consideration the supposed founding principles of this civilization, examines the anarchist thought in order not only to display the correspondences between this thought and the vision of Iain M. Banks, but also to show that the various anarchistic currents are in a way outdistanced by the emerging challenges posed by these novels. The third part, written again from a political standpoint, attempts to establish more concrete connections, based on discernable evolutions in computerization or automation of technological systems, which seem to be working their way into a growing number of social processes and their regulation.

© 2011 Elsevier Ltd. All rights reserved.

## 1. Introduction

Through analyses combining a literary perspective, political theory and forward thinking, the objective of this contribution is to test a hypothesis that sounds like science fiction, but could go beyond science fiction itself. This hypothesis is based on part of the works of the Scottish writer Iain M. Banks, notably the “Culture novels”, and the social organization that is described in these works. This series of novels portrays a galactic civilization ruled by anarchistic principles in which problems of shortage are overcome and power structures seem to be dismantled. In this civilization called the Culture, artificial intelligences or “Minds” are responsible for managing the tasks linked to

the handling of collective affairs, thus freeing up the population to pursue more spiritual or fun activities. The type of social organization described by Iain M. Banks in his novels<sup>1</sup> exists mostly because of the protective support provided by these artificial intelligences.

If this hypothesis is considered beyond a literary point of view, could it help to conceive the role that “intelligent” machines, or at least highly evolved ones, might play in social and political organization? How could these machines be integrated into collective life? How far would their inclusion go concerning their ability to modify institutional workings? In the civilization model of the Culture, certain ontological distinctions have disappeared, since these entities behave like people and are treated as such.

E-mail address: [rumpala@unice.fr](mailto:rumpala@unice.fr).

<sup>1</sup> An explanatory essay from the author is also available on the Internet (Ref. [1]).

Vessels and space stations have their own “Minds” that make their own choices. In a way, these “conscious” and “sensitive” machines, which are much more intelligent than humans, “are” these spacecrafts. They are the reflective backbone of the Culture, which in fact they control more than they actually live there.

If we follow the vision of Iain M. Banks, the development and the widespread presence of these artificial intelligences have disrupted the political system, and even the conception of politics. This would be a very specific application of anarchistic principles. The author has indeed created an organized world in which the plan to replace the government of men with the administration of things has been carried out, thanks to artificial intelligences and limitless material wealth and energy. In this model, there would not really be any political choices left to be made.<sup>2</sup> Difficult decisions brought about by resource allocation problems would have no reason to be, or at worst could be resolved using enhanced processing power. Abuse of power would not really be feared, since power would in a way be allocated to these artificial intelligences, which, constitutively, would have risen above these challenges (or in any case, for who this type of temptation would be senseless).

In the work of Iain M. Banks, these elements are not simple elements of science fiction scenery: they play an important and intimate role in the stories. Going beyond literary analysis, they can be used as a basis of questioning regarding the possibilities of “social” regulation without direct human intervention, or more precisely, with the mediation of machines evolving towards a form of artificial intelligence. This contribution will also be a way to test up to what point and on what basis such a hypothesis can hold up. Can advances in computer technologies lead to re-imagining the possible ways societies can be regulated?<sup>3</sup> If so, to what extent? What is left of politics when it becomes dependent on computer systems that are more and more advanced?

It is difficult to answer these questions without finding (and it is also one of the challenges of this article) how to initiate a discussion about techniques which do not exist in practice, or which exist only in a potential state. The solution proposed here is to consider future-oriented fictional works as heuristic media.<sup>4</sup> More precisely, works of science fiction can be taken both as a reservoir of thought experiments and as forms of problematizations (in the sense of Michel Foucault). These works may not have been conceived as thought experiments, but the majority of them can be considered according to this model, in particular by providing hypotheses to work with (What if...?). Science fiction can be considered jointly as a way to problematize not only developments in the field of science (if one remains attached to the name of the genre), but also, and perhaps above all, more or less direct consequences on

social and political systems. In the manner of Michel Foucault,<sup>5</sup> these problematizations can be conceived as ways for thought to seize objects which have a relatively new appearance. To be more precise, they may be ways to examine conditions of possibility and function so that between the beginning and the end of the work of fiction, the representation of a question is changed. In the case of a literary work, these problematizations may also merely be the rearrangement of diffuse representations more or less consciously taken up by the author.

Reconsidered in this manner, the fictional material can find methodological support to also become a medium of knowledge, even if its content may seem very detached from reality. On the subject at hand, it can consist in identifying narrative situations in which the reader can see these “artificial intelligences” operating. These representations are scattered, but their combination is expected to draw a relatively coherent configuration,<sup>6</sup> with the added benefit of intellectual freedom enabling to go beyond the question of the (largely artificial) borders between what is technical and what is political. Even if the envisaged technologies are still hypothetical, potentialities can thus be actualized, not in reality, but in a fictional construction (which can happen to create effects of reality). Treated as a form of problematization (also with its share of reactivation of more or less ancient myths), science fiction can then be more easily related to other forms of problematization, such as those which are available in political or philosophical reflections, or those which weave the discursive accompaniment of technical developments.

To progress in this type of questioning, it is no longer possible to maintain a vision of machines from the last century. That would mean misunderstanding the challenges that might come up in the more or less near future. It is necessary to “take out the notion of machine from an industrial conception”, to quote an objective set by Frédéric Vengeon in a syllabus from the *Collège international de philosophie*.<sup>7</sup> And above all, it is necessary to restore not only the mechanical nature of machines, but also the digital one.<sup>8</sup>

In fact, this evolution of machines appears to generate important consequences. For a long time, humanity has

<sup>5</sup> See Ref. [16].

<sup>6</sup> From a methodological point of view, familiarity with the author's work helps, but it is usefully supplemented by the collection of the positions he has taken up and what is concerning the “paratext” (See Ref. [18]).

<sup>7</sup> See Ref. [42].

<sup>8</sup> As a first approach, we could start by examining the characteristics identified by Dirk Nicolas Wagner: “In essence, a rough portrait of today's machines could be painted along the following lines: At an accelerating pace, machines are becoming more and more powerful. Indicative of this process is Moore's Law, which states that the power of processors doubles every 18 months while cost remains the same. Increasingly, computers are becoming social artifacts rather than mechanical objects. The functions executed by machines are becoming ever more important. To an increasing degree, computers are influencing the entire environment physically, economically, and socially. The way machines take over different functions is changing. Rather than machines directly manipulated by humans, more and more complex tasks are being delegated to them. Machines no longer act in isolation but are interacting with humans and with other machines. The Internet provides a common global infrastructure that is open to any actor – human or artificial” (Ref. [44]).

