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More is Less: Mental Avarice and Mass Information

1.1. The revolution of the cognitive market

The cognitive market is a metaphor that allows us to envisage the fictitious space through which cognitive products, such as hypotheses, beliefs, knowledge, etc., spread. It will be preferred to the *information market* metaphor, since a piece of information may as well be the address of a restaurant or someone's phone number, whereas the notion of cognitive product will imply, in the sense I will attribute to it here, the organizing of information into a discourse, whether explicit or implicit, on truth and/or on what is good. These cognitive products can be in competition with one another as are, for example, the literal description given by the Bible about the first appearance of man and animals on the Earth and their oldness, *with* the rival interpretation advanced by the theory of evolution. According to the biblical text, and specifically Genesis (1: 20-30 and 2: 7), animals and man were created by God, each species was created separately, the Earth was made in 6 days (Genesis 1: 1-31) and it should be 6,000 years old. Fossil finds, their dating, the interpretation that puts forward the theory of evolution and, generally, the progress of knowledge over the last two centuries have made the biblical vision of the world, predominant for hundreds of years, very impractical. It is possible to say that these two cognitive products are still in *competition* (especially in the United States).

The cognitive market may be very competitive but, on the contrary, it may also be oligopolistic, not to say monopolistic. The market liberalization depends on several criteria, the political one being the most evident. Totalitarian regimes always entail the supervision of the cognitive market, or

at least of some of its themes. Thus, it will be difficult to express Christian beliefs if the Talibans are in power. However, cognitive oligopolies may also exist within democracies, this time not because of political constraints, but because truth seems so evident that competing products are completely unsuccessful. So, the notion that the Earth is flat is not a very engaging product in contemporary society[1].

The Internet – I will often bring this up – is the appropriate tool for a deregulation of the cognitive market. Thus, the cognitive market belongs to a family of social phenomena (which also includes the economic market), where individual interactions converge, more or less unquestionably, toward relatively steady forms of social life. The word *market* is not, it goes without saying, neutral. It has a long history that a few trace back to Aristotle [DEF 95], whereas many associate its origins with Smith or Turgot. My aim is not to apply this term to the universe of human cognition by seeking "word-for-word" applications for those realities that are common on the economic market. On the contrary, I had the opportunity to show some of the limits of this metaphor [BRO 03], but the fact remains that its descriptive qualities are very helpful for defining the phenomena at stake here.

We can say that the first appearance of language in human history is the *sine qua non* of the subsistence of a cognitive market. As for writing, since it hinders the semantic volatility of every conversation, it has been a fundamental stage in preparation for this revolution of cognitive supply, which characterizes 21st Century democracies. However, the beginning of a kind of cognitive supply intended for a gradually increasing public can be traced back[2] to the 15th Century, when typography and printing became operational, and to the 17th Century, when the first important periodicals appeared. On this account, Luther's will to translate the New Testament into a vernacular language (and not into Latin) in 1524 favors the access for most people to a source of information deemed fundamental at the time. If such bibles existed before, they were manuscripts and consequently unaffordable, besides being condemned by the Vatican.

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1 But, it is nonetheless "put forward" since the members of the Flat Earth Society claim that our planet is disk-shaped, with the North Pole as its center and Antarctica as its circumference. And since no one would ever cross Antarctica, no one would ever fall off the disk. See http://www.lepcf.org/wiki.

2 All of what follows draws from [ALB 03, CAR 10, FLI 10] and [POU 11].

Nonetheless, the development of printing in the 17th and 18th Centuries occured under the yoke of censorship, which provoked people's mistrust and perpetuated the appeal of the manuscripts circulating from town to town and that of precious books, less liable to be controlled by political and religious powers. The following centuries were marked by the progressive liberalization of supply, first in England and then in France at the time of the Declaration of the Rights of Man in 1789, which proclaims that "the free communication of thoughts and opinions is one of the most precious rights Man has; every citizen can talk, write, and print freely". Censorship is an ever-recurring phenomenon in the history of the diffusion of information and ideas, but it will soon be outflanked by technical innovations (cylindrical press, rotary printing press, linotype, etc.) which will bring down the price. It will also shrink down due to the democratic injunctions that pepper the 20th Century.

