

## Abstract :

Resisting to nanotechnology<sup>1</sup> :  
analyse<sup>2</sup> of the argumentations built around an emergent technology

### About this paper :

This paper is an abstract of my sociology masters' thesis, as such, there will certainly be shortcuts or gaps (although it would be presumptuous to claim that the thesis itself does not suffer from any lack). I hope that the necessary summarizing done here will not be detrimental to the overall meaning of the original work.

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### Introductory statement

« If the analysis of scientific controversies often remain confined in laboratories or specialists' communities, it is merely because the sociologists who study them cease to follow the protagonists as they leave the scientific field in itself. »

Michel Callon<sup>4</sup>

The above statement by sociologist Michel Callon reflects the main track followed along the thesis. In a few words, the leading idea can be put like this : science is not the private property of scientists. Other actors are involved, and their statements and acts must be taken in consideration if one intends to study science, especially when focusing on scientific controversies.

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- 1 The French title states Fr. plu. *nanotechnologies*, but we translated it with English sing. *nanotechnology*. In French literature, both singular and plural forms can be met, but we assume that the English singular form is more appropriate (not to mention the fact that most of the English-speaking documents consulted also used the singular form).
  - 2 The word "analyze" is used here in its global sense of "examine methodically" and should not be mistaken for its psychoanalytically connoted homonym.
  - 3 <http://creativecommons.org/licenses/by-nc-sa/2.0/be/>
  - 4 We translate. CALLON Michel, 1990, « Éléments pour une sociologie de la traduction. La domestication des coquilles Saint-Jacques et des marins-pêcheurs dans la baie de Saint-Brieuc », in *Année Sociologique*, 1986, n°36, pp. 169-208. (p. 172)

## Methodological notes and required specifications

### Methodology : sociological background

We decided to adopt the point of view of symmetrical sociology throughout the thesis. The principle of global symmetry implies that the sociologist must not support any of the involved actors in their process of legitimation<sup>5</sup>. The sociologist must treat information using his or her own repertoire and can not use those of the actors. Our repertoire is composed by three argumentative registers that are all used by the various actors. The work also focusses on the role of representation (as a mental state) of science, scientists, technology, etc., which led us to explore the philosophical concept of “vision of the world”<sup>6</sup>. This concept is sometimes mistaken and associated with a relativist stance often blamed for its inclination toward a politic of global justification. We did not intend to justify any of the opinion emitted by the actors, but rather to show them and put them in a sociological perspective by confronting the world visions using a single repertory.

### Introducing nanotechnology

The choice of nanotechnology is far from a naive one, but before developing this, a few things should be said for non-initiated readers. The task of explaining what is nanotechnology (or what are nanotechnologies, but the debate deserves more than we can allow here) fills ten pages of the thesis. For the sake of clarity, the simplification will be even greater here.

Etymologically, the prefix 'nano-' derives from the Greek 'nanos', literally 'dwarf'. Now that we know that this is a matter of size, let us find out which scale we are dealing with. In the metric system, a nanometer equals  $10^{-9}$  meter. As it can be hard to figure out how thin it is, the two following examples may be useful : the thickness of a human hair averages 10.000 nanometers ; a chain made out of the alignment of ten hydrogen atoms would be one nanometer long. Nanotechnology is about building devices at the atomic scale (i.e. between 1 and 100 nanometers). This definition is obviously restrictive and incomplete, but we assume that after a short development of what can be done<sup>7</sup> at that scale, the reader will be acquainted enough with nanotechnology to find his or her way through this short

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5 We translate. CHATEAURAYNAUD Francis & TORNÉY Didier, 1999, *Les sombres précurseurs. Une sociologie pragmatique de l'alerte et du risque*, Éditions de l'École des Hautes Études en Sciences Sociales, Paris. (p. 15)

6 From the German “*weltanschauung*”.

7 We should add : “what is expected”. As we shall see later, the notion of “prospective” is very important.

paper.

One will easily understand that those devices, due to their shortness, can (at least potentially) be added to everything. Stretch your arm and grab something : you're touching atoms. You did not reach anything ? Well the air your arm is waving into is also made out of atoms. If there are atoms, there could be nanotechnology as well. What for ? Habitually, nanotechnology is subdivided into three domains : nanoelectronic, nanomaterials and nanobiotechnology. It helps to increase computers' performances, to build structures with unique properties and is used in a growing number of medical procedures. A part of the work in the field of nanotechnology remains at a theoretical or experimental level, but a vast range of things<sup>8</sup> already benefits from "improvements" directly related to it. It's praised by some and cursed by others. Beside those (soon to come) real applications, it is frequent to find documents describing nanotechnology in a much more contested way, the main argument being that these contested theories are not established on rational and scientific basis<sup>9</sup>.