<sup>2</sup> See Ref. [8], especially p. 632.

<sup>3</sup> Which can lead to conceiving computer algorithms, “artificial intelligences”, etc., as being “actants” also likely to be integrated into the “collective” and participate in it more or less actively, if we use the terms and perspective proposed by Bruno Latour to re-integrate non-humans into sociological analysis. See for example Ref. [28].

<sup>4</sup> See Ref. [38].

filled the world with various artifacts, but it now seems in the process of adding a whole range of artifacts with new possibilities. In addition to machines transforming energy and/or material, there are now machines capable of processing information flows, and this in quantities and at speeds that seem prodigious. It is still unclear whether these machinic artifacts might be the premise of “artificial intelligences” to come. In any case, these artifacts can no longer be considered as mere instruments for human activities, but they eventually form a socio-technical assemblage in which they appear to gain more self-regulatory capacities. In this evolution, the relationship of the collective with its artefactual creations is likely to change. Of course, non-human artifacts could already benefit from forms of delegation from humans. But with “artificial intelligence”, the stakes could rise to a higher level. Above all, such an issue is typically part of issues that may come from an increase in technological development and that has become difficult to conceive in the present tense (the risk being to allow these changes without thinking about their political implications). Although these potential advances in technology are not yet in operation, it is thus useful to find a way to put them in context.

Notwithstanding, given the uncertainties in the possible developments, it is better not to have a too restrictive definition of “artificial intelligences”, and consider them as openly as Iain M. Banks does. It is preferable to not define them according to what they are (that is, an essentialist vision), but what they do or rather what they seem to be able to do (that is, a pragmatic vision), thus considering the web of relations they are a part of.

This contribution, which thus uses the work of fiction as a way to reflect on the social and political inclusion of technological evolutions,<sup>9</sup> will be organized into three sections. The *first* part will show the political questions that the novels, which have the Culture as a framework, allowed to be formulated regarding the consequences of progress in artificial intelligence and their effects on the organization of societies. The *second* part, which takes into consideration the supposed founding principles of this civilization, examines the anarchist thought in order not only to display the correspondences between this thought and the vision of Iain M. Banks, but also to show that the various anarchistic currents are in a way outdistanced by the emerging challenges posed by these novels. The *third* part, written again from a political standpoint, attempts to establish more concrete connections, based on discernable evolutions in computerization or automation of technological systems, which can participate in the regulation of social processes.

## 2. A few notes about the Minds of the culture

Why is it interesting to make a connection between the literary vision of science fiction and politico-philosophical

reflections? Not for the pleasure of speculating, but because exploring this connection can be a stimulating way to question the political implications of progress in artificial intelligence. Which tasks can be entrusted to machines that are no longer simple automata? Could these tasks interfere with others that involve human collective choices? What are the implications of involving artificial intelligence in the management of societal matters? Is an anarchistic project more credible because it includes the use of such highly developed machines?

First of all, a few details about the Culture need to be made clear. The Culture, as Iain M. Banks portrays it, is a civilization, not an empire. Its members do not have any ambition to exercise authority or sovereignty over the parts of the galaxy where it is present. This does not mean that the Culture is not interested in their fate, on the contrary. The novels in this series are episodes in which the Culture is in contact with other civilizations, with the challenge of defending or promoting its collective model in the most peaceful way possible. Most of the time, the Culture does this by striving not to be directly visible, but entrusting this mission to specialized units (“Contact” for the diplomatic issues and “Special Circumstances” for spying and undercover operations), whose agents are known for being discrete and efficient.

### 2.1. Open society and automated abundance

The Culture is a civilization that is sure of its values and, more often than not, confident in its abilities. There are many reasons to believe in them, since the Culture has reached a level of technical evolution that ensures the elements it needs to sustain itself and expand. From a material point of view, the Culture has acquired an ability to produce unlimited amounts of materials and energy (but Iain M. Banks does not give details about this apanage). In addition, what is of particular interest for us is the fact that the Culture receives support from different types of artificial intelligences, from those that can manage gigantic artificial space habitats (“orbitals”, whose size can go up to a few million kilometres in diameter), to “drones”, which correspond more closely to the standard image of robots. At a first glance, the Culture could be an incarnation of the hope formulated by those who believe in the technological convergence and positive effects of nanoscience.<sup>10</sup> The Culture seems to have reached a level that allows “pacific and mutually advantageous interaction between human beings and intelligent machines, the disappearance of all obstacles to generalized communication, and notably those resulting from the diversity of languages, and access to inexhaustible sources of energy”.<sup>11</sup>

However, the description provided by Iain M. Banks goes beyond interaction. These intelligent machines, each with a distinct personality, the most highly developed of them that he calls “Minds”, have collectively become the administrative infrastructure of this civilization. Their capabilities are such that there appears to be no reason why

<sup>9</sup> And which can have a speculative dimension, but which can also find with this speculative dimension a value in its own right, as Diane P. Michelfelder defends, by helping to uncover challenges that might go otherwise unnoticed, to redefine questions that might otherwise be forgotten, and examine questions that might otherwise go unasked. See Ref. [29].

<sup>10</sup> Regarding this concept of convergence and its rhetorical foundations, see Ref. [39].

<sup>11</sup> Ref. [36].

the Culture could not rely on them to ensure the general welfare for all. This omnipresence seems to have rendered institutions that our fellow humans are familiar with unnecessary. The Culture is not without rules, but they are not part of written laws, *a fortiori* formulated by a legislative body. Its functioning is not dependent on institutions that we would call a government. A high level of technological advancement has seemingly allowed for basic functions, from which a society can perpetuate, to be automated, while the more complicated functions are handled by the “Minds” (for example, “Hubs” for those who manage the rings of “orbitals”). Regarding the humanoids who are part of the Culture, they no longer need to work since less evolved machines without consciousness can carry out the menial tasks. Money is no longer needed because material scarcity does not exist.