The 19th Century is marked by the first sharp increase in the circulation of information, supported by a now overabundant supply of periodicals. Simultaneously, people's growing literacy ensured favorable conditions for the appearance of a demand that grow global and automatically boosted the strength of supply.

The 20th Century was evidently a turning point in the history of this revolution of supply. From this point of view, 1898 is a significant date since it is when, for the first time, a piece of information was transmitted independently from corded technology. On November 5 of that year, Eugène Ducretet transmited a message in Morse code from the Eiffel Tower to the Pantheon. Cognitive supply took a crucial step: it cut loose from the spatial and temporal constraints that burdened it. It was from the Eiffel Tower itself that the first program was broadcast in France. We had to wait until 1921, but this message, rather than being transmitted in Morse code, was broadcast in a language everyone could hear, which lasted half an hour and included a press review, a weather report and a piece of music. At this moment in time, demand was technically limited insofar as few people owned radio sets, but soon a number of households were equipped and this demand increased massively, whereas the supply remained feeble (in England, for example, the BBC was in a position of monopoly until 1955). 1926 saw the first appearance of the technology that would radically change over the course of the 20th Century the history of cognitive supply: the television. However, we had to wait until 1930 for the marketing of the first popular television set (the first regular TV program was offered from 1935 onward) and many more years before every household had one.

In France, despite the 1923 bill (which forced those who owned radio sets to declare it officially), the existence of private radio was tolerated, but World War II ended this liberal approach and re-established, from 1945, a strict State monopoly of French radio broadcasting and, naturally, television. The first use of FM broadcasting, which allowed us to technically augment supply, in 1954 would later occasion a shift in policy of the State monopoly.

In the meantime, in 1961, MIT student Leonard Kleinrock, with Joseph Licklider's contribution, laid the theoretical foundations of what would later become the Internet. This was the epilogue of the Arpanet project, conceived in 1968, that advanced a system of networked dissemination of information that could get round the damage provoked by a nuclear attack. Soon afterward, this network started developing more in US West Coast universities than in military bases, especially over the following year, linking Columbia, Stanford, the University of Utah and the University of California to a network allowing a data sharing speed of up to 50 kbits/s.

Simultaneously, and progressively, cognitive supply developed, and, in France for example, in 1972 the third television channel was created. It is true that only a quarter of French people could receive it, but this represented another step toward the introduction of supply competition. We still had an illiberal system of State monopoly but the dismantling of the *office de radiodiffusion-télévision française* (ORTF) in 1975 announced the end of this era. In this audiovisual panorama, the creation of CNN, the first television channel without interruption, by Ted Turner, was a significant step. A year later, France took a crucial step toward the deregulation of the cognitive market by authorizing public radio. Supply became cacophonic, but Darwinian selection shows year after year the nature of the demand that defines the radio landscape as we know it today. This point is important since the audience of the time, which regulated demand, was confronted with a really wide range of offers and the aggregation of this supply has shaped the nature of the radio market. No one who experienced this age could say that the audience was conditioned to ask for mediocrity rather than for challenging products. The evolution itself of these radio stations, such as NRJ and Fun Radio, says a great deal about the kinds of adjustments made by the supply to meet the demand.

In 1986, the French television market opened to private supply with Silvio Berlusconi's *La 5*. Soon, it became really competitive with the privatization of *TF1* in 1987 and the appearance of M6. The former became the first French general-interest channel, whereas the latter, on some evenings, objected to its title. In the meantime, in the United States, *the Well*

(Whole Earth 'Lectronic Link), which represents the prototype of all those forums of virtual discussion we are so familiar with nowadays, was founded in 1985. Some years later, in 1989, Tim Berners-Lee's work started outlining the "Web", as it became known. In the United States, the Internet enterprise started taking the shape of something with the potential to affect the general public in the 1990s, with the appearance of the first browsers and search engines. Netscape, for example, first got listed on the stock market in 1995. We know what happened afterward, in 1995 there were 23,500 Websites, more than 205 million were listed in 2010. Like radio or television, the Internet quickly conquered households all over the world in developed or emerging countries, creating demand in the same way literacy had formerly been an important condition for the development of the cognitive market. The Internet represents a double revolution, as Cardon writes [CAR 10, p.11]: "On the one hand, the right to speak publicly is extended to the whole of society; on the other, a part of private conversation is incorporated into public space".