But the whole story was neither about blaming scientists for being close-minded nor was it about pointing at non-scientists' fantasies. What we chose instead was to show that science did not own the monopoly of rationality.

### "To resist"

The title of the thesis mentions "to resist". The definition we wrote to describe the concept of resistance is the following : "resistance" consists of any form of contestation, doubt, reticence directed toward a given technological project and purposefully set to interact in the process of development of the aforementioned project. The need to clarify the sense of resistance came from a prevalent though misleading conception of it : it is often mistaken for technophobia.

### Methodology : choosing the actors

Following a few criteria, we picked up two groups of actors that could fit with the definition of "resistance". They were both Internet based organisations and their opinions have been studied through documents' studies. The third actor chosen had in fact been created on

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8 From everyday products (such as sunglasses or personal computers) to more complex tools (medical or laboratory equipments for instance).

9 Things are not this simple in reality, see for instance the debate surrounding K. E. Drexler's researches on molecular factories.

purpose. We selected three scientists who worked in the field of nanotechnology : an astrophysicist and two chemists. We gathered them following a simple criterion : they had degrees in science and worked as scientists. The data were collected during head-to-head interviews.

### **Argumentative registers**

We shall now briefly expose the three registers we created to study the discourses of the actors.

#### Utopian register

The utopia imbeds two fundamental components : an ideal (unreachable by definition) and the efforts made by the actors to get as close as possible to this ideal. The arguments used by the actors tend to defend an ideal society, different from the one they are living in. In such arguments, we find references to a particular project, a set of opinions regarding the present but also regarding to where the world is going and what should be done to come nearer to the utopia.

#### Realist register

When comparing the terms “realist” and “utopian”, one might be tempted to think we are discrediting “utopian” by considering it as “fantasist”. That is incorrect. The two registers are opposing each other, but they both are rationally structured. Here, it is all about the domination of technical arguments and empirical facts to defend a vision of the world. The sets of thoughts corresponding to the realist register are most wanted because they are associated with the scientific rationality. Non-scientists value them because they legitimate their discourses and can not be pushed aside for the sake of being unserious science-fictionist mumbo-jumbo. It is important to notice that this register bypasses the merely technical form of argumentation : it is not only about the technical data but also about the way they are interpreted and the conclusions drawn.

#### Prophecy of evil's register

We borrowed here what has been theorised by French sociologists F. Chateauraynaud and D. Torny. In “The dark precursors, a pragmatic sociology of vigilance and risk”, they describe actors being on the lookout for danger (who they call “the alert throwers”) as

being in “an intermediate position between the frontier state of the technical sensor on one side, and the evil's prophet on the other. ... These prophets are having a visionary activity that seeks to convince the humanity of the incoming of an era of great troubles<sup>10</sup>. This register shares some similarities with the utopian register and suffers the same threat : some could attempt to evict the arguments belonging to the register on behalf of irrationality. Therefore, we considered exclusively the rationalist prophecies of evil which link the ineluctability of the phenomenon to a scientific and technical demonstration<sup>11</sup>.

### **Where it leads us...**

Along with the theoretical developments of the three registers, the thesis mentioned examples of arguments used by each group and fitting in every registers. To the contrary of what some might think, scientists were not the only one to use the realist register. And their speeches were far from free of arguments belonging to the two other registers. So was it for the two groups of “resisting” actors.

We came to the conclusion that the argumentations of the three groups had roots strongly anchored into the three registers. Each one of them builds its own vision of the world by combining and mixing arguments. If you espouse this point of view, you acknowledge that actors have good reasons to act their way. Admitting this is not the same as agreeing with one actor or the other, but it testifies of the plurality of rationality and of the theoretical equity of various forms of legitimacy. In the thesis, we intended to preserve the fluctuations of reality and to show the perpetual embedment of the statements upon nature and those upon society<sup>12</sup>. Also, we tried to demonstrate that science and, as a matter of fact, scientists are not neutral. They are dependent on a certain vision of the world. We did not endeavour to diminish or depreciate scientists or their work, but to the contrary to give them back their humanity and to recall that they belong to society. Consequently, when he or she is confronted with science, the lay citizen should remember that he or she is facing an equal. The choice belongs to him or her and it is fundamental that he or she sees defection as a conscious choice. A choice that does not necessarily lead to a happy end.

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10 We translate. (Chateauraynaud & Torny, 1999 : 36-37)

11 *Idem.* (p. 58)

12 We translate. (Callon, 1990 : 177)