## 2.2. Computer-assisted anarchy

Iain M. Banks thus eliminates a good number of factors that foster domination. As he explains in a lengthy article: “Briefly, nothing and nobody in the Culture is exploited. It is essentially an automated civilization in its manufacturing processes, with human labour restricted to something indistinguishable from play, or a hobby. No machine is exploited, either; the idea here being that any job can be automated in such a way as to ensure that it can be done by a machine well below the level of potential consciousness; what to us would be a stunningly sophisticated computer running a factory (for example) would be looked on by the Culture’s AIs as a glorified calculator, and no more exploited than an insect is exploited when it pollinates a fruit tree a human later eats a fruit from”.<sup>12</sup>

Human beings and machines thus co-exist in a collective that seems to function on the basis of equality, with mutual respect. The presence of highly evolved machines in the everyday environment is a normal occurrence for the humanoids who live with them. In the Culture, artificial intelligence is not an object that is used; it is a companion, a partner, an advisor, sometimes a trustworthy friend, or even a permanent supervisor, such as the “slap-drone”, punishment for those convicted of murder.<sup>13</sup> In its most evolved form, the technical object is personified, and its technical aspect nearly disappears (“drones” even have their own name), in the same way that those humans who could have understood this level of technical sophistication, such as scientists, technicians, and other knowledgeable people from the technical sphere, seem to disappear. Therefore, except if their destruction becomes a moment of revelation (or shortly before, at the very beginning of *Consider Phlebas*), the readers do not know how the machines work and find themselves confronted with a species of technological wonder: “When technology operates “normally” its workings are hidden, effortless, and as if magical—an exaggeration of the everyday experience of technology, but, in this context of vast powers, a telling

one. Further, Banks has imagined a future society of almost utopian technological reach, but one which has assigned labour (physical or mental) to unseen “Minds” and drones. He has no disposition to imagine the work of the expert, or technician, or scientist as a way of revealing technology”.<sup>14</sup>

Thanks to artificial intelligences, the Culture could represent the reign of rational activity, but end up being supported by a rationality that is no longer completely human, since it is largely artefactual. To such a point that Patrick Thaddeus Jackson and James Heilman have come to consider that: “In turning virtually everything of consequence over to the Minds, the Culture has in effect allowed itself to be governed by reason more purely than any society dependent on human authorities could possibly be. [...] The Culture’s operating presumption, then, is that if Minds decree it, then it must be reasonable, and inasmuch as the Culture is a reasonable society, it should listen to its Minds”.<sup>15</sup> Differences of opinion can exist between the Minds (as in *Excession* to deal with an outside threat), but they are resolved without getting out of control and leading to more open conflicts.

## 2.3. The culture: a hedonistic and benevolent civilization...that is also post-political?

The expansion of this civilization on a galactic scale can also explain the necessity of resorting to “artificial intelligences”, insofar as human capabilities, even when they are brought together and improved, seem to be largely below the level required to achieve a degree of organization that goes beyond understanding (all the more so, given the examples of episodes in the novels of this series, the Culture continues to expand and absorb other civilizations). These “artificial intelligences”, which are fully integrated into the civilization, carry out both its daily upkeep and the long term planning for its future.

Indeed, human beings no longer have the capacity to acquire the same level of intelligence as the “Minds”. They have become dependent on entities that have become superior in a way. That is why the main protagonist, Horza, in the novel *Consider Phlebas*, a mercenary for the Idirans, a rival civilization, considers the Culture to be a degenerate society that has succumbed to the dependence on machines. In other words, its members have not noticed that the price to pay for their hedonistic way of life is an underlying relinquishment of individual free will. The human beings in the Culture could respond that they find a sort of security for everyone. Given the different types of electronic devices that they wear, the humans always have a line of communication with the “Minds”, which prevents them from being stranded in difficulty or abandoned if they are in a dangerous situation, such as an accident.

While the Culture is *a priori* a pacifist and benevolent society, its members, including its “artificial intelligences” can nevertheless in certain circumstances be brought to go to war. For example, in *Consider Phlebas*, the Culture goes to war against the Idirans and their expansionist

<sup>12</sup> Ref. [1].

<sup>13</sup> “All a slap-drone does is follow the murderer around for the rest of their life to make sure they never murder again” (Ref. [1]).

<sup>14</sup> Ref. [33].

<sup>15</sup> Ref. [21].

fanaticism, and thus to defend the values of their society. If the need arises, its defensive and offensive systems are as highly developed as its technological capacities, which can be very impressive for people from less-advanced civilizations (with for example combinations of combat that are capable of compensating for the weaknesses of their users).

According to the vision of Iain M. Banks, politics still seems to have a place in society, but it takes on principally a form of referenda and closely follows the principles of subsidiarity, where the intervention of the higher authorities is not necessary at the most pertinent level: “Politics in the Culture consists of referenda on issues whenever they are raised; generally, anyone may propose a ballot on any issue at any time; all citizens have one vote. Where issues concern some sub-division or part of a total habitat, all those – human and machine – who may reasonably claim to be affected by the outcome of a poll may cast a vote. Opinions are expressed and positions on issues outlined mostly via the information network (freely available, naturally), and it is here that an individual may exercise the most personal influence, given that the decisions reached as a result of those votes are usually implemented and monitored through a Hub or other supervisory machine, with humans acting (usually on a rota basis) more as liaison officers than in any sort of decision-making executive capacity; one of the few rules the Culture adheres to with any exactitude at all is that a person’s access to power should be in inverse proportion to their desire for it”.<sup>16</sup> It seems that everyone’s opinion can be collected and be publicly voiced. This public forum no longer exists physically, since all community choices are done in a virtual space (the “dataverse”), where each person can put forth his or her arguments. And yet again, discussions and procedures in progress can be followed thanks to machines, which are also responsible for acting the resolutions that were voted on.

As we can see, these hypotheses are more optimistic than those at the heart of popular films such as *The Terminator* or *The Matrix*, prophecies of doom in which “artificial intelligences” end up turning against their creators. In the Culture, the “Minds” embody a form of wisdom and guarantee the smooth functioning of the collective. It benefits from a high level of organization, which goes beyond politics. Not only are activities redistributed, but also responsibilities, notably moral responsibilities. This is very close to the ideal situation according to Iain M. Banks: “So yeah, I think it’s, “Wouldn’t it be cool if the moral responsibility was taken away from us by incredibly clever and cool wise machines and we were just free to get on with being human within a general benign moral framework, and wouldn’t it be great if the more intelligent you were, the nicer you were?” That’s my private theory, anyway”.<sup>17</sup> The “artificial intelligences” could almost be considered to be a type of guardian angels, pure spirits continuously watching over humans in order to keep them on the right path.