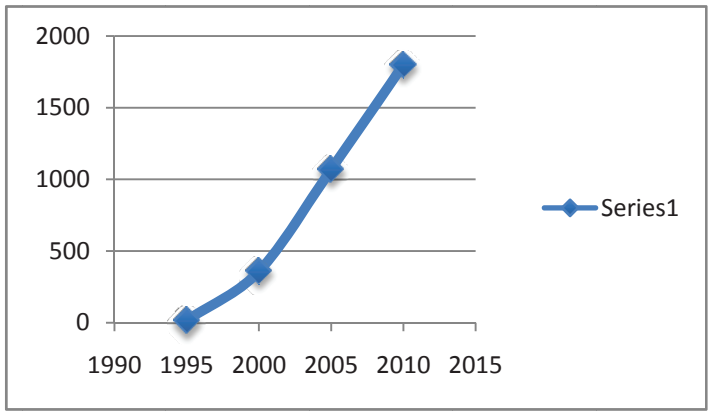

Figure 1.1. *Number of Internet users (in millions) across the globe*

What makes the Internet possible is thus a revolution of cognitive supply. In France, the July 29th, 1881 bill on freedom of the press allowed professionals to have a monopoly of the diffusion of public information. They operated a selection between the flux of information that could be diffused and the one that had to, according to depreciation standards everyone could understand. This filter no longer exists and the opportunity to provide supply on the cognitive market has been radically democratized. Millions of people manage a blog and more than 2 billion of them are on

social networks. For example, Indymedia, proposing a summary of this Web potential, has adopted the slogan: "Do not hate the media, become the media!" This Website is in fact pivoted around the principle of "open publishing". Gradually, on the Internet, the idea of an *a posteriori* form of editorial control has established itself, as can be found on Wikipedia, OhmyNews or Agoravox, contrary to the standard *a priori* control that had up to then prevailed in the traditional media. Before this supply revolution, which concretized the Internet, access to the public space was very strict and socially discriminating but, as we will see, the door has opened so wide that the usual rules of sensible debate are sometimes carried away with the stream. Simultaneously, as stated by Poulet [POU 11, p. 23, p. 50], this supply revolution goes hand-in-hand with a decline in the number of traditional formats for the dissemination of information: in the United States, we find, in 2008, no more than 53 million newspaper buyers, whereas there were 62 million in 1970 and, he explains, "if we take into account the population increase, that represents a 74% drop". The situation is identical in France – and a bit everywhere – and for that matter big general-interest radio stations and even the main TV channels see tens of thousands of viewers walking away from their screen every year. We may argue that this change in the format of dissemination and reception of information is not really important, were it not that this transformation also affects the nature of distributed information. Poulet sensibly shows that this global movement is automatically accompanied by the impoverishment of the quality of information.

It is then the simultaneity of political and technical conditions that has made this revolution of the cognitive marked possible. Its many consequences only started being gauged recently: price drop in information distribution and acquisition, mass supply, increase in competition between distributors of information, etc.

1.2. Amplification of the confirmation bias

The cognitive market of contemporary Western societies is globally liberal to the extent that, with few exceptions (for example, the interdiction of Holocaust denial), products are not subjected to state tax or prohibition. This cognitive liberalism is an integral part of the constitution of democracies itself, and we saw that in 1789 it had been regarded as a fundamental Human right. This cognitive liberalism is authorized by political decisions and made possible by technological advances. From this point of view, the Internet is its emblematic manifestation. This political and technological liberalization

of the cognitive market inevitably leads to mass-distributed information. Thus, some research [AUT 02] has claimed that the amount of worldwide information produced *over 5 years* at the end of the 20th and at the beginning of the 21st Century was quantitatively superior to *the entirety of the information printed since Gutenberg*. Let us remember that in 2005, humankind produced 150 exabits of data, a number that goes up to 1,200 in 2010. In brief, a large amount of information is disseminated and in such proportions that it is already a major turning point in human history. But basically, what difference does all of that make? There is more and more information available. All the better for democracy and all the better for knowledge, which will of course end up forcing itself on everybody's mind.