### 3. Can highly evolved machines find their place in an anarchistic project?

If anarchy can be defined as “order without power”,<sup>18</sup> then indeed the Culture is not far from it. However, if the galactic civilization described by Iain M. Banks has an anarchistic basis,<sup>19</sup> it is not easy to relate it to the anarchistic tradition, specifically concerning the ways of thinking about the role of technical progress.

Uri Gordon called to mind the ambivalence of anarchistic positions regarding technology. From his point of view, there are two major competing approaches found in anarchistic literature: a “Promethean anticapitalism” and a primitivist critique of civilization.<sup>20</sup> Iain M. Banks’ vision seems to be closer to the first one.

#### 3.1. Searching for the liberatory potential of technology

Certain anarchistic thinkers consider that technology has potentialities of moving towards emancipation. According to Mikhail Bakounine, technology could reduce an individual’s heavy workload, thus participating in the destabilization of the capitalist order.<sup>21</sup> Petr Kropotkine also welcomes the possibilities that “those intelligent beings, modern machines” could offer: “[...] mankind in general, aided by the creatures of steel and iron which it already possesses, could already procure an existence of wealth and ease for every one of its members”.<sup>22</sup>

More recently, Murray Bookchin considered the possibility of a “liberatory technology”,<sup>23</sup> but without losing the vision of a more general social and political design. Damian F. White places Bookchin’s line of thinking along the lines of Kropotkine.<sup>24</sup> If we were to summarize Murray Bookchin’s political ideal, it would be a radically decentralized and democratized society. Such a project, far from being incompatible with the advanced technologies developed throughout human history, could even gain an advantage and be facilitated by them.<sup>25</sup>

Murray Bookchin held a critical position of the dynamics of industrialization as it happened in history, but in technological developments, for example computerization, he perceived the potential to lead a society closer towards decentralization and a reduction of the amount of individual labour.<sup>26</sup> Along the same lines, progress in engineering and computer science and a trend towards

<sup>18</sup> “l’ordre sans le pouvoir” (Ref. [35]).

<sup>19</sup> Made necessary, in his opinion, by the community life in space and the technological sophistication corresponding to it: “Essentially, the contention is that our currently dominant power systems cannot long survive in space; beyond a certain technological level a degree of anarchy is arguably inevitable and anyway preferable” (Ref. [1]).

<sup>20</sup> See Ref. [20]. See also “Luddites, Hackers and Gardeners: Anarchism and the Politics of Technology”, in Ref. [19].

<sup>21</sup> See Ref. [30].

<sup>22</sup> Ref. [27], p. 12. See also “Luddites, Hackers and Gardeners: Anarchism and the Politics of Technology”, in Ref. [19].

<sup>23</sup> See “Towards a liberatory technology” in Ref. [4].

<sup>24</sup> Ref. [45], p. 75. See Ref. [26].

<sup>25</sup> See Ref. [45], p. 75–76.

<sup>26</sup> See “Towards a liberatory technology”, Ref. [4,5].

<sup>16</sup> Ref. [1].

<sup>17</sup> Ref. [3].

miniaturization would allow industrial production to evolve towards a smaller scale, in other words, without needing to use large production units. As a result, conditions in which humanity finds itself could be improved thanks to technological developments, such as automation. The challenge would no longer really be to liberate humanity from need, since technology would allow for that, but to use this potential to help improve the relationship between human beings and nature. These technological developments would thus vehicle a new promise, more qualitative than quantitative, that would lead to achieving human freedom, which itself could henceforth be part of an “ecocommunity”.<sup>27</sup>

In the “social ecology” that Murray Bookchin defends, technology indeed has a role to play and so it is not possible to ignore the different ways it can be integrated into the social fabric. It is specifically a question of finding the least oppressive ways and encouraging their implementation. Along the same lines as automation, which would seem to be advantageous for workers in terms of decreasing strenuous working conditions, technological innovations would have potential that would need to be separated from the industrial capitalist logic. Murray Bookchin makes a connection between the development of computers and the possibility of integrating computers into the manufacturing industry.<sup>28</sup> These technological advances support the vision he proposes, one in which the use of machines could help to construct a socio-economic organization built on new basis: “It is easy to foresee a time, by no means remote, when a rationally organized economy could automatically manufacture small “packaged” factories without human labor; parts could be produced with so little effort that most maintenance tasks would be reduced to the simple act of removing a defective unit from a machine and replacing it by another—a job no more difficult than pulling out and putting in a tray. Machines would make and repair most of the machines required to maintain such a highly industrialized economy. Such a technology, oriented entirely toward human needs and freed from all consideration of profit and loss, would eliminate the pain of want and toil—the penalty, inflicted in the form of denial, suffering and inhumanity, exacted by a society based on scarcity and labor”.<sup>29</sup>

However, Murray Bookchin has a vision of “cybernetic technology” that corresponds to its development at the moment when he was writing. Logically, he imagines its applications especially in the industrial sector: “All but hidden from society, the machines would work for man. Free communities would stand at the end of a cybernated assembly line with baskets to cart the goods home. Industry, like the autonomic nervous system, would work on its own, subject to the repairs that our own bodies require in occasional bouts of illness. The fracture separating man from machine would not be healed. It would simply be ignored”.<sup>30</sup> Therefore, there would be possible

links between the human world and the machine world, but they would need to be constructed.

In terms of technology, Noam Chomsky seems to hold a similar opinion to Murray Bookchin: “I mean, is it necessary that anarchist concepts belong to the pre-industrial phase of human society or is anarchism the rational mode of organization for a highly advanced industrial society? Well, I myself believe the latter, that is, I think that the industrialization and the advance of technology raise possibilities for self-management over a broad scale that simply didn’t exist in an earlier period. [...] A good deal could be automated. Much of the necessary work that is required to keep a decent level of social life going can be consigned to machines – at least, in principle – which means that humans can be free to undertake the kind of creative work which may not have been possible, objectively, in the early stages of the industrial revolution”.<sup>31</sup>

While these authors present many theoretical arguments, empirical arguments still need to be developed. The readers of these works are informed of the possibilities, but it is not clearly explained how to comprehend them in light of liberatory technology.