This perspective seems too optimistic to me. It presupposes that, in this open competition between beliefs and systematic knowledge, the latter will necessarily gain the upper hand. Now, faced with this overabundant market supply, a person may easily be tempted to form an opinion of the world that tends to be more mentally handy than truthful. In other words, the plurality of offers available to this person will allow him or her to easily avoid the mental discomfort often generated by the products of knowledge. This discomfort may be the consequence of many things.

On the one hand, these products are often more complex than their competitors and, in order to be completely and properly understood, they need technical and theoretical competences that are often beyond the scope of common sense, even in their popularized forms. Many get discouraged in advance when faced with a scientific utterance and eventually only agree to listen to its conclusions to better and more rapidly forget about them and to accept more accessible interpretations of these phenomena. Consequently, certain unscientific or pseudoscientific explanations seem more convincing since, besides being themselves well argued, they are inspired by a kind of logic that can be grasped at once by the interlocutor.

On the other hand, the products of knowledge may easily arouse a form of disenchantment since the models they offer for understanding the world are based on mechanisms rather than magic tricks or transcendental wills whose existence could assure us that the universe makes sense.

Simultaneously, the products of belief pander to the natural inclinations of our mind. The revolution of the cognitive market therefore organizes a wildly competitive space. This competition, besides being ruthless, is quite unfair.

I have just mentioned such terms as "mental easiness", mind inclinations... how are we supposed to interpret them? The explosion of supply facilitates the *pluralist* presence of cognitive offers on the market and their greater *accessibility*. Nowadays, everyone can easily subscribe to a representation of the world drawing some of its elements from Christianity, some others from Buddhism and some others again from conspiracy theories, all the while believing that our health is governed by waves and claiming, however, to somehow be a rational being. The least noticeable consequence, and yet the more determining for this state of affairs, is that all these conditions are gathered together allowing the *confirmation bias* to show its potential to lead us away from the truth. Out of all the inferential temptations that trouble ordinary logic, the confirmation bias is undoubtedly the most influential for the perpetuation of beliefs. It is described as early as aphorism 46 of Bacon's *Novum Organum*:

> "The human understanding when it has once adopted an opinion (either as being the received opinion or as being agreeable to itself) draws all things else to support and agree with it. And though there be a greater number and weight of instances to be found on the other side, yet these it either neglects and despises, or else by some distinction sets aside and rejects; in order that by this great and pernicious predetermination the authority of its former conclusions may remain inviolate. And therefore it was a good answer that was made by one who when they showed him hanging in a temple a picture of those who had paid their vows as having escaped shipwreck, and would have him say whether he did not now acknowledge the power of the gods, – "Aye," asked he again, "but where are they painted that were drowned after their vows?" And such is the way of all superstition, whether in astrology, dreams, omens, divine judgments, or the like; wherein men, having a delight in such vanities, mark the events where they are fulfilled, but where they fail, though this happen much oftener, neglect and pass them by."

The confirmation bias allows us to consolidate every sort of belief, even the most insignificant ones, like our superstitious fixations which can only be instilled into us because we make efforts to remember *only* the lucky incidents favored by one ritual or another, as the most remarkable. It is the confirmation bias which allowed an unpleasant case to develop in Seattle in the middle of the last century.

1.3. The Seattle affair

Around the end of the 1950s, a collective psychosis took over Seattle. In restaurants, on the street, at their workplace, etc., people only talked about one strange incident: a number of windshields were found to be pockmarked by little cracks. As the news spread around the city, everyone wanted to verify the condition of his or her car. The rumor grew bigger and soon became a point of concern on everyone's lips. Why had car windshields become like that?

This mystery momentarily drew the attention of public opinion and became such a big issue that President Eisenhower, at the state governor's request, saw fit to mobilize a team of experts in order to shed light on it. These investigators first realized that two competing convictions clashed with each other. According to the first theory, called "the fallout", people were dealing with the consequences of Soviet nuclear tests, which had polluted the atmosphere. The fallout resulting from this contamination, by means of a drizzle that was corrosive on glass, created this epidemic of cracked windshields.

The second theory, named "the asphalt", indicted the redevelopment of road networks issued by Governor Rosollini. This highway plan was thought to create a frequent spatter of acid drops generated by the new road surface, favored by the humid weather typical of Puget Sound.