### 3.2. Persistence and a revival of luddism in the 21st century

In other parts of the anarchistic movement, a strong suspicion of technology remains (more or less associated with the capitalist domination). The critics evoke social factors in its developments, refuse to let themselves be misled by what they consider to be illusory promises, and prefer to encourage the development of less ambitious technologies that appear to be easier to control and more respectful of nature and their users.<sup>32</sup>

The most radical form, the expression of which has recently gained vigour,<sup>33</sup> is expressed in the primitivist tendency, which goes beyond a criticism of technology towards a profound criticism of the idea of progress and civilization. This contestation of technology in general is done on behalf of the preservation of individual autonomy and anthropological arguments emphasizing the “hunter-gatherer” lifestyle.<sup>34</sup>

Moreover, the criticism is not necessarily only verbal and can lead to the practice of new forms of luddism<sup>35</sup> and action repertoires of near-sabotage. Nanotechnologies have already started to provoke this type of combative response.<sup>36</sup> Previously, in the 1970s and 1980s, some underground groups had already undertaken to attack computers. The Committee for Liquidation and Destruction of Computers (or CLODO in French<sup>37</sup>), a group with anarchistic, anti-authoritarian, and anti-industrial principles,

<sup>27</sup> See “Towards a liberatory technology”, Ref. [4].

<sup>28</sup> See “Towards a liberatory technology”, Ref. [4].

<sup>29</sup> See “Towards a liberatory technology”, Ref. [4].

<sup>30</sup> See “Towards a liberatory technology”, Ref. [4].

<sup>31</sup> Ref. [11].

<sup>32</sup> See also “Luddites, Hackers and Gardeners: Anarchism and the Politics of Technology”, in Ref. [19].

<sup>33</sup> See Ref. [34].

<sup>34</sup> See for example Ref. [47].

<sup>35</sup> Including actions to destroy machines that can be placed on a more or less mythic continuum along with older movements. See Ref. [23].

<sup>36</sup> See “Who’s afraid of nanotechnologies?”, in Ref. [22], p. 83s.

<sup>37</sup> Comité pour la Liquidation Ou la Destruction des Ordinateurs or Comité de Libération et de Détournements d’Ordinateurs.

attacked computer companies in France that were accused of promoting and producing not banal technological tools, but tools of domination.<sup>38</sup> Other forms of criticism and neo-luddite actions have continued to develop recently, targeting partly computer technology. Bill Joy, who is known for being the co-founder of the computer company Sun Microsystems in 1982, is also often cited for a text that seems to join a luddite spirit (*Why the future doesn't need us*<sup>39</sup>), based on the results of his reflections about technology. It does not support the anarchistic tendency, but cites the writings of Theodore Kaczynski, the mathematician whose criticism of technology led him to withdraw from modern life and above all send a series of mail bombs to targets he considered guilty of supporting an industrialized civilization (which explains the origin of the pseudonym Unabomber that was given to him while he was being searched for by the FBI).<sup>40</sup>

These reflections and critics more or less related to traditions of anarchism maintain some sort of consciousness in which new technologies must not spread throughout the general passivity. Indeed these technologies create a fear of new forms of alienation, and thus fuel attempts to counterbalance the supposed advantages with the disadvantages that may be less apparent.

Here again, the efficiency of the criticism and the concrete solutions it proposes are questionable. It would be difficult to completely remove existing technologies that are already a large part of everyday life (supposing, moreover, that an agreement could be reached regarding such a decision).

### 3.3. *Technological consciousness and the place of machines in society*

If we consider the range of positions previously mentioned, we could imagine that the progress in the field of artificial intelligence would be met with ambivalence at the least in anarchistic circles, and would probably not be met with the optimism found in the novels of Iain M. Banks.

At least these positions encourage questions to be asked concerning technological evolutions and mastery over them. First of all, an important question is knowing who is in control of the technologies. More precisely, who designs and produces them? In the works of Iain M. Banks, we do not really know how the “Minds” are fabricated. He explains (very briefly) that “[the Culture’s AIs] are designed (by other AIs, for virtually all of the Culture’s history) within very broad parameters, but those parameters do exist”.<sup>41</sup>

However, reviewing the anarchistic theory and doctrines acts as a reminder that controlling technological advances is a political challenge. How can already dominant actors be prevented from taking ownership of these technologies? What can be done to prevent the development of “artificial intelligences” from creating new forms of domination?

Murray Bookchin wondered what the liberatory potential of modern technology could be.<sup>42</sup> We could ask the same question about “artificial intelligences”. Could such a technology contribute to the decline of the State? It could indeed eliminate a number of justifications and prerogatives from the State, thus favoring its dismantlement. Technology can make certain mediations obsolete (for example, when accessing knowledge) and thus weaken the temptation of certain leaders to consider themselves indispensable. The spread of computer capacities and their interconnection can allow for a distributed reflexivity by increasing the access to information and knowledge and by facilitating their reappropriation.

On the other hand, we must also be conscious of the forms of domination that this technology could be used for. Is it possible to trust the designers and promoters? Intentions that were initially generous can be deformed, leading to a pernicious use of technology.

## 4. Has a new phase of machinization already begun?

In the Culture novels, Iain M. Banks presents a civilization that appears to have been functioning for a long time. However, what is missing from his works (but this was probably not part of his intentions) is a presentation of course of events that led these technologies to become liberatory. And yet, this course of events is contingent and not necessarily the most probable one. Prospective reflections have developed regarding the course of events that could be currently underway in the field of “new information and communication technologies”, and they oscillate between promise and fear. The worries are rising and based on the threats that such technologies could pose to freedom. As far as “artificial intelligences” are concerned, specialized academic journals are already dedicated to this subject, for example, *AI & Society*, and their publication is additional proof that the social integration of these technological developments will not happen without concerns.

### 4.1. *Computerization and the increase of machine performance*

The technical progress towards a growing presence of highly evolved machines, more or less directly derived from computers and microprocessors, can have a certain level of plausibility. It is possible to identify evolutions that can appear to be milestones along the way. Indeed, the continual deployment of computerized infrastructures seems to be the tendency, and a growing number of tasks are thus delegated to machines without really evoking any discussion or reflection. These tasks are supposed to be carried out more quickly or more efficiently thanks to computers, which explains the growth of the concerned domains. For example, automation has taken an important place in airplanes. On the financial markets, “automated trading systems” are capable of observing “in real time” the

<sup>38</sup> See <http://www.processedworld.com/Issues/issue10/i10clodo.htm>.

<sup>39</sup> Originally published in the magazine *Wired* (Ref. [24]).

<sup>40</sup> For a presentation of Theodore Kaczynski’s grievances against technology, see for example Ref. [40].

<sup>41</sup> Ref. [1].

<sup>42</sup> “What is the liberatory potential of modern technology, both materially and spiritually?” (Ref. [4], p. 108).

evolution of stock prices and reacting by calculating when to buy and sell which stock. In the legal field, doctrinal questions are posed because the number of contracts that are established by software programs, therefore with little human intervention, is on the rise.<sup>43</sup> In the medical field, expert systems are also being developed to help professionals with diagnostics and prescriptions.

Therefore, an implicit trust seems to be more frequently put in computers, which are capable of collecting, storing, processing, and interpreting large quantities of information. Computer technology appears to be a way to help deal with a growing level of complexity. The technical capacities of computers can help to manage information overload. Computer models can be a way to study and compare different options through the use of algorithms, by varying the hypotheses and exploring the possible consequences.<sup>44</sup>

Moreover, technological progress modifies how information and knowledge are accessed. When the necessary equipment is available, massive amounts of information can become immediately accessible thanks to nearly permanent connections.<sup>45</sup>

#### 4.2. *Machinization of everyday life*

With the advent of “pervasive computing”, another project has been developed: integrating computer technologies into everyday situations. Current research claims to offer an invisible infrastructure in the long term, composed of intermediaries (objects, tools, buildings, etc.) which themselves would be made “intelligent” by their technological and computing capacities: everyday activities would gain a new dimension to become “augmented” activities. In doing so, the “ambient intelligence” relocates engaging everyday choices to a world of relatively autonomous artefacts and machines, which raises the question about the possibilities of controlling these automated functionalities.<sup>46</sup> From another point of view, this “ubiquitous” computing technology is also presented as a way to develop additional forms of interactivity.

For example, the urban environment is supposed to become digital and “intelligent”. Reflections and investments are underway to connect part of the street furniture in cities so it can collect or provide data and eventually become an interactive interface. All in all, with this “pervasive computing”, the fabric of cities tends to undergo a new process of technological densification.

In doing so, even if this is not the main ambition that promoters emphasize, the deployment of these technologies leads to another relationship with the world. As a result of such technologies, the understanding of the world tends to be routed through specific mediations. As is the case for many types of technology, it is the new

resources that are emphasized, and not the additional constraints that can be associated with them.<sup>47</sup> Through these “smart” technologies that are increasingly integrated into the everyday environment and designed to “anticipate” expectations, individuals and human groups could also have their lives caught in a permanent form of assistance, even almost managed,<sup>48</sup> and liable to produce new forms of dependencies.<sup>49</sup>

#### 4.3. *Machines becoming autonomous*

Previously, “artificial intelligence” had already become a field of study (and of speculation) in its own right. However, debates about how to define it still remains. One part of these debates is due to the term “intelligence”, which can be addressed from different angles and therefore become a source of many axes of controversy. Distinctions have also been made between a “weak” and “strong” version of “artificial intelligence”, the former targets the replication of certain mental processes to be applied to specific tasks, whereas the latter would attempt to attain the same level, even go beyond, human intelligence in all its forms.

Certain thinkers, who tend to believe in this type of technology, are convinced that in the long term, these machines will become even more intelligent than humans. Among the influential figures is the philosopher Nick Bostrom, director of the Future of Humanity Institute at the University of Oxford.<sup>50</sup> This is also the case for the trend of thought that developed based on the idea of “singularity”. This concept owes a part of its resonance to the science fiction genre, since one of its founders, Vernor Vinge, was both a mathematician at the University of San Diego in the United States and a science fiction author.<sup>51</sup> The “singularity” theory states that at some point, thanks to the accumulation of developments in computer science, the capacities of machines would allow them to attain a level of intelligence superior to that of humans, which would disrupt the conditions of techno-scientific progress. This concept has fueled a growing number of more or less grounded speculations, going from completely optimistic to entirely pessimistic and worrisome. Even though these “artificial intelligences” are not available, reflections are

<sup>47</sup> Regarding the case of “intelligent buildings” and possible infringements of privacy, see for example Ref. [9].

<sup>48</sup> At Stanford University, the Persuasive Technology Lab for example is working on “machines designed to change humans”. Researchers in the laboratory have thus engaged in what its director, BJ Fogg, called the “captology,” which is defined as: “the study of computers as persuasive technologies. This includes the design, research, and analysis of interactive computing products (computers, mobile phones, websites, wireless technologies, mobile applications, video games, etc.) created for the purpose of changing people’s attitudes or behaviors” (<http://captology.stanford.edu/about/what-is-captology.html>, site accessed October 26, 2011). Ref. [15].

<sup>49</sup> Which are not necessarily related to the technology itself, but which may also ensue from the cultural logics in which this technology is situated or in which it participates (Ref. [25]). Regarding the fears for freedom and autonomy that “ambient intelligence” can give rise to, see also Ref. [7].

<sup>50</sup> See Ref. [6].

<sup>51</sup> He first published this idea in a short article: Ref. [43].

<sup>43</sup> See Ref. [12].

<sup>44</sup> Discussions on climate change have for example become largely dependent on models that need powerful technological capacities, since there are multiple interrelated variables they try to test. See Ref. [31]; Ref. [14].

<sup>45</sup> See Ref. [10].

<sup>46</sup> See Ref. [41].

already underway concerning the risks to fear created by these technological evolutions.<sup>52</sup>

Similar to what happened in robotics, military use of artificial intelligence might be among the first types of its application. It is probable that the States capable of high level research will be encouraged to develop technologies associated with “artificial intelligences” if they see in it a way to strengthen military advantages.<sup>53</sup>

Other uses can develop without the term “artificial intelligences” necessarily being employed. Computer systems are evidently a logical outlet, for example for data mining or spam filtering. But a growing number of other domains are opening up to the use of these technologies, integrating them, and even adapting them (video surveillance thanks to the automated interpretation of video content, and BAS (building automation systems) to manage the energy parameters of large buildings, etc.).

Having confidence in machines raises questions about accountability.<sup>54</sup> How would it be possible to hold “artificial intelligences” responsible for what they have done or contributed to? What would happen if they made a mistake? In the novels written by Iain M. Banks, the “Minds” do not appear to be affected by “bugs”, as if they were infallible. Keeping a hold on these “artificial intelligences” could also presuppose a certain conception based on the principles of *open source*. In the Culture, the question is not raised, since apparently the “Minds” do not function according to this principle. In any case, the high tech nature of the “artificial intelligences” may make them incomprehensible for the vast majority of the population, for whom they would be like “black boxes”.