The investigators, undoubtedly because they were not steeped in this atmosphere of belief, found these two explanations dubious. As a methodical way of thinking should work in such circumstances, they first tried to verify the facts. Was it really true that all windshields had been damaged? Then, they examined those cars carefully and actually noticed the presence of microfissures on the windshields, but they also realized that these little cracks were barely visible to the naked eye. What about the windshields in neighboring towns? By asking this simple question, they showed they were capable of freeing themselves from the confirmation bias. It was enough to drive some 10 km to test this conviction, which had spread around Seattle, but this time through *contradiction*: if something strange was really happening in this city, then cars in neighboring towns should not present similar features. They discovered that, simply enough, the cars of the other towns they went to showed the same symptoms as those in Seattle.

In fact, as the rumor started to spread around the city, its residents began doing what they evidently did not normally do: they started very closely

examining the windshield of their cars, and thus could see that sometimes it was actually streaked with little crevices. However, as experts declared, this was nothing more than the natural, and generally unnoticed, consequence of the wear and tear of their car. Watzlawick [WAT 78, p. 81] was then right to remark about this case that: "What Seattle experienced was not an epidemic of pockmarked windshields, but an outbreak of examined ones".

If those living in Seattle, rather than verifying whether their windshield was actually pockmarked, thus *confirming* the belief, could have observed the windshields of the cars in neighboring towns, they would have realized that this conviction was *invalid*.

1.3.1. *The Wason experiment*

As was suggested by Bacon's remarks and illustrated by the Seattle affair, the approach of belief refutation is quite unintuitive for the ordinary man's mind. It is something that can be tested experimentally, as Wason did in 1966. The British psychologist introduced a four-card, ostensibly quite simple, game to some volunteers.

After the explanation that it is possible to find two letters on the front, **E** or **K** and, similarly, two figures on the back, **4** or **7**, this question is asked: "Which cards need to be turned over to verify the following statement: *if a card has a vowel on one side, it has an even number on the other*?"

The solution consists of turning over cards **1** and **4**, but the vast majority choose cards **1** and **3**. By doing this, we focus on the cases that *confirm* the rule, rather than on those that *contradict* it. It seems natural to think that *card* **3** confirms the rule set by the statement of the problem, which is the case if we find a vowel when we examine its back. However, we could find a consonant on it without this rule being broken. The only card (apart from the first card) able to establish its validity is the fourth card, since if it had a vowel on its back it would be evident that the statement is false.

This mental process offers a simple, yet significant, was of understanding the longevity of beliefs. We often notice facts which are not incompatible with a dubious statement, but this demonstration is of no value if we do not take into account the proportion, or even the existence, of those other facts that contradict it.

If this hankering for verification is not the expression of objective rationality, this somehow also makes life easier for us. Thus, the process of contradiction is undoubtedly more effective if our aim is to look for the truth, since it diminishes the probability of mistaking something false for true. However, it also requires a time commitment [FRI 93] that may, in the worst-case scenario, be deemed absurd, since it is then merely a matter of making a *satisfactory* decision. Drozda-Senkowska [DRO 97, p. 109] writes quite aptly about this: "Think about the multitude of decisions we take every moment. If we followed, for the most important ones, the contradiction approach what would happen? We would be permanently doubting and questioning everything. We would never take action".

Stoczkowski [STO 99] also humorously remarks that resorting to irreproachable reasoning procedures can be dangerous for our health. To rigorously test the notion that fire burns, should we not, he asks, make sure that it actually burns every part of our body? Maybe you have already burnt your hand by moving too close to the fireplace, which proves that fire can burn your hand, but have you already done the same with your foot? A contradiction approach would not accept to agree with the assumption that fire burns our body unless it could resort to a kind of method that common sense may legitimately regard as stupid and dangerous. Moreover, common sense is also supported on this point by Stoczkowski [STO 99 p. 393], who thinks it is obvious that sometimes "it is sensible not to be too rational, since there are circumstances where *efficient rationality* strangely resembles paranoia".

Fundamentally, social players accept certain objectively doubtful explanations because of their apparent *pertinence*, in the meaning Sperber and Wilson [SPE 89] gave to this term. In a situation of competition, they explain, we will opt for the proposition that produces the greatest cognitive effect with the least mental effort. The objectively right solution, when it exists, is often the most satisfactory as we experience when we find out the solution to a logical problem, but people do not always have enough imagination and motivation to conceive it and often surrender to what Fiske

and Taylor [FIS 84] call our "cognitive avarice[3]". This often leads us to support doubtful, yet relatively convincing, beliefs since, when it comes to a number of subjects, we do not have enough motivation to become informed people. The fact is that if methodical knowledge often produces a cognitive effect superior to that of merely "satisfactory" propositions, i.e. beliefs, it also involves greater commitment. The probability of endorsing the former relies on how easily we find the latter.

About our mental avarice

To illustrate this idea, I suggest that you try to solve a little entertaining problem known in the published literature as the "*THOG Problem*" [WAS 77]. Here are the rules: we suppose that the experimenter has chosen two features that allow an object to be a "THOG": shape and color. There are only two possible shapes (heart and diamond) and two possible colors (black and gray). In order to be "THOG", an object only needs to possess *one* of the characteristics chosen by the experimenter (either color or shape), being a "not-THOG" when it has both or neither. We do not know what the experimenter's choice is, but we know that a black diamond is a "THOG". Consequently, are the black heart, the gray diamond and the gray heart "THOGS" or "not-THOGS"? It is possible to give three answers: such a figure is a thingie, it is not a thingie or it is impossible to determine whether it is one or not. This problem is summarized in the following table.

THOG	*?*	*?*	*?*

Three kinds of reasoning can be observed experimentally [ERI 83, EIR 89, O'BR 90]. The most common way of thinking is as follows: since the black diamond is a "THOG", the experimenter must have chosen either the diamond shape or the color black. Consequently, the gray heart, which possesses neither of these features, cannot be a "THOG". Similarly, the black

3 I showed experimentally [BRO 06, BRO 07a, BRO 07b] that, when faced with problems with an objective solution, people tend to regard this solution as superior to the others … provided that they find it out, which does not happen too often.

heart and the gray diamond, which present one of these characteristics, are "THOGS". Thus, we obtain this result:

♦	♥	♦	♥
THOG	THOG	THOG	Non-THOG

Another kind of reasoning can be supported: the gray heart, which possesses neither of the characteristics that the black diamond does, cannot be a "THOG", but it is possible to deduce from the statement that the black heart and the gray diamond are. In fact, we do not know which characteristic was chosen by the experimenter. Now, if the color black was chosen, then the black heart is a "THOG", whereas the gray diamond is not. Reciprocally, if the diamond shape was chosen, then the gray diamond is a "THOG", whereas the black heart is not. Thus, we cannot find out whether the black heart and the gray diamond are "THOGS" or "not-THOGS", and we obtain the following result:

♦	♥	♦	♥
THOG	Insoluble	Insoluble	Non-THOG

These two lines of reasoning are chosen by most people due to their satisfactory appearance. They offer a solution to the question with a reasonable amount of mental commitment. They reveal our mental avarice *and* are completely false.

The only valid type of reasoning is the one chosen on average by only 10% of respondents. It is slightly beyond the scope of intuition and involves thus a greater commitment than other more immediate solutions. It can be formalized as such: since we know that the black diamond is a "THOG", we can deduce that the experimenter has chosen either the color black or the diamond shape as the "THOG" feature, but not both (since then the black diamond would not be a "THOG"). Hence, we can deduce that the gray heart is a "THOG". The black diamond is a "THOG" either because of its color, and consequently the second "THOG" characteristic must be the heart shape,

or because of its shape, and the second "THOG" feature must then be the color gray. In either case, the gray heart corresponds to the definition of "THOG". However, neither the black heart nor the gray diamond can be "THOGs". In fact, if the "THOG" feature is the color black, its shape will have to be the heart. Consequently, the black heart will possess both features and the gray diamond neither. In either case, they are "not-THOGS". Reciprocally, if the "THOG" shape is the diamond, then its color will have to be gray. The black heart then does not present either of the "THOG" features, whereas the gray diamond possesses both. Consequently, the solution to the problem is as follows:

♦	♥	♦	♥
THOG	Non-THOG	Non-THOG	THOG

The solution to the problem formulated here is quite surprising and counterintuitive, but once we have discovered it, we *know* it is the right solution. The problem is that 90% of respondents to the experiment got misled by false solutions before reaching this conclusion. Their disorientation arises from the fact that their reasoning provides a solution to the problem (which is a strong incentive to stop thinking) and its erroneous nature is not immediately obvious. A great part of the problem derives from this very simple aspect of our mind's workings.