## 5. Conclusion

It is difficult to predict the effects that research and innovations in the “artificial intelligence” field could have. They might be considerable, but nothing can ensure that technical development itself would allow a society to arrive at a type of collective organization described by Iain M. Banks in his novels about the Culture.

The uncertainties must not necessarily prevent a reflection on the potential consequences of possible leaps and bounds in computer developments. It is not only a technical question; its political implications must also be examined, especially how it could affect collective affairs. Technology and values are not two separate matters: values are part of technology, where some are favored and others disadvantaged. Fictional productions, by seizing technical potentialities in an imaginary form, may contribute to the initiation of forms of reflexivity and to contrasting different ways of implementing the technical promises.

Iain M. Banks, when he describes this civilization that he calls the Culture, seems to postulate a form of equality

between humans and machines, and, in any case, an absence of hierarchy. In this vast galactic universe, technological progress appears to have allowed the civilization to achieve a post-governmental regime in a society without class distinction. The capabilities of the “artificial intelligences” have eliminated any reason to entrust the management of collective affairs to a State or an administration.

This model, which goes beyond the simple coexistence of entities of different natures, seems to postulate a general agreement regarding what the common good is. And the main divisions of interest appear to have disappeared. While the political model proposed by Iain M. Banks resembles a democracy, it is controlled and regulated by a new form of an elite whose judgement is taken for granted, an elite who would be of a particular technocratic form since it would be made up of “artificial intelligences”. Indeed, civilization would be going from one delegation to another.

Moreover, it is interesting to examine the relationship between Banks’ model and theoretical reflections about democracy. Recent developments in these reflections have contributed to emphasizing the deliberative dimension of political activities, especially as a guarantee for the legitimacy of collective choices.<sup>55</sup> In the works of Iain M. Banks, this deliberative dimension seems to be non-existent. Readers can only ask themselves if it is possible to debate with “artificial intelligences”, and *a fortiori* on a large scale. In what kind of public space would it be possible?

An increasingly widespread presence of highly evolved machines leads to a profound questioning of the pertinence of decision-making. For human beings, how much individual autonomy remains? This type of collective functioning presupposes that trust can be put in machines (and in the new range of expert systems).

However, it is not because progress in “artificial intelligences” would not produce a centralizing, hierarchical, and oppressive technology that it necessarily has liberatory potential.<sup>56</sup> In the Culture novels, nothing is mentioned about how the “Minds” activities can be supervised. That is, if the “Minds” let themselves be controlled...

Far from being simplistic, the works of Iain M. Banks show the ambivalence of such a regime. Moreover, he associates the coming of a civilization like the Culture with the development of humanity in space: “In the purest sense, you get to the Culture almost whether you like it or not. But it does involve getting out to space, and it does involve just a huge amount of manufacturing capability. Because what you end up with is entities, space ships or whatever, that become self-sufficient and free moving in space, and it’s very hard to keep effective control of them”.<sup>57</sup> If this step is the determining factor, it goes without saying that humanity still has a long way to go.

<sup>52</sup> See Ref. [46].

<sup>53</sup> In the United States, the Defense Advanced Research Projects Agency (DARPA) had consistently invested the field. See Ref. [37].

<sup>54</sup> The issues identified by Helen Nissenbaum even tend to be reinforced by the progress in technology. See Ref. [32].

<sup>55</sup> See Ref. [13].

<sup>56</sup> Alexander R. Galloway showed this ambivalence about the Internet. See Ref. [17].

<sup>57</sup> Ref. [2].