1.4. The theorem of information credulity

Since beliefs often propose solutions that suit our minds' natural inclinations, and since they rely on the confirmation bias, they will produce a cognitive effect beneficial to the mental effort involved. As Ross *et al.* [ROS 75] and Ross and Lepper [ROS 80] show, people, after accepting an idea, will persevere with their conviction. Their persistence will be all the more trouble-free since the increase in unselective dissemination of information has made it likelier for them to find "data" confirming their belief. I do not agree at all with the idea that the Internet biologically rewires our brain, as essayist Nicholas Carr affirms [CAR 08]. However, the fact that a mind looking for information on the Internet has to rely partially on the way a search engine organizes it seems acceptable to me. What the Web reveals is not a new way of thinking but, quite the opposite, one that is very old.

Does anyone trust in the efficacy of homeopathy? This person will find, due to any search engine on the Internet, hundreds of pages which allow him

or her to strengthen his or her belief. We all know that, depending on our political orientation, we will tend to read a certain kind of newspaper more than others. It is easy to set the impression that we are wasting our time when we consult information sources that do not suit the way we see the world. Some social psychology research proves this fact. A study[4] carried out in 2006 and focused on the readers of political blogs unsurprisingly showed that 94% of the 23,000 respondents only read blogs that correspond to their leanings. Similarly, on Amazon, books on politics are bought more and more according to the buyers' political preferences. It is a fact as old as Man himself and the confirmation bias, and, taking into account the revolution of the cognitive market, it makes it possible to formulate the *theorem of information credulity*. This is based on the fact that the mechanisms of selective search for information are facilitated by the mass features that information now possesses. All of this helps to ensure the stability of the belief empire. This theorem can then be enunciated in its most simplified form as such[5].

The greater the amount of non-selected information within a social space, the more credulity will spread.

"Personally, to make sure, I check on the Internet"

On December 8th, 2011, I agreed to appear on a radio program that aired on Sud Radio, called "*Inquiry and investigation*", about conspiracy theories. The backdrop of this program was yet another development of the Dominique Strauss-Kahn affair. An American journalist, Edward Jay Epstein, claimed he could provide new elements, suggesting that the former managing director of the IMF might have been the victim of a conspiracy. To tell the truth, the conversation was less concerned with this matter than with the question of conspiracy in general. As it often happens, my participation in this kind of program resulted in a torrent of criticism.

"Gerald Bronner is exactly like one of those collaborators who want to deprive people of all of their judgments" is only one of the many criticisms found on a forum. However, this is not what struck me. One of my interlocutors, a fellow guest called Thomas, was quite in favor of a conspiracy-related view of reality and, in order to prove the solidity of his approach, he declared: "Personally, I verify every bit of information I come

4 http://www.themonkeycage.org/blogpaper.pdf.

5 Naturally, this theorem does not imply its converse.

across: when I hear "attack in Egypt" or elsewhere, I look it up on the Internet together with the word "conspiracy".

Thinking, of course, that he was expressing the impartiality of his point of view, Thomas provided unawares a perfect illustration of how the Internet could help the confirmation bias. Thomas, confident that he is employing an objective method to get his bearings in the information maze of the cognitive market, is unknowingly inoculating himself with a mental poison. I do not think that my arguments convinced him back then. However, today, it would be quite easy for him to become the subject of a little experiment and subsequently realize that I was right. Let us consider some current events important enough to have been commented about: the earthquake that hit Haiti in 2010 and Lady Diana's death. Let us suppose that Thomas employs his infallible method in order to "verify every piece of information". These are the results he would obtain:

	Lady Diana	Haiti earthquake
Without the word "conspiracy"	2	0
With the word "conspiracy"	20	15

Table 1.1. *Number of websites dedicated to conspiracy theories out of the first 30 results given by Google*

As regards the Diana affair, Thomas will have a 67% chance of being faced with conspiracy theories if he organizes his search around the terms "Diana" and "conspiracy". If he only looks up "Diana", his chance will be only 7%. As for the earthquake in Haiti, he has a 50% chance of finding conspiracy-related Websites, which drops to 0% if he deletes the word "conspiracy". This may seem obvious, but the fact remains that once Thomas had made this public claim he seemed to be confident he was displaying a form of intellectual rigor. He was doing nothing more than showing how much common sense may be deceived by the force of the confirmation bias. The cognitive market has become a sort of potluck dinner where we find as

much as we bring; the fact is that the nature itself of Thomas's question was bound to lead him to what he wanted to find. At this stage, we may suppose that Thomas also ignored the existence of something else that further strengthens the expression of this confirmation bias once we resort to Google to get informed: *filter bubbles*.