## References

- [1] Banks Iain M. A few notes on the culture, <http://www.futurehi.net/phlebas/text/cultnote.html>; 1994.
- [2] Banks Iain M. Interview for the site Salon, <http://www.salon.com/books/int/2005/02/17/banks/index.html>.
- [3] Banks Iain M. "Humanity's future is blister-free calluses!", Interview for CNN (2008), <http://edition.cnn.com/2008/TECH/space/05/15/iain.banks/index.html>.
- [4] Bookchin Murray. Post-scarcity anarchism. Montreal/Buffalo: Black Rose Books; 1986.
- [5] Bookchin Murray. Remaking Society, Pathways to a Green Future. Boston: South End Press; 1990.
- [6] Bostrom Nick. When machines outsmart humans. *Futures* September 2003;35(No. 7):759–64.
- [7] Brey Philip. Freedom and privacy in ambient intelligence. *Ethics and Information Technology* 2005;7(No. 3):157–66.
- [8] Brown Chris. 'Special circumstances': intervention by a liberal Utopia. *Millennium – Journal of International Studies* 2001;30(No. 3):625–33.
- [9] Callaghan Vic, Clarke Graham, Chin Jeannette. Some socio-technical aspects of intelligent buildings and pervasive computing research. *Intelligent Buildings International* 2009;1(No. 1):56–74.
- [10] Castells Manuel. The rise of the network society. The information age: economy, society, and culture. 2nd ed., vol. I. Malden: Wiley-Blackwell; 2010.
- [11] Chomsky Noam. The Relevance of Anarcho-syndicalism, interviewed by Peter Jay, *The Jay Interview*, July 25, 1976. URL: <http://agone.revues.org/index246.html> (Accessed on 11 March 2011).
- [12] Dahiyat Emad Abdel Rahim. Intelligent agents and contracts: is a conceptual rethink imperative? *Artificial Intelligence and Law* 2007;15(No. 4):375–90.
- [13] Dryzek John S. Deliberative democracy and beyond. Liberals, critics, contestations. Oxford: Oxford University Press; 2000.
- [14] Edwards Paul N. A vast machine. Computer models, climate data, and the politics of global warming. Cambridge: MIT Press; 2010.
- [15] Fogg BJ. Persuasive technology. Using computers to change what we think and do. San Francisco: Morgan Kaufmann; 2002.
- [16] Foucault Michel. Le souci de la vérité, in *Dits et écrits 1954–1988, Tome II (1976–1988)*. Paris: Quarto Gallimard; 1994.
- [17] Galloway Alexander R. Protocol. How control exists after decentralization. Cambridge: MIT Press; 2004.
- [18] Genette Gérard. Paratexts. Thresholds of interpretation. Cambridge: Cambridge University Press; 1997.
- [19] Gordon Uri. Anarchy alive! Anti-authoritarian politics from practice to theory. London: Pluto Press; 2008.
- [20] Gordon Uri. Anarchism and the politics of technology. *Working USA* September 2009;12(No. 3):489–503.
- [21] Jackson Patrick Thaddeus, Heilman James. Outside context problems: liberalism and the other in the work of Iain M. Banks. In: Hassler Donald M, Wilcox Clyde, editors. *New boundaries in political science fiction*. Columbia, University of South Carolina Press; 2008.
- [22] Joachim Christian, Plévert Laurence. Nanosciences. The invisible revolution. Singapore: World Scientific Publishing Company; 2009 [pp. 83–97].
- [23] Jones Steven E. Against technology. From the luddites to neo-luddism. New York: Routledge; 2006.
- [24] Joy Bill. Why the future doesn't need us. *Wired* April 2000;(8.04), <http://www.wired.com/wired/archive/8.04/joy.html>.
- [25] Kinder Katharina E, Ball Linden J, Busby Jerry S. Ubiquitous technologies, cultural logics and paternalism in industrial workplaces. *Poiesis and Praxis* 2007;5(No. 3–4):265–90.
- [26] Kropotkin Peter. Fields, factories and workshops. New Brunswick: Transaction Publishers; 1993.
- [27] Kropotkin Petr. The conquest of bread and other writings. Cambridge: Cambridge University Press; 1995.
- [28] Latour Bruno. Reassembling the social: an introduction to actor-network-theory. Oxford: Oxford University Press; 2007.
- [29] Michelfelder Diane P. Dirty hands, speculative minds, and smart machines. *Philosophy and Technology* 2011;24(No. 1):55–68.
- [30] Morris Brian. Bakunin. The philosophy of freedom. Montreal: Black Rose Books; 1993.
- [31] Müller Peter. Constructing climate knowledge with computer models. *Wiley Interdisciplinary Reviews: Climate Change* July/August 2010;1(No. 4):565–80.
- [32] Nissenbaum Helen. Accountability in a computerized society. *Science and Engineering Ethics* 1996;2(No. 1):25–42.
- [33] Palmer Christopher. Galactic empires and the contemporary extravaganza: Dan Simmons and Iain M. Banks. *Science Fiction Studies*, #77 March 1999;26(Part 1), <http://www.depauw.edu/sfs/backissues/77/palmer77.htm>.
- [34] Parson Sean. "At War With Civilization: Anti-civilizational anarchism and the newest social movements", Paper presented at the annual meeting of the WPSA Annual Meeting "Ideas, Interests and Institutions", Hyatt Regency Vancouver, BC Canada, Vancouver, March 19, 2009. [http://www.allacademic.com/meta/p317533\\_index.html](http://www.allacademic.com/meta/p317533_index.html).
- [35] Proudhon Pierre-Joseph. Les confessions d'un révolutionnaire pour servir à l'histoire de la Révolution de Février, 1849, <http://gallica.bnf.fr/ark:/12148/bpt6k5518220d/f8.image.r=proudhon.langFR>.
- [36] Roco Mihail C, Bainbridge William Sims (eds). *Converging technologies for improving human performance*. Nanotechnology, biotechnology, information technology and cognitive science, NSF/DOC-sponsored report, 2002, and Dordrecht: Kluwer Academic Publishers; 2003.
- [37] Roland Alex, Shiman Philip. Strategic computing, DARPA and the quest for machine intelligence, 1983–1993. Cambridge: MIT Press; 2002.
- [38] Rumpala Yannick. Ce que la science fiction pourrait apporter à la pensée politique. *Raisons politiques* 2010;4(No. 40):97–113.
- [39] Schummer Joachim. From nano-convergence to NBIC-convergence: 'the best way to predict the future is to create it'. In: Kaiser Mario, Kurath Monika, Maasen Sabine, Rehmann-Sutter Christoph, editors. *Governing Future Technologies. Nanotechnology and the Rise of an Assessment Regime*, vol. 27. Berlin-Heidelberg: Springer Sociology of the Sciences Yearbook; 2010. 57–71.
- [40] Skrbina David. Technological anarchism: reconsidering the unabomber, chromatikon V. Louvain-la-Neuve: Presses universitaires de Louvain; 2009. 191–202.
- [41] Spiekermann Sarah, Pallas Frank. Technology paternalism – wider implications of ubiquitous computing. *Poiesis & Praxis: International Journal of Technology Assessment and Ethics of Science* 2006; 4(No. 1):6–18.
- [42] Vengeon Frédéric. Philosophie de la machine. Un programme du Collège international de philosophie. *Revue de synthèse* 2009; 130(6e série, No. 1):177–80.
- [43] Vinge Vernor. The coming technological singularity. *Whole Earth Review*, Winter; 1993.
- [44] Wagner Dirk Nicolas. Software agents take the internet as a shortcut to enter society: a survey of new actors to study for social theory. *First Monday* July 2000;5(No. 7), [http://firstmonday.org/issues/issue5\\_7/wagner/index.html](http://firstmonday.org/issues/issue5_7/wagner/index.html).
- [45] White Damian F. Post-industrial possibilities and urban social ecologies: bookchin's legacy. *Capitalism Nature Socialism* March 2008;19(No. 1):67–81.
- [46] Yudkowsky Eliezer. Artificial intelligence as a positive and negative factor in global risk. In: Bostrom Nick, Cirković Milan M, editors. *Global catastrophic risks*. Oxford: Oxford University Press; 2008.
- [47] Zerzan John. *Twilight of the machines*. Los Angeles: Feral House; 2008.

**Yannick Rumpala** is Maître de conférences in Political Science at the University of Nice Sophia Antipolis, where he teaches public policy. He has written two books in French (*Régulation publique et environnement. Questions écologiques, réponses économiques*. Paris: L'Harmattan; 2003, and *Développement durable ou le gouvernement du changement total*. Lormont: Le Bord de l'eau; 2010) and articles on various aspects of environmental policies and sustainable development. In line with his exploration of the political potentialities of network thinking (see "Knowledge and praxis of networks as a political project," 21st Century Society, *Journal of the Academy of Social Sciences*, 4(3), November 2009), Yannick Rumpala is working on ways to rebuild alternative solutions outside market and state regulation.