1.5. Filter bubbles

Let us suppose that two different people, regular Internet users with dissimilar political, environmental and moral leanings, are looking up a piece of information on Google. They are not trying to find the address of the closest pizzeria, but data on death penalty, the financial crisis or the Arab revolutions. Are they going to be offered the same thing, and in the same order, by their search engine? No, if Eli Parisier [PAR 11] is right. Our searches on the Internet, especially if we use Google, are restricted by filter bubbles, which give us the information we asked for on the basis of 57 criteria, among which one our browsing history, our location, the kind of computer we own, our language, etc. This undoubtedly arises from the will to improve the performance of our searches: if someone living in Italy wishes to buy a piece of furniture, he or she will benefit from the fact the search engine will suggest shops located in Italy rather than Peru. However, this may become quite problematic if we want to steer clear of information that is already in line with our convictions, i.e. if we want to avoid being victim of the confirmation bias. If the search engine tends to display Websites according to an order that, we suppose, suits our inclination as consumer and citizen, then it is not only advertising banners that tend to confine us to a form of electronic expression of ourselves, but also, to an extent, information as it is shown on the first pages of Google.

Apart from Google, it seems that the organization of information on the Internet is resorting more and more to filter bubbles. So the *Washington Post*, owner of Slate.com, makes the use of Trove and *The New York Times* of News.me, two search engines that keep track of users' preferences to orient them toward information supposed to be of primary interest. Similarly, a piece of software called Findory allows the user himself/herself to program his or her preferred topics and subjects, but it reprograms itself if it appears that the user does not ultimately follow his or her own directions. We could multiply these examples by recalling, in particular, applications such as Flipboard and Zite, which can generate tablet-friendly magazines based on the users' social-networking feeds (Facebook and Twitter). Thus, people have a personalized mini-magazine. It is yet another aspect of the way

technological progress sharpens an ancestral disposition of the human mind. This technological extension of our mental disposition can turn out to be quite useful for acts of day-to-day consumption or, indeed, if we prefer to be offered sports articles rather than pieces on social security management during our daily 30-minute commute. But, it may also be possible that it strengthens our comfortably preconceived, and not always truthful, ideas about the world.

Maybe the danger posed by filter bubbles is not as troubling, if we believe the "second inquiry" undertaken by Jacob Weisberg[6] on this matter. Do we find totally different things when we look up information, with the same keywords, on Google? Weisberg asked several people, whose leanings were quite dissimilar (someone working on Wall Street, a moderate democrat who manages a small to medium-sized business, a liberal and former programmer of the Slate Website, a transport worker with strong leftist tendencies, etc.), to use Google for keywords liable to be subjected to ideological fragmentation. It so happens that, with the support of screenshots, Weisberg did not find any significant difference between the results shown by the search engine. For Weisberg, Pariser's denunciation is mainly extremist and his fears unjustified[7]. When he took the initiative of questioning Google on this matter, he was told: "Actually we have algorithms that are specifically created to limit personalization and to promote variety on the results pages". Similarly, Jonathan Zittrain, law and informatics professor at Harvard, explains: "My experience makes me think that the effects of search personalization are minor". I have to say that the numerous experiences that I have conducted with my students about the relationship between beliefs and the Internet have led me to be less alarmist than Pariser on this point, but I will return to this. The phenomenon of filter bubbles does exist and provides further assistance to the expression of the confirmation bias on the modern cognitive market, but it is undoubtedly marginal for the time being. There are several much more important things than these filter bubbles concerning what controls the organization of the presentation of information on the Internet, as we will see now.

6 http://www.slate.fr/story/39977/web-bulle-personnalisation-google.

7 Pariser was the manager of the liberal activist group Moveon.